The Action Plan for

Australian Butterflies

By D.P.A. Sands and T.R. New

The Action Plan for

Australian Butterflies

By

D.P.A. Sands[1] and T.R. New[2]

1 CSIRO Entomology, 120 Meiers Road, Indooroopilly, Queensland 4068

2 Department of Zoology, La Trobe University, Bundoora, Victoria 3083

Citation:
Sands, D.P.A. and New, T.R. (2002) The Action Plan for Australian Butterflies, Environment Australia, Canberra

The Action Plan for Australian Butterflies 2002.

By D.P.A. Sands and T.R.New

Published by Environment Australia

ISBN 0642548498

Published October 2002

Photographs by Don Sands, CSIRO Entomology
Layout and Design by Di Walker Design, Canberra.

Contents

Summary

The Australian butterflies (comprising a total 654 specific and subspecific taxa) are evaluated for conservation need, and the conservation status of all taxa previously claimed to be of significance is reviewed. Synopses are given for 220 taxa, identifying threatening processes and threatened ecological communities for all species and subspecies deemed to be threatened. Recovery outlines are presented for all taxa for which conservation action is needed. A ‘master list’ of all Australian butterflies summarises the history of conservation concerns for each, including species from outlying Australian islands. The taxonomic arrangement adopted for subspecies is that by Common and Waterhouse (1981).

One hundred and five taxa are listed as of conservation interest in Australia in Appendices 1 and 2. Twenty-six (Hesperiidae 8, Nymphalidae 5, Lycaenidae 13) are ‘threatened’ (Critically Endangered, Endangered, Vulnerable) at National or state level; 86 taxa (Hesperiidae 24, Papilionidae 3, Pieridae 2, Nymphalidae 18, Lycaenidae 39) are Lower Risk, Data Deficient or threatened at ‘municipal’ level.

Seven taxa (Hesperiidae 2, Nymphalidae 1, Lycaenidae 4) appear on both these lists, reflecting different assessments at National and state levels. The largest single category Nationally, is Data Deficient (43 taxa), reflecting the difficulties of assessing threats to taxa known from few individuals and, in some cases of uncertain residential status and from single localities. In this Action Plan it was not possible to address the conservation significance of some taxa recently described, including *Candalides hyacinthus gilesi* Williams and Bollam (Williams and Bollam 2001), *Ogyris otanes sublustris* Williams and Hay and *Ogyris otanes arcana* Williams and Hay (Williams and Hay 2001).

Background information is given on the development of butterfly conservation. The difficulties of applying the IUCN (1994) criteria to butterflies (because of lack of quantitative data on population fluctuations and structures) are discussed and an alternative workable system is proposed. Note that the categories, although following IUCN names for ranking, differ substantially in definition from conventional IUCN categorisation, as discussed in the text. The ‘listing’ process for taxa is recognised as a provisional step — requiring regular revision to add or remove species considered to be threatened, as new information or recovery actions affect the determined status. The problems with listing taxa are discussed in terms of ‘prohibition of take’, and the importance of listing being a prelude to de-listing taxa as ‘rehabilitated’ (taxa that have responded adequately to recovery actions) is emphasised.

A major need in promoting butterfly conservation is to foster effective cooperation between lepidopterists as the major contributors to original knowledge of butterfly biology and distribution, and the conservation agencies. This necessitates the establishment of more effective communication between these parties; a code of conduct is proposed for discussion to facilitate this important step. The Butterfly Action Plan differs from some others by relying very substantially on information obtained by non-professional entomologists having first-hand experience with the taxa, and it recognises that the efforts, goodwill and interest of these people are integral to pursuing the conservation of butterflies in the future.

Acknowledgements

We thank Environment Australia for funding the preparation of this Butterfly Action Plan through the Endangered Species Program, and successive officers, particularly John Vranjic in charge of the project, Gerry Maynes, and Cathy Coote, for their patience in awaiting completion of what has proved to be a much more complex and time-consuming task than we had anticipated.

This Action Plan could not have been constructed with credibility without the consideration and cooperation of a large number of Australia's most informed and experienced lepidopterists. Many of these people have dedicated years of their leisure time to collecting, studying and documenting the Australian butterfly fauna, and their knowledge has formed the foundation of status appraisals and conservation concern for all taxa. Many enthusiasts participated in workshops held in conjunction with developing this Action Plan. We hope we have not misrepresented their views, or abused their trust in producing the final document. Several people were consulted repeatedly for information on particular species, and have been very patient in their dealings with us. They include Peter Copley, Murdoch De Baar, Rod Eastwood, Ted Edwards, Ted Fenner, Ross Field, Steve Johnson, John Kerr, Ian Knight, Russell Mayo, Grant Miller, John Moss, Ed Petrie, Simon Nally, Sue Scott, Peter Valentine, Richard Weir, Andy Williams, Matt Williams and Alan Yen. We also thank the referees for their constructive comments on the Draft BAP, and Veronica Brancatini for her help in formatting the document. Suellen Grosse and Geoff Clarke, CSIRO Entomology, Canberra, prepared the distribution maps to formats requested by Environment Australia. We thank Geoff also for his enthusiastic input to the drafts of the Action Plan.

1 Introduction

The Action Plan for Australian Butterflies (Butterfly Action Plan: BAP) is the first such document for a group of invertebrates in Australia, and follows from a series of similar Action Plans which cover the conservation needs of many groups of vertebrates. In many ways, butterflies (although a numerically minor component of a single insect order, Lepidoptera) are the most suitable natural group of invertebrates with which to pioneer this approach. Butterflies are by far the best-documented group of insects in Australia, largely reflecting the sustained interest of non-professional enthusiasts, and readily foster public sympathy for their wellbeing. Their biology is reasonably well understood, although details for many species remain to be clarified, and the need for their conservation is accepted widely. In Australia, butterflies have been paramount as flagships for fostering more general progress in invertebrate conservation.

The need for a BAP was foreshadowed by the commissioning of an earlier document on Status Evaluation of Australian Butterflies (Dunn et al. 1994), in which distributional information was synthesised and many records accumulated by collectors since the publication of the last standard text (Common and Waterhouse 1981) were presented. However, this report has not been adopted widely as a national policy document, despite the great amount of practical information it contained. Collectively, the weaknesses of the report by Dunn et al. (1994) perceived by reviewers, some of them arising from misunderstandings of the scope of the document by the wider community of lepidopterists, did little to endorse its credibility. However, the most unfortunate consequence was that the Queensland section of the report was translated directly into protective legislation, a purpose for which the review was not intended and a step for which the authors should not be held accountable. That single step has done much to foster suspicion of authority among lepidopterists, and has retarded progress in butterfly conservation substantially in Queensland, not least because of the inherent ambiguities of listing for protection a number of species designated as ‘common’ and of no conservation significance.

A major overview of the conservation needs of Australia’s non-marine invertebrates (Yen and Butcher 1997) has far-reaching significance, and other major documents were essentially placed ‘on hold’ until this was available widely as a compendium of published information and constructive suggestions for future progress.

2 Aims and Methods

The aims of the BAP are rather broader than for many of the earlier vertebrate action plans. They reflect the more general lack of knowledge of butterfly biology and conservation largely inevitable in a group in which many of the species are perceived as rare and having small distributions in a large geographical area of which much has been incompletely surveyed. The BAP includes fuller background information than given in most vertebrate Action Plans, to help redress this lack, and to enable practitioners to evaluate the recommendations as constructively as possible.

The major tasks requested for inclusion in the Action plan were to:

- Overview the conservation status of all Australian butterfly species, using 1994 IUCN criteria.
- Identify key critical threatened habitats for all threatened taxa.
- Identify processes threatening Australian butterflies.
- Provide recovery outlines for each taxon identified in a threatened category.
- Summarise the main issues involved in Lepidoptera conservation.
- Review current research and management programs, and recommend priorities for future action.
- Provide a list of experts on butterflies, who may be approached (e.g. by Environment Australia) for comments on issues or particular taxa.

Approach

The study of Australian butterflies has relied very heavily on the input of hobbyists and non-professionals, in addition to the very small corpus of professional scientists working on Lepidoptera in Australia. Likewise, future progress in conservation management and recovery for butterflies will depend very largely on the efforts of non-professionals. This perspective has influenced strongly both our approach to the BAP and the nature of the product. The BAP differs fundamentally from many of the vertebrate plans, in which status evaluations and execution of recommendations is largely the province of professional scientists and state authorities.

Much of the knowledge of butterflies held by hobbyists and others never takes its place in the formal scientific record. It is thereby inevitable that published information on Australian butterflies always lags behind the knowledge of experts who may never be approached to contribute their expertise or who, for various reasons, elect not to do so. A major task in compiling the BAP has been to provide opportunities for consultation with the widest possible range of butterfly enthusiasts, to contribute information, express their concerns over butterfly conservation, and to recommend the conservation status of all species applying the fullest possible information and from field assessments. This exercise was undertaken through a series of weekend workshops, referred to in this document as BAP Workshops (in sequence, held in Cairns, Brisbane, Perth, Melbourne, Sydney, Adelaide, Hobart, Canberra and Darwin), and more opportunistic consultation elsewhere.
In these workshops the scope of the BAP was outlined, the various problems of interpretation discussed, and the conservation status of all butterfly species discussed and appraised, with particular attention being paid to the views of people who have had field experience with taxa of possible conservation concern. We have attempted to respect the trust and confidences of the people who have helped in this important information-gathering exercise, and to represent their views as objectively as possible.

We emphasise here the importance of safeguarding and facilitating this flow of information between the 'scientific establishment' and those who are outside it, and we comment later on the processes by which this may be achieved.

Taxonomic framework

More than for any other invertebrate group, trinomial names applied to morphologically-distinct populations have proliferated in the classification of butterflies. The initial intentions of those names vary widely (discussed by New 1999), but they are enshrined as formal subspecies under the provisions of the International Code of Zoological Nomenclature, with the common legislative consequence that they are deemed equivalent to 'species' if their validity is accepted by expert consensus. The precise evolutionary status of many trinomial forms of butterflies in Australia, and their relationship to clines, remains to be clarified, but it is clearly necessary that a stable — or at least — a definable taxonomic arrangement be adopted for the BAP.

We are aware of a number of taxonomic rearrangements and implied new synonymies (affecting, especially, the perceived status of subspecies) in recent accounts (for example, Dunn and Dunn 1991; Braby 2000). As some of these will be unfamiliar to readers, and many may be contentious, we have opted to use the arrangement given in Common and Waterhouse (1981), except in the few cases where detailed revisionary studies have been made subsequently. In making this decision we have taken into account the comment by Edwards et al. (2001) — 'Because a subspecies was erected on insufficient evidence, is not a reason why it should synonymised on insufficient evidence'.

The arrangement adopted (given as the list in Appendix 3) represents that in most common use during the period over which most contributors to the Action Plan have gained their practical experience. It is one to which most lepidopterists in Australia can relate easily and thus has considerable practical relevance in the context of the BAP, despite occasional differences from more recent synopses. All workshops, and most assessments were completed before the publication of Braby (2000). In accordance with the Code, genders of species and genus names agree. Except for the agreement in genders not followed by Nielsen et al. (1996) and Edwards et al. (2001), we have used the spelling of names for taxa that they have shown to be valid.

A number of anomalies are discussed individually in context. Most concerns for conservation arise in the three largest families, Lycaenidae, Hesperiidae and Nymphalidae. The overall total is 427 species and, including subspecies, a sum of 654 taxa for evaluation (Table 1).

Table 1: Number of taxa and species of butterflies assessed

(Australian mainland, islands and Territories)

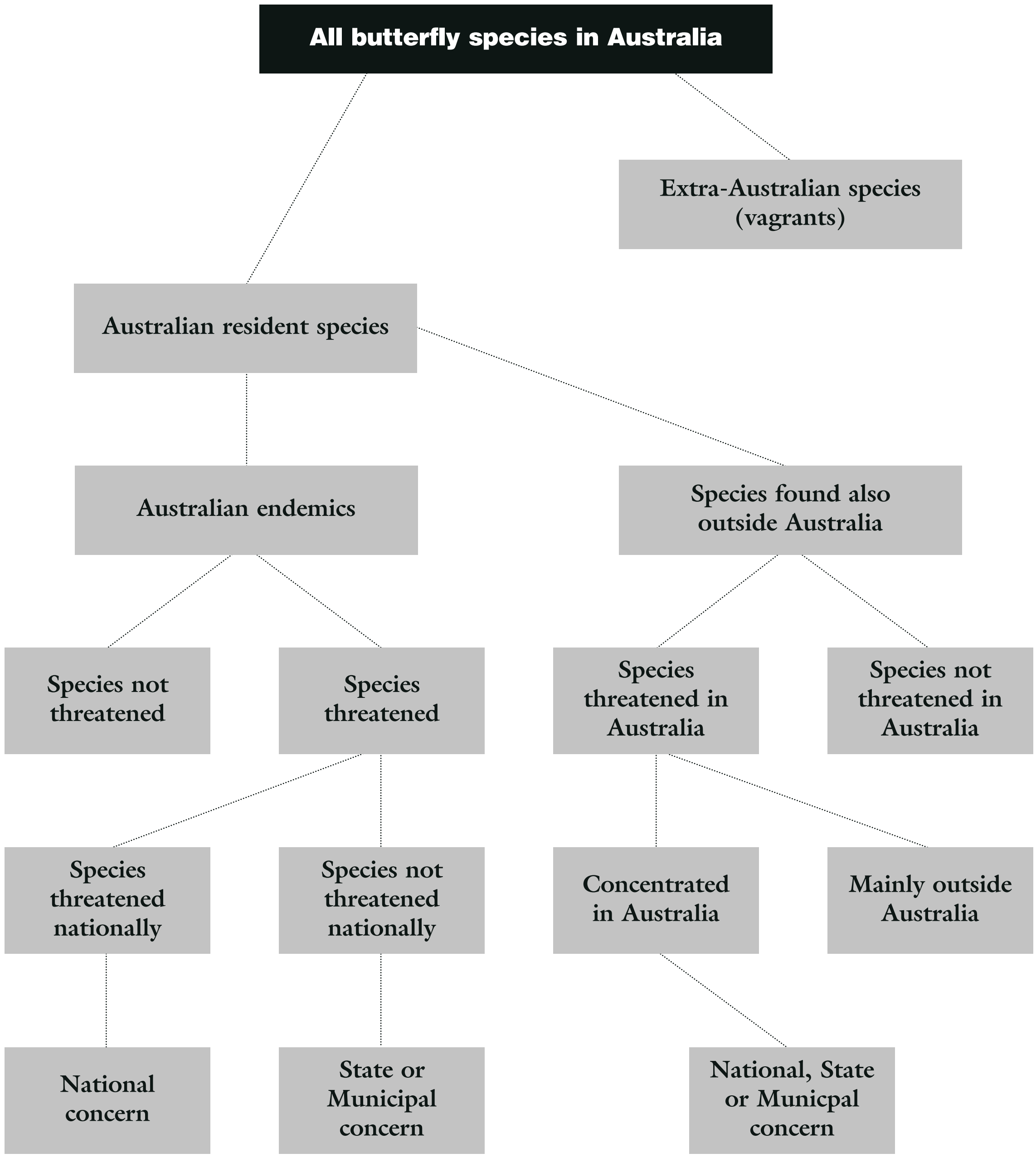
Family	No. Taxa	No. Species
Australia, Australian islands and Territories		
Hesperiidae	190	124
Papilionidae	34	21
Pieridae	51	38
Nymphalidae	147	90
Lycaenidae	232	154
Total	654	427

Levels of conservation concern

We have followed a similar categorisation of European butterflies (van Swaay and Warren 1999) in emphasising Australian endemic taxa, and relatively lessening the importance of more widely distributed species and those which are presumed to be non-resident in Australia, or whose natural distributions are only marginal in Australia. A number of butterflies from the Torres Strait Islands, for example, are not known to be resident there, and several are known from very few individuals. At this stage, they seem most likely to be vagrants from New Guinea, where they are generally more common and of no known conservation significance.

The scheme shown in Fig. 1 exemplifies these functional categories, with conservation concerns paramount in the groups shown toward the bottom left of the diagram. Endemic species (with subspecies deemed equivalent entities, see above) threatened nationally (in essence, 'globally') are given highest priority. They are also of major concerns on more restricted geographical bases, even if secure nationally. Non-endemic species are also divided into those whose major distribution is within Australia, and those predominantly found elsewhere; the former have higher conservation priority. Although not shown here, because of the focus in the BAP on butterflies in Australia, it is implicit that species also found outside Australia, which are threatened outside of Australia, may foster additional interest in conservation of populations in Australia as part of a more international focus.

Figure 1: Hierarchy of conservation concern



Most interest in butterfly conservation by official organisations in Australia has been at the State level, with concerns over a number of taxa reflected in their inclusions on various protected species schedules and lists, under a variety of conservation status categories. Such regional concerns may not always coincide with the priorities at a National (Federal) level. Particular taxa may assume considerable importance as local 'emblems' or flagship taxa within states and territories, and it is not the role of the BAP, with a primarily national focus, to downplay the importance of more local priorities. We have therefore included state and more local ('municipal') priorities as levels in the ranking hierarchy and commented on their broader significance in relation to national priority. Our primary focus is on taxa likely to become extinct if threatening processes continue.

To illustrate this possible ambiguity, *Acrodipsas myrmecophila* (Lycaenidae) is widespread in New South Wales and Queensland, where it has no conservation significance at present. It also occurs in the Northern Territory where it is known from one locality. In Victoria, it is ranked as having very high conservation priority, because it is now known from only a single population in the State, where it has contracted in distribution, appears to be highly localised, small and vulnerable, and a disjunct outlier from the species' broader range. National and state rankings differ widely, but it is important that the BAP does not lose sight of the fact that the Victorian population may indeed be significant. Many similar cases arise, and a crude parallel may be drawn between different rankings of European butterfly species in different European countries. Many European countries are smaller in area than most states of Australia, and a unified European listing of conservation priorities (Van Swaay et al. 1997) differs considerably from many individual country listings.

The broader relevant point here is that the natural ranges of many Australian butterflies are circumscribed, so that many predominantly northern species may extend only marginally across the borders of some southern states, and the converse. Such species are essentially 'political incidentals' and, although they may be naturally sparse in such range fringes, their real conservation need may be minimal. Each such case may need careful and individual evaluation within the boundary of a range state.

Methods for determining 'conservation status'

When considering difficulties in applying all the IUCN categories to the butterflies, we have retained the spirit of these categories, whilst taking particular note of documented contractions in distribution, losses, and of the nature of threats to each species, in relation to the potential for management or recovery actions (see Sands 1999). In concentrating on those taxa that are threatened with extinction, we note that most Australian butterflies have suffered from human disturbance or loss of habitats, resulting in reduction in areas of occupancy, isolation of populations and sometimes range contractions for most taxa.

We have heeded the knowledge of people with first hand experience of each species, who were asked to provide information on the following topics, with our appraisal gradient for each of these noted in parentheses. 'High' ranking means 'high conservation concern'.

1. Number of localities at which species were personally observed / collected, and the time period over which these observations accumulated (overall, fewer localities ranked higher than many localities).
2. Estimate of contraction of distribution (0, 20, 50 or >80 %) over the past (stated no.) of years (any contraction significant; larger and / or more rapid contraction ranked higher than smaller, slower contraction).
3. Estimate of increase of known distribution over this period (recognising that this will almost always reflect increased field work rather than range expansion; if the latter, can it be documented?).
4. Estimate of the number of populations that have become extinct at (X) localities over (Y) years (higher number, if reflecting also a higher proportion, ranked higher than a lower number or proportion; number of remaining populations also important).
5. Evidence for decline based on personal experience (any reliable evidence considered seriously, and ranked much higher than undocumented 'hearsay').
6. Knowledge of breeding populations in high quality reserves such as National Parks or World Heritage Areas, on the basis that populations in such reserves may not need management or are potentially capable of being managed and studied effectively. However, we note the possible complacency of relying on

this criterion and emphasise that such populations are not necessarily secure. Also, that it is necessary to distinguish carefully between assembly sites, such as hilltops, and breeding populations (Dunn et al. 1994). Species with some populations reserved are ranked as more secure than species with no populations reserved.

7. Listing of threats affecting the taxon (kinds and severity of threats discussed; continuing threats, especially anthropogenic effects, affecting habitat and critical resources ranked highly). Identification of threats to a species is of critical importance.

The very different levels of information available on individual species make it unwise to rank within a single sequence. For some species, the essential information has come from a single person; in others there has been broader consensus, but all opinions and advice have been tested on a broader audience. Some ambiguities for particular species are noted in the individual synopses. It is inevitable that a spectrum of viewpoints occurs for some taxa, reflecting different degrees of familiarity with the taxon. We emphasise the need to regularly review all species considered to be of conservation concern, to take into account new information and the changes in status that are likely to follow effective recovery actions.

3 Approaches to butterfly conservation

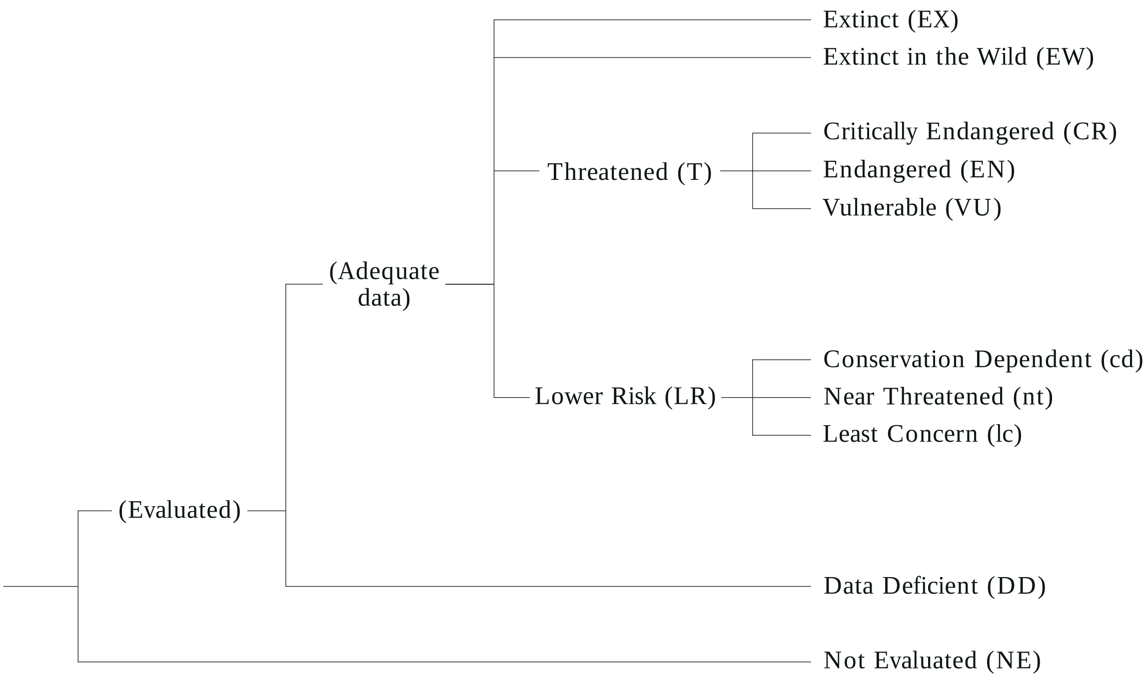
IUCN Categories of threat and discussion of criteria

The 1994 IUCN categories (Appendix 4) are now used widely to assess the conservation status of species. Note that the now superseded earlier IUCN categories, with less demanding quantitative criteria, were used by Dunn et al. (1994), so that their status evaluations were based on different criteria from those we have used. The hierarchy of categories (Fig. 2) separates major divisions of extant taxa for which adequate information is available into ‘threatened’(T) and ‘lower risk’ (LR), each of which has three subdivisions. Evaluated taxa for which data are insufficient to categorise as any of the above, or as secure, are ‘data deficient’ (DD).

For each subdivision, emphasis for correct allocation is placed on unifying quantitative criteria, with the different criteria derived ‘from a wide review aimed at detecting risk factors across the broad range of organisms and the diverse life histories they exhibit’ (IUCN 1994). Application of the criteria has been a subject of much discussion since the categories were introduced, and we have experienced difficulty in applying them properly to butterflies without undue extrapolation. Difficulties of applying the criteria, which were developed mainly with greater regard to vertebrates (for which accurate population counts are commonly easily available), to invertebrates have been discussed widely (Hutchings and Ponder 1999). Much of the difficulty has focused on issues of estimating

Figure 2: The IUCN red list categories (1994)

IUCN 1994. IUCN Red list categories. IUCN, Gland.



population sizes and interpreting causes and significance of change. It is important to comment on these difficulties, as correct allocation of conservation status is at the core of the BAP. We preface this comment with a brief outline of butterfly biology, and emphasise also the lack of quantitative population data for every species we considered. Biological knowledge of many butterfly species is fragmentary and the anomalies in interpreting status (discussed below) centre on population dynamics, measuring butterfly numbers and population structure.

1. Population dynamics

Butterflies undergo complete metamorphosis during their development. The conspicuous diurnal adults of any species may be present for only a few weeks each year, commonly in either one (univoltine species), two (bivoltine species) or more (multivoltine species) periods. More continuous flight periods may reflect several generations. The precise flight period(s) of a given species are predictable within broad limits, but are influenced by factors such as temperature and food quality during development, which may vary between years. For the remainder of the year, butterfly species are present as eggs, larvae (caterpillars) or pupae, each of which may undergo a form of dormancy (such as diapause) in which inclement seasons are passed. A number of species (for example, of Papilionidae and Nymphalidae) can enter protracted pupal diapause, which may extend from six months to four years or more. Others (some genera of Lycaenidae) undergo egg diapause for a year or more. However, the same species under other circumstances may develop without any significant delay.

Adult butterflies are nectarivorous, feeding through specialised haustellate mouthparts. Larvae of most species are chewing herbivores, but those of many Lycaenidae have obligate or facultative associations with ants. Their life cycle involves the need for particular ant species, in addition to specific larval food plants. At its most basic level, fragmentation or loss of habitat supporting a food plant or a mutualistic ant may have adverse effects on a specialist butterfly species that depends on those resources.

Each of these life history stages is subject to different influences, threats and mortalities. As a (hypothetical) example, eggs may be attacked by one or more species of parasitoid wasps, and a suite of small predators; larvae suffer the vagaries of irregular food plant supply and quality, influencing their growth rates and survival, as well as depredations from another suite of natural enemies; pupae may be lost to predators, inclement weather and other factors; and adult butterflies are subject to yet other selections from predators, availability and quality of nectar, weather, and so on. Understanding butterfly population fluctuations necessitates understanding of mortality schedules at all these life stages, and their integration (as a 'life table') to appraise generational mortality. It is thus very difficult to determine whether even large inter-generational changes in numbers are part of a pattern of normal fluctuation, or a cause for concern.

2. Measuring butterfly numbers

The conspicuous adult butterfly stage has traditionally been used to constitute a measure of inter-generation changes in numbers in conservation studies, simply because it is perceived as the easiest stage to estimate by such techniques as transect counts and mark-release-recapture methods (Pollard and Yates 1993; New 1996, 1997). However, this assumption is open to question, because the number of adults reflects the pressures operating at each stage of the life cycle, which may themselves differ substantially in different generations, so that the number of adults (even if determined accurately) may not reflect the relative importance and 'cancelling out' of various previous mortalities. In essence, a single stage measurement is of only limited use in assessing threats and mortality factors and, thus, in planning alleviation of these. Population measurements can be made satisfactorily only on closed or otherwise well delimited populations.

High fecundity may in part compensate for high generation mortality, but it is entirely normal for insect populations to fluctuate many-fold over successive generations, so that determining a decline of significance for conservation may necessitate long term study to detect a consistent trend over a series of generations. An apparent decline in adult numbers (even assuming that the evidence for this is reliable) may not herald conservation need but, rather, be a manifestation of normal variation in numbers. Several species are known to 'disappear' for months or years from a site and inexplicably reappear — presumably as a response to changed conditions (*Hypochrysops byzos*, Lycaenidae), a break in diapause (*Mynes geoffroyi*, Nymphalidae; *Protographium leosthenes*, Papilionidae) or after migration (*Badamia exclamationis*, Hesperiidae). Stages that have a protracted development or diapause may affect the timing and appearance of adults according to seasons. Very low densities at certain times may thus give an incorrect impression of extirpation or permanent decline.

Extending from this, apparent extinction or extirpation of a butterfly may be difficult to prove (except in the extreme case of habitat / site destruction), as very low numbers (and consequent difficulties in enumeration and detection) may be a normal nadir in a species' life-system. The former IUCN definition of 'extinction' (EX) involved a species not having been seen in the wild for 50 years, and this 'persistence of absence' led Dunn et al. (1994) to elect two taxa (*Ogyris iphis doddi* in the Northern Territory; *Hesperilla mastersi marakupa* in Tasmania) as regionally extinct. These cases emphasise the difficulties of interpreting very limited field data without adequate background knowledge of biology and threatening processes, and appropriate, targeted surveys. In passing, we note that Kudrna (1986) employed the term 'missing' to designate species with no contemporary records from a region (despite searches), but for which there are no apparent anthropogenic causes for their loss, and for which 'reappearances' can not be ruled out.

3. Population structure

Many early studies on butterfly populations were made on the assumption that the populations were discrete and 'closed'. This is now suspected to be the case in only a minority of taxa. Many butterfly species manifest a metapopulation structure, whereby local extirpations are entirely normal, and often reflect changes in plant condition or phenology. Knowledge of the population structure of a given species is integral to assessing threats to the species, as emphasised below.

Application of the IUCN criteria to butterflies

The five main criteria (A-E below) used for decision-making within IUCN major categories each may be used alone, but all are quantitative, albeit with the qualification that they should be used 'on the basis of the available evidence on taxon numbers, trends and distribution, making due allowance for statistical and other uncertainties' (IUCN 1994, Appendix 2). It is recommended also that in cases of uncertainty it is legitimate to list in the highest risk category that may apply, a process we have largely avoided because of the uncertainties involved.

Clarke and Spier-Ashcroft (2002) noted that there have been few actual attempts to apply the criteria to determine the real usefulness of IUCN (1994) categories for invertebrates. They indicated the possible values of the Ramas Redlist approach (Akcakaya and Ferson 1999) in providing for more appropriate categorisation based on less precise data than the five criteria discussed below. However, as with the species they analysed, data for butterflies are mostly insufficient for any formal assessment — even as 'fuzzy numbers'. The invertebrates treated by Clarke and Spier-Ashcroft (2002) gave polarised results, being either 'critically endangered' or 'data deficient'.

In attempting to apply the IUCN (1994) criteria to butterflies confined to Europe, van Swaay and Warren (1999) also found inadequacies and, essentially, dismissed use of criteria C, D and E on the grounds of (C) 'absolute numbers are rarely available and so less relevant', (D) 'not relevant' and (E) 'with the material available this criterium (sic) cannot be used'.

For criterion A, they evaluated trends over 25 years, rather than 10 years, and based these on distribution. Van Swaay and Warren pointed out that, although the IUCN criterion refers to trends in population size, data available on European butterflies (far more comprehensive than for Australia, and reflecting outcomes from many long-established mapping schemes and accumulated historical data) is nearly always on trends in distribution. However, in Europe range declines of colonial butterflies assessed from distribution data can seriously underestimate population declines (Thomas and Abery 1995). A population decline over a 10 year period was therefore translated to (A) 'decrease in distribution of at least (CR 80%; EN 50-60%; VU 20–50%) over the last 25 years'. Criterion B remained unchanged.

The historical data base from which to evaluate trends in distribution and abundance is much less for Australia than for most of Europe and, in general, the butterfly fauna is much less completely documented, with novelties and striking new distribution records continuing to be discovered. Consequently, our evaluations cannot be as free of ambiguities as the European status allocations.

Taking the five IUCN criteria in turn (Appendix 4):

Criterion A. (Rate and extent of population decline) In no case have we discovered quantitative data on an Australian butterfly adequate to allow us to estimate or project quantitative population fluctuations or declines, or to use this criterion to differentiate between categories of threat. The modification noted above (van Swaay and Warren 1999) is likewise difficult to apply.

Criterion B. (Distribution). This is the most useful criterion for butterflies, despite considerable difficulties in estimating 'area of occupancy' within the 'extent of occurrence' of most species. This reflects the 'spot' nature of many butterfly records and the lack of comprehensive and systematic distributional surveys, so that even the number of discrete populations is generally not known accurately. Many collectors revisit 'traditional' sites to obtain specimens rather than explore elsewhere, and such traditional sites may reflect the known occupancy amongst large areas of apparently suitable, similar habitat which has not been surveyed. The number of sites known may thus be points in an apparent continuum or (of greater conservation significance) be isolated remnant habitats in a largely inhospitable landscape of agricultural or cleared land. The need for further survey is a recurrent recommendation in many of the species synopses later in this Action Plan.

Population structure is linked intrinsically with considerations of occupancy. The former widespread perception that many butterflies form closed, reproductively isolated populations, which often occupy only a few hectares of habitat or less, has been questioned. This is due to the rise of the metapopulation concept, whereby a species may occupy small sites within a greater habitat area but such colonies are essentially temporary. Each colony is largely independent demographically, manifesting characteristics of an isolated population, but the metapopulation comprises a number of such colonies and persists by a rolling series of extirpation and recolonisation over the entire suite of sites (equivalent to suitable patches of habitat), so that any one site is occupied or unoccupied at any given time. Local extirpations are thereby a normal facet of population dynamics, and loss of the butterfly at a given site is not necessarily cause for alarm; it may be a natural event and compensated by a colonisation elsewhere in the area of occurrence. On the other hand, increased frequency of local extirpations, such as by localised anthropogenic threats, may disrupt the functioning of the metapopulation and thereby pose a threat far greater than the direct impact observed. Recent studies, particularly in Europe (Thomas 1995), suggest that many butterflies have a 'metapopulation structure'. Each subunit of a population may be subject to different threats, and its dynamics influenced by availability of suitable food plants, mutualistic species and individual habitat quality.

Designation of a 'population' must be done with considerable care, in view of likely difficulties of definition for many butterfly species.

The sub-criteria of severe fragmentation (B1), continuing decline (B2) and extensive fluctuations (B3) need to be assessed in the twin contexts of normal, variable population structure and heterogeneity / discontinuity of suitable habitat patches. If a metapopulation is to buffer against extinction, exchange between component sub-populations must occur. Severe fragmentation may reduce the possibility of recolonisation, especially for species with poor powers of dispersal. Closely related butterfly species may differ substantially in their dispersal ability, and it is generally unwise to extrapolate from one species to another, even in the same genus.

Criterion C. (Population size and decline) Two anomalies occur: the problems of estimating the number of adults present, and the assumption that the total population size is equivalent to the effective population size.

The number of individual butterflies (census size) in a population (with the caveat of defining 'population' convincingly, as opposed to the number at a site) is difficult to estimate. Even allowing for maximum accuracy, the number is likely to differ each day over the flight period, so that repeated surveys over the flight season are needed to determine the greatest number. Information is needed also on the particular species' pattern of diurnal activity, as many butterflies are active during only part of a day — for example, because they avoid or seek the hotter intervals. Their activity is influenced more irregularly by weather factors such as between-season variation in adult emergence, precipitation, wind, temperature, cloud cover and sunlight, so that counts at different times of a day, or at the same times under different conditions may both vary considerably. Changes in numbers reflect emergences, deaths and movements, including migration in or out of the site being assessed. Numbers of individuals in a butterfly population may show longer term cycles over a period of several years to produce apparent 'boom and bust' cycles.

Methods available for enumerating adult butterflies include direct counts on transects or other defined areas, mark-release-recapture (MRR) studies (to give information also on individual longevity and turnover within a closed population), and capture and caging of individuals of one sex for release unharmed at the end of the day's survey. The last method, used recently for the Brenton blue (*Orachrysops niobe*) on its only known site in South Africa (Silberbauer and Britton 1999) is based on the assumption that the population sex ratio is unity, so that temporarily removing all individuals of one sex from a closed or restricted population will provide an accurate estimate of numbers at that time, and eliminate the errors that easily result from double counting of free-flying butterflies. MRR methods may be detrimental in causing harm to delicate butterflies through handling, and the method relies on the behaviour of released butterflies being entirely normal, with any marking not rendering the insects more susceptible to predators or other mortality or biasing their chances of recapture.

Effective population size may differ substantially from census population size. Precise figures for Australian butterflies are not available, but Frankham (1995) and others emphasise that effective population size may be as much as two orders of magnitude less than census size for some invertebrates.

For many years, commercial collectors in other parts of the world have utilised baits (such as fruit or carrion) to attract large numbers of large showy butterflies for capture and sale. In most cases only males are attracted to baits, so females are not taken. This practice has been condoned widely because it is generally believed that:

1. Sex ratio is unity
2. Male butterflies can mate several times during their life, whereas females mate only once, so that
3. Even by removing a high proportion of males from the population, enough remain to ensure that the nuclear effective population is not depleted.

Protandry (males emerging before females) is not uncommon in butterflies. It is evident, for example, in several Australian species of *Heteronympha* (Nymphalidae), in which mating occurs soon after males mature (several days after emergence) and females emerge, so that assumptions of uniform sex ratios may be seasonally distorted. Likewise, the two sexes may not be equally conspicuous or 'samplable' because of differential appearance and / or behaviour. Female *Heteronympa merope*, for example, are believed to aestivate (Edwards 1973) after mating, so that female inactivity renders the apparent population strongly male-biased. Many other butterflies show an apparent male predominance reflecting behaviour and conspicuousness rather than actual incidence. Thus, even when the sex ratio is unity, the two sexes are rarely seen in similar numbers at a site. Difficulties in applying criteria, and of numerical true fluctuations in numbers, apply to many conservation assessments of other taxa.

This criterion is unsuitable for use unless very sound biological and behavioural understanding is available, and both subcriteria (C1, C2) are virtually impossible to apply to any Australian butterfly.

Criterion D. (Very small and restricted populations) The above discussion for criterion C applies equally to criterion D, with the additional observation that species present in very small numbers may actually be easier to estimate by experienced field workers, simply because there is no apparent ambiguity over whether larger numbers are present! The main practical dilemma when only a few individuals are observed is in deciding whether this is a true reflection of the number present, or a sampling anomaly. As one example, the true numbers of *Acrodipsas illidgei* may bear little relation to the numbers seen, simply because they are very cryptic and noticed only if disturbed.

Criterion E. (Probability of extinction) Quantitative analysis of probability of extinction in the wild is currently impossible for any Australian butterfly, except in the extreme case of the only known site(s) being threatened with total destruction. The requisite life table data do not exist, and inferences from any of the few long term population studies of particular species (many discussed in Kitching et al. 1999) are inadequate. Densities of butterflies may sink temporarily to very low levels, so that the species are extremely difficult to detect.

Lower risk and data deficient categories

Emphasis on threats, rather than simply on rarity, has inevitably biased some assessments away from 'threatened' (because threats are not defined, other than in general, bland terms) toward 'lower risk' (LR) or, in some cases, 'data deficient' (DD). LR implies positive evaluation and a decision that a species does not satisfy the criteria for inclusion in any threatened category. DD implies that further information is needed in order to make a more precise evaluation of status.

Many Australian butterflies are of no conservation concern (but note that several 'common' species including two, *Papilio ulysses* and *Ornithoptera* *priamus* which are listed primarily for their commercial interest, rather than conservation need, are listed for protection in Queensland [QNCA 1994])*. The act of listing could be interpreted as giving these species formal LR status, but we have preferred to use this category to signal species we have broadly assessed as having 'conservation significance', in the sense that action or investigation is needed to assure their wellbeing. However, the recommended epithet 'near threatened' — although in some cases accurate — is inappropriate when impressions of decline are largely subjective and specific threats have not been identified.

Properly, under IUCN (1994) many of these taxa are DD, in that allocation to this category allows for a taxon which 'may be well studied and its biology well known, but appropriate data on abundance and / or distribution is lacking' (IUCN 1994). However, IUCN (1994) also emphasised the difficulty of allocation between DD and threatened. We have tried to allocate to DD those species for which biological and distributional data is most fragmentary. Species placed as LR include those for which concern is indeed evident, but for which the information to quantify and evaluate threats is inadequate.

IUCN criteria are thus unsatisfactory for application to butterflies (and, indeed, to many other invertebrates) because the details needed are almost invariably unavailable or inappropriate, and there are considerable uncertainties over how any information to hand may be applied consistently. Whereas IUCN criteria embody consideration of the relative severity of threats, it is also largely implicit that there is strong relationship between 'rarity' and 'degree of threat'. Other than for the self-evident predisposition to stochastic effects for small populations, this is usually not the case. Rule sets, such as IUCN (1994), are inherently attractive for use, because of their apparent explicitness and clarity, but ineffective if they can not be applied reliably and on the basis of sound biological understanding — and, as many authors (such as Given and Norton 1993) have noted, they do not provide a ranking of signalled species from most threatened to least threatened. This need can be approached by some form of point scoring procedure, such as those used by Millsapp et al. (1990) and CALM (1994). The values of scoring systems can be enhanced by weighting features to apply to particular taxa, so that butterflies and other invertebrates can be scored differently from mammals or vascular plants, for example. Hutchings and Ponder (1999) noted that the greatest failing of IUCN criteria for invertebrates was the reliance on set thresholds (numbers) in population and geographical parameters, despite their precision being attractive for legal enforceability.

* QNCA Amendment Regulation (No. 1) 2001, Subordinate Legislation No. 215, has not been taken into consideration during preparation of this Action Plan.

4 Conservation status of Australian butterflies

Conservation status for the Butterfly Action Plan

The relative degrees of concern became very clear from these pointers and subsequent discussions. We allocate taxa using IUCN category names (Appendix 4) to denote degree of severity of concern but modified in a way we consider applies to Australian butterflies. Note that we have not adopted any strict quantitative thresholds, as the generality these imply is transcended by the wide variations in individual species circumstances. Not all listed criteria need be fulfilled for given species, and these are indicative of the conservation status applied.

Categories are listed below and are separated by the following key:

1. Information on biology, distribution and resident / vagrant status sufficient to make an informed evaluation of conservation status..2
   — Information insufficient to make an informed evaluation; with little or no information on any of the above topics .DD
2. Threats defined for the species: threats to major populations or population segregates likely to lead to species extinction...................3
   — No threats defined for the species: threats to major populations or population segregates not likely to lead to species extinction ....NCS
3. Threats identified for all known populations and considered to pose a risk of extinction within 5 years (one or more listed conditions implicit), usually no more than 5 populations or major population segregates known ....CR
   — Threats identified for all or most known populations, normally including those of greatest significance (size, distribution), and considered to pose a risk of extinction within 5–10 years (one or more listed conditions implicit)................................EN
   — Threats identified for some populations and considered sufficiently important to pose a risk of species extinction within 10–20 years (one or more listed conditions implicit)..VU
   — Threats identified but not considered to pose a risk of species extinction within 20 years (one or more listed conditions implicit) ....LR

Extinct (EX). Extinction of all historically known populations of a species. A species which has not been found in any documented habitat where it was formerly present, or elsewhere, despite targeted searches and surveys over an extended period (*ca* 20 years).

No full species of Australian butterfly is known to have become extinct, but a few subspecies may be either extinct or extremely elusive. This situation is in significant contrast to many groups of vertebrates, in which Australian extinctions are documented unambiguously.

Critically Endangered (CR). Threats identified for all known populations, continuing and apparently severe. In combination with one or more of: (a) no populations known in protected areas, (b) species known from one or very few populations; (c) evidence of population demise or loss of breeding sites; (d) evidence of decline in area of occupancy, and none of expansion. Recovery measures deemed urgent, requiring habitat reservation, protection, and management to prevent a very high risk of extinction in the immediate future (up to 5 years) unless recovery actions are pursued. The category includes taxa that may be extinct, pending confirmation.

Endangered (EN). Threats identified for all or most known populations, continuing but (a) threats less severe than CR, and in combination with one or both of: (b) none, one or few breeding populations in protected areas, and (c) management inadequate for reducing threats leading to a high risk of extinction in the near future (5–10 years) unless recovery actions are pursued.

Vulnerable (VU). Threats identified for all or most known populations, continuing but (a) threats not necessarily as severe as EN, commonly varied across different populations; and in combination with: (b) none, one or few breeding populations in protected areas, (c) small number of populations and / or small range of occurrence, with or without evidence of decline in area of occupancy; (d) management inadequate for reducing risks of extinction in the longer term (10–20 years) unless recovery actions are pursued.

The above three categories are collectively 'threatened'.

Lower Risk (LR). (a) some threats recognised but not well defined for all populations; (b) usually localised or limited range species, ecological specialists and (c) signalled as of conservation interest because of documented decline in area of occupancy or range, or failure to discover additional populations by targeted surveys, (d) some populations may be in protected areas; surveys and monitoring of conservation status to take precedence over recovery actions / management. Not categorised as at risk of extinction. The IUCN basic subcategories of Near Threatened, Least Concern and Conservation Dependent are employed here as necessary.

These should not be formally listed as 'protected species' unless further evidence is sufficient to elevate them to one of the above categories.

Data Deficient (DD). Knowledge of biology / ecology insufficient to determine if: (a) threats, (b) natural low density, (c) migration, diapause or other biological parameters prevent accurate conservation assessment. Species for which the most informed consensus does not reveal more precise categorisation, or information upon which to base sound judgement regarding threats is manifestly inadequate. Some are known from very few individuals; their provenance or label data may be ambiguous, and they have not been subject to targeted survey over parts of their potential range. They are a collective priority for further investigation, to augment basic knowledge. Data deficient taxa should not be listed as 'protected species'. Surveys and monitoring are of the utmost importance to facilitate clarification of their status as either 'threatened' or 'no conservation significance'.

Note that this interpretation differs from IUCN (1994), where DD includes taxa that 'may be well studied and biology well known, but appropriate data on abundance and / or distribution is lacking'. Australia's new Environmental Protection and Biodiversity Protection Act also recognises the category 'conservation dependent' (CD), which relates to taxa already subject to conservation actions (such as execution of formal recovery plans) and whose long term persistence depends on continuation of those actions. In principle, the designation could apply to species found only in national parks or world heritage areas, reflecting the conservation responsibilities of management in those areas. However, such species are not ipso facto the focus of conservation management. Taxa nominated solely as CD are distinct from LR (CD) above.

Conservation Significance (CS). In addition, the term CS is available to flag all taxa which can not be allocated clearly between LR and DD, but which do not appear to be currently threatened (CR, EN, VU). Many of these would earlier have been classified as 'rare', and some are taxa for which extensive field study has not revealed range declines. However, the area of occurrence / occupancy of most of these species is small; they are thus the 'narrow range endemics', some of evolutionary significance in our fauna. Rather than create further ambiguity, we have endeavoured to categorise all relevant taxa as either DD or LR. They should not be listed as 'protected species'.

No Conservation Significance (NCS). All other species for which information is sufficient to exclude them from any of the above categories. This category includes many of the species signalled historically of conservation concern, in addition to species nominated as 'common'. They should not be listed as 'protected species'. We note a reviewer's comment that ALL species should be of conservation significance, but retain the term 'No Conservation Significance' for species which *currently* require no actions to promote their wellbeing.

We acknowledge readily the difficulties of categorising some taxa in this way, especially without more complete information, and that the differences between species makes more consolidated ranking unwise. It is pertinent to consider the criteria used by Dunn et al. (1994), together with the ensuing criticisms of these. Seven criteria were used by Dunn et al. (1994) to provide a short list of taxa for further appraisal:

1. Very small distribution in Australia (based on maps in Common and Waterhouse 1981, and the greater detail provided by Dunn and Dunn (1991).

2. Number of known sites.
3. Number of extant sites.
4. Reputedly rare based on literature opinion and informed collector discussion.
5. Taxa already given conservation attention.
6. Number of sites within reserves or National Parks.
7. Those confined to threatened habitats.

Three categories were then applied by Dunn et al. (1994) to the species short-listed, on a state by state basis:

A. Small distribution but now known from many sites.
B. Political incidentals (taxa at their distributional limits in particular political regions but which are often common beyond that region).
C. Selected taxa (supposed threatened forms).

The critical number of sites was set by Dunn et al. (1994) at fewer than 20 for the best-known states (Victoria, New South Wales) and fewer than 15 for others.

Some parallels occur with our system. It is indeed difficult to 'weight' for security in reserves, for example, or to determine what may constitute a 'site' in relation to unknown population structure and dynamics. A hilltop in a National Park may or may not encompass breeding habitat for assembling species; and a 'site' may represent a whole closed population or a single metapopulation segregate. Although we have taken note of all species that have been flagged as of conservation interest, we note also that comment on many species nominated in the past as 'endangered', 'threatened' and the like in Australia has not been based on quantitative data for any life stages, and that some nominations have been made on incomplete understanding both of the species' biology and the application of the conservation categories invoked. Moreover, these terms have sometimes been used without reference to the likelihood of extinction. In a few cases, such inferences have arisen simply from misidentification of taxa. Importantly, and in contrast to our emphasis, specific threatening processes have not been addressed routinely, as a prelude to de-listing as threatened.

Patrick and Dugdale (2000) discussed a set of criteria they used for guidance in assessing New Zealand Lepidoptera, and which exemplify well some additional features that could be employed in broader consideration of conservation status:

1. Uncommon or rarely encountered, but widespread and with no historical evidence of dwindling populations or range decline.
2. As above, but with historical evidence of dwindling populations and range declines
3. Known only from the type locality.
4. Uncommon or rare, biology unknown.
5. Type locality grossly altered.
6. Type locality at risk.
7. Host plant / site at risk, or predator influences seen in major parts of species' range.
8. Genetic swamping of the endemic populations by self-adventive Australian sister taxon.
9. No record of capture for >25 years, and now presumed extinct.

Numbers 7 and 8 in the above list exemplify threats not documented for butterflies in Australia. The New Zealand endemic *Dodonidia helmsi* (Nymphalidae) is at risk from predation by adventive social wasps (*Vespula, Polistes*), and many populations of the lycaenid *Zizina oxleyi* have been lost by genetic replacement by the Australian *Z. labradus*, whose spread has been facilitated by proliferation of introduced Fabaceae.

Rarity

The term 'rarity' has had a central influence on how many butterflies have been evaluated for conservation in the past. Rarity has consistently been equated with 'desirability' by collectors, and may also confer commercial value. Species which are hard to find, or perceived to occur in low numbers or in few places, constitute the majority of butterflies currently named on lists of protected species and the like in Australia. It is necessary to distinguish carefully between 'rarity' and 'vulnerability' in conservation assessment, as the two terms are often confounded.

Rarity, following Rabinowitz et al. (1986) is a function of three main parameters: abundance (on an axis of many to few individuals, the latter 'rare'), distribution (widespread, on many sites to restricted to few sites or a single site, the last 'rarest'), and ecological specialisation (from generalist with a wide range of ecological tolerances and foods to specialist, at the extreme monophagous and with narrow ecological range, the latter 'rare'). These parameters combine in various ways, so that the rarest species are those which occur in low numbers, at one or few sites, and are extreme specialists in their requirements; and those which combine any two of the three rarity states are rarer than those which show only one of them. However, whichever condition(s) of rarity a species shows, this may be an entirely natural and stable condition unless other factors intervene, and one which per se need arouse no concern for conservation.

Concern arises because of ‘vulnerability’ due (normally) to the imposition of change: external threats (below), by which a species’ abundance and / or distribution declines due to loss of habitats and critical resources. Rarity may predispose a species or population to vulnerability — so that, for example — small numbers and limited distribution may render the species liable to stochastic extinction by chance effects of fire or flood, which would have little impact on larger or more widely distributed taxa. A single site occupied by the last population of a species may assume much greater importance than if many occupied sites are known.

In making status evaluations for Australian butterflies, we have emphasised the importance of evaluating threats in relation to vulnerability, and to any evidence (or supposition) of accelerated decline and / or loss from human activities. Many threats can necessarily be inferred only rather imprecisely. In evaluating the conservation status of Lepidoptera in New Zealand, Patrick and Dugdale (2000) included appraisals as follows, based on criteria advanced by Molloy and Davis (1994):

1. Legal protection of habitat (implying lower risk).
2. Habitat loss rate.
3. Predators / harvest impact.
4. Other factors affecting survival,

in addition to vulnerability through habitat and or dietary specificity. Each of the above was ranked on a scale of 1 to 5, with 5 the ‘most at risk’ category.

Effects of listing

Two levels and contexts of ‘listing a species’ may be confused. On one hand, the legislative process of listing a species under threat may have far-reaching consequences through continuing formal obligation and priority. On the other, a taxon may simply be included on an advisory or other non-legislative list of ‘threatened species’ or similar category, flagging its conservation interest, but not necessarily accompanied by objective assessment or by legislative obligations.

The recognition of threatened status leads inexorably and progressively to ‘listing’ of species on schedules of protected taxa either Nationally or for a state, a situation which ideally fosters information flow, recovery actions and downgrading to secure. Such listing (as with allocation to any threat category) is a politically charged and dynamic process, invaluable in helping to select and rank the species most in need of practical conservation, which should set in train the processes needed to facilitate de-listing, as the ultimate goal of practical conservation. Indeed, we believe that listing should be undertaken only with a commitment to pursue de-listing. Listing is thereby a responsible action, which can confer priority for funds and attention by appropriate authorities on justifiable criteria. In the past there has been a tendency for ‘listing’ to be seen as a conservation achievement per se, with scant regard to practical needs for conservation; indeed, listing has been taken to represent security, and sometimes as a more-or-less perpetual condition. State agencies are bound by the legislation that dictates their responsibilities, with some authorities seeking to retain species on lists with little apparent justification. In other cases, species may need continuing management (as CD species), in which long-term listing may be warranted.

‘Legal protection of butterflies .... can positively contribute towards their conservation only if it fulfils certain conditions:

1. It must protect them and their habitat from the effects of harmful anthropogenic factors primarily responsible for their decline.
2. It must facilitate the continuing of genuine research, whether it is carried out by professional or voluntary research workers’ (Kudrna 1986).

The first of these points has positive values, in that ‘listing’ a species may facilitate controls over habitat (such as prevention of clearing a site on which a listed species occurs) without the need for a more comprehensive impact statement being prepared.

A major problem exists with listing butterflies, to which we return later, but introduce here as a major influence on our evaluations and approach to the BAP. Listing a species is invariably combined with ‘prohibition of take’, or the need for permits to capture and study, with penalties for transgressions. Some state authorities have an enlightened attitude, and will readily give permits for collecting and study activities that are unlikely to have detrimental effects on the species. In other states though, this juxtaposition has led to alienation of non-professional lepidopterists whose continued input is vital in augmenting knowledge, and whose knowledge and concerns have been largely responsible for the initial recognition of conservation needs of many butterfly species. Several highly experienced field workers were reluctant even to contribute to our BAP workshops, for fear of drawing attention to their interests and activities, and censure that might flow from this, although their concerns for conservation remain paramount.

'Listing' and 'prohibition of take' are very different issues, and should not be confounded. The former implies the need to signal a taxon as of conservation concern. The second conveys the implication that 'take' is a threat contributing to that concern. This difference is appreciated by some state authorities but apparently not so by others.

We view such impediments to communication, whether real or perceived, as a major barrier to advancing knowledge and perspective — and, ultimately, conservation. They are predicated on the supposition that collecting is a threatening process, a generally untenable claim which we discuss below. That recently acquired knowledge of many butterfly species is essentially 'underground' is a lamentable reflection on how the listing process is perceived in the wider community, and how its strictures are pursued by some authorities. A critique by Beale (1997) showed that many deficiencies in protective legislation may not be appreciated until they have been experienced at first hand.

A survey by Greenslade (1999) revealed many of the problems perceived to occur from listing butterflies in Australia, with a wide spectrum of views in the responses received. Some points from her survey are:

1. Nearly half the respondents saw no benefits in listing species; 20 saw some benefits and 10 saw benefits only if listing was accompanied by habitat protection. Fifty of the respondents saw disadvantages in listing and only three noted no disadvantages.
2. Many respondents noted species on lists which they felt should not have been listed; others noted needs for listing in states where no such lists exist (WA, NT, SA).
3. 41 respondents felt that the application process for permits was too complex; only four saw no need to change the process.

Listing is sometimes seen as the only way to obtain funding for study of particular species, leading to temptations to nominate taxa which might not otherwise merit a place on a select schedule of deserving species. Final decision on nomination lies with independent scientific committees, ensuring that such listing is as responsible as can be achieved with the knowledge available. On rare occasions the conservation needs of genuinely threatened butterflies may have suffered because of lack of listing. More general appraisal of the problems by Stubbs (1985) reveals the extent of broader debate.

5 Threatening Processes

Human disturbance of habitat

Identification of threats is a pivotal step in practical conservation (New 1997, Sands 1999). Definition and assessment of threat is central to allocation of conservation status in the BAP, and our attempts to do this have shown the array of influences which may need to be considered in any case. Earlier accounts have enumerated these, albeit often in general rather than detailed terms. General appraisals of threats to butterflies are included in a number of more general accounts (New 1997). There is often a wide gulf between suggestion and hard evidence of causes of butterfly decline, and a message that emerged strongly from our workshops was 'if you can not specify threats, don't guess them!'. The following broad ecological topics were discussed at workshops. In many cases, their influence on a particular species of butterfly can be inferred, and the workshop sentiment quoted above can be countered by need for caution, in that threats equally should not be discounted until they are shown not to have adverse effects.

1. **Habitat destruction.** This is the paramount threat to localised butterflies, as for most other biota. It takes many forms, with the key effects of removing or diminishing the supply of places to live and key resources needed by species. Examples are clearing of native vegetation to provide land for urbanisation and commercial purposes such as agriculture, mining and forestry plantations, with their attendant communication systems, such as highways.

   Particular developments may affect particular ecological communities on which suites of ecologically specialised butterflies depend. Several are cited later but, as examples, loss or increased pressures on coastal rainforests, coastal mangroves, wetlands, coastal sedgelands, native grasslands and isolated forest patches are of concern as having effects beyond simply harm to single butterfly species.

2. **Impacts of land management.** Examples of inappropriate land management are rife. They range from broad scale effects such as clearing of vegetation for grazing or planting crops, salinisation in the south east, unnatural burning regimes, and drainage of wetlands, all of which may have severe impacts on early stages and have been linked with some butterfly extirpations.

3. **Agricultural and forestry practices.** Agriculture and forestry have many effects from fragmentation and loss of natural habitat, to replacement of natural vegetation by exotic species, weed invasion, burning, grazing of food plants and the need to control pests involving chemical use. Exotic vertebrate herbivores may be very destructive to butterfly habitats, especially by grazing sensitive grassland and watercourse vegetation, and grazing and trampling of sedges. All are processes to which declines of butterflies have been broadly linked.

4. **Clearing/levelling hilltops.** One lesser-appreciated habitat change relevant to many butterflies is the changes made to isolated hilltops for establishment of telecommunications towers, forestry lookout towers, and the like. Many butterflies 'hilltop', a behaviour in which individuals congregate, perhaps from a radius of many km, on isolated high points in a landscape as an assembly area presumed to facilitate finding mates (Shields 1967). Some such hilltops in Australia are well known collecting localities, and a number of apparently scarce butterflies are known only from them, although believed to breed and occur over much broader landscapes.

   Disturbance of hilltops by levelling of landscape, removing trees and other vegetation, and construction of towers, may decrease the carrying capacity of the hilltops on which a number of species and individuals need to maintain individual territories. These changes may influence the competitive behaviour and genetic selection by mates and changes as the outcome of more limited breeding success. Hilltops are also key sites for insects as prey for predatory birds and other vertebrates. More detailed evidence on this is needed, but there is strong suggestion that harmful effects may occur from major human disturbance to these habitats. At this stage, it is prudent to be cautious in considering cases such as this form of habitat / resource loss — and another reason for conserving hilltops noted by a reviewer is simply that many are habitat islands in a much changed surrounding landscape. We note that in New South Wales, the 'Loss and / or degradation of sites used for hill-topping by butterflies' has recently (April 2001) been listed as a 'key threatening process' under Schedule 3 of the Threatened Species Conservation Act.

5. **Pesticides.** Pesticide use extends well beyond agricultural areas, and is of concern in contexts such as spraying of roadside and railside vegetation, often representing small remnants of native vegetation, and spraying to control biting flies in wetlands and mangroves. Run-off of herbicides, e.g. applied to sugarcane and entering waterways upstream, is likely to affect the butterflies occupying affected plant communities. Aerial use of fenitrothion against plague locusts in large areas of inland Australia is another example likely to affect non-target taxa.
6. **Weeds.** Exotic plants, especially introduced pasture grasses, semi-aquatic grasses, woody shrubs and vines, competitively displace native flora and affect symbiotic fauna (e.g. ants), a process which may involve loss of critical food plants. Seedlings of *Pinus* spp. invading natural ecosystems pose a major threat, especially in the longer-term near plantations and at road edges.
7. **Exotic arthropods.** Amongst the vast array of exotic animals in Australia, particular concerns have been advanced over arthropods such as feral honeybees, ants such as *Pheidole megacephala* and *Linepithima humile*, and parasitoids. They can increase mortality (of early stages), displace native species (such as the specific ant hosts of Lycaenidae by introduced ants), or compete for food resources (such as feral honeybees for nectar). While some exotic predators are known to have detrimental effects on native arthropods, at present there is no evidence that exotic parasitoids have threatened any Australian butterfly.
8. **Climate change.** The effects of long term climate change on butterflies are extremely difficult to predict, but some key environments are likely to be particularly vulnerable. The limited alpine areas of the southeastern Australia, for example, may contract substantially within a few decades, according to some predictions. For birds on Torres Strait islands, Garnett and Crowley (2000) noted 'the effects of rising sea level are unpredictable'; the same applies equally to butterflies in such low-lying regions.
9. **Over-collecting.** This topic, treated separately below, has assumed importance in butterfly conservation far disproportionate to its documented effects. As with any purported threat, evidence is needed on a case-by-case basis.

Collecting as a threatening process

This controversial topic plays a central role in butterfly conservation activities. Despite widespread suggestions to the contrary, there is little or no evidence that non-commercial collecting of adult butterflies in Australia has ever been a threat to survival of a species or a population. However, this is not to claim that it could not become so under certain circumstances. For marginal populations already reduced to small remnants, any such additional 'pressure' could be harmful. At least in theory, concerted and concentrated efforts by many competent collectors on butterflies occupying very small and isolated sites could lead to extirpation. In practice, such circumstances are extremely rare in Australia and thus, the collection of specimens should not be considered generally to pose a risk. We do not need to emphasise again that most collectors have a responsible concern for the wellbeing of butterflies, but make a number of related points:

1. The number of active butterfly collectors in any part of Australia is not large, and the number visiting a given site to seek a particular butterfly species for a limited period each year is unlikely to exceed, at the most, a few tens of people.
2. The number of individual butterflies sought by each collector is typically small; a series of 6–10 good quality specimens of a species is usual, and males usually predominate. Some collectors visiting a remote or unusual locality will also take series for colleagues, so the maximum number may exceed this. Numbers of individuals required for bona fide taxonomic or other research may also be higher in individual cases. For some taxa and vulnerable populations, further monitoring of take may be warranted.
3. High quality, unblemished specimens are sought, so that many adult butterflies present are often not suitable and are usually not collected. Although there are unsubstantiated reports of such damaged specimens being killed by collectors (to avoid distraction by

recapturing them), this is relatively unusual, and most are either not collected or released unharmed.

4. Many of the individual butterflies present (even if the total population is there, in itself unlikely) may elude capture.
5. Females are likely to have reproduced (mated, oviposited) before capture.
6. The number of adults taken by collectors, even without restraint, is commonly far less than the number of individuals lost to the generation through juvenile or adult mortality. However, as noted above, any additional mortality may at times be unwise.

Possible negative aspects

In practice, many collectors prefer to rear their specimens from larvae or pupae collected in the field, to assure good quality cabinet specimens. Such practices have some potential to be much more damaging, for two main reasons:

1. Collectors may take a greater number from closed populations than actually needed, for example to counter losses due to parasitisation. For some Hesperiidae, for example, half or more of the larvae collected from sedges or grasses may be parasitised. However, individual gravid females are usually used to provide offspring for rearing. A single gravid female may provide sufficient eggs (sometimes >30 per female) to provide the collector with a desired series.
2. Collecting may be associated with damage to habitats and destruction of critical habitat components. Excessive stripping of bark from trees when seeking *Ogyris* pupae, or uprooting food plants to find individuals in soil around their base has been reported, although direct evidence is elusive.
3. When obtaining plant material for rearing larvae, food plants may be defoliated, or dug up for replanting in locations more convenient for collectors such as home gardens. Particularly in the case of uncommon plants including woody perennials, the practice may critically deplete wild food plant stocks. Such unsupervised collection of genuinely rare plant species may in some cases cause harm by degrading a habitat. Most collectors obtain plants from seed or by growing potted plants from nurseries on which to rear specimens.
4. The third category addressed is the impact of commercial collecting. Two kinds of collecting are relevant, reflecting the nature of the trade: using the terminology of Morris and Collins (1985), these are of 'high volume-low value' and 'low volume-high value' taxa. The former are exemplified by the large, showy taxa, not in themselves rare, but desirable as 'souvenirs' and for display in butterfly houses. The second category is of greater conservation relevance, as it is the capture of very low density or elusive taxa for sale to collectors. As for other collecting, emphasis may be on rearing specimens to assure highest quality and greater returns. Long-term rearing of some species may not be possible, because of inbreeding effects (such as inbreeding depression) or appearance of normally 'latent' viruses; some breeders of *Papilio ulysses*, for example, have found it necessary to rejuvenate laboratory stocks from the wild after a very few generations.

When specimens are reared for commercial purposes, long series can easily be bred in captivity from one or few females, since the fecundity of most butterflies (often 30–60 eggs / female) provides more than the numbers of offspring usually required for rearing in captivity. The diversity of potential commercial operations necessitates individual appraisal to evaluate conservation impacts. However, we have found little evidence of harmful effects in Australia, and no evidence that there is a major commercial demand for Australia's more elusive butterflies.

Concerns in Australia parallel those in Europe, where 'It must be stressed that a simple ban on collecting is not an effective way of conserving butterflies, especially as our results show that it is a comparatively minor threat. Moreover, simple bans on collecting can be counter-productive since it hinders butterfly research by amateurs' (van Swaay and Warren 1999).

Effects of collecting are likely to vary considerably with taxon, population and site and on very rare occasions the activity may need to be appraised in relation to other conservation activities undertaken in that particular context, so that any unmanaged cumulative impacts are prevented.

Threatened ecological communities

The threats noted for many of the butterflies in the BAP demonstrate the over-riding importance of habitat security and management as primary conservation measures. Some restricted vegetation associations are linked closely with suites of dependent butterflies. We draw attention to the following butterfly habitats which occur repeatedly in the species synopses which follow, and decline of which is associated clearly with increased concern for the security of butterflies which live there. All have other conservation values, and merit attention as foci for 'coordinated conservation plans', as discussed for birds by Garnett and Crowley (2000). Many of the management recommendations advanced by Garnett and Crowley devolve around maintenance of habitat security and quality, together with proposals for rehabilitation of habitats where necessary, and apply equally to butterflies.

The following vegetation associations and ecological communities are of particular importance as habitats currently appearing to be at risk in parts of Australia. Examples of taxa affected (in decline but not all currently threatened) are given in parenthesis:

1. Mangrove communities in Queensland and New South Wales (*Acrodipsas illidgei*, *Hypochrysops apelles apelles*, *H. epicurus*).
2. Coastal grasslands and associated melaleuca wetlands in eastern Australia (*Argyreus hyperbius inconstans*, *Ocybadistes knightorum*, *Telicota eurychlora*, *Tisiphone abeona 'joanna'*, *Junonia hedonia zelima*).
3. Saline sedgelands in southern Australia and Tasmania (*Hesperilla flavescens flavescens*, *H. f. flavia*, *H. chrysotricha* ssp., *Oreisplanus munionga larana*).
4. Coastal sand dunes and heathlands in southwestern Western Australia; heathlands in southeastern Queensland (*Hypochrysops halyaetus*, *Nesolycaena albosericea*, *Theclinesthes hesperia hesperia*, *Trapezites atkinsi*).
5. Summits of hilltops and of inland sand dunes (most *Acrodipsas* spp., many *Hypochrysops* spp., *Ogyris* spp., many Trapezitinae).
6. Inland native grasslands and heathlands, especially west of the Main Divide in southeastern Australia; some affected by salination (*Candalides heathii* ssp. "Wimmera", *Anisynta cynone* ssp., *Herimosa albovenata* ssp., *Trapezites luteus*)
7. Inland plant communities of (old growth) brigalow (*Acacia harpophylla*) and bulloak (*Allocasuarina luehmannii*) in eastern Australia (*Jalmenus evagoras eubulus*, *Ogyris* spp., *Hypochrysops piceatus*).
8. The removal of mistletoes from host trees for control of mistletoe browntail moth (*Euproctis edwardsii*) in South Australia (*Ogyris* spp.).
9. Lowland, coastal subtropical rainforests in eastern Australia (*Ornithoptera richmondia*, *Hypochrysops miskini miskini*, *Pseudodipsas cephenes*, *Telicota anisodesma*).
10. Riverine and water course plant communities in eastern Australia (many taxa including *Hesperilla sexguttata*, *Tisiphone abeona rawnsleyi*).
11. Native plant communities on islands, especially those of Torres Strait (most indigenous taxa).

Threats to defined geographical areas or to broader arrays of habitats may also be of general significance to butterflies, as for birds. As two examples, both noted by Garnett and Crowley: (1) the recent rapid spread of the introduced Crazy Ant (*Anoplolepis gracilipes*) on Christmas Island, where they currently occupy some 15% of the island and continue to spread, has the potential to disrupt the ecology of the entire island in ways which are scarcely predictable at present; and (2) changes to the Mount Lofty Ranges, South Australia, nearly all of which has been cleared for grazing and agriculture, have led to declines of several butterflies formerly more widespread in that region. Long (1999) stated that more than 85% of vegetation in the Mt Lofty Range has been cleared. The exotic *A. gracilipes* has recently been discovered in Queensland and it may eventually become an environmental pest in mainland Australia.

Examples could be multiplied, but — in addition to species focussing — we emphasise the need to consider butterfly conservation above the species level, and to incorporate vegetational and regional parameters in developing viable plans for conservation and recovery. Several of our species synopses contain suggestions for conjoint surveys or other activities to cover several coexisting and ecologically-linked species of concern.

6 Recommendations

The science of butterfly conservation has developed in Australia, as in other parts of the world, mainly through concerns for individual species. General principles continue to evolve in broader aspects of the discipline, which was pioneered in the northern hemisphere, predominantly Britain and continental Europe (New et al. 1995). As with many other facets of biology, many of the ideas have been imported to Australia with little critical reappraisal on how they may be adapted realistically to the Australian environment. For example, lepidopterists working on the small British butterfly fauna have a long history of recording species incidences and abundance, so that each of the 55 resident butterfly species is remarkably well documented and novelties in incidence, abundance and distribution can be appraised reliably. Much of the relevant background information on butterfly conservation has been summarised by Dunn et al. (1994) and Yen and Butcher (1997), and in the more general text by New (1997); these accounts contain numerous references to both specific cases and general themes, and these are not repeated here.

Taxa of ‘municipal’ concern

The term ‘municipal’ is introduced for taxa when they are not threatened at National or state level but are populations considered to be threatened: (i) at the edge of their range, (ii) that exhibit unique biological characteristics or (iii) that exhibit unique morphological (but not recognised taxonomically) or molecular (DNA) identities.

Listing of taxa

The major outcome of concern for butterflies in Australia has been progressive ‘listing’ of species for ‘protection’, predominantly through individual state legislation. This step has elevated a number of butterfly species to ‘flagship’ status, but much listing remains controversial. Some has been considered to be over-zealous in relation to conservation need. Nevertheless, considerable benefit has come from some cases, in gaining publicity, acceptance and practical help for conservation, and in helping to establish the credibility of invertebrates on wider conservation agendas. The Eltham copper in Victoria (Braby et al. 1999) is perhaps the most important insect advocate for conservation in that State. Likewise, conservation of the Richmond birdwing in southern Queensland and northern New South Wales (Sands et al. 1997) has helped to harness support for insect conservation in ways that would not have been possible a decade or so ago. Both these cases, and others, have helped to establish butterfly conservation as of practical importance in Australia.

A tangible outcome, important in developing the BAP, has been the number of state initiatives to investigate conservation status and recovery needs of selected butterflies, most of them as a direct consequence of ‘listing’ or proposals to list. Much of the relevant documentation remains in the ‘grey literature’, as an undervalued resource. Most such accounts are noted in the taxon summaries later in this Action Plan.

With increasing capacity to designate ‘threatened communities’ in various parts of Australia, and the realisation that habitat protection (including management, for example of particular successional stages on which particular butterflies may depend) is a paramount need, the wider needs of butterflies are being increasingly considered. Status assessments and recovery plans reveal more detailed biological background, rather than simple counts of individuals and sites. In Victoria, the designation of ‘Butterfly Community No.1’ under the Flora and Fauna Guarantee Act 1988 has promoted considerable general discussion over how such entities may be recognised and defined.

The recovery process

Management or more aggressive ‘recovery’ programs for butterflies divide naturally into two major phases, research and practical management, in relation to defined objectives (based on the best possible knowledge of the species’ biology) and time intervals for review and possible change in support and need.

The species synopses that follow differ widely in the suggestions and recommendations made, reflecting the information available and the different factors affecting the various taxa. For some species, the most urgent need is for 'research', predominantly survey studies to determine occurrence and extent of other populations and to increase basic knowledge of biology and key ecological needs. For other species the knowledge template is sufficient to initiate defined management. This will inevitably lead to further biological understanding, and any recovery plan must be sufficiently flexible to incorporate this and be changed as necessary during its execution. Relatively few butterfly recovery plans have been designed and pursued in Australia and these, included in the following species synopses, may be viewed as case histories for evaluation in relation to steps needed for other taxa.

The paramount initial need in recovery is to address abatement of threats. We noted earlier that many of these are related to loss or degradation of habitats, and that some broader key habitat types may be important for a number of butterfly species. Habitat loss for butterflies is noticed most frequently in relation to changes at particular sites where, for example, vegetation may be cleared for some form of development such as urbanisation, agriculture, or road-widening. An important aspect of management for butterflies is thus to signal to the responsible authority that important small habitat patches (often fragments in a highly changed landscape) may be necessary to sustain populations or species, and to seek protection and security for these; without securing a place for a butterfly to live, many other aspects of potential recovery become redundant. Habitat change can also be more insidious, such as through replacement of native vegetation by invasive weeds, or of native ants by exotic species whose effects may not be obvious immediately.

Habitat protection and management is the most important aspect of butterfly conservation. It is also the most expensive and difficult to achieve, because of political conflicts over priorities for land use, and the high costs of purchasing land for reservation. It is flagged as a recovery need for many of the species we discuss below. There appear to be abundant opportunities for protection of butterfly habitats through voluntary conservation agreements. A variety of mechanisms for securing land tenure exist in various parts of Australia. These include:

1. Acquisition and reservation by a state or Commonwealth agency
2. Reservation under local government support
3. Covenant on the title of the land
4. Designation under a conservation management scheme such as Land for Wildlife
5. Designation under some environmental planning instrument

The main conjoint activities needed for many butterfly recovery plans are (1) further exploration to detect any previously unknown populations, whose discovery may affect other priorities and needs, (2) acquisition, or conservation measures, to secure critical sites for the butterfly, and (3) aspects of restoration and management of degraded habitats, either of existing secure habitats to increase their carrying capacity for butterflies or as 'new' sites within the historical range, to which butterflies might be introduced to constitute additional populations. Several of the cases noted detail aspects of this restoration, involving predominantly the augmentation and / or establishment of larval food plants. The wider experiences with butterfly conservation in Britain have led to development of a series of practical points to be considered in such exercises (Butterfly Conservation 1995, Appendix 5). Any such restoration project and translocation should be documented carefully, together with evaluating the monitoring and management needed subsequently.

Threat abatement measures vary widely for different species, and are detailed in context. There are dangers in complacency; simply that a key site for a butterfly is in a protected area such as a National Park does not obviate needs for site management, for example.

For any butterfly species subject to conservation management, establishment of a formal review process, such as through a Recovery Team, is necessary. This team should involve experienced lepidopterists, in addition to the spectrum of management and wider community sector interests involved. We view the participation of lepidopterists in such activities as of very great importance, not least because many of the other members of a team are likely to have little practical knowledge of 'how butterflies work'. We recommend the formation in each state, of a single coordinating body for butterfly recovery programs. This will aim to ensure that communication is most efficient and the best expertise is involved in single recovery teams for each taxon.

De-listed species

Species are removed from lists of protected taxa for two main reasons:

1. Further study, prompted and facilitated by the initial listing, reveals the taxon to be more secure than supposed previously, so that its conservation need and status was overstated.
2. Recovery actions are successful and result in the taxon becoming secure, so the initial conservation need has been satisfied.

Both outcomes are entirely satisfactory, although the first emphasises the need for careful status evaluation before listing, when this is feasible, rather than the converse process. Criteria for de-listing should be set in relation to individual species' management / recovery plans. De-listing is a responsible step, and acceptance of this principle necessitates formal provision for regular review and evaluation of the status and needs of all butterfly species placed an any schedule of 'protected species'. We suggest the following process for this:

1. All listed species should be reviewed formally at no more than five year intervals from the date of listing. (Note that such a provision for review, with various time intervals, already exists in some state legislation).
2. This periodic review should include:
   a. New information accumulated since listing or previous review.
   b. The validity and stage of execution of the current Action or Recovery Plan. For the first review, it may be necessary to ensure that such a plan has indeed been designed and a suitable recovery team convened.
   c. Progress of recovery actions, and the extent and sources of support for these; whether additional resources are needed.
   d. The balance between 'research' and 'management' components.
   e. Decision to retain on list (and what further management steps are then necessary) or to de-list the species.

A case for retaining a species as listed implies that recovery has not been completed or confirmed, and that the species is thus still dependent on needs for further conservation management.

The 'Rehabilitated taxon'

There is some danger that once a species is de-listed as a result of recovery, it may henceforth be ignored. In cases of doubt over whether recovery has occurred, the species should remain listed.

However, even for 'fully recovered species' threats may recur or new threats arise, with a likely need to re-list the taxon, with a consequent second recovery sequence being needed. It is important to ensure that such taxa do not become neglected, but are monitored sufficiently to ensure sustainability, and detect changes in status. This continuing obligation of conservation agencies will be facilitated by categorising such species with some epithet to signify their previous conservation significance, thereby retaining them on a schedule of formally de-listed taxa.

We suggest the term **'rehabilitated species or taxon'** for these (Macquarie dictionary: 'rehabilitate: to restore formally to a former rank or standing').

The principle is in some ways similar to that of recently-advocated 'Blue Lists' (Gigon et al. 2000), which enumerate Red List species experiencing 'lasting overall stabilisation or an increase in abundance in the region considered'. Blue lists were proposed to incorporate three major categories:

1. Species whose increases merit de-listing from a Red List.
2. Species increasing in abundance but not enough to merit de-listing.
3. Species whose abundance is stable.

They thereby include a broader array of taxa than proposed here, and our rehabilitated species include only the first category listed above. We are not including 'conservation dependent' species. The major problem we foresee, that of maintaining attention to delisted species, was not addressed by Gigon et al. (2000).

We consider the rehabilitated species concept to have considerable importance also for other taxa, in ensuring that their conservation needs are not neglected after they are deemed secure as a result of recovery actions. The taxa deemed 'rehabilitated' could constitute an 'administrative list' rather than a category which would trigger protective legislation.

Secondary lists

Formal listing of butterfly species for protection must be undertaken responsibly, and only based on scientific evidence. Many taxa are noted as of conservation concern but for some of these, direct evidence for decline or threats is lacking; evidence of threatened status is thereby subjective. Following the example set by Victoria (DCE 1995), we note the value of 'secondary lists' of such taxa, predominantly including taxa which are LR, DD or of ambiguous allocation, with some simply suggested to be of concern. These can thereby become the foci for further documentation as opportunity presents, without the constraints imposed by more formal legal elevation. Taxa entered on secondary lists should not be categorised as ‘protected species’.

Community involvement

The foregoing recovery outlines emphasise the participation of local people and interest groups in many aspects of butterfly conservation, from helping to establish status to taking important initiatives in habitat management, such as weed removal, restoration (for example by cultivating and planting larval food plants) and monitoring. Many such operations are part of a broader local natural history focus so important in much conservation, and much such work proceeds independently of more ‘official’ conservation. ‘Friends groups’ and the like will continue to be important components of recovery teams, and will continue to play leading roles in conservation of species, habitats and sites, not always on species which are immediately threatened. Preventative measures to safeguard apparently secure species are an important component of butterfly conservation. Our workshops were attended by a number of people participating in such activities.

As examples only, we note the following to demonstrate the spectrum of such activities:

1. Victoria. The ‘Friends of the Eltham Copper’ were formed in 1987, and have been involved with all activities related to management of *Paralucia pyrodiscus lucida* since then. Counts of adults and larvae have relied very heavily on their voluntary participation, as have aspects of site maintenance, such as sanitation, and planting of larva food plants.
2. Victoria. The ‘Sword-grass Brown butterfly project’, initiated by the Knox Environmental Society, is a long-term project dedicated (since 1993) to ensuring the survival of *Tisiphone abeona* and promoting population increases in outer eastern Melbourne, in particular. Surveys, and habitat enhancement by propagation and planting of *Gahnia* (the name of the group’s regular newsletter) continue to be key activities for conservation. See Belvedere et al. (1998) for details of the group’s activities. The project is innovative and pre-emptive in seeking to halt decline of the butterfly.
3. South Australia. Butterfly Conservation South Australia Inc. (BCSA Inc.) was set up in 1998 to raise awareness of butterfly losses in South Australia. The group’s activities include surveying and protecting habitats, providing information and advice, promoting awareness of food plant and site conservation, and of the needs of butterflies at all levels, as well as working with other environment groups to involve butterfly conservation in their activities.
4. Western Australia. The Western Australian Insect Study Society Inc. was founded in 1989, and has done much to promote the study of butterflies in the State. A major achievement has been the production of a book on Butterfly Gardening for Western Australians (Houston, 1994).
5. New South Wales. Conservation of the Bathurst copper (*Paralucia spinifera*) was developed as major community exercise (Nally 2000), with funding provided by Environment Australia. Activities included monitoring of butterfly numbers, weed control and habitat quality assessment. The community became directly involved in recovery actions, and an active media / publicity campaign helped to promote the recovery needs and measures for *P. spinifera*.
6. New South Wales / Queensland: The Richmond Birdwing Conservation Project. A major project to conserve the Richmond birdwing (Sands et al. 1997) began in 1991, sponsored by the New South Wales National Parks and Wildlife Service, with the CSIRO Education service in Queensland extending much of the community and education coordination in 1993. In 1999, the Project gained the support of a Threatened Species Network Community Grant.
7. Queensland. A Draft Recovery Plan for the bulloak jewel (*Hypochrysops piceatus*) was developed by the Queensland Parks & Wildlife Service (Payne, A. and Lundie-Jenkins, G. 1999), with funding from Environment Australia. Activities include setting aside roadside habitat as a protected area, surveys to locate new populations of the butterfly and collaboration with local councils and farm owners.
8. Queensland. The Butterfly and other Invertebrates Club Inc. was founded in 1994 and has a wide spectrum of activities, including growing butterfly food plants, and promoting habitat conservation. It has produced a colour poster of the life stages of

ten local Papilionidae and their host plants. In July 1997, the Club initiated a Planning Project, which led to the production of an interim recovery plan for the Australian fritillary.

Protected Area Surveys

There is need for a coordinated inventory of the incidence and status of all butterfly species in Australia's National Parks and other high level reserves. Lack of such information has been a major impediment to status evaluations for the BAP. In many cases we have assumed that species may occur in such reserves, but this is sometimes uncertain because of the lack of reliable records, or reliance on historical data. Systematic surveys of butterflies in reserves, sponsored by State Agencies and undertaken by experienced lepidopterists, could do much to redress this situation. Until now, the respective agencies in various States have done little to foster such coordinated study. We believe that State Conservation Agencies have a responsibility to undertake such surveys, and see them as of critical importance in advancing understanding of the needs for butterfly conservation in Australia.

Without these data as a template for future conservation planning, augmentation of the reserve system for butterflies, and setting priorities for complementarity is difficult. Representation of butterflies in most national parks is simply unknown other than by serendipitous accumulation of records. Likewise, threatening processes for butterflies in national parks are very poorly documented.

Codes of conduct

Considerable interest exists in developing a 'code of conduct' or 'code of ethics' (Greenslade 1999) to facilitate and link the different priorities of non-professional lepidopterists and the various State / Territory conservation agencies and Environment Australia, in the interests of advancing knowledge and conservation of butterflies. This should foster a cooperative approach to butterfly conservation, recognising the need to develop an agenda of mutual trust, and joint activities between collectors and conservation authorities.

Such a code is not a novel suggestion. Codes exist in the United Kingdom (JCCBI 1971) and the USA (Lepidopterists Society 1982) (Appendix 6). Both those codes emphasise primarily the needs for responsibility by collectors. In Australia we view the need, rather, as a joint protocol for collectors and conservation agencies seeking to understand other viewpoints for mutual benefit and respect. In the spirit of the 'Osaka Statement', sections 13 and 14 (Lepidopterological Society of Japan 1996) ('protocols [namely a series of well-reasoned, non-legal regulations], rather than formal legislative protection of butterflies, if established as conservation guidelines for individual species, or groups of endangered species, appear to be the best means of sustaining butterfly populations, as they maintain the goodwill and support of interested people. Protocols can only be established effectively in consultation with professional and amateur lepidopterists who have intimate or general knowledge of the butterfly species under consideration'), we put forward the following points for discussion with a view to their adoption by all interested parties. We emphasise that this is not a 'prescriptive' code. Rather, we put forward the various points made to us during the gestation of the BAP as a basis for a 'meeting of minds' on matters of interest to various levels of government, and professional and non-professional entomologists. It equates in part, to a 'code of collecting ethics — produced in consultation with the whole entomological community...' as suggested by Greenslade (1999).

General

1. The hobby of butterfly collecting has contributed significantly to knowledge of taxonomy, distribution, biology and conservation of butterflies in Australia, and 'collectors' (broadened in concept to a wide spectrum of 'non-professional lepidopterists') will remain a vital source of information relevant to butterfly conservation and management. Collecting is also an important way of inducing awareness of the natural environment, perhaps particularly amongst young people.
2. The formal listing of butterfly species for protection can alienate the interests of such contributors, through prohibiting take, the imposition of penalties for doing so, and numerous general uncertainties and suspicions over 'correct behaviour' and permit requirements. Listing, despite laudable stated aims of some legislation to stimulate gaining new information, is frequently a disincentive to non-professionals, some of whom have consequently ceased to study butterflies in Australia. We are also aware of the strongly-felt dichotomy between those who seek extensive listing of taxa as a means to deter any collecting, and those who urge minimal listing so as not to

impede their hobby. Notwithstanding strong ethical viewpoints, the problem of particular practical concern for conservation is the nexus between 'listing' and 'prohibition or restriction of take' of taxa for which collecting is not a threatening process, and which tends to demean the significance of listing.

3. The difficulties which arise are not insolvable, and can be overcome by non-legal protocols involving cooperation between collectors and conservation agencies (both state and National), in ways which will encourage contributions to basic knowledge and its applications for effective conservation of butterflies. Several states already foster such cooperation.
4. The code seeks to ensure maximum responsibility for conservation by all parties, whilst recognising the differing priorities involved and not hampering unduly the activities and interests of any parties wishing to contribute to knowledge of butterflies.

Collectors

1. No more specimens than actually needed for any purpose should be killed, with due regard to any 'bag limit' imposed rationally in the interests of conservation need. Specimens for exchange or distribution to other collectors should be taken only after consideration (if necessary by seeking informed prior advice) of whether the population is sufficiently large / viable to enable this to be done without harm. The population may be an 'important population' (Environmental Protection and Biodiversity Act 2000) on which controls may be warranted. Uncritical use of traps which take bulk samples and kill insects should not occur on sites where any threatened butterfly species is known to occur; should such species be found in other sites where such traps are in use, their operation should be controlled.
2. If seeking perfect specimens for the cabinet, specimens not retained should not be killed or otherwise harmed, but released into the population from which they were captured. If necessary, surplus individuals can be kept alive in pill boxes in a cool container and released at the end of the visit.
3. Capture of mostly males is usual and preferable to taking many females. If females are to be used to obtain eggs for captive breeding, consideration should be given to releasing unneeded females after sufficient eggs have been obtained. Breeding from a gravid female may be preferable to taking long series from the field. Unwanted and excess reared stock should, wherever possible, be released into the parental population, unless to be used for a planned translocation of the species (see translocation guidelines). Any such operation must be planned carefully and undertaken only after consultation and documentation. In general translocation is a responsible measure and should not be undertaken lightly, and releases should never be made outside the known, documented historical range of the species.
4. Supposed or known natural enemies (predators and parasitoids, other than invasive exotic species such as European wasps and some ants) and symbionts / mutualists (ant hosts of Lycaenidae) should not be destroyed. Reared parasitoids should be retained for eventual deposition in institutional collections.
5. Specimens of 'listed species', and others of known or suspected conservation significance, should be collected only with restraint. Specimens from outside the documented range are of particular importance as vouchers, and such incidences should be brought to the attention of the relevant conservation agency (see below). The authorities, in turn, should undertake to deal responsibly with such records, and encourage their accumulation. To this end, collectors are encouraged to extend their activities beyond visits to traditional, well-known sites for particular species within the limits of time available.
6. Disturbance to the habitat, especially to critical resources such as larval food plants, should be kept to a minimum. Recognising that disturbance can occur unwittingly, especially when collecting / seeking early stages, the following examples indicate the kinds of restraint which may be needed in particular situations:
   a. Ant nests should not be dug up and destroyed whilst seeking Lycaenidae.
   b. Rocks and dead wood, such as overturned logs, should be replaced as closely as possible to their original position after disturbance.
   c. Dehiscent bark on trees should be removed with restraint, rather than whole trunks being stripped. 'Trap banding' should be viewed as an alternative procedure.
   d. Larval food plants should not be pulled up and discarded, removed or otherwise damaged.

e. Small patches of habitat should not be trampled excessively.

7. Property rights should be respected, and permission obtained to enter any private land, designated reserve, etc. No litter should be discarded on sites visited. Special care should be taken to avoid disturbances in designated reserves and by observing any restrictions applied to permits to collect.

8. Collected material is a valuable resource. Specimens should be fully and accurately labelled, and protected from damage. Specimens of conservation significance should be able to be retained in private collections without any penalty or fee, and the data from these made available freely for use in conservation assessment and planning.

9. Where possible, collecting in places with high public attention (such as busy roadsides) should be minimised.

Conservation authorities, agencies and managers

1. Agencies should recognise that information gained by collectors is the predominant source of information on Australian butterflies and their conservation needs, and that collections made by non-professionals constitute the bulk of State Museum and Australian National Insect Collection holdings of butterflies. These collections provide an important resource, which by far exceed the input from the small number of professional lepidopterists in this country. Much of the information would never otherwise be obtained.

2. Likewise, collecting is rarely, if ever, a threatening process to butterflies. The problems caused by prohibition of take and associated loss of communication by far outweigh any adverse impact of these activities. Prohibition of take and other legislative impediments are detrimental to the interests of butterfly conservation. Where species are known from only single sites / localities and the population size and vulnerability is unknown, the precautionary principle dictates that collecting may need some control or, rarely, that collecting should be prohibited completely or monitored carefully. For the great majority of species, this is not so.

3. Non-professional lepidopterists should be involved as community participants in all recovery teams for butterflies, and be encouraged by Agencies to participate in all aspects of species and habitat management.

4. It is incumbent on Agencies to investigate how the needs of non-professionals may be satisfied in harmonious and non-harmful ways, whilst harnessing the information obtained for use in conservation assessment and management.

Topics worthy of constructive exploration include:

a. Permits for access to restricted areas or to collect 'listed taxa' to be issued to organisations rather than only to individuals, with participants providing regular returns of information to the permitting Agency. Each collector may be restricted to a 'bag limit' for a season or site, this to be determined realistically in relation to population size and vulnerability. Other conditions (such as specifying the number of females permitted to be captured) may from time to time be necessary.

b. For species which occur on a number of sites, it should be feasible to permit collecting on particular site / s which support larger, viable populations whilst maintaining protection for others perceived as more vulnerable.

c. Organisation / promotion of 'open days' on particular 'safe' sites, as a forum for collecting and exchange of information between interested parties.

d. Eliminate the need for permit requirements which currently prevent collectors from taking voucher specimens of species from areas outside the current documented range, so allowing them to do this without fear of penalty. Collectors should be encouraged to extend surveys in this way, and provide information on knowledge of such range extensions and distributional changes.

e. Agency personnel should liaise effectively with local lepidopterists, such as by attending society / group meetings, to promote appreciation of mutual interests. The appointment of a designated person in each Agency, who can be a direct point of approach for lepidopterists seeking advice, permissions (etc.), is strongly recommended.

f. The practice of charging annual or other fees for retaining specimens in collections is undesirable, as a deterrent to interested participation.

g. Active encouragement of surveys of protected areas or other key localities for which inventory data on butterflies will enhance conservation perspective. Initiatives by conservation agencies to promote such surveys could do much to foster cooperation.

National Advisory Group

Following from the recommendation by Yen and Butcher (1997) that an Agency position dedicated to invertebrate conservation matters be established in each State, we see considerable value in establishing a broad national advisory group on butterfly conservation under the aegis of Environment Australia. Such a group could include representatives of conservation agencies, experienced professional and non-professional lepidopterists, and broader community representation, and have the primary responsibility of coordinating and reviewing all aspects of butterfly conservation in Australia.

We do not presume to define the constitution of the group (for example, whether it should include representatives nominated by the Australian Entomological Society or other interest groups), or its terms of reference, but see it as responsive to any relevant issue of listing / de-listing taxa, design of recovery / management plans, promotion of priority studies, review, and promoting liaisons between involved parties.

Representation on State Advisory committees

We see considerable benefits in participation by experienced non-professional lepidopterists on State Advisory Committees. They should be involved in nominations of species for listing, review of relevant management or recovery plans, and other relevant activities. Without consideration of their expertise, such committees throughout Australia can not function for the greatest benefit of butterfly conservation. A state butterfly recovery team, not precluding the individual recovery teams for each species, should be an appropriate coordinating body for a variety of relevant activities.

Need for a National Butterfly Data Base

We regard the establishment of a ***National Data Base for Australian Butterflies*** as a key tool for conservation planning. Although data bases (such as Dunn and Dunn 1991) contain much valuable information, they are not readily available and a system whereby interlinked data could be coordinated, and a single repository for new data would furnish much valuable information into the future. Such a data base should be updated at regular intervals to accommodate taxonomic changes and new taxa, and should follow the taxonomic requirements (but not necessarily recommendations) of the most recent published edition of the International Code of Zoological Nomenclature.

7 References

Akcakaya, H.R. and Ferson, S. 1999. RAMAS Redlist. Threatened species classifications under uncertainty. Version 1.0. Applied Biomathematics, Setauket, New York.

Beale, J.P. 1997. Comment on the efficacy of Queensland nature conservation legislation in relation to *Acrodipsas illidgei* (Waterhouse and Lyell) (Lepidoptera: Lycaenidae: Theclinae). Pacific Conservation Biology 3: 392–396.

Belvedere, M., Bain, G. and Steller, P. 1998. Sword grass brown butterfly project. Victorian Naturalist 115: 142–145.

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Braby, M.F., Atkins, A.F., Dunn, K.L., Woodger, T.A. and Quick, W.N.B. 1997. A provisional list of common names for Australian butterflies. Australian Journal of Entomology 36: 197–212.

Braby, M.F., van Praagh, B. D. and New, T.R. 1999. The dull copper, *Paralucia pyrodiscus* (Lycaenidae). Pp. 247-260 in Kitching, R.L., Scheermeyer, E., Jones, R.E. and Pierce, N.E. (eds) Biology of Australian Butterflies. CSIRO, Melbourne.

Butterfly Conservation 1995. Lepidoptera restoration: Butterfly Conservation’s policy, code of practice and guidelines for action. Butterfly Conservation News 60: 20–21.

CALM 1994. (Department of Conservation and Land Management). Setting priorities for the conservation of Western Australia’s threatened flora and fauna. Policy Statement No. 50. CALM, Perth.

Clarke, G.M and Spier-Ashcroft, F. Conservation Overview of Selected non-marine invertebrates. Environment Australia, Canberra (2002).

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia (revised edition) Angus and Robertson, Sydney.

DCE 1995. (Department of Conservation and Environment [now Department of Natural Resources and Environment]) List of threatened fauna in Victoria. Melbourne.

Dunn, K. L. and Dunn, L.E. 1991. Revision of the Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Published by the authors, Melbourne.

Dunn, K.L., Kitching, R. L. and Dexter, E.M. 1994. The conservation status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

Edwards, E.D. 1973. Delayed ovarian development and aestivation in adult females of *Heteronympha merope merope* (Lepidoptera, Satyrinae). Journal of the Australian Entomological Society 12: 92–98.

Edwards, E.D., Newland, J. and Regan, L. 2001. Lepidoptera: Hesperioidea, Papilionoidea. *In* Wells, A. and Houston, W.W. K. (eds) Zoological Catalogue of Australia. Vol. 31.6, Melbourne; CSIRO Publishing, Australia.

Frankham, R. 1995. Effective population size / adult population size ratios in wildlife: a review. Genetical Research 66: 95–107.

Garnett, S.T. and Crowley, G.M. 2000. The Action Plan for Australian Birds 2000. Environment Australia, Canberra.

Gigon, A., Langenauer, R., Meier, C. and Nievergelt, B. 2000. Blue lists of threatened species with stabilised or increasing abundance; a new instrument for conservation. Conservation Biology 14: 402–413,

Given, D,R, and Norton, D.A. 1993. A multivariate approach to assessing threat and for priority setting in threatened species conservation. Biological Conservation 64: 57–66.

Greenslade, P. 1999. What entomologists think about listing species for protection: a survey of butterfly specialists in Australia. Pp. 345–349 in

Ponder, W. and Lunney, D. (eds) The other 99%. The conservation and biodiversity of invertebrates. Transactions of the Royal Zoological Society of New South Wales, Mosman.

Houston, T.F. (ed.) 1994. Bring back the butterflies. Butterfly gardening for Western Australians. Western Australian Museum, Perth.

Hutchings, P.A. and Ponder, W.F. 1999. Workshop: criteria for assessing and conserving threatened invertebrates. Pp. 297–315 in Ponder, W. and Lunney, D. (eds) The other 99%. The conservation and biodiversity of invertebrates. Transactions of the Royal Zoological Society of New South Wales, Mosman.

IUCN 1994. IUCN Red list categories. IUCN, Gland.

JCCBI 1971. A code for insect collecting. Entomologist's monthly Magazine 107: 193–195.

Kitching, R. L., Scheermeyer, E., Jones, R.E. and Pierce, N. E. (eds) 1999. Biology of Australian butterflies. CSIRO, Melbourne.

Kudrna, O. 1986 Aspects of the conservation of butterflies in Europe. Butterflies of Europe, 8. Aula-Verlag, Weisbaden.

Lepidopterists Society 1982. The Lepidopterists' Society statement of committee on collecting policy. News of the Lepidopterists' Society, No. 5.

Lepidopterological Society of Japan 1996. The Osaka Statement. Pp. vii-viii *in* Ae, S.A., Hirowatari, T., Ishii, M. and Brower, L.P. (eds) Decline and conservation of butterflies in Japan III. Lepidopterological Society of Japan, Osaka.

Long, M. 1999. A biological inventory of the Mt Lofty Range of South Australia. Department of Environment, Heritage and Aboriginal Affairs, South Australia.

Millsapp, B.A., Gore, J.A., Runde, D.E. and Cerulean, S.I. 1990. Setting priorities for the conservation of fish and wildlife species in Florida. Wildlife Monographs 111: 1–57.

Molloy, J. and Davis, A.M. 1994. Setting priorities for the conservation of New Zealand's threatened plants and animals, 2nd edn. Department of Conservation, Wellington, New Zealand.

Morris, M.G. and Collins, N.M. 1985. Threatened swallowtail butterflies of the world. IUCN, Gland and Cambridge.

Nally, S. 2000. *Paralucia spinifera*. Lithgow's endangered copper butterfly. Community education and involvement program. Annual Report 2000, NSW National Parks & Wild life Service.

New, T.R. 1996. Evaluating the status of butterflies for conservation. Pp. 4-21 *in* Ae, S.A., Hirowatari, T., Ishii, M. and Brower, L.P. (eds), Decline and conservation of butterflies in Japan III. Lepidopterological Society of Japan, Osaka.

New, T.R. 1997. Butterfly Conservation (2nd edn). Oxford University Press, Melbourne.

New, T.R. 1999. The evolution and characteristics of the Australian butterfly fauna. Pp. 33–52 *in* Kitching, R. L., Scheermeyer, E., Jones, R.E. and Pierce, N. E. (eds) 1999. Biology of Australian butterflies. CSIRO, Melbourne.

New,T.R., Pyle, R.M., Thomas, J.A., Thomas, C.D. and Hammond, P.C. 1995. Butterfly conservation management. Annual Review of Entomology 40: 57–83.

Nielsen, E.S., Edwards, E.D. and Rangsi, T.V. 1996. Checklist of the Lepidoptera. Monographs on Australian Lepidoptera, Vol. 4. CSIRO, Melbourne.

Olliff, A.S. 1888. On Rhopalocera from the vicinity of Mt. Bellenden-Ker, Queensland. Proceedings of the Linnean Society of New South Wales (2) 3: 394–396.

Patrick, B.H. and Dugdale, J.S. 2000. Conservation status of the New Zealand Lepidoptera. Science for Conservation 136. Department of Conservation, Wellington.

Payne, A. and Lundie-Jenkins, G. 1999. Draft Recovery Plan for the Bulloak Jewel butterfly (*Hypochrysops piceatus*) 1998–2002. Queensland Parks & Wildlife Service, January 1999.

Pollard, E. and Yates, T.J. 1993. Monitoring butterflies for ecology and conservation. Chapman and Hall, London.

QNCA 1994. *Nature Conservation Act 1992* (Queensland, revised 1994). Queensland Parks & Wildlife Service, Queensland.

QNCA 1994. (Queensland, amendment regulation No. 1, 2001). *Nature Conservation Act 1992*. Queensland Parks & Wildlife Service, Queensland. Subordinate Legislation No. 215.

Rabinowitz, D. S., Cairns, S. and Dillon, T. 1986. Seven forms of rarity and their frequency in the flora of the British Isles. Pp. 182–204 *in* Soulé, M.E. (ed.) Conservation biology: the science of scarcity and diversity. Sinauer, Sunderland, Mass.

Sands, D.P.A. 1999. Conservation status of Lepidoptera: assessment, threatening processes and recovery actions. Pp. 382–387 *in* Ponder, W. and Lunney, D. (eds) The other 99%. The conservation and biodiversity of invertebrates. Transactions of the Royal Zoological Society of New South Wales, Mosman.

Sands, D.P.A., Scott, S.E. and Moffatt, R. 1997. The threatened Richmond birdwing butterfly (*Ornithoptera richmondia* (Gray)): a community conservation project. Memoirs of the Museum of Victoria 56: 449–453.

Shields, O. 1967. Hilltopping. An ecological study of summit congregations of butterflies on a southern California hill. Journal of Research on the Lepidoptera 6: 69–178.

Silberbauer, L.X. and Britton, D.R. 1999. Holiday houses or habitat: conservation of the Brenton blue butterfly *Orachrysops niobe* (Trimen) (Lepidoptera: Lycaenidae) in Knysna, South Africa. Pp. 394–397 in Ponder, W. and Lunney, D. (eds) The other 99%. The conservation and biodiversity of invertebrates. Transactions of the Royal Zoological Society of New South Wales, Mosman.

Stubbs, A.E. 1985. Is there a future for butterfly collecting in Britain? Proceedings and Transactions of the British Entomological and Natural History Society 18: 65–73.

Thomas, C.D. 1995. Ecology and conservation of butterfly metapopulations in the fragmented British landscape. Pp. 46-63 in Pullin, A.S. (ed.) Ecology and conservation of butterflies. Chapman and Hall, London.

Thomas, C.D. and Abery, J.C.F. 1995. Estimating rates of butterfly decline from distribution maps: the effects of scale. Biological Conservation 73: 59–65.

Van Swaay, C. and Warren, M.S. 1999. Red data book of European butterflies (Rhopalocera). Nature and Environment series no. 99. Council for Europe, Strasbourg.

Van Swaay, C., Warren, M.S. and Grill, A. 1997. Threatened butterflies in Europe. Provisional report. Report VS 97.25. Dutch Butterfly Conservation and British Butterfly Conservation.

Williams, M.R. and Bollam, H.H. 2001. A new subspecies of *Candalides hyacinthinus* (Semper) (Lepidoptera: Lycaenidae) from Western Australia. Australian Entomologist 28: 49–54.

Williams, M.R. and Hay, R.W. 2001. Two new subspecies of *Ogyris otanes* C. & R. Felder (Lepidoptera: Lycaenidae) from Western Australia. Australian Entomologist 28: 55–63.

Yen, A.L. and Butcher, R. J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered Species Program, Environment Australia, Canberra.

8 Taxon synopses

Introduction

The synopses of the species (or of subspecies) which follow consist of appraisals of conservation status and needs, given under a series of headings which parallel those used in other recent Action Plans for Australian fauna. We have attempted to include synopses of all species and subspecies of Australian butterflies nominated or suggested to be of conservation interest, however tenuous the grounds for such assertion. Several further anomalous taxa, such as poorly defined populations of *Jalmenus* spp. (Lycaenidae) are not included because of lack of any reliable taxonomic information on their status. Clarifying the status of any such isolated populations is an important priority for the future.

We regard each synopsis as a form of 'Extinction Risk Assessment', despite the lack of quantitative information implicit in some uses of this term. We summarise: the nomenclature of the species and its taxonomic relationships, its geographical range and finer details of its distribution, its conservation status (including any historical record of interest and legislative treatment), major relevant features of biology, and the reasons for conservation concern (with particular attention to detection of any key threats), before addressing the measures needed to address these. We suggest whether knowledge is sufficient to undertake recovery actions, to define the major research and management needs, and note the resources necessary for these to be pursued. Note that the budget figures (given in year 2000 dollars) are only indicative; we have not attempted, for example, to estimate costs of site purchase or reservation even when this is a priority measure for the taxon. We have also suggested a time frame for such recovery actions. In essence, each account is not a full recovery plan, but encapsulates what we believe to be a realistic appraisal of the current situation, and is a basis for development into fuller investigation by local lepidopterists. Even for many species deemed secure, we have suggested research needs to enhance our understanding of the taxon, and the factors which may influence its abundance; actions may be needed to prevent decline of species to more significant levels of conservation concern. For many taxa, closer focus may lead to rather different conclusions; for example, a recommendation for many taxa is the need for survey, and discovery of additional colonies/ populations in localities which have not yet been surveyed in detail may lower the conservation status considerably. Conversely, extensive surveys without discovery of further populations may increase level of concern. Key references for each species are included in the individual accounts.

The synopses are given as a single sequence, in alphabetical order of genera and species within each butterfly family, and synopses are numbered as in the accompanying contents and status summary. The schedules of species treated are given as Appendices 1–3. The first group are those butterflies of conservation concern at National and state levels (Appendix 1). This list is relatively short and, indeed, will seem to many people to be far too short! However, we believe it to be a realistic appraisal of defined priorities in relation to defined threatening processes, excluding the species which have not been documented soundly or adequately. Appendix 1 also lists the species of concern at State levels. Thus, many of the species listed as Data Deficient (Appendix 2) are potential candidates for much higher level listing. Note that strict application of the precautionary principle (as advocated by IUCN, to place species in the higher category of risk in cases of ambiguity) would extend these listings. For example, Appendix 2 includes species as Data Deficient or Lower Risk. Conversely, a substantial number of species earlier flagged as of conservation concern now appear to have no conservation significance (NCS). Our synopses incorporate consideration of all Australian butterfly species previously noted, even casually, as of conservation significance or interest. There are some, very few, additional species known from very few individuals but have never been signaled as of conservation interest. All were considered at BAP Workshops, and none is included here.

It should be emphasised that these evaluations reflect the information available to us, with a few exceptions as noted in context, by September

2000. DPAS and TRN have discussed all synopses, and attempted to harmonise a sometimes wide spectrum of opinions emanating from our consultations, so that each is a joint effort. However, Sands has contributed more to the ‘northern taxa’, and New to the ‘southern taxa’. It is important to emphasise that each taxon summary may change rapidly as additional information is accumulated and new threats appear. Periodic review is vital, because of the rapidity with which some butterflies respond to change; a picture of relative security can be transformed easily to one of endangerment, and a general need is for a ‘watching brief’ to be instituted for all the taxa included in Appendix 2.

For each taxon included in this section (Table 2), assessment has been attempted using the following criteria, as discussed earlier.

1. **Threatening processes:** In many cases specific threats are noted to taxa, most commonly associated directly with habitat loss or degradation. For many species, additional threats have been suggested in previous accounts, and some of these have not been supported by objective investigation.
2. **Distribution changes:** Any significant loss of range is evaluated, as far as possible, in relation to biological knowledge of the butterfly and its potential security. Simply that a species has a small geographical range, or occurs at very few sites, does not ‘automatically’ qualify it for threatened status, if no threatening process(es) can be identified. The species may, though, be signalled for closer monitoring should any changes occur to limited habitats.
3. **Security and tenure of habitat:** This is paramount, particularly in providing opportunity for practical management, such as through recovery plans. Representation of taxa in National Parks or similar high level reserves (such as World Heritage Areas) is a key objective, as likely to provide effective conservation opportunity, and threat alleviation. Albeit idealistically, we opt to regard such tenure as ‘lowest risk habitats’ unless inadequate or inappropriate management prevails. Other land categories are generally rated as higher risk, as more susceptible to short term changes in tenure or usage. Many small conservation reserves and the like on private lands may be far more vulnerable than is widely assumed.

Table 2: Current and previously evaluated taxa

1 *Abbreviations:* CR: Critically Endangered; EN: Endangered; VU: Vulnerable; LR: Lower Risk; (NT: Near Threatened; LC: Least Concern; CD: Conservation Dependent); DD: Data Deficient; NCS: No Conservation Significance. [a,b,c,d: see text]. States and population localities in bold and italics.

2 *Common names:* Listed alphabetically, based on Braby et al. (1997), Braby (2000) and other popular books.

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
	HESPERIIDAE			
1	*Allora doleschallii doleschallii*	NCS	Peacock Awl	43
2	*Allora major major*	NCS	Greater Peacock Awl	44
3	*Anisynta cynone cynone*	VU [a,b,d]	Brown Cynone Skipper, Cynone Skipper, Mottled Grass-skipper	45
4	*Anisynta cynone gracilis*	LR (LC)	Brown Cynone Skipper, Cynone Skipper, Mottled Grass-skipper	45
5	*Anisynta cynone grisea*	NCS	Cynone Skipper, Grey Cynone Skipper, Mottled Grass-skipper	47
6	*Anisynta cynone gunneda*	NCS, LR (LC) (***Bolivia Hill:*** MUNICIPAL)	Cynone Skipper, Grey Cynone Skipper, Mottled Grass-skipper	48
7	*Anisynta dominula dominula*	NCS	Dominula Skipper, Two-brand Grass Skipper	49
8	*Anisynta dominula* ssp. 'Moree'	DD	Moree Skipper	50
9	*Antipodia atralba*	NCS	Black and White Skipper, Diamond Sand-skipper	51
10	*Antipodia chaostola chaostola*	NCS	Chaostola Skipper, Heath-sand Skipper	52
11	*Antipodia chaostola chares*	NCS	Chaostola Skipper, Heath-sand Skipper	53
12	*Antipodia chaostola leucophaea*	DD	Chaostola Skipper, Heath-sand Skipper	54
13	*Antipodia dactyliota anaces*	NCS	Western Atralba, Western-sand Skipper	55
14	*Antipodia dactyliota dactyliota*	DD	Western Atralba, Western-sand Skipper	56
15	*Antipodia dactyliota nila*	DD	Western Atralba, Western-sand Skipper	57
16	*Badamia exclamationis*	NCS	Brown Awl, Migratory Skipper, Narrow-winged Awl	58
17	*Borbo cinnara*	NCS	Formosan Swift, Rice Swift	59
18	*Chaetocneme porphyropis*	NCS	Purple Brown-eye, Purple Dusk-flat	60
19	*Chaetocneme sphinterifera*	NCS	Banded Dusk-flat, Banded Red-eye	61
20	*Croitana aestiva*	DD	Desert Sand-skipper	62
21	*Croitana arenaria*	DD	Inland Sand-skipper	63
22	*Euschemon rafflesia alba*	NCS	Northern Regent Skipper, Raffles' Skipper, Regent Skipper	64

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
23	*Euschemon rafflesia rafflesia*	NCS; LR (LC) ***(NSW, s. of Port Macquarie:*** MUNICIPAL)	Raffles's Skipper, Regent Skipper, Southern Regent Skipper	65
24	*Exometoeca nycteris*	NCS	Western Flat	67
25	*Herimosa albovenata albovenata*	VU [a,b,d]	White-veined Sand-skipper, White Veined Skipper	68
26	*Herimosa albovenata fuscata*	DD	White-veined Sand-skipper, White Veined Skipper	71
27	*Herimosa albovenata weemala*	NCS	White-veined Sand-skipper, White Veined Skipper	73
28	*Hesperilla chrysotricha leucosia*	NCS; ***SA:*** LR (LC)	Chrysotricha Skipper, Golden-haired Sedge Skipper, Golden-haired Skipper	74
29	*Hesperilla chrysotricha lunawanna*	DD	Chrysotricha Skipper, Golden-haired Sedge Skipper, Golden-haired Skipper	75
30	*Hesperilla chrysotricha naua*	NCS	Chrysotricha Skipper, Golden-haired Sedge Skipper, Golden-haired Skipper	76
31	*Hesperilla crypsargyra crypsargyra*	NCS	Silver Sedge Skipper, Silvered Skipper	77
32	*Hesperilla crypsargyra lesouefi*	NCS	Lesouef's Skipper, Silver Sedge Skipper, Silvered Skipper	78
33	*Hesperilla donnysa delos*	NCS	Donnysa Skipper, Varied Sedge Skipper	79
34	*Hesperilla donnysa diluta*	NCS	Donnysa Skipper, Varied Sedge Skipper	81
35	*Hesperilla donnysa galena*	DD	Donnysa Skipper, Varied Sedge Skipper	82
36	*Hesperilla flavescens flavescens*	LR (LC), VU (***Altona:*** MUNICIPAL) [c,d]	Altona Skipper, Flavescens Skipper, Yellow Donnysa Skipper, Yellow Sedge Skipper, Yellowish Skipper	83
37	*Hesperilla flavescens flavia*	VU [b,c,d]	Flavia Skipper, Yellow Donnysa Skipper, Yellow Sedge Skipper, Yellowish Skipper	86
38	*Hesperilla idothea clara*	NCS; ***SA:*** VU [b,c]	Flame Sedge Skipper, Flame Skipper	90
39	*Hesperilla mastersi marakupa*	DD	Chequered Sedge-skipper, Master's Skipper	92
40	*Mesodina aeluropis*	NCS	Aeluropis Skipper, Montane Iris-skipper, Mountain Skipper	93
41	*Mesodina gracillima*	NCS	Northern Iris-skipper	94
42	*Mesodina hayi*	NCS	Narrow-winged Iris-skipper, Small Iris Skipper	95
43	*Mimene atropatene*	NCS	Purple Swift	96
44	*Motasingha trimaculata dea*	NCS	Dirphia Skipper, Grey Dirphia Skipper, Large Brown Skipper, Reddish Dirphia Skipper, Small Dirphia Skipper, Tepper's Skipper, Yellow-brown Dirphia	97

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
45	*Motasingha trimaculata trimaculata*	NCS	Dirphia Skipper, Grey Dirphia Skipper, Large Brown Skipper, Reddish Dirphia Skipper, Small Dirphia Skipper, Western Three-spotted Skipper, Yellow-brown Dirphia	98
46	*Ocybadistes knightorum*	VU [b,c,d]	Black Grass-dart, Knight's Dart	99
47	*Oreisplanus munionga larana*	LR (LC)	Alpine Sedge Skipper, Alpine Skipper, Marrawah Skipper	102
48	*Oreisplanus perornatus*	NCS	Montane Sedge Skipper, Mountain Painted Skipper, Mountain Spotted Skipper, Spotted Mountain Skipper	104
49	*Pasma tasmanica*	NCS	Tasmanica Skipper, Two-spotted Skipper, Grass-skipper	105
50	*Rachelia extrusa*	NCS	Blue-flash Skipper	106
51	*Signeta tymbophora*	NCS	Dark Shield Skipper, Dingy Shield Skipper	107
52	*Suniana lascivia lasus*	DD	Dingy Dart, Dingy Grass Dart, Northern Dingy Dart	108
53	*Taractrocera ilia ilia*	NCS	Northern Grass-dart, Rock Grass-dart	109
54	*Taractrocera ina*	NCS, ***NSW:*** DD	Ina Grass-dart, No-brand Grass Dart	110
55	*Telicota ancilla baudina*	DD	Green Darter, Greenish Darter	111
56	*Telicota anisodesma*	NCS	Large Darter, Southern Large Darter	112
57	*Telicota brachydesma*	NCS	Small Darter	113
58	*Telicota eurotas laconia*	NCS	Dingy Darter, Northern Sedge-darter, Sedge Darter	114
59	*Telicota eurychlora*	LR (LC); ***Q:*** VU [b,c]	Dingy Darter, Sedge Darter, Southern Sedge Darter	115
60	*Telicota mesoptis mesoptis*	NCS, ***NT:*** DD	Lower's Darter, Narrow-brand Darter	118
61	*Trapezites atkinsi*	NCS	Heath Ochre, Speckled Ochre	119
62	*Trapezites eliena*	NCS, ***SA:*** LR (LC)	Eliena Skipper, Orange Ochre	121
63	*Trapezites genevievae*	NCS	Ornate Ochre	122
64	*Trapezites heteromacula*	NCS	Northern White-spot Skipper, Orange White-spot, Orange White-spot Skipper, Small Orange Ochre	123
65	*Trapezites luteus luteus*	NCS; ***SA:*** LR (LC)	Rare White-spot Skipper, Yellow Ochre	124
66	*Trapezites phigalia phigalia*	NCS; ***SA:*** VU [b,c]	Heath Ochre, Phigalia Skipper	126
67	*Trapezites sciron eremicola*	NCS	Mallee Ochre, Sciron Skipper	128
68	*Trapezites symmomus soma*	NCS; ***SA:*** LR (LC)	Splendid Ochre, Symmomus Skipper	129
69	*Trapezites symmomus sombra*	NCS	Splendid Ochre, Symmomus Skipper	131
70	*Trapezites taori*	NCS	Sandstone Ochre	132
71	*Trapezites waterhousei*	NCS	Laterite Ochre, Mottled Ochre, Waterhouse's Skipper	133

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
	PAPILIONIDAE			
72	*Cressida cressida cressida*	NCS; ***NSW:*** DD	Big Greasy, Clear Wing Swallowtail, Greasy Swallowtail, King Greasy, Mimicking Papilio	134
73	*Graphium macleayanum insulanum*	DD	Green Fanny, Macleay's Swallowtail	135
74	*Ornithoptera euphorion*	NCS	Cairns Birdwing, Cooktown Birdwing	136
75	*Ornithoptera priamus macalpinei*	NCS	Northern Birdwing, Priamus Birdwing	136
76	*Ornithoptera priamus poseidon*	NCS	New Guinea Birdwing	136
77	*Ornithoptera priamus pronomus*	NCS	Cape York Birdwing	136
78	*Ornithoptera richmondia*	NCS; ***Q:*** LR (LC)	Richmond Birdwing, Richmond River Birdwing, The Trogan	138
79	*Papilio ulysses joesa*	NCS	Blue Mountain Butterfly, Blue Swallowtail, Imperial Swallowtail, Mountain Blue Butterfly, Ulysses, Ulysses Butterfly, Ulysses Swallowtail	141
80	*Protographium leosthenes geimbia*	NCS	Fourbar Swordtail, Four-barred Swordtail, Swallow-tailed Fanny	142
	PIERIDAE			
81	*Appias albina albina*	DD	White Albatross	143
82	*Delias aganippe*	NCS	Red-spotted Jezebel, Spotted Jezebel, Wood White	144
83	*Delias mysis aestiva*	NCS	Red-banded Jezebel, Mysis Jezabel, Mysis Jezebel, Northern Union Jack, Union Jack	145
84	*Elodina claudia*	NCS	Cape York Pearl-white, Claudie Pearl-white, Claudie River Pearl White	146
85	*Elodina perdita*	NCS	Coastal Pearl-white, Delicate Pearl-white, 170Northern Pearl-white	147
86	*Elodina tongura*	NCS	Small Pearl-white, Tongura Pearl-white	148
87	*Eurema alitha amplexa*	DD	Scalloped Grass-yellow	149
88	*Leptosia nina comma*	NCS	Black-spotted White, The Psyche	150
	NYMPHALIDAE			
89	*Apaturina erminia papuana*	NCS	New Guinea Emperor, Turquoise Emperor	151
90	*Argyreus hyperbius inconstans*	DD; ***Q:*** VU [b]	Australian Fritillary, Laced Fritillary	152
91	*Charaxes latona papuana*	NCS	Orange Emperor	157
92	*Danaus affinis gelanor*	NCS	Brown Tiger	158
93	*Euploea alcathoe enastri*	NCS	Alcathoe Crow, No-brand Crow	159
94	*Euploea alcathoe monilifera*	NCS	Alcathoe Crow, No-brand Crow	159
95	*Euploea climena macleari*	DD	Climena Crow	160
96	*Euploea modesta* ssp.	DD		161

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
97	*Euploea netscheri erana*	DD		162
98	*Geitoneura klugii mulesi*	NCS	Klug's Xenica, Marbled Xenica	163
99	*Heteronympha cordace comptena*	NCS	Bright-eyed Brown	164
100	*Heteronympha cordace legana*	NCS	Bright-eyed Brown	165
101	*Heteronympha cordace wilsoni*	CR [a,b,c]	Bright-eyed Brown	166
102	*Heteronympha penelope maraia*	NCS	Shouldered Brown	168
103	*Junonia erigone walkeri*	DD	Northern Argus, Rainforest Argus	169
104	*Lexias aeropa eutychius*	DD	Orange-banded Plane, Orange Nymph	170
105	*Libythea geoffroy genia*	NCS	Australian Beak, Australian Libythea, Purple Beak	171
106	*Libythea geoffroy nicevillei*	NCS	Australian Beak, Australian Libythea, Eastern Libythea, Purple Beak	172
107	*Melanitis amabilis valentina*	DD	Banded Evening Brown	173
108	*Melanitis constantia*	NCS	Papuan Evening Brown	174
109	*Mycalesis sirius*	NCS	Cedar Bush-brown	175
110	*Oreixenica kershawi ella*	NCS	Kershaw's Brown, Kershaw's Xenica, Striped Xenica	176
111	*Oreixenica kershawi kanunda*	LR (LC); ***SA:*** VU [b,c]	Kershaw's Brown, Kershaw's Xenica, Striped Xenica	177
112	*Oreixenica lathoniella barnardi*	NCS	Common Silver Xenica, Silver Xenica, Silvery Xenica, Tasmanian Silver Xenica	179
113	*Oreixenica lathoniella herceus*	NCS; ***SA:*** DD	Common Silver Xenica, Silver Xenica, Silvery Xenica	180
114	*Oreixenica latialis theddora*	LR (NT)	Alpine Silver Xenica, Small Alpine Xenica, Mount Buffalo Xenica	182
115	*Oreixenica ptunarra angeli*	LR (LC)	Ptunarra Brown, Ptunarra Xenica	184
116	*Oreixenica ptunarra ptunarra*	LR (LC)	Ptunarra Brown, Ptunarra Xenica	184
117	*Oreixenica ptunarra roonina*	VU [b,c]	Ptunarra Brown, Ptunarra Xenica	184
118	*Oreixenica ptunarra* ssp.	LR (LC)	Ptunarra Brown, Ptunarra Xenica	184
119	*Orsotriaena medus moira*	NCS	Nigger, Sooth-eyed Bush-brown	188
120	*Polyura andrewsi*	DD	Christmas Emperor	189
121	*Polyura sempronius tiberius*	DD	Four-tailed Emperor, Tailed Emperor	190
122	*Polyura* sp.? *jupiter*	DD		191
123	*Taenaris artemis jamesi*	DD	Artemis Owl, Cape York Owl, Pearl Owl	192
124	*Tisiphone abeona* 'Comboyne'	DD	Large Wood Brown, Sword-grass Brown, Varied Sword-grass Brown	193
125	*Tisiphone abeona 'joanna'*	LR (LC) (MUNICIPAL)	Large Wood Brown, Sword-grass Brown, Varied Sword-grass Brown	194
126	*Tisiphone abeona antoni*	NCS	Large Wood Brown, Sword-grass Brown, Varied Sword-grass Brown	196
127	*Tisiphone abeona morrisi*	NCS; ***Q:*** CR [a,b]	Large Wood Brown, Sword-grass Brown, Varied Sword-grass Brown	197

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
	LYCAENIDAE			
128	*Acrodipsas arcana*	DD	Black-veined Ant-blue	200
129	*Acrodipsas brisbanensis brisbanensis*	NCS; ***WA:*** DD	Bronze Ant-blue, Large Ant-blue	202
130	*Acrodipsas brisbanensis cyrilus*	VU [b,c]	Bronze Ant-blue, Large Ant-blue	203
131	*Acrodipsas hirtipes*	NCS; ***NT:*** DD	Black Ant-blue	206
132	*Acrodipsas illidgei*	NCS; ***NSW:*** DD	Illidge's Ant-blue, Mangrove Ant-blue	207
133	*Acrodipsas melania*	NCS	Grey Ant Ant-blue	210
134	*Acrodipsas mortoni*	NCS; ***Q***:DD	Brown Ant-blue	211
135	*Acrodipsas myrmecophila*	NCS; ***V:*** EN [b]; ***NT:*** DD	Small Ant-blue	212
136	*Candalides consimilis toza*	DD	Consimilis Blue, Dark Pencilled-blue, Pencilled Blue	215
137	*Candalides heathi aeratus*	DD	Rayed Blue, Western Rayed Blue	216
138	*Candalides heathi doddi*	NCS	Rayed Blue	217
139	*Candalides heathi* ssp. 'Wimmera'	EN [b,c]	Rayed Blue, Wyn Wyn Blue	218
140	*Candalides hyacinthinus josephina*	NCS	Dusky Blue, Varied Dusky Blue	220
141	*Catochrysops amasea amasea*	DD	Amasea Blue, Cobalt Pea-blue	221
142	*Catopyrops florinda estrella*	NCS; ***WA***: DD	Dull Speckled Line-blue, Speckled Line-blue	222
143	*Danis danis syrius*	NCS	Large Green-banded Blue	223
144	*Hypochrysops apelles apelles*	NCS; ***NSW:*** LR (NT)	Copper Jewel	224
145	*Hypochrysops apollo apollo*	NCS; LR (NT) (***Ingham-Cardwell:*** MUNICIPAL)	Apollo Jewel	226
146	*Hypochrysops apollo phoebus*	NCS	Apollo Jewel	228
147	*Hypochrysops arronica arronica*	DD	Purple Ant-plant Jewel	229
148	*Hypochrysops byzos hecalius*	NCS	Yellow Jewel, Yellow-spot Jewel	260
149	*Hypochrysops cleon*	NCS	Splendid Jewel	230
150	*Hypochrysops delicia delicia*	NCS	Blue, Jewel, Moonlight Blue, Moonlight Jewel	231
151	*Hypochrysops digglesii*	NCS; ***NSW:*** DD	Diggles Blue, Silky Jewel	232
152	*Hypochrysops elgneri barnardi*	NCS	Amethyst Jewel	233
153	*Hypochrysops epicurus*	NCS	Dull Jewel, Mangrove Jewel	234
154	*Hypochrysops halyaetus*	NCS; LR (NT) (***Perth-Moore River***: MUNICIPAL)	Turquoise Jewel, Western Jewel	236
155	*Hypochrysops hippuris nebulosis*	NCS	Paradise Jewel	238
156	*Hypochrysops ignitus chrysonotus*	NCS; ***WA:*** LR (LC)	Dingy Jewel, Fiery Jewel	239

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
157	*Hypochrysops ignitus erythrinus*	NCS	Dingy Jewel, Fiery Jewel	240
158	*Hypochrysops ignitus ignitus*	NCS; ***V*, *SA:*** LR (LC)	Dingy Jewel, Fiery Jewel	241
159	*Hypochrysops piceatus*	EN [b,c]	Bulloak-jewel, Darling Downs Jewel, Piceatus Jewel, Pitch-spotted Jewel	243
160	*Hypochrysops theon cretatus*	NCS	Green-banded Jewel	248
161	*Hypochrysops theon medocus*	NCS	Green-banded Jewel, Theon Jewel	249
162	*Ionolyce helicon hyllus*	NCS	Bronze Line-blue, Helicon Line-blue, Pointed Line-blue	250
163	*Jalmenus aridus*	VU [b,c]	Inland Hairstreak	251
164	*Jalmenus clementi*	NCS	Turquoise Hairstreak	253
165	*Jalmenus evagoras eubulus*	LR (LC); ***NSW:*** VU [b]	Imperial Blue, Pale Imperial Blue	254
166	*Jalmenus icilius*	NCS; ***V:*** LR (NT)	Amethyst Hairstreak, Icilius Blue	257
167	*Jalmenus inous*	DD	Inous Blue, Varied Hairstreak	258
168	*Jalmenus lithochroa*	LR; (***Adelaide:*** MUNICIPAL)	Lithochroa Blue, Waterhouse’s Hairstreak	259
169	*Jalmenus notocrucifer*	DD	Southern Cross Hairstreak, Varied Hairstreak	262
170	*Jamides cytus claudia*	NCS	Pale Cerulean	264
171	*Jamides nemophilus nemophilus*	DD	Papuan Cerulean	265
172	*Jamides* sp. nr. *phaseli*	DD		265
173	*Liphyra brassolis major*	NCS	Moth Butterfly	266
175	*Nacaduba biocellata biocellata*	NCS; T: DD	Double Spotted Blue, Double-spotted Line-blue, Two-spotted Line-blue	267
176	*Nacaduba calauria calauria*	DD		268
177	*Nacaduba kurava felsina*	NCS	White-banded Line-blue, White Line-blue	269
178	*Nacaduba pactolus cela*	DD	Large Line Blue	270
179	*Neolucia agricola occidens*	NCS; DD (***Julimar:*** MUNICIPAL)	Fringed Blue, Fringed Heath-blue	271
180	*Neopithecops lucifer heria*	DD	Devil’s Blue, Quaker	272
181	*Nesolycaena albosericea*	NCS	Satin Blue, Satin Opal	273
182	*Nesolycaena urumelia*	NCS	Spotted Opal	274
183	*Ogyris aenone*	NCS	Cooktown Azure, Orange-spot Azure, Sapphire Azure	275
184	*Ogyris amaryllis amata*	NCS	Amaryllis Azure	276
185	*Ogyris amaryllis meridionalis*	NCS	Amaryllis Azure, Satin Azure	277
186	*Ogyris barnardi delphis*	NCS	Barnard’s Azure, Bright Purple Azure	278
187	*Ogyris genoveva araxes*	NCS	Genoveva Azure, Purple Azure Southern Purple Azure	279
188	*Ogyris genoveva gela*	NCS	Genoveva Azure, Purple Azure Southern Purple Azure	279

No.	Taxon	Recommended conservation status[1]	Common names[2]	Page ref.
189	*Ogyris genoveva splendida*	DD	Genoveva Azure, Purple Azure Southern Purple Azure	280
190	*Ogyris ianthis*	NCS	Golden Azure, Sydney Azure	281
191	*Ogyris idmo halmaturia*	EN [b]	Large Brown Azure	282
192	*Ogyris idmo idmo*	NCS	Large Brown Azure	285
193	*Ogyris iphis doddi*	DD	Dodd's Azure, Orange-tipped Azure	286
194	*Ogyris otanes*	DD; ***V*** [b,c]: CN	Brown Azure, Western Dark Azure, Small Brown Azure	288
195	*Ogyris subterrestris petrina*	CE [b]	Arid Bronze Azure	291
196	*Ogyris subterrestris subterrestris*	VU [b,c]; ***NSW:*** DD	Arid Brown Azure, Mallee Brown Azure, Mildura Ogyris	293
197	*Ogyris zosine zolivia*	NCS	Purple Azure, Northern Purple Azure	296
198	*Ogyris zosine zosine*	NCS	Purple Azure, Northern Purple Azure	297
199	*Paralucia pyrodiscus lucida*	VU [a,c]	Dull Copper, Eltham Copper, Fiery Copper	298
200	*Paralucia spinifera*	LR (CD)	Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper	302
201	*Philiris azula*	DD	Azure Moonbeam	307
202	*Philiris diana diana*	NCS	Diana Moonbeam, Large Moonbeam	308
203	*Philiris ziska titeus*	NCS	White-margined Moonbeam	309
204	*Praetaxila segecia punctaria*	NCS	Australian Harlequin, Harlequin Metalmark	310
205	*Prosotas gracilis saturiator*	DD	New Guinea Line-blue	311
206	*Pseudalmenus chlorinda barringtonensis*	NCS	Australian Hairstreak, Barrington Tops Hairstreak, Silky Hairstreak	312
207	*Pseudalmenus chlorinda chlorinda*	NCS	Australian Hairstreak, Orange Tit, Silky Hairstreak, Tasmanian Hairstreak	313
208	*Pseudalmenus chlorinda conara*	NCS	Australian Hairstreak, Orange Tit, Silky Hairstreak, Tasmanian Hairstreak	314
209	*Pseudalmenus chlorinda fisheri*	NCS	Australian Hairstreak, Orange Tit, Silky Hairstreak, Victorian Hairstreak	315
210	*Pseudalmenus chlorinda myrsilus*	VU [b,c]	Australian Hairstreak, Orange Tit, Silky Hairstreak, Tasmanian Hairstreak	316
211	*Pseudalmenus chlorinda zephyrus*	NCS; ***T:*** LR (NT)	Australian Hairstreak, Orange Tit, Silky Hairstreak, Victorian Hairstreak	319
212	*Pseudodipsas cephenes*	NCS; ***NSW:*** DD	Bright Forest-blue, Cephenes Blue	321
213	*Theclinesthes albocincta*	NCS; ***Q:*** DD	Bitter-bush Blue, Grund's Blue	323
214	*Theclinesthes hesperia hesperia*	LR (LC)	Western Bitter-bush Blue, Western Blue	324
215	*Theclinesthes hesperia littoralis*	NCS	Western Bitter-bush Blue, Western Blue	325
216	*Theclinesthes serpentata lavara*	NCS	Chequered Blue, Little Blue, Salt Bush Blue	326
217	*Udara tenella*	NCS	Australian Hedge Blue, Delicate Blue	327
218	*Zizeeria karsandra*	NCS	Dark Grass-blue, Spotted Grass-blue	328
219	*Zizina labradus labdalon*	NCS	Clover Blue, Common Blue, Common Grass-blue	329
220	*Zizina otis*	DD	Lesser Grass Blue	330

HESPERIIDAE

HESPERIIDAE: COELIADINAE

Scientific name: *Allora doleschallii doleschallii* (C. Felder)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Torres Strait Islands, Cape York Peninsula to Townsville and possibly, Schute Harbour and Mackay.

Taxonomy: Five other subspecies of *Allora doleschallii* occur east of Weber's Line, Indonesia, Papua New Guinea, New Britain and Solomon Islands (Evans 1949).

Infra-specific relationships or variation: Australian *A. doleschallii* vary in the extent of bluish-green on the upperside and size of white spots on the underside. The extent of the post median white patch on the underside of the inner margin of the fore wing is also variable, sometimes approaching the appearance of the closely related *A. major*. No geographical variation has been observed in Australian populations.

Habitat critical to survival: *Allora doleschallii* occurs where its food plant, *Rhyssopterys timoriensis* grows, mainly at the edge of rainforest, along water courses or in vine thickets. *R. timoriensis* is usually a deciduous vine except when near water courses. The butterfly fluctuates in abundance and is dependent on seasonal growth of the food plants. Adults sometimes occur on hilltops, for example at Mount White, Coen and on Thursday Island.

History of conservation concern: Dunn et al. 1994 stated the species was rare, but identified no threats. The taxon is currently listed as 'common' and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994) (QPWS 1994). Braby (2000) suggested that *A. doleschallii* was patchy in distribution but did not express any concern for its conservation. Some deciduous vine thickets, habitats of *A. doleschallii*, have been destroyed but the butterfly remains secure in extensive areas of state, private and aboriginal lands, and in several national parks.

Major threatening processes: No threats have been identified but fire is likely to affect local populations when encroaching into dry vine thickets and creek embankments.

Is knowledge sufficient to formulate recovery actions: Yes. Recovery actions are not required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Evans, W. H., 1949. A Catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History). British Museum, London.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies.

A report to Australian National Parks and Wildlife Service, Canberra ACT. QPWS 1994. Queensland Parks and Wildlife Service.

HESPERIIDAE: COELIADINAE

Scientific name: *Allora major major* (Rothschild)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range, Pascoe and Claudie River areas, Cape York Peninsula.

Taxonomy: *Allora major* is closely related to *A. doleschallii*. Three other subspecies of *A. major* occur from eastern Indonesia, east of Weber's Line, throughout Papua New Guinea and New Britain (Evans 1949).

Infra-specific relationships or variation: The post median white patch on the underside of the inner margin of the fore wing is variable but is more extensive than that of *A. doleschallii*.

Habitat critical to survival: *Allora major* occurs only in and at the edge of primary rainforest. *A. major* was first recorded from Australia in the 1970s (Sands and Kerr 1978). The food plant has not been recorded in Australia but is probably *Corynocarpus cribbianus*, a food plant in Papua New Guinea (Parsons 1998).

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988), the status presumably attributed to its small distribution on Cape York Peninsula.

Major threatening processes: None recognised. The species occurs in Iron Range National Park and in the nearby resources reserve and is not known to have contracted in its distribution or populations. None of the known habitats has been destroyed.

Is knowledge sufficient to formulate recovery actions? Yes. Recovery actions are not required.

References:

Evans, W. H., 1949. A Catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History). British Museum, London.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Sands, D.P.A. and Kerr, J.F.R 1978. *Allora major* (Rothschild) (Lepidoptera: Hesperiidae): a butterfly recognised in Australia for the first time. Australian Entomological Magazine 4: 95–96.

Parsons, M. 1998. The butterflies of Papua New Guinea: Their systematics and biology. Academic Press, London.

HESPERIIDAE: TRAPEZITINAE

Scientific names: *Anisynta cynone cynone* (Hewitson); *A. cynone gracilis* (Tepper)

National Conservation Status: ssp. *cynone:* Vulnerable [VUa,b,d]; ssp. *gracilis:* Lower Risk (Least Concern)

Range: South Australia.

Distribution: Victor Harbor to Robe (ssp. *cynone*), Gulf St Vincent to south of Adelaide (ssp. *gracilis*).

Taxonomy: Two of four named subspecies of *Anisynta cynone* (Hewitson), all of which have relatively narrow distributions in southeastern Australia.

Infra-specific relationships or variation: Dunn and Dunn (1991) considered subspecies *gracilis* to be poorly defined and a likely synonym of *A. c. cynone*, and Braby (2000) did not recognise *A. c. gracilis* as a distinct subspecies.

Habitat and key ecological features: *A. c. cynone* occupies open woodland and coastal dune grasslands. Larvae feed on several grasses, including the introduced *Brachypodium distachyon* (Poaceae).

History of conservation concern: Hill and Michaelis (1988) considered that sspp. *cynone* and *gracilis* were threatened. *A. c. cynone* was recommended by BCSA (1999) as 'Vulnerable', a ranking followed by Grund (2001). It was not ranked by Dunn et al. (1994), other than noting the small distribution. Fisher (1978) noted both subspecies as rare. More recent appraisals vary, with workshop recommendations of NCS. However, local expertise suggests need for some concerns. Both subspecies are confined to southern South Australia, *A. c. gracilis* over much of Yorke Peninsula and *A. c. cynone* to a wider coastal area south of Adelaide. The southernmost location is Robe where it was last seen in 1940, and it was not encountered in surveys of the lower southeastern region by Grund and Hunt (2000).

A. c. cynone is estimated to have undergone range contraction of up to 80% during the last 50 years, with populations present in a few reserves. Decline of *A. c. gracilis* has not been quantified.

Major threatening processes: Threats specified include farming activities (grazing, land improvement; both subspecies), urban and housing developments, unsuitable use of fire, changes to water regimes, and weed invasion (*A.c. cynone*). More data are needed on habitat tenure to evaluate current threats to both taxa. The Adelaide BAP Workshop noted that *A. c. cynone* is confirmed at present from only one area, in a conservation park near Victor Harbor, of around 10 km^2. The area is open to development, so that threats to the butterfly could become severe.

Is knowledge sufficient to formulate recovery actions? Yes. However, there is a need to clarify threats to both subspecies and safeguard them further, if necessary. Ensuring the security of the Victor Harbor populations of *A. cynone cynone* is a priority.

Resources required:

	Action	$
1	Initial surveys and tenure evaluation	5,000.00
Total		5,000.00

Lead Organisation: South Australian Department of Environment, Heritage and Aboriginal Affairs.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

BCSA 1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss proposed nominations of threatened South Australian butterflies.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

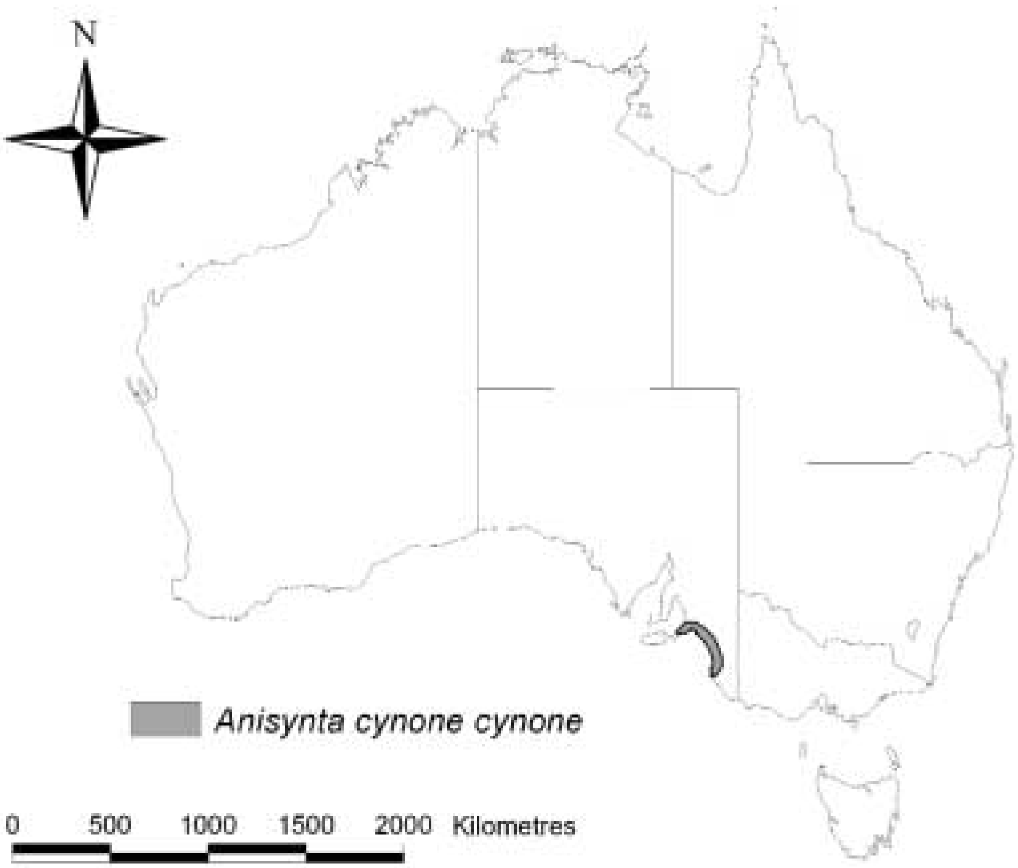
Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid.checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department of Environment, Heritage and Aboriginal Affairs, South Australia.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13. (1988).

Distribution of *Anisynta cynone cynone*



HESPERIIDAE: TRAPEZITINAE

Scientific name: *Anisynta cynone grisea* Waterhouse

National Conservation Status: No Conservation Significance

Range: New South Wales, Victoria.

Distribution: Murray Valley, inland areas in both States, especially at Kerang and Gunbower, also near Deniliquin (E.D. Edwards).

Taxonomy: *Anisynta cynone grisea* was not recognised as a distinct subspecies by Dunn and Dunn (1991) or Braby (2000). However, Common and Waterhouse (1981) stated that ssp. *grisea* differed from the nominotypical ssp. *cynone*. Dunn and Dunn observed differences for some, but not all, specimens of *grisea*. The subspecies of *A. cynone* require formal assessment to determine the validity of names applied to populations, especially those geographically separated from each another.

Infra-specific relationships or variation: Four subspecies of *A. cynone* have been recognised. *A. cynone grisea* is variable and not always easily distinguishable from sspp. *cynone* or *gracilis*.

Habitat critical to survival: The species occurs in open woodland with an understorey of grasses including its food plants. The subspecies is locally common and has adapted to some disturbed areas where its larvae often feed on a common millet, *Oryzopsis miliacea* (Douglas and Braby 1992). Other food plants are *Stipa scabra* and green couch grass, *Cynodon dactylon*.

History of conservation concern: Dunn et al. (1994) considered that this subspecies was Vulnerable, although all habitats except for those at Kerang, Victoria, were stated to be intact. Braby (2000) considered ssp. *grisea* (as *A. c. cynone*) to be of concern in southwestern Victoria.

Major threatening processes: None known. The subspecies and its food plant are widely distributed and relatively secure. Braby (2000) suggested that the food plants were depleted by grazing. The suggestion by Dunn et al. (1994) that control of common millet is likely to affect survival of the subspecies is not considered valid.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate and no recovery actions are considered necessary. However, a formal re-appraisal of the taxonomy is required to enable an accurate assessment of the National Conservation Status of the various subspecies.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. and Braby, M.F. 1992. Notes on the distribution and biology of some Hesperiidae and Lycaenidae (Lepidoptera) in Victoria. Australian Entomological Magazine 19: 117–124.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1-4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Anisynta cynone gunneda* L.E. Couchman

National Conservation Status: No Conservation Significance; Bolivia Hill population: Municipal Lower Risk (Least Concern).

Range: New South Wales.

Distribution: Gunnedah, Somerton, Tenterfield, Mount Kaputar.

Taxonomy: Four subspecies of *Anisynta cynone* have been described from southern and inland Australia.

Infra-specific relationships or variation: Four subspecies of *Anisynta cynone* have been described, including ssp. *gunneda*. Specimens from Bolivia Hill, Tenterfield, are extremely variable in size and colour. The population at Mount Kaputar also differs somewhat from typical ssp. *gunneda*. Some specimens are similar to *A. tillyardi* and others are intermediate between *A. cynone* and *A. tillyardi*. Populations from Bolivia Hill may prove to represent a natural hybrid zone between these two otherwise distinct species (c.f. Endler 1977).

Habitat critical to survival: *A. cynone gunneda* occurs on slopes and ranges in open woodland with an understorey of grasses including the food plants.

History of conservation concern: Dunn et al. (1994) stated that this subspecies was Vulnerable based on the few (ca 5) known populations of *A. cynone gunneda*. However, no evidence for a decline in any population has been noted. The subspecies may be local, but no doubt many populations remain undiscovered in New South Wales, particularly on western slopes of the Main Divide north from Tamworth. The population at Bolivia Hill, New South Wales should be considered taxonomically significant and of Municipal Conservation Significance with its associated ecological community.

Major threatening processes: None recognised. None of the known habitats has been destroyed and the population at Mount Kaputar is within a National Park. At Gunnedah a relatively small area near Blackjack Colliery has been disturbed for coal mining but it represents a very small portion of the habitat which extends into adjacent undisturbed ranges. Fires, temporarily affect populations of *A. cynone gunneda* on a local scale but they have always been followed by re-colonisation. The unusual population at Bolivia Hill may be threatened by future road widening or major disturbance.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate and no recovery actions are considered necessary. However, we recommend research to understand the taxonomic relationships of the population at Bolivia Hill, and include also specimens from Mount Kaputar. DNA analysis as well as morphometric studies are needed to quantify the differences between this and other neighbouring populations. Surveys are needed to determine the proximity of Bolivia Hill to other populations of *A. cynone gunneda* and *A. tillyardi*. The tenure of Bolivia Hill also requires assessment.

Lead Organisation: New South Wales National Parks and Wildlife Service.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Endler, J.A. 1977. Geographic variation, speciation, and clines. Princeton University Press. New Jersey.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Anisynta dominula dominula* (Plotz)

National Conservation Status: No Conservation Significance

Range: Tasmania.

Distribution: Northern and eastern coastal Tasmania.

Taxonomy: Five subspecies of *A. dominula* were recognised by Common and Waterhouse (1981).

Infra-specific relationships or variation: Little variation recorded. *A. dominula dominula* differs from *A. dominula pria* from western Tasmania, being larger and the yellow subapical spots are larger. Common and Waterhouse (1981) and Dunn and Dunn (1991) noted the differences between Tasmanian and mainland populations of *A. dominula*. However, Braby (2000) suggested that mainland populations and those from Tasmania were all ssp. *dominula*.

Habitat critical to survival: The species occurs in certain open woodlands where the food plant, *Poa* sp., is abundant.

History of conservation concern: Based on the appraisal by Dunn et al. (1994) who suggested that *A. dominula dominula* was insufficiently known. However, at the BAP Workshop held in Hobart, participants claimed the species was adequately known, and that it was of no conservation concern. The species is considered to be rare but is widely distributed. Very few of the known habitats have been destroyed.

Major threatening processes: Dunn et al. (1994) suggested that habitats had been altered by agricultural and pastoral activities, naming sites at Bagdad, Cranbrook, Bellbrook and Swansea.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are considered necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Anisynta dominula* ssp. 'Moree'

National Conservation Status: Data Deficient

Range: New South Wales.

Distribution: Known from one female specimen collected at Binguay, near Moree, on 3 April 1990 (Sands unpublished).

Taxonomy: Unclear. The single specimen is likely to be a form or subspecies of *Anisynta dominula*.

Infra-specific relationships or variation: Not known. The specimen differs in a number of characteristics from populations from the New England region of the Main Divide. *A. dominula draco* is likely to be the most closely related subspecies.

Habitat critical to survival: The single specimen originated at a much lower altitude than previously known for northern populations of *A. dominula*. The nearest previously known locality, for *A. dominula draco*, was southwest of Grafton (Braby 2000).

History of conservation concern: A single specimen is from a light trap at Stahmann Farms, a pecan orchard at Binguay, and has not been previously referred to in the literature. Much of the native vegetation near Moree has been cleared for farming and pasture improvement. The single specimen may represent a subspecies previously unrecognised.

Major threatening processes: None known.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. It is essential that experienced lepidopterists be encouraged to carry out surveys to locate additional habitats, especially in appropriate national parks west of the Main Divide, and near Moree and Narrabri, New South Wales.

Recovery needs: Surveys for the subspecies and mapping of areas where the taxon may occur are needed.

Can recovery be carried out with existing resources? No. Support for surveys is required.

Resources required:

	Action	$
1	Surveys over 3 years	5,000.00
Total		5,000.00

Lead Organisation: New South Wales National Parks and Wildlife Service.

Reference:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Antipodia atralba* (Tepper)

National Conservation Status: No Conservation Significance

Range: Victoria, South Australia.

Distribution: Hattah, Big Desert, Wyperfeld National Park, Victoria, Kangaroo Island, Yorke and Eyre Peninsulas, Ceduna and near Adelaide, South Australia.

Taxonomy: No formal subspecies of *A. atralba* are recognised, but Dunn et al. (1994) noted the apparent differences between Victorian and South Australian populations, following notes by Atkins (1984).

Habitat and key ecological features: The larval food plant, *Gahnia lanigera*, is a sporadic component of the ground flora of mallee heathlands. The sedge is common throughout parts of southern South Australia, where larvae also eat *G. ancistrophylla* (Fisher 1978). Atkins (1997) noted that larvae can be abundant on fresh growth of plants after fires. The species may, though, be Vulnerable to such fires (Braby 2000).

History of conservation concern: Douglas (1993) regarded *A. atralba* as ‘a naturally rare species’ in Victoria and Braby (2000) noted it as of regional conservation concern in Victoria. Some BAP Workshop participants felt that this species was Data Deficient. The main populations of *A. atralba* are in South Australia, and scattered populations are found in northwestern Victoria. Until records summarised by Douglas (1993), only three sites were known in Victoria, but the more recent records suggest that small populations occur throughout the southeastern parts of the Big Desert, possibly reflecting the localised distribution of the larval food plant, *Gahnia lanigera*. In South Australia, the butterfly is also ‘patchy’ in incidence, but the main conservation concerns apply to the Victorian populations, whose status and needs remain unclear.

Major threatening processes: None documented.

Is knowledge sufficient to formulate recovery actions? Yes. Recovery actions are not required. However, further surveys, especially in Victoria, are recommended to clarify the status of this species.

Lead Organisation: South Australian Department of Environment, Heritage and Aboriginal Affairs.

References:

Atkins, A.F. 1984. A new genus *Antipodia* (Lepidoptera: Hesperiidae: Trapezitinae) with comments on its biology and relationships. Australian Entomological Magazine 11, 45–58.

Atkins, A.F. 1997. Biological and distributional notes for some southern Australian skipper butterflies. Victorian Entomologist 27, 3–4.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Antipodia chaostola chaostola* (Meyrick)

National Conservation Status: No Conservation Significance

Range: New South Wales.

Distribution: Lithgow, Newnes, Blackheath and Katoomba.

Taxonomy: Three species of *Antipodia* are described, occurring mostly in southern States and southern Western Australia.

Infra-specific relationships or variation: Three subspecies of *Antipodia chaostola* have been described. Little variation has been observed in ssp. *chaostola*, which is limited to the Blue Mountains.

Habitat critical to survival: *A. chaostola chaostola* occurs in open forest or heathlands where its food plant, *Gahnia filifolia*, is abundant. This species has a remarkable relationship with its food plant, parasitoids and fire. Adults are usually very low in density. The immature stages which have a 2-year life developmental period and are naturally heavily attacked by parasitoids. However, soon after bushfires when the food plants have recovered, recolonising adults from unburnt areas are able to temporarily increase in abundance due to low densities of the natural enemies, mostly parasitoids (R. Mayo pers. comm.). The species subsequently subsides in abundance to very low densities, maintained until after further burning and recolonisation. *A. chaostola chaostola* is thus renowned for its 'boom and bust' cycles and for its rarity between these periods of abundance.

History of conservation concern: *A. chaostola chaostola* was listed as threatened by Hill and Michaelis (1988), and Dunn et al. (1994) considered the subspecies Endangered. No declines in the area occupied or the density of adults have been confirmed (R. Mayo pers. comm.).

Major threatening processes: None identified, but a relationship with bush fires was suggested by Dunn et al. (1994). They noted this subspecies was restricted to a small area of the Blue Mountains. Many of the habitats are in national parks and the rarity of adults does not reflect a threatened status. R. Mayo (pers. comm.) suggested that increases in abundance occur after fires, when breeding on regrowth of the food plant and before parasitoids deplete the numbers.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Although the area of occupancy is small, the species is not threatened and much of its habitat is secure. Natural fluctuations in adult numbers occur due to the interactions of fire and parasitoids R. Mayo (pers. comm.).

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Antipodia chaostola chares* (Waterhouse)

National Conservation Status: No Conservation Significance

Range: Victoria.

Distribution: Southern Victoria, including West Gippsland, outer eastern Melbourne, Anglesea and the Grampians.

Taxonomy: One of three named subspecies of *A. chaostola* (Meyrick), all of which are highly localised. *A. c. chares* is generally larger and brighter than the other forms.

Habitat critical to survival: In western Victoria, the most usual habitat is eucalypt forest with *Gahnia* in the understorey (Douglas 1993). Larvae feed on *Gahnia* spp., most usually *G. radula* (Common and Waterhouse 1981), but *G. sieberana* and *G. microstachya* have also been recorded. The subspecies is believed to have a two year life cycle (Common and Waterhouse 1981).

History of conservation concern: *A. chaostola chares* was designated as Vulnerable by Dunn et al. (1994) and of conservation concern by Douglas (1993). Sands (1990) thought that this subspecies was becoming rare and in danger of becoming extinct.

A. chaostola chares has a disjunct distribution, extending from the Grampians to east of Melbourne, and is thus known only from parts of southern Victoria. Dunn et al. (1994) noted possible losses of some colonies but there is little evidence of overall decline in range. Braby (2000) quoted D.F. Crosby's estimates that eight of 15 colonies are adequately reserved but four are extinct due to land clearance. Many of the areas where it occurs are possibly susceptible to burning, as part of fuel reduction and other maintenance activities. However, the biological characteristics of this subspecies may be similar to those of the nominotypical subspecies (R. Mayo pers. comm.) and the role of fire in this subspecies' ecology needs further investigation.

Major threatening processes: Close to Melbourne, urban development was a threat perceived by Dunn et al. (1994).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. This subspecies is not considered to be threatened.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Sands, D.P.A. 1990. Australia's Endangered butterflies. News Bulletin Entomological Society of Queensland 18: 63–68.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Antipodia chaostola leucophaea* (Couchman)

National Conservation Status: Data Deficient

Range: Tasmania.

Distribution: Southeastern Tasmania, predominantly south of Hobart.

Taxonomy: A distinct subspecies of *A. chaostola*, in which the underside markings are relatively obscure.

Habitat critical to survival: This subspecies was said to favour sandy hillsides on the banks of the Derwent River (Common and Waterhouse 1981), but this was denied by a reviewer. Larvae feed on *Gahnia radula* in open eucalypt forests at low altitudes (McQuillan 1994).

History of conservation concern: *A. chaostola leucophaea* is one of few Australian butterflies listed by IUCN (1988: 'Indeterminate'); regarded as 'Endangered' by several other authorities (Couchman and Couchman 1977, Dunn et al. 1994), and listed as 'Endangered' in Tasmania in the Threatened Species Protection Act 1995. It is currently known from four sites in eastern Tasmania. The butterfly was formerly found in isolated colonies around Kingston, but urban expansion has reduced its incidence considerably. Dunn et al. (1994) knew of only two extant populations, both threatened by urbanisation, with other colonies having been lost already. Braby (2000) noted recent discovery of a breeding colony on the Freycinet Peninsula, about 30 km south of Bicheno.

Major threatening processes: Urban expansion. There is suggestion that the butterfly is a 'fire succession species' and its relationships with fires are a major gap in ecological knowledge in relation to formulating management needs for active conservation.

Is knowledge sufficient to formulate recovery actions? No. Surveys are needed together with further information on the species' ecology.

Can recovery be carried out with existing resources? No.

Resources required:

Action		$
1	Surveys for distribution and population status	10,000.00
2	Elucidation of the role of fire in the species' ecology.	20,000.00
3	Evaluation of the security of all habitats.	3,000.00
Total		33,000.00

Lead organisation: Department of Primary Industries, Water and Environment, Tasmania.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Couchman, L.E. and Couchman, R. 1977. The butterflies of Tasmania. Tasmanian Year Book 1977, 66–94.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

IUCN 1988. IUCN Red List of threatened animals. International Union for Conservation of Natural Resources. Gland, Switzerland.

McQuillan, P.B. 1994. Butterflies of Tasmania. Tasmanian Field Naturalists Club. Inc., Hobart.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Antipodia dactyliota anaces* (Waterhouse)

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: Southwestern Western Australia, from Lesmurdie, Waroona, Hamel and National Park.

Taxonomy: Four subspecies of *Antipodia dactyliota* have been recognised, all from southwestern Western Australia. The species is closely related to *A. atralba*, from which males are easily distinguished by the narrower sex brand (Dunn and Dunn 1991).

Infra-specific relationships or variation: *A. dactyliota anaces* can be distinguished from other subspecies by its larger size and the obscurity of the spots beneath the hind wings, which are more prominent in other subspecies (Common and Waterhouse 1981). Braby (2000) regarded ssp. *anaces* as indistinguishable from ssp. *dactyliota*, but both require formal taxonomic evaluation before his synonymy can be accepted.

Habitat critical to survival: *A. dactyliota anaces* occurs in heathlands and at the edge of eucalypt forests, usually in moist places where its food plant, *Gahnia lanigera*, is abundant.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988), and Dunn et al. (1994) considered the subspecies to be rare and insufficiently known. At the BAP Workshop held in Perth this subspecies was said to be of no conservation concern. *A. dactyliota anaces* occurs commonly south from Perth, Western Australia. Some of its habitat has been disturbed or destroyed by urban development but it remains secure over a wide area and in reserves.

Major threatening processes: None identified other than historical loss of some populations from urban development.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Antipodia dactyliota dactyliota* (Meyrick)

National Conservation Status: Data Deficient

Range: Western Australia.

Distribution: Geraldton.

Taxonomy: One of four subspecies of *A. dactyliota* (formerly included in *A. atralba* (Tepper). *A. d. dactyliota* appears to differ from other subspecies by its size, the forewing spots being much larger than ssp. *anaces*, but its status is still uncertain; the taxonomic background to this group is given by Atkins (1984). Braby (2000) had a broader concept of ssp. *dactyliota* and did not separate this subspecies from sspp. *anaces* and *anapus*.

Habitat and key ecological features: Nothing is known of the biology of this subspecies, but larvae of other subspecies feed on *Gahnia lanigera* (Atkins 1984, Grund 1998).

History of conservation concern: *A. d. dactyliota* was considered 'Insufficiently known' by Dunn et al. (1994). It was long known only from the three type specimens, from Geraldton (Common and Waterhouse 1981). It has a very narrow distribution, and has been recorded from three sites only: Geraldton, s.e. of Jurien, and 103 km north of Perth (Dunn et al. 1994). However, specimens from the last-named localities are allocated only tentatively to this subspecies. Workshop discussions confirmed interest in the conservation of the butterfly. Other than general points such as widespread loss of suitable habitat through conversion for agriculture, details of threats have not been elucidated.

Major threatening processes: The type locality at Geraldton is subject to land clearing and weed encroachment.

Is knowledge sufficient to formulate recovery actions? No. The details of distribution, site tenure, population sizes and threats are largely unconfirmed.

Can recovery be carried out with existing resources? No. However, there is little basis to determine funding needs accurately. The initial need is for thorough survey over the area encompassing the documented sites, over at least two seasons, and for broad assessment of the location of remaining suitable habitats in the region.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
Total		15,000.00

Lead organisation: Western Australian Department of Conservation and Land Management.

References:

Atkins, A.F. 1984. A new genus *Antipodia* (Lepidoptera: Hesperiidae: Trapezitinae) with comments on its biology and relationships. Australian Entomological Magazine 11, 45–58.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Grund, R. 1998. New food plant recordings and biological observations for some Western Australian butterflies. Victorian Entomologist 28: 65–68.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Antipodia dactyliota nila* (Waterhouse)

National Conservation Status: Data Deficient

Range: Western Australia.

Distribution: Dirk Hartog Island.

Taxonomy: *A. d. nila* is apparently very similar to *A. d. dactyliota*, but males have a narrower 'sex brand' on the fore wing (Dunn and Dunn 1991). The wings are said to be darker beneath (Common and Waterhouse 1981).

Habitat and key ecological features: Nothing is known of the developmental biology of *A. d. nila*, but it is likely that larvae feed on *Gahnia*.

History of conservation concern: Dunn et al. (1994) considered that this subspecies was insufficiently known. *A. d. nila* is known only from Dirk Hartog Island, near Carnarvon, and has apparently not been taken or seen since 1920. Dunn et al. (1994) suggested that it might occur also on nearby mainland areas, but it has not yet been found there.

Major threatening processes: There is at present no information on this subspecies, and no specific threats have been documented.

Is knowledge sufficient to formulate recovery actions? No. Security of the habitat on Dirk Hartog Island needs evaluation together with any possible threats for the butterfly. Additional surveys on the nearby mainland are needed to determine if this or another subspecies occurs there.

Can recovery be carried out with existing resources? Recovery needs cannot be evaluated before surveys, as above.

Resources required:

Action		$
1	Surveys	10,000.00
Total		10,000.00

Lead organisation: Western Australian Department of Conservation and Land Management.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1-4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: COELIADINAE

Scientific name: *Badamia exclamationis* (Fabricius)

National Conservation Status: No Conservation Significance

Range: Western Australia, Northern Territory, Queensland, New South Wales, Victoria

Distribution: Coastal and occasionally inland areas of the States listed, from North West Cape, Western Australia, northern and eastern Australia, occasionally as far eastern Victoria. This species occurs widely throughout the Pacific region.

Taxonomy: Two species are known in the genus *Badamia*. One is confined to the mountains of Fiji.

Infra-specific relationships or variation: *Badamia exclamationis* shows little variation throughout its range from India, China, Southeast Asia, Australia and the central Pacific. Adult size and sometimes the extent of fore wing spots may vary in Australian specimens.

Habitat critical to survival: *Badamia exclamationis* occurs in a range of habitats, especially near the sea where its principal food plant, *Terminalia catappa*, occurs mostly north of Tully, Queensland but also elsewhere in northern Australia. Other plants including *T. oblongata* are utilised by this species (Braby 2000).

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988). However, no threats or features of conservation interest have been recorded.
In some countries, larvae of the butterfly are considered to be pests of ornamental or horticultural plants, especially the beach almond, *T. catappa*. The species is a tropical migrant and its sustained breeding colonies appear to coincide with the distribution of its food plants. References to this species as of conservation concern are misleading, and are based on a misunderstanding of its biology. This tropical species is well adapted to migrating distances over land and water, sometimes establishing breeding colonies when the food plant is located by gravid females in remote localities such as Tonga and Samoa. In Australia in some years, adults migrate south along the Queensland coast and extend their range to the southern mainland States as far south as Victoria.

Major threatening processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Recovery actions are not required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: HESPERIINAE

Scientific name: *Borbo cinnara* (Wallace)

National Conservation Status: No Conservation Significance

Range: Northern Territory, Torres Strait Islands, Queensland. This species also occurs in Malaysia, Sri Lanka, southern China, Indonesia, Papua New Guinea and Vanuatu.

Distribution: Darwin, Adelaide River, Northern Territory, Torres Strait Islands to Claudie River.

Taxonomy: This species occurs widely in Southeast Asia, northern and western Pacific Islands.

Infra-specific relationships or variation: None recorded.

Habitat critical to survival: In Papua New Guinea *B. cinnara* occurs commonly in wetlands, where it breeds on inundated grasses, including cultivated rice (D.P.A. Sands unpublished). The habitats in Australia have not been recorded but are likely to be wetlands, similar to those overseas. Braby (2000) noted the food plants for larvae in Torres Strait include *Rottboellia cochinensis* (Poaceae).

History of conservation concern: Dunn et al. (1994) stated that the species was insufficiently known and listed the species with 'less threatened taxa'. They mentioned the few specimens known from Northern Territory, and proposed that the species may be only temporarily established in the Northern Territory. Sufficient is known of its ecology overseas to regard *B. cinnara* as of No Conservation Significance in Australia. The species has probably been overlooked in the field due to its similarity to other abundant species (Braby 2000).

Major threatening processes: None recognised. Wetland habitats predicted to be suitable for the species are not under threat.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. Studies for possible wetland habitats for *B. cinnara* are needed in Australia to determine its distribution and environmental requirements.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: PYRGINAE

Scientific name: *Chaetocneme porphyropis* (Meyrick and Lower)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Helenvale to Paluma, and western slopes of the Atherton Tablelands.

Taxonomy: In appearance, *Chaetocneme porphyropis* is unlike other members of the genus.

Infra-specific relationships or variation: The median-tornal band of the fore wing varies in colour from pale to dark yellow.

Habitat critical to survival: Occurs in coastal and upland tropical rainforest, wherever food plants are abundant. These include a range of Lauraceae, particularly *Cryptocarya* spp and *Litsea* spp. (Braby 2000).

History of conservation concern: *C. porphyropis* is currently listed as Vulnerable and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). Dunn et al. (1994) stated that the species was Vulnerable, attributed to clearing of land near Kuranda. Despite these comments by Dunn et al. (1994), few of the known habitats have been destroyed and extensive areas of habitat are protected in the World Heritage rainforests of northern Queensland, roadside vegetation, in national parks and on private property. The species occasionally occurs and breeds in shaded gardens (late R. Straatman pers. comm.).

Major threatening processes: None confirmed. Dunn et al. (1994) stated that clearing of rainforest near Kuranda destroyed or reduced the size of populations. However, no evidence has been presented to support this statement.

Is knowledge sufficient to formulate recovery actions? Yes, no recovery actions are required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: PYRGINAE

Scientific name: *Chaetocneme sphinterifera sphinterifera* (Fruhstorfer)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Bamaga to McIlwraith Range, Rocky River.

Taxonomy: *Chaetocneme sphinterifera sphinterifera* has also been treated as a subspecies of *C. critomedia* by Common and Waterhouse (1981) and Braby (2000). However, Parsons (1998) showed that the two are separate species.

Infra-specific relationships or variation: Another subspecies, ssp. *hydra*, occurs in Papua New Guinea (Parsons 1998). *C. sphinterifera hydra* and the related *C. critomedia* are sympatrically distributed in Papua New Guinea.

Habitat critical to survival: *C. sphinterifera sphinterifera* is widely distributed in open forest on Cape York Peninsula. Although adults are crepuscular and rarely seen, the species is adapted to a range of habitats. Breeding occurs at the edge of rainforest or near creek embankments where a range of food plants grow in shaded areas, especially Lauraceae and Myrtaceae (Wood 1985, Braby 2000).

History of conservation concern: Dunn et al. (1994) considered this species to be rare and were not sure if the species survived at Cape York. However, there are no doubts that most of the habitats near Cape York are intact. This taxon is currently listed as 'common' and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994).

Major threatening processes: None recorded. Habitats are very extensive and there are no threats other than temporary natural processes such as fire.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Parsons, M. 1998. The butterflies of Papua New Guinea. Their systematics and biology. Academic Press, London.

Wood, G. 1985. The life history of *Chaetocneme critomedia sphinterifera* (Fruhstorfer) (Lepidoptera: Hesperiidae: Pyrginae). Australian Entomological Magazine 11: 41–42.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Croitana aestiva* Edwards

National Conservation Status: Data Deficient

Range: Northern Territory.

Distribution: Known from 25 km, 41km (Standley Chasm) and 75 km (Ellery Gorge) west of Alice Springs (Edwards 1979).

Taxonomy: *Croitana aestiva* is one of three or possibly four species in the genus, all adapted to low rainfall, and some desert areas of Australia.

Infra-specific relationships or variation: Slight variation in the size of the fore wing spots reported by Braby (2000).

Habitat critical to survival: Near Alice Springs, *C. aestiva* occurs in open woodland dominated by mulga (Braby 2000). No details of its life cycle are known.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988). Dunn et al. (1994) considered the species 'indeterminate' and recorded no threats. These authors have referred to this species because it is poorly known and occurs in relatively inaccessible areas of Central Australia. As pointed out by Dunn et al. (1994), until the biology is understood, information needed to assess the conservation needs of the species remains unavailable.

Major threatening processes: None recognised.

Is knowledge sufficient to formulate recovery actions? No, the data are not available.

Recovery needs:

1. Surveys and mapping are recommended to determine the distribution of *C. aestiva*.
2. Biological studies to determine the life history and if there are any threats.
3. Appropriate conservation measures based on 1 and 2.

Can recovery be carried out with existing resources? No.

Resources required:
Initial resources required:

Action		$
1	Surveys, mapping, and biological studies — $5,000 / year over 3 years.	15,000.00
Total		15,000.00

Lead Organisations: Parks and Wildlife Commission of the Northern Territory, Environment Australia.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Edwards, E.D. 1979. Two new species of *Croitana* Waterhouse (Lepidoptera: Hesperiidae) from central Australia. Australian Entomological Magazine 6: 29-38.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Croitana arenaria* Edwards

National Conservation Status: Data Deficient

Range: Northern Territory, South Australia.

Distribution: Known from several localities in NT near Alice Springs or 190-245 k to the east and northeast including the Plenty River and possibly Hermannsburg (Edwards 1979, Atkins and Miller 1987). In South Australia it is recorded from the Botenella Range, north of Kimba (Moore 1988, Braby 2000). About nine localities are known (Dunn et al. 1994).

Taxonomy: *C. arenaria* is one of three or possibly four species in the genus. All are adapted to low rainfall and sometimes desert areas of Australia.

Infra-specific relationships or variation: Braby (2000) noted slight variation in the size of fore wing spots and bands beneath the hind wing of the male.

Habitat critical to survival: This species, described from Central Australia by Edwards (1979), occurs between low hills and in dry river and creek beds, in spinifex scrub and on sand plains (Moore 1988, Atkins and Miller 1987). The larvae feed on *Enteropogon acicularis* near Alice Springs.

History of conservation concern: Dunn et al. (1994) considered that this species was 'insufficiently known'. This species is probably widespread in central arid areas of Australia (Braby 2000), but more information on distribution is required.

Major threatening processes: None recognised.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. Surveys are required to enable assessment of any threatening processes and evaluate security of habitats.

Recovery needs:

1. Surveys and mapping, especially in national parks, identification, preservation and management of areas where the species occurs.
2. Possible need to manage weeds and fire regimes in habitats.

Can recovery be carried out with existing resources? No. Surveys are a priority.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
Total		15,000.00

Lead Organisations: Parks and Wildlife Commission of the Northern Territory, South Australian Department of Environment, Heritage and Aboriginal Affairs.

References:

Atkins, A.F. and Miller, C.G. 1987. The life history of *Croitana arenaria* Edwards, 1979 (Lepidoptera: Hesperiidae: Trapezitinae) Australian Entomological Magazine 14: 73–75.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Edwards, E.D. 1979. Two new species of *Croitana* Waterhouse (Lepidoptera: Hesperiidae) from central Australia. Australian Entomological Magazine 6: 29–38.

Moore, M.D. 1988. A new butterfly record from South Australia and a list of species from northern Eyre Peninsula. Victorian Entomologist 18: 24–25.

HESPERIIDAE: PYRGINAE

Scientific name: *Euschemon rafflesia alba* Mabille

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: From Mackay to Schute Harbor, Bluewater State Forest to Cooktown.

Taxonomy: This subspecies differs from the nominotypical ssp *rafflesia* by the more extensive green and yellowish suffusions on underside of the wings.

Infra-specific relationships or variation: As with ssp. *rafflesia*, the deep yellow areas of the upperside are sometimes replaced by pale yellow or white.

Habitat critical to survival: *E. rafflesia alba* is very abundant, although local, on the slopes of the Paluma Range and near Kuranda, sometimes breeding in gardens where the food plants have been retained. Larvae of the subspecies feed on small trees or shrubs of *Tetrasynandra* spp., growing in or at the edge of rainforest.

History of conservation concern: The subspecies *alba* was said by Dunn et al.(1994) to be rare, a comment that cannot be justified, because it is locally abundant wherever the density of food plants is adequate. This taxon is currently listed as 'common' and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994. Dunn and Dunn (1991) also indicated that the subspecies was of conservation concern. However, it is neither rare or of conservation concern, especially since most of the habitats are secure in World Heritage rainforests between Paluma and Cooktown.

Major threatening processes: None recognised. Some populations may have been destroyed by urban development or road widening activities near Kuranda and nearer the coast.

Is knowledge sufficient to formulate recovery actions? Yes. Recovery actions are not required. As with the southern subspecies, the species would be a suitable target for community and school conservation projects involving habitat enrichment.

References:

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1-4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: PYRGINAE

Scientific name: *Euschemon rafflesia rafflesia* (W.S. Macleay)

National Conservation Status: No Conservation Significance; New South Wales south of Port Macquarie: Lower Risk (Least Concern).

Range: Queensland, New South Wales.

Distribution: From Bulburin State Forest, Miriam Vale, Queensland, south to about Port Stephens, New South Wales.

Taxonomy: The monospecific genus *Euschemon* is endemic to Australia and is not closely related to any other genus. There are two subspecies of *E. rafflesia*, ssp. *rafflesia* occurring in southeastern Queensland and New South Wales and ssp. *alba* occurring further north from Mackay to Cooktown (Braby 2000).

Infra-specific relationships or variation: Variation in *E. rafflesia rafflesia* is known in the yellow areas of the wings, which range from pale to deep yellow. Rarely these are replaced by white.

Habitat critical to survival: The species only occurs near or in rainforest where species of *Wilkiea*, mainly *W. huegeliana* and *W. macrophylla*, are abundant.

History of conservation concern: Dunn et al. (1994) considered *E. rafflesia rafflesia* to be 'rare' and populations at risk from development in coastal New South Wales. Braby (2000) noted range contractions and risks from development and habitat fragmentation. Many habitats for *E. rafflesia rafflesia* have been destroyed, resulting from coastal development, especially near Brisbane, Queensland and between Port Macquarie and Bungwahl, and elsewhere in central New South Wales (McCubbin 1971, Dunn et al. 1994), for example at Elizabeth Beach (Sands unpubl.). Its decline near urban sites has attracted attention from lepidopterists. The subspecies is secure in a number of national parks and reserves in northern New South Wales and southern Queensland, and the subspecies has stabilised in some semi-disturbed areas, for example north from Port Macquarie including Murwillumbah and Lismore, and on the New South Wales / Queensland border Ranges where the species is not threatened. Many habitats west of Brisbane have been destroyed by urban development but others near Mount Cotton are probably secure. Concerns are mainly related to contractions in the southern distribution in central New South Wales, and loss of individual populations in northern New South Wales and near Brisbane, Queensland. The species is adapted to shaded forested areas for breeding and is dependent on relatively high densities of the food plants.

Major threatening processes: Habitat disturbance and destruction, and sand mining in coastal areas from near Brisbane, Queensland to Elizabeth Beach, central New South Wales. Secure further from the coast near Lismore, New South Wales, on the New South Wales / Queensland Border ranges and north from Beerwah, Queensland. The species appears unable to persist in habitats when food plants decline in density due to disturbance. Dunn et al. (1994) identified invasion of habitat by bitou bush (*Chrysanthemoides monilifera*) as a threatening process, presumably only in coastal areas. The species is an excellent ecological indicator for disturbance.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary except south from Port Macquarie, especially where the species is at the edge of its southern range.

Recovery needs:

1. Monitoring of southern population to ensure they are secure, especially those near Port Macquarie, New South Wales where a special case might be made for a local recovery effort.
2. Preservation and management of areas, especially environmental parks where the species occurs, especially in the southern part of its range.
3. The species will respond to enrichment planting of *Wilkiea* spp. by community bush regeneration groups.

Can recovery be carried out with existing resources? No. Not required as the species is not threatened. However, the species is an excellent flagship species for community rainforest conservation, which should be acknowledged and supported wherever possible.

Lead Organisation: New South Wales National Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

McCubbin, C. 1971. Australian Butterflies. Nelson, Melbourne.

HESPERIIDAE: PYRGINAE

Scientific name: *Exometoeca nycteris* Meyrick

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: Perth to Albany.

Taxonomy: Distinctive species, and the only species of the genus *Exometoeca*.

Habitat critical to survival: This species occurs in a range of habitats including open woodland and heathlands. Burns and Rotherham (1969) suggested that *Hibbertia* spp. may be larval food plants for this species. The food plants have since been found to be *Tetratheca hispidissima* and *T. hirsuta* (Atkins et al. 2002).

History of conservation concern: Dunn et al. (1994) noted that it has been confirmed at only three or four of the 17 known sites, and assessed it as 'Vulnerable'. However, Atkins et al. (2002) suggested that *E. nycteris* may be more widespread and locally common than previously thought. Several of the localities are in national parks.

Major threatening processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Recovery actions are not required.

References:

Atkins, A.F., Williams, A.A.E., and Williams, M.R. (2002). *Exometoeca nycteris* Meyrick (Lepidoptera: Hesperiidae: Pyrginae): life history and morphological studies. Australian Entomologist 29: 1–10.

Burns, A.N. and Rotherham, E.R. 1969. Australian Butterflies in colour. Reed, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Herimosa albovenata albovenata* (Waterhouse)

National Conservation Status: Vulnerable [VUa,b,d]

Range: South Australia.

Distribution: South Australia from the lower Murray Valley, between the Yorke Peninsula and Victorian border. Previous localities include Point Pearce, type locality (Waterhouse 1940, Common and Waterhouse 1981), east of Eucla (Dunn et al. 1994), Carrieton, Orroroo (Grund 1997), Peterborough (Atkins 1994), Ardrossan (Dunn and Dunn 1991), Murray Bridge and Tintinara [possibly extinct] (Dunn and Dunn 1991). *H. albovenata* has not been recorded from Victoria but it is likely that the species occurs there (Braby 2000).

Taxonomy: *H. albovenata albovenata* was originally assigned to the genus *Anisynta* Lower, and was subsequently transferred by Atkins (1994), to a new monotypic genus *Herimosa*. It is very closely allied to the monotypic *Proedoisa polysema*.

Infra-specific relationships or variation: The taxonomic status of subspecies is unclear but, other than the nominotypical subspecies *albovenata*, two have been described: *H. albovenata fuscata* from southern Western Australia and *H. albovenata weemala* from New South Wales (Gunnedah and Mount Kaputar). Common and Waterhouse (1981), Dunn and Dunn (1991) and Atkins (1994) considered specimens from South Australia to be ssp. *albovenata*, specimens from Western Australia to be ssp. *fuscata* and all specimens from New South Wales, to be ssp. *weemala*. However, Braby (2000) considered that *H. albovenata albovenata* also occurs in southern New South Wales and south Western Australia. The subspecific arrangement given by Atkins (1994) is followed here and only South Australian populations of *H. albovenata albovenata* are assessed as threatened in the present evaluation.

Habitat critical to survival: The habitats of *H. albovenata albovenata* were described by Atkins (1994). *H. albovenata* occurs mainly as small colonies in grassy woodlands, sometimes with limestone outcrops, exposed grasslands or grassy heathland on the coast, only where the food plants are present. Its flight period is limited to spring, depending on local climate, from September to October with one generation per year. The larval food plants are *Austrostipa* (*Stipa*) *semibarbata*, *A. eremophila* and *A. scabra* (Poaceae) (Atkins 1994, Grund 1996, 1997a,b; Braby 2000), and possibly *Danthonia* sp. (Atkins 1994) including *Danthonia setacea* (Common and Waterhouse 1981). In the field adults are cryptic in behaviour, fly rapidly and settle frequently, and usually occur in low densities, making them difficult to detect. The flight season is also very short (Grund 1997b). These factors limit accurate assessment for the National Conservation Status of each subspecies.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988). The conservation of *H. albovenata albovenata* was referred to by Yen and Butcher (1997) and Grund (1996, 1997). Both Fisher (1993) and Fisher and Watts (1994) discussed its limited distribution and conservation interest, the latter regarding it as Threatened. Grund (2000) gave the possible status of Vulnerable. Dunn et al. (1994) suggested that ssp. *weemala* was Endangered, but without defining the threatening processes. Subspecies *albovenata* is not currently listed as threatened by State or Commonwealth authorities. Insufficient secure habitat is available in South Australia to sustain survival of this subspecies. Most habitats are roadsides, grassy remnants or on farmlands (Grund 1997). *H. albovenata albovenata* is currently known to occur at only about five localities, of a total of nine historically recorded in the State (Fisher and Watts 1994). Most are grazed and all surrounded by disturbed vegetation and separated without corridors between populations. The land tenure for these habitats has not been established but when known, may affect the strategy required for preparing a recovery plan. The locality at Tintinara may no longer support *H. albovenata albovenata* (Grund 1996).

Major threatening processes: Hill and Michaelis (1988) identified roadworks, clearing and over grazing as threats to this species. Many of the habitats have been destroyed in the State and the subspecies is known to have declined in its distribution, resulting from urban development. Disturbance or destruction of grassland habitats, possibly grazing (Braby 2000) and displacement of grass communities supporting the food plants, by weeds and exotic species, are threatening processes. Additional threats noted by Fisher and Watts (1994) include pesticides (aerial spraying in the Peterborough area) and predation by house mice during plagues (Monarto, Yorke Peninsula)(see also Grund 1999).

Based on observations for ssp. *weemala* at Bredbo, New South Wales, the subspecies may be tolerant of moderate grazing by stock (E.D. Edwards pers. comm.). Human-induced or unseasonal fires, increased fire frequency and loss of corridors preventing re-colonisation, are also major threatening processes. The collection of specimens is not considered a threatening process and collectors should be encouraged to locate new localities.

Is knowledge sufficient to formulate recovery actions? No. More information is required from surveys to clarify the direction of recovery actions. It is likely that localities with food plants and *H. albovenata albovenata* may have been overlooked due to the limited seasonal and cryptic behaviour, and low densities of the adult butterflies. Special efforts are required to locate the species in protected areas where the habitat appears suitable and the food plant is present. A recovery plan was prepared for this taxon by Fisher and Watts (1994).

Recovery needs:

1. Refine the Recovery Plan, appoint a Recovery Team; revise and identify key recovery actions
2. Survey potential new habitats with food plants for presence of *H. albovenata albovenata*.
3. Map existing habitats, assess them for permanent conservation, and provide signage especially roadside plant communities where the grasses, *Austrostipa* spp., support *H. albovenata albovenata*. Dunn et al. (1994) predicted that this subspecies probably occurs continuously along the Great Australian Bight, indicating this area needs surveying for *H. albovenata albovenata*.
4. Establish schedules for weed and fire control for habitats, especially to regulate burning seasons (avoid March to September) and frequency.
5. Rehabilitate sites for long-term protection for habitat management by community groups and encourage enrichment of food plants by plant propagation and cultivation.
6. Potential to integrate existing habitats into public recreation areas.
7. Establish a schedule for recovery and de-listing of *H. albovenata albovenata*.

Can recovery be carried out with existing resources? No.

Resources required:

Action*		$
1	Surveys and mapping, $ 5,000 / year over 3 years	15,000.00
2	Site rehabilitation after the surveys, plant propagation and cultivation, $15,000 per year over 3 years	45,000.00
Total		60,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Timeframe for Rehabilitation of Taxon

- In train 2 years
- Completed 6 years
- De-listing 8 years

Lead Organisation: South Australian Department of Environment, Heritage and Aboriginal Affairs.

References:

Atkins, A. 1994. A new genus, *Herimosa* (Lepidoptera: Hesperiidae: Trapezitinae) and its relationship to the *Proeidosa* group of endemic Australian skippers. Australian Entomologist 21: 143–152.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1-4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R.H. 1993. The conservation status of the white-veined skipper butterfly (*Anisynta albovenata albovenata* Waterhouse) in South Australia, and recommendations for its recovery. Unpublished Report. South Australia Museum, Adelaide.

Fisher, R. and Watts, C.H.S. 1994. The white-veined skipper butterfly (*Anisynta a. albovenata*) Recovery Plan. Report to Australian National Parks and Wildlife service, Canberra.

Grund, R. 1996. Range extensions, new food plant recordings and biology for some South Australian butterflies. Victorian Entomologist 26: 93–100.

Grund, R. 1997a. Additional range extensions, new food plant recording and biology for some rare South Australian butterflies, including the life history for *Candalides cyprotus cyprotus* (Oliff). Victorian Entomologist 27: 7–14.

Grund, R. 1997b. Butterfly conservation in southern Eyre Peninsula. Department of Environment and Aboriginal Affairs, South Australia.

Grund, R. 1999. Butterfly conservation in the southern Flinders region. Department of Environment and Aboriginal Affairs, South Australia.

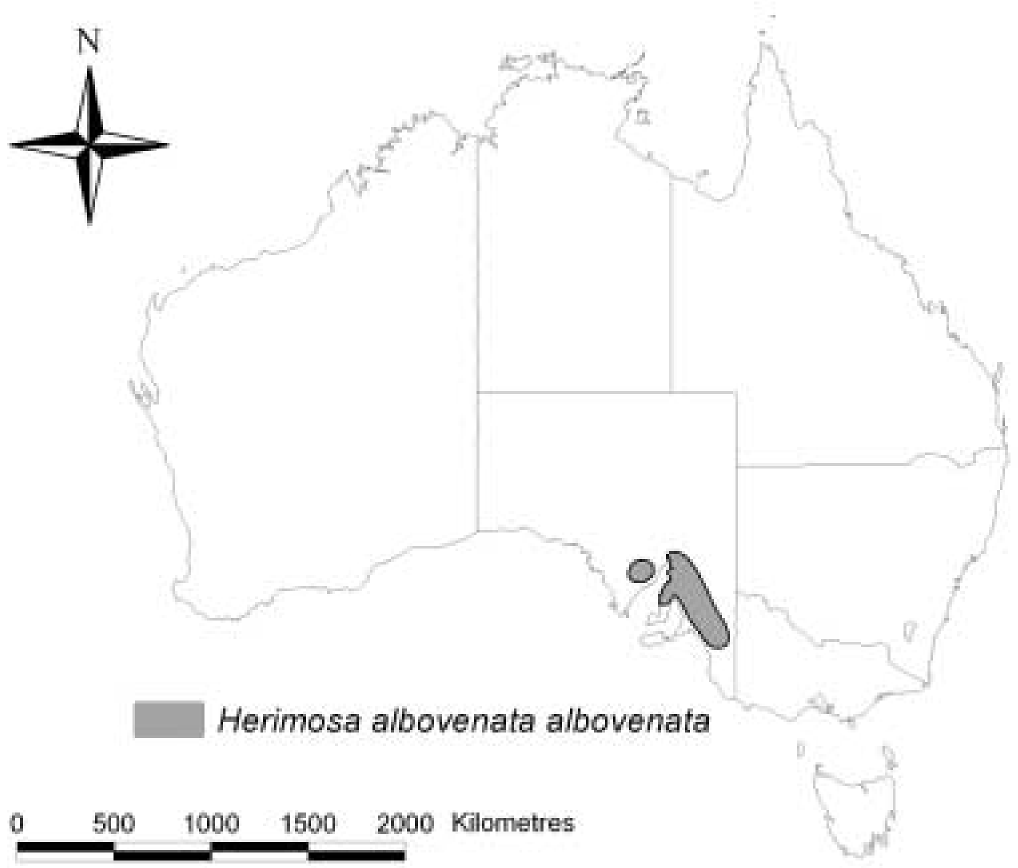
Grund, R. 2001. South Australian butterflies check list. http://www.adelaide.net.au/~reid/checklist.htm (Assessed 18 April 2001).

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Waterhouse, G.A. 1940. Australian Hesperiidae. IX. Descriptions of new species. Proceedings of the Linnean Society of New South Wales 66: 215–218.

Yen, A.L. & Butcher, R. J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered Species Program, Environment Australia, Canberra.

Distribution of *Herimosa albovenata albovenata*



HESPERIIDAE: TRAPEZITINAE

Scientific name: *Herimosa albovenata fuscata* (Parsons)

National Conservation Status: Data Deficient

Range: Western Australia.

Distribution: Southern, mainly inland areas of the State from Norseman to Esperance on the coast (Common and Waterhouse 1981).

Taxonomy: This subspecies may be distinguished from ssp. *albovenata* and ssp. *weemala* by its considerably larger size, larger and deeper yellow spots (instead of cream) on the fore wing, and darker shade of brown (Common and Waterhouse 1981). Braby (2000) suggested that ssp. *albovenata* as well as ssp. *fuscata* occurs in Western Australia. Atkins (1994) indicated that the Western Australian taxon is ssp. *fuscata*, an arrangement followed here until a formal re-assessment of subspecies and their distribution has been made.

Infra-specific relationships or variation: Some variation occurs in the size of spots on the fore wing.

Habitat critical to survival: This subspecies is recorded as occurring in sand hills (Braby 2000). The larvae of other subspecies feed on *Stipa* sp.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988). Braby (2000) suggested that ssp. *fuscata* is regionally threatened. However, other subspecies are known to tolerate moderate grazing pressures which are also not likely to be a major threatening process for this subspecies. It may have suffered from range contraction as suggested by Braby (2000), but this requires confirmation. The species is likely to be similar in its ecology to the two eastern subspecies but much more information is required, involving carrying out detailed surveys to determine biology and distribution. Concerns are possibly due to the rarity and seasonally restricted appearance of adults.

Major threatening processes: None recognised. Other subspecies are relatively tolerant of light grazing in pastures unless exotic species or weeds replace the native *Stipa* spp., food plants for the larvae.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. Initially the taxonomic status needs to be determined for Western Australian populations when specimens become available.

Recovery needs

1. Surveys and mapping for determining distribution
2. Preservation and management of known habitats.
3. Managing weeds and fire control for habitats.

Can recovery be carried out with existing resources? No. Research and distributional studies on this taxon are needed at the appropriate time of the year. Support for surveys, especially by State conservation authorities in appropriate national parks is recommended.

Resources required:

Action*		$
1	Surveys and mapping, $ 5,000 / year over 3 years	15,000.00
2	Taxonomic and biological studies	20,000.00
3	Preservation and management of known habitats.	30,000.00
Total		65,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisation: Western Australian Department of Conservation and Land Management.

References:

Atkins, A. 1994. A new genus, *Herimosa* (Lepidoptera: Hesperiidae: Trapezitinae) and its relationship to the *Proeidosa* group of endemic Australian skippers. Australian Entomologist 21: 143–152.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Herimosa albovenata weemala* (L.E. Couchman)

National Conservation Status: No Conservation Significance

Range: New South Wales.

Distribution: Known from near Gunnedah (Couchman 1954) and Mount Kaputar (Daniels 1979). The subspecies probably occurs at other intervening and surrounding localities where the food plant is abundant, for example, near Coonabarrabran and Warrumbungle Ranges.

Taxonomy: This subspecies may be distinguished from sspp. *albovenata* and *fuscata* by its smaller size, rich brown colour and large spots of the fore wing (Braby 2000).

Infra-specific relationships or variation: Some variation occurs in the size of spots on the fore wing.

Habitat critical to survival: This subspecies occurs on the ranges near Gunnedah (Couchman 1954) and on slopes of Mount Kaputar (Daniels 1979). Adults occur at very low densities and are very cryptic in behaviour, making observations and surveys very difficult. The food plant is a species of *Stipa* (*Austrostipa*, Braby 2000), probably *S. scabra*.

History of conservation concern: Dunn et al. (1994), listed this subspecies as Endangered and the species was listed as threatened by Hill and Michaelis (1988). Braby (2000) did not consider ssp. *weemala* to be threatened.

Major threatening processes: None confirmed. The habitats of *weemala* are relatively intact, including Mount Kaputar National Park. Dunn et al. (1994) stated that ssp. *weemala* was Endangered and it may be threatened by grazing. However, there is no evidence for this, since the best-known localities at Gunnedah and Mount Kaputar are not grazed. At Gunnedah, extensive areas of habitat are intact and there is little disturbance by coal mining activities, which are limited to one area only. Heavy grazing has had no known effect on this ssp. near Bredbo, where the species is stable and sometimes abundant, even where weeds have invaded and fire has occurred (E.D. Edwards pers. comm.). A weedy grass referred to as 'love grass' is known to displace food plants of ssp. *weemala* at one habitat at Bredbo, New South Wales, and there it is likely to be a longer-term threatening process (E.D. Edwards pers. comm.).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate.

Recovery needs: Surveys are recommended to establish the presence of additional habitats, especially to determine if the subspecies is present in the Warrumbungle National Park

Resources required: As part of surveys for other little known taxa, support for surveys, especially by State conservation authorities in appropriate national parks is recommended.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Couchman, L.E. 1954. Notes on some Tasmanian and Australian Lepidoptera-Rhopalocera with descriptions of new forms. Proceedings of the Royal Society of Tasmania 88: 67-79.

Daniels, G. 1979. The butterflies of Mount Kaputar National Park, New South Wales. Australian Entomological Magazine 6: 57-58.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla chrysotricha leucosia* Waterhouse

National Conservation Status: No Conservation Significance; South Australia: Lower Risk (Least Concern)

Range: Victoria, South Australia.

Distribution: Glenelg River, southwestern Victoria; southeastern region, southern Mount Lofty Ranges, Yorke Peninsula, South Australia.

Taxonomy: Six subspecies of *H. chrysotricha* (Meyrick and Lower) have been described, all with limited distribution in southern Australia. However, Dunn and Dunn (1991) and Braby (2000) considered several of these, including *H. chrysotricha leucosia*, to be synonyms of *H. c. cyclospila* (Meyrick and Lower). The validity of all subspecies of *H. chrysotricha* requires further investigation.

Habitat critical to survival: *H. chrysotricha leucosia* occurs in brackish swamps where the food plant, *Gahnia trifida* is abundant. Other recorded food plants are *G. sieberana* and *G. filum*.

History of conservation concern: BCSA (1999) proposed Vulnerable status for this subspecies. BAP Workshop participants in Adelaide estimated that range declines of around 50% occurred over the last 20 years, and some populations had become extinct over this period. Grund (2001) listed this taxon (as *H. c. cyclospila*) as Vulnerable. Douglas (1993) noted the need for additional surveys to clarify its distribution in Victoria.

Major threatening processes: The range of threats cited includes urbanisation, farming activities, unnatural use of fire, weed invasions and changes to drainage, with concerns for the *Gahnia* on which larvae feed. Trampling and grazing by stock, and changes to hydrology have been noted as threats to specific sites. Grund and Hunt (2000) noted that this subspecies used to be a relatively common butterfly of the coastal wetlands, and it is very intolerant of environmental degradation.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is known from National Parks but several populations are known to have declined or have been lost. Others may prove to be Vulnerable, but threats are not sufficiently general to threaten the survival of this subspecies.

Recovery needs: Documentation is needed to evaluate the security of all known populations and clarification of threats to each. More detailed recovery measures cannot be formulated without this information.

Lead Organisation: Department of Environment, Heritage and Aboriginal Affairs, South Australia.

References:

BCSA 1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss nominations of threatened South Australian butterflies.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid. checklist.htm. (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south east region. Department of Environment, Heritage and Aboriginal Affairs, South Australia.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla chrysotricha lunawanna* L.E. Couchman)

National Conservation Status: Data Deficient

Range: Tasmania.

Distribution: South Bruny Island, southeastern Tasmania.

Taxonomy: Subspecies *lunawanna* is one of six described subspecies of *Hesperilla chrysotricha*. It was not recognised as distinct by Dunn and Dunn (1991) or Braby (2000) who considered it to be a synonym of ssp. *cyclospila*. The taxonomy of subspecies of *H. chrysotricha* requires formal reappraisal.

Infra-specific relationships or variation: *H. chrysotricha lunawanna* is very similar to ssp. *plebia* but the subapical spots are white instead of yellow. The post median spots beneath the hind wing are said to be variable in size (Common and Waterhouse 1981).

Habitat critical to survival: *H. chrysotricha lunawanna* occurs in saline swamps where the swordgrass *Gahnia trifida* is food plant for its larvae.

History of conservation concern: Dunn et al. (1994) considered *H. chrysotricha lunawanna* (as a 'form' of ssp. *cyclospila*) was Vulnerable. However, little of the known habitat has been destroyed or is likely to be disturbed (Hobart, BAP Workshop) and no threats can be identified.

Major threatening processes: None currently recognised. Bishop and Quick (1972) noted that larvae are prone to desiccation but this is unlikely under field conditions (I. Knight pers. comm.). Dunn et al. (1994) were concerned with the limited range of *H. chrysotricha lunawanna* and indicated that it would be threatened by the drainage of swamps.

Is knowledge sufficient to formulate recovery actions? No. The subspecies is Data Deficient and further surveys are required. The tenure of known wetland habitats for the butterfly should be investigated and if not secure, action taken to prevent future threats to them or the food plants, *Gahnia* spp. Surveys should include Labirrardiere State Park.

Resources required:

Action		$
1	Surveys and mapping, $3,000 / year over 3 years	9,000.00
Total		9,000.00

Lead organisation: Department of Primary Industries, Water and Environment, Tasmania.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Bishop, A.D. and Quick, W.N.B. 1972. Notes on breeding Victorian butterflies. Victorian Entomologist 3: 7–13.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla chrysotricha naua* L.E. Couchman

National Conservation Status: No Conservation Significance

Range: South Australia.

Distribution: Eyre Peninsula, Port Lincoln to Coffin Bay.

Taxonomy: *H. chrysotricha naua* was one of six subspecies recognised by Common and Waterhouse (1981).

Infra-specific relationships or variation: Subspecies *naua* differs from typical *chrysotricha* by the size and shape of the patch on the upperside of the hind wing, and spots beneath (Couchman 1949). *H. chrysotricha naua* is geographically isolated from other subspecies. *H. c. naua* is somewhat darker than *H. c. leucosia*, and the hind wing 'patch' is more clearly defined. The subspecies was not recognised by Braby (2000), who treated both as synonyms of *H. c. cyclospila*.

Habitat critical to survival: *H. chrysotricha naua* occurs in brackish swamps where the food plant, *Gahnia trifida*, is abundant.

History of conservation concern: Dunn et al. (1994) considered the subspecies rare and that the restricted distribution and small populations may render it non-viable in the longer term. BCSA (1999) proposed this subspecies for Vulnerable status.

Major threatening processes: Said by Dunn et al. (1994) to be possibly threatened by urban development, grazing, fire (see also Grund 1997) and drainage of swamps. The small areas of some habitats were also considered to place them at risk. However, many habitats remain intact and several are secure in national parks. Fisher (1978) noted that the subspecies survived among clumps of food plant on the Eyre Peninsula and between Port Lincoln and Coffin Bay, despite extensive agriculture in the surrounding areas. Putative *H. c. naua* is not known to occur in national parks on Kangaroo Island. If, as Fisher (1985) believed, the Kangaroo Island populations are not in fact true *H. c. naua*, the distribution of this subspecies becomes restricted to a very small part of the Eyre Peninsula, where Dunn et al. (1994) noted seven sites between Sheringa and Port Lincoln. It was seen at few places in the southern Eyre Peninsula, including within the Sleaford Mere Conservation Park, by Grund (1997).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Threats identified are not likely to lead to extinction of this subspecies. However, surveys are required to confirm that sufficient populations occupy secure habitats to ensure it is unlikely to become threatened. The validity of all subspecies of *H. chrysotricha* requires further investigation.

References:

BCSA Inc.,1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss proposed nominations of threatened South Australian butterflies.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Couchman, L.E. 1949. Notes on the geographical races of *Hesperilla chrysotricha* Meyrick and Lower (Lepidoptera: Hesperiidae). Proceedings of the Royal Society of Tasmania, pp 65–73.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R. H., 1978. Butterflies of South Australia (Lepidoptera: Hesperioidea, Papilionoidea). Government Printer, Adelaide.

Fisher, R.H. 1985. Butterflies (Lepidoptera: Hesperiidae, Papilionoidea) of Kangaroo Island, South Australia. Australian Entomological Magazine 12: 1–8.

Grund, R. 1997. Butterfly conservation in southern Eyre Peninsula. Department of Environment Heritage and Aboriginal Affairs, South Australia.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla crypsargyra crypsargyra* (Meyrick)

National Conservation Status: No Conservation Significance

Range: New South Wales, Victoria.

Distribution: Blue Mountains, New South Wales to Gippsland, eastern Victoria. *Hesperilla crypsargyra crypsargyra* is mainly a montane species. The species has very occasionally been collected closer to the coast near Sydney, at Berowra, Wahroonga and Kur-ing-gai Chase.

Taxonomy: *Hesperilla crypsargyra* is a distinctive endemic species in the genus in Australia.

Infra-specific relationships or variation: Three subspecies are usually recognised but Braby (2000) considered that ssp. *lesouefi*, from the Grampians, Victoria was a synonym of ssp. *crypsargyra*.

Habitat critical to survival: Larvae of the butterfly feed mainly on *Gahnia microstachya* but also on other *Gahnia* spp. Adults occur in a range of vegetation types wherever the food plants are present, but particularly near running streams.

History of conservation concern: Dunn et al. (1994) thought that this species was rare. This species is by no means rare anywhere in the Blue Mountains. Few of the known habitats have been destroyed for housing but substantial areas continue to be secure, especially those in national parks.

Major threatening processes: No particular threats were identified and Dunn et al. (1994) mentioned that most habitats were in national parks.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla crypsargyra lesouefi* Tindale

National Conservation Status: No Conservation Significance

Range: Victoria

Distribution: Briagolong, Licola, Mount William, Grampians National Park.

Taxonomy: *H. crypsargyra lesouefi* was not recognised as a distinct subspecies by Dunn and Dunn (1991) or Braby (2000).

Infra-specific relationships or variation: This subspecies is said to be smaller and darker, with the spots paler yellow, and differs on the underside from ssp. *crypsargyra* (Common and Waterhouse 1981).

Habitat critical to survival: The larvae of *H. crypsargyra lesouefi* feed on *Gahnia microstachya*, growing among mountain gums or in dense undergrowth.

History of conservation concern: The subspecies was referred to as rare and local by Douglas (1993). Many habitats for *H. crypsargyra lesouefi* are in national parks or reserves. Few of the known habitats have been destroyed and the subspecies is secure at most known localities including national parks.

Major threatening processes: Douglas (1993) referred to damage to roadside vegetation with the food plant at Mount William. *H. crypsargyra lesouefi* is probably susceptible to bushfires but populations are able to recolonise when populations nearby survive or corridors are intact.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to the Victorian Department of Conservation and Natural Resources.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla donnysa delos* Waterhouse

National Conservation Status: No Conservation Significance

Range: Victoria, South Australia.

Distribution: Ararat, Grampians to Port Campbell, Victoria; Mount Lofty, Beachport, Kangaroo Island, South Australia.

Taxonomy: Nine subspecies of *H. donnysa* have been recognised by Common and Waterhouse (1981). Subspecies *delos* was said to be larger and darker than ssp. *donnysa* but it was not recognised as distinct by Dunn and Dunn (1991) or Braby (2000).

Infra-specific relationships or variation: Subspecies *delos* is variable and specimens are very similar to some other subspecies of *H. donnysa*. A formal taxonomic reappraisal of all subspecies of *H. donnysa* is needed to clarify their taxonomic status.

Habitat critical to survival: *H. donnysa delos* occurs in a range of plant communities occupied by various species of *Gahnia*, including *G. trifida*, *G. radula* and *G. filum*.

History of conservation concern: Fisher (1978) stated this subspecies 'clings precariously to' a few moist valleys south and east of Adelaide, swampy areas in the southeast and on Kangaroo Island. *H. donnysa delos* from South Australia was listed as threatened by Hill and Michaelis (1988). Although some habitats have been destroyed, sufficient populations of the typical subspecies were thought to be secure by BAP Workshop participants in Adelaide. In Victoria the subspecies is secure and common in areas of suitable habitat (Douglas 1993). The distribution of sspp. *delos* and *patmos* share boundaries close to a closely related species of conservation concern, *H. flavescens*, and may form hybrid zones (M. Moore pers. comm.). Following assessment, some populations closest to, or sharing distribution with *H. flavescens flavia*, should be considered Lower Risk (municipal). The interactions between *H. donnysa* and *H. flavescens* in Victoria and South Australia have scientific significance, and several intermediate populations require further study to determine their geographical boundaries and municipal conservation significance. The species are sometimes sympatric (Fisher 1978, Crosby 1990).

Major threatening processes: Possible threats to municipal populations from urban and pastoral development, and drainage of swamps.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Surveys, taxonomic and DNA studies on sspp. *delos* and *patmos* are required, to identify populations sharing boundaries or hybrid zones with *H. flavescens*.

Resources required:

Action*		$
1	Surveys and mapping, $ 5,000 / year over 3 years	15,000.00
2	Taxonomic and DNA studies on selected populations	10,000.00
4	Habitat maintenance, $3,000 / year over 3 years	9,000.00
Total		34,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisations: Department of Environment, Heritage and Aboriginal Affairs, South Australia; Victorian Department of Natural Resources and Environment.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Crosby, D.F. 1990. A management plan for the Altona skipper butterfly Hesperilla flavescens flavescens Waterhouse (Lepidoptera: Hesperiidae). Arthur Rylah Institute for Environmental Research, Technical report Series No. 98, Melbourne.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K. L. and Dunn, L.E. 1991. Revision of the Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Published by the authors, Melbourne.

Dunn, K.L., Kitching, R. L. & Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla donnysa diluta* Waterhouse

National Conservation Status: No Conservation Significance

Range: South Australia.

Distribution: Mundoo Island, Goolwa, Port Elliot, Yorke and Eyre Peninsulas (Fisher 1978, Dunn and Dunn 1991).

Taxonomy: Dunn and Dunn (1991) did not recognise this subspecies as valid, a decision followed by Braby (2000). Subspecies *diluta* is very similar to other subspecies of *Hesperilla donnysa* and it requires formal appraisal to determine if it is valid.

Infra-specific relationships or variation: *H. donnysa diluta* varies in the amount of yellowish suffusion on the upperside.

Habitat critical to survival: *H. donnysa diluta* occupies a variety of plant communities where its food plants, *Gahnia ancistrophylla* and *G. deusta*, are abundant (Common and Waterhouse 1981).

History of conservation concern: The subspecies was listed as threatened in South Australia by Hill and Michaelis (1988) but they did not provide reasons for listing this taxon. See the comments on threatened populations of *H. donnysa delos* when they are close to the distributional range of *H. flavescens.*

Major threatening processes: None recognised. Urban development and farming activities are likely to have affected some populations of the subspecies.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary but the subspecies should be included in the studies recommended for ssp. *delos* (above), when their populations occur close to those of *H. flavescens.*

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1-4. Privately published by the authors, Melbourne.

Fisher, R.H. (1978). Butterflies of South Australia. Government Printer, Adelaide.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla donnysa galena* Waterhouse

National Conservation Status: Data Deficient

Range: Western Australia.

Distribution: Geraldton district.

Taxonomy: *H. d. galena* is a distinctive subspecies of a very variable skipper, *Hesperilla donnysa* Hewitson. It is clearly separable from other forms of this complex, and 'may eventually prove to be a separate species' (Common and Waterhouse 1981). Dunn and Dunn (1991) noted that it might, rather, be a form of *H. flavescens*, but the yellowish suffusion is generally not as extensive as in that species (Braby 2000).

Habitat and key ecological features: This subspecies is associated with heathlands. The type series and recently-collected specimens were reared from pupae collected from *Gahnia trifida* (G. Miller pers. comm.).

History of conservation concern: Dunn et al. (1994) considered it 'Insufficiently known' and general expressions of concern have not been translated into more formal evaluation. Until recently, this subspecies was known only from the type series, collected in the Geraldton district. More recent searches have revealed two populations, both extant in 1998 (G. Miller, pers. comm.). The more extensive population abuts Kalbarri National Park to the south of the Murchison River. Natural habitats around Geraldton have undergone considerable change in recent decades, and some workshop participants suggested that a higher ranking, of 'Vulnerable' or even 'Endangered' might be appropriate for the subspecies. Several sites for *H. donnysa* have been discovered north from Geraldton, to Kalbarri National Park (Dunn et al. 1994), but the subspecific status of those colonies has not been clear. It now seems that these may be the *galena* colonies noted above.

Major threatening processes: None has been defined but land use changes (including changes to roads) may have been harmful to it. Populations near Kalbarri National Park may be threatened by destruction of habitat.

Conservation needs:

1. Targeted surveys to determine the distribution and population status of the butterfly in the Geraldton district, and systematic searches on remaining patches of *G. trifida* in the region.
2. Systematic searches of suitable habitats to the north of Geraldton, and characterisation of the form(s) of *H. donnysa* extending to Kalbarri National Park. C. G. Miller (pers. comm. 2000) believes that known colonies are true *galena*, and distinct from other forms of *donnysa*.
3. Site security may be a priority and should be clarified urgently, with the Kalbarri sites being perhaps the easiest to protect. This security is needed in order to evaluate population status and vulnerability as a basis for assessing management needs, if any.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
Total		15,000.00

Lead Organisation: Western Australian Department of Conservation and Land Management.

References:

Braby, M.F. (2000). Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. (1981). Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. (1991). Review of Australian butterflies: distribution, life history and taxonomy. Parts 1-4. Privately published, Melbourne.

Dunn, K.L., Kitching, R. L. & Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla flavescens flavescens* Waterhouse

National Conservation Status: Lower Risk (Least Concern); Altona population (Municipal): Vulnerable [Vuc,d]

Range: Victoria.

Distribution: Southern coastal Victoria to the west of Melbourne.

Taxonomy: *Hesperilla flavescens* is closely related to, and was formerly considered to be, a subspecies of *H. donnysa*.

Infra-specific relationships or variation: See also the notes on *H. f. flavia*. Clinal and subspecific variation in *H. flavescens* is complex, and the concept of *H. f. flavescens* is sometimes restricted to the extreme yellow-suffused form typified by populations around Altona Bay, near Melbourne (from where the butterfly derives its common epithet of Altona skipper). The original specimens were assigned to *H. donnysa* (Spry 1904), and the complex was discussed and divided further by Waterhouse (1927, 1932, 1941) before Burns (1951) raised *flavescens* to a full species. The limits of *H. f. flavescens* are still debatable, following a survey by Crosby (1990), who attributed specimens from 27 Victorian populations to this subspecies, although many populations from western and central western Victoria differed substantially in appearance from the 'Altona form'. Crosby noted that the butterfly is perhaps diversifying rapidly, so that study of the '*flavescens-donnysa* complex' in Victoria may be of considerable interest in clarifying the evolution of this variable group.

Habitat and key ecological features: At the main localities near Altona the larval food plant is *Gahnia filum* (chaffy saw-sedge). This plant is widespread in coastal areas and salt marshes, and limited almost entirely to mildly saline unshaded swamps, often subject to shallow seasonal inundations. Elsewhere, *G. radula* is also eaten. Adult butterflies appear not to disperse far from the *Gahnia*. Eggs are laid singly at the base of leaves, close to ground level, and larvae construct a cylindrical shelter from one or more leaves tied together with silk. Small, tender plants are preferred for oviposition and feeding. Pupation takes place within the last instar larval shelter. Larger colonies tend to be close to areas of nectar plants.

History of conservation concern: Crosby (1990) ranked these populations as 'Vulnerable'. Dunn et al. (1994) ranked the subspecies as 'Vulnerable' while Braby (2000) noted *H. flavescens* as of national conservation concern. The Altona populations of *H. f. flavescens* have long been recognised informally as of conservation interest in Victoria, and the butterfly is one of several included in a voluntary Code of Conduct to restrict collecting, initiated by the Entomological Society of Victoria. The butterfly was nominated (as 'the phenotype equivalent to the type') for possible listing as a threatened taxon on Schedule 2 of Victoria's Flora and Fauna Guarantee Act 1988. SAC (1991) noted that the nomination depended on making a 'special case', as it was for an entity below that of subspecies, and that this was not made. The variation inherent in the subspecies (wider concept of Crosby) was 'not seen as essential to the survival or evolutionary development of the taxon', and the subspecies appeared to be secure. SAC did, though, acknowledge the existence of threats to the type populations. The obvious declines of *H. f. flavescens* at Altona have been the major stimulus for conservation interest, prompting biological studies and search for additional populations.

Major threatening processes: The major decline was linked with urban and industrial expansion (Crosby 1990) associated with drainage of swamplands. In addition to the decline of the butterfly per se, the evolutionary significance of the Altona populations was recognised in relation to the need for their conservation. All three colonies are isolated from each other. The largest patch (Trugannina Swamp, Altona) was estimated to support a population of about 600 individuals (Crosby 1990). Other colonies are also relatively small, with no more than a few hundred individuals, although that at Point Cook may have expanded in recent years. One colony, near Corio, is believed to have been extirpated by industrial expansion in the 1960s (Crosby 1990). Potential anthropogenic threats to the habitats of the Altona populations listed by Crosby (1990) are pollution by pesticides or water-borne chemicals from local industry, human interference (trampling, dust, dumping of rubbish), animal interference (grazing and trampling by stock), fire, changed hydrology, weeds and overgrowth, in addition to direct threats to the butterflies by pesticides and collecting.

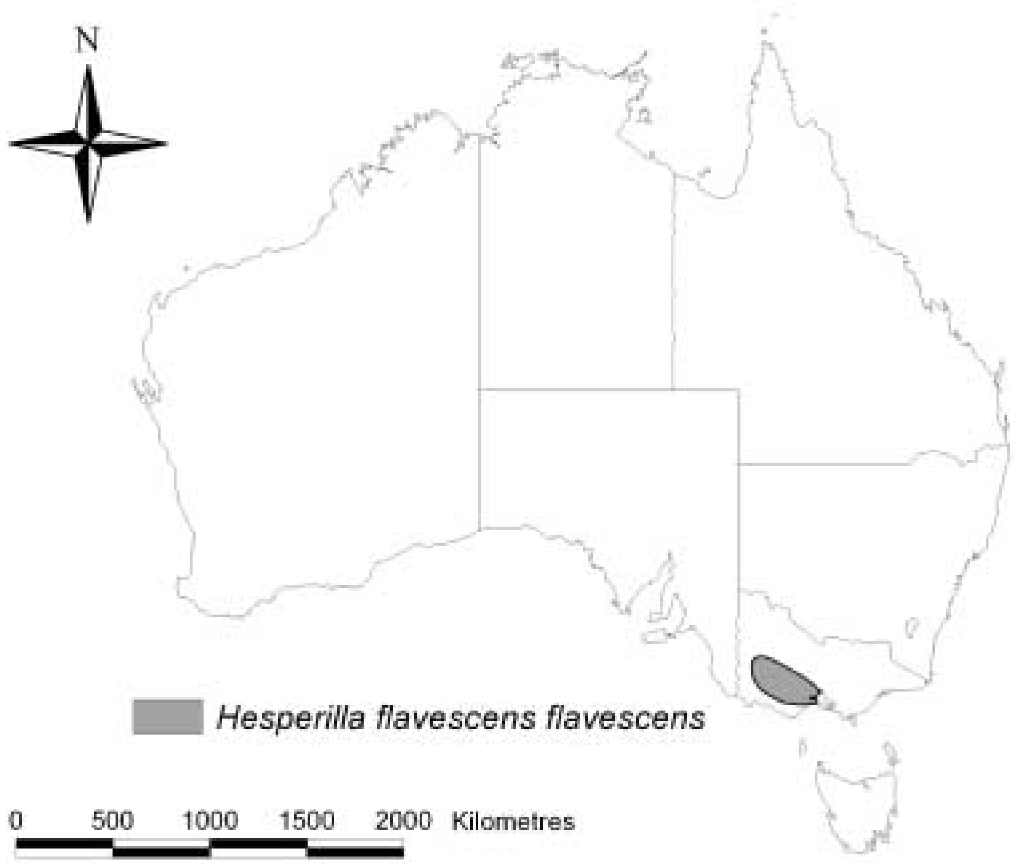
Is knowledge sufficient to formulate recovery actions? Yes. The major conservation needs devolve on the populations at sites around Altona. The biology of *H. f. flavescens* has been studied extensively at those sites, and knowledge gained is applicable to other populations. The focal populations are circumscribed, so that specific threats to each, and management needed for each colony can be appraised in some detail, as Crosby noted. Habitats of each colony are well defined, and methods exist for restoration of these.

Recovery needs: Crosby (1990) advocated development of a State Management Strategy, with the prime aim of managing the most significant sites of *H. f. flavescens* to ensure their sustainability. The three major locations were nominated as Altona (three sites), Point Cook and Point Wilson, which have particular values as 'reference sites' for this form. More widely, another 12 sites were ranked as 'very desirable to protect, including sites of special scientific interest' and all others (nine) as 'desirable'. All the major colonies are to some extent protected by reservation.

Management needs differed in detail for each site, but broadly encompass the following themes.

1. Improve security of habitats by removal of stock and horses, restricting human and vehicle access, providing firebreaks, and removing invasive weeds such as *Phragmites* and artichoke thistles.
2. Increase sanitation at the Altona sites, such as by removing weeds and rubbish.
3. Promote regeneration of *G. filum*, through slashing areas to promote natural regrowth, and replanting of young cultivated *G. filum*.

Distribution of *Hesperilla flavescens flavescens*



Can recovery be carried out with existing resources? In part, if support from local authorities and volunteers continues at present levels, and sites remain secure. Additional assured support would enhance conservation effort considerably.

Resources required:

Action		$
1	Annual monitoring of Altona and Point Cook populations, with counts of larvae and adults on all major reference sites (5) to determine population trends: $5 000 / year / five years.	25,000.00
2	Site maintenance and sanitation at these sites	8,000.00
3	Site restoration, involving extension of suitable *G. filum* patches	10,000.00
Total		43,000.00

lead organisation: Victorian Dept of Natural Resources and Environment.

References:

Braby, M.F. (2000). Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Burns, A.N. 1951. Notes on Australian Rhopalocera with descriptions of new subspecies and life histories. Memoirs of the National Museum of Victoria 17, 83–105.

Crosby, D.F. 1990. A management plan for the Altona skipper butterfly *Hesperilla flavescens flavescens* Waterhouse (Lepidoptera: Hesperiidae). Arthur Rylah Institute for Environmental Research, Technical report series, No. 98. Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

SAC 1991. Scientific Advisory Committee, Fauna and Flora Guarantee Act, Victoria. Final recommendation on a nomination for listing. Nomination No. 147.

Spry, F.P. 1904. Exhibits. Victorian Naturalist 21: 4.

Waterhouse, G.A. 1927. Australian Hesperiidae. Part 1. Notes and descriptions of new forms. Proceedings of the Linnean Society of New South Wales 52, 275–283.

Waterhouse, G.A. 1932. Australian Hesperiidae. Part II. Notes and descriptions of new forms. Proceedings of the Linnean Society of New South Wales 57, 218–238.

Waterhouse, G.A. 1941. Australian Hesperiidae. Part X. On *Hesperilla donnysa* Hewitson, 1868. Proceedings of the Linnean Society of New South Wales 65: 568.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla flavescens flavia* Waterhouse

National Conservation Status: Vulnerable [Vub,c,d]

Range: South Australia.

Distribution: Formerly near Adelaide (St Kilda, Henley Beach), mouth of the Murray River and more recently parts of the Coorong National Park. Yorke and Eyre Peninsula populations included as this taxon but not all are typical ssp. *flavia*.

Taxonomy: *Hesperilla flavescens* shows considerable intraspecific variation over its range in southern Victoria and South Australia. Both named subspecies are of conservation significance in their respective regions, but it is difficult to allocate some individuals clearly to one or other of these apparently clinal forms, and also to separate them from some forms of the variable *H. donnysa*. Braby (2000) did not recognise ssp. *flavia* as distinct from the nominotypical subspecies.

Infra-specific relationships or variation: In the sense applied here, the name *H. f. flavia* encompasses all South Australian populations of *H. flavescens*, but some populations in the State (Yorke Peninsula) may prove to represent another, undescribed form.

Habitat and key ecological features: The habitat of *H. f. flavia* comprises tidal saltmarsh, freshwater tidal wetlands, and saltbush communities (Coleman and Coleman 2000). The larval food plant is *Gahnia filum*, but Fisher (1978) noted that larvae will eat various species of *Gahnia* in captivity. *G. deusa* is utilised as a food plant by the Yorke Peninsula population (Grund 1998), but detailed ecological knowledge of the butterfly is limited.

History of conservation concern: *H. f. flavia* has been ranked informally as high as Critically Endangered in South Australia. BCSA (1999) proposed it for National listing under Endangered Species Protection Act 1992 as 'Endangered', and the outcome of that nomination has not yet (June 2001) been finalised. This status is listed by Grund (2001). It was not ranked separately by Dunn et al. (1994), who (following Dunn and Dunn 1991) included *flavia* as a synonym of *H. f. flavescens*, and ranked as 'Vulnerable'.

The species *H. flavescens* was regarded as of national conservation concern by Braby (2000). *H. f. flavia* has been found at a few sites near Adelaide, and on the Yorke Peninsula. However, it has not been seen in the Adelaide region for some years, and is believed to be extinct on the Adelaide plains. Reports of its current presence on the Coorong National Park need confirmation because informal reports to us suggest that it may be well established there. Our ranking of this subspecies as Vulnerable is based on the strong likelihood of persistence in the Coorong National Park. Should surveys fail to detect viable populations of the subspecies there, a higher conservation status would be appropriate.

Major threatening processes: Decline has occurred because of habitat loss from urbanisation and clearing of vegetation for horticulture and grazing. Some remnant patches of *G. filum* occur in the region, but most are small. Coleman and Coleman (2000) noted that 'many thick stands of *Gahnia filum* have disappeared' and 'The known stands remaining in the St Kilda area of the Northern Adelaide plains each occupy less than one hectare'. Remnant vegetation in the area is restricted to road verges, areas of tidal inundation, mining lease, small crown reserves, and the like. *G. filum* is regarded by many land owners as undesirable, because it is relatively unpalatable to stock, and it is often slashed and burned to remove it (Coleman and Coleman 2000).

A wide variety of threats have been implicated in the butterfly's decline, most of them by affecting *G. filum*. Coleman and Coleman (2000) included the following processes affecting quality and extent of habitat: weed invasion (woody weeds competing with *G. filum*; grasses growing densely around the sedge bases), vehicle uses (including recreational activities), dust from roadways (possibly decreasing palatability of foliage, though not proven for *H. f. flavia*), fire, grazing and clearing, impacts of feral animals (rabbits and hares: eating plants, uprooting, burrowing beneath *Gahnia*), habitat fragmentation from clearing of vegetation, collection of *Gahnia* seedheads (for dried flower arrangements), spray drift (weed and mosquito control, nearby agriculture), land drainage and sea level change, and collecting of the butterflies (direct evidence is lacking).

There is a need to clarify the butterfly's status in the Coorong National Park (Grund 1997), with likely threats from land drainage and clearing.

Is knowledge sufficient to formulate recovery actions? Yes. The basic biology of *H. f. flavia* is clear, as is also its marked decline near Adelaide. Recent increases in knowledge of the requirements for *G. filum* have facilitated practical recovery measures involving restoration of habitats, both generally and for threat alleviation at particular sites. Knowledge of populations in the Coorong National Park area is less certain.

Recovery needs: The following are the twelve objectives of the threat abatement plan proposed by Coleman and Coleman (2000).

1. Assessment of threats operating on freehold and Commonwealth land. This includes an assessment of all current *G. filum* stands on such lands on the Northern Adelaide Plains, and investigation of recovery actions needed for the butterfly.
2. Prevention of clearing and habitat fragmentation, and impact assessment of future developments. Steps include effective liaison with all responsible authorities to make them aware of recovery needs, facilitate better management of areas adjacent to target sites to prevent threats to potential habitat, and provision of signage to deter accidental clearance.
3. Habitat augmentation. Techniques for germinating and propagating *G. filum* now allow restoration of habitat by planting, to expand existing areas of food plant and revegetate other areas to create a network of suitable patches for the butterfly. Considerable restoration has occurred already.
4. Management of weeds. Local authorities to undertake weed control in areas under their respective controls. This would include control of African boxthorn (*Lycium ferrocissimum*) and others near to potential *H. f. flavia* habitat patches, in addition to planting weedfree areas with potential habitat species.
5. Prevention of collecting the subspecies on the Northern Adelaide Plains. Collection is not yet believed to be an option, as the butterfly is believed to be extinct in this region. However, any translocation of discovery of a small remnant population may be Vulnerable to even very limited collecting, at least initially. Prevention of collecting under such circumstances is seen as a precautionary need.
6. Management of vehicle access and recreational vehicle use. At sites where administrative control is possible, access of unauthorised vehicles should be deterred by appropriate fencing. Signage is also needed.
7. Management of road surfaces / embankments and maintenance activities. Roads adjacent to habitat patches should be managed so as to reduce possible dust input (in some cases this may require road sealing). Slashing of road verges should avoid any *G. filum* present.
8. Management of fire prevention activities and planning. Fire management of sites should utilise the best knowledge of the butterfly's ecological needs: details are provided in an appendix to Coleman and Coleman (2000).
9. Management of grazing activities. Grazing by domestic stock should be excluded from all potential butterfly sites, unless specific advice to the contrary is given by the recovery team.
10. Management of impacts associated with feral animals. If significant impacts are evident, land holders should be encouraged to run a control program for the feral animal(s) involved.
11. Management of seed and grass collection. Collection of *G. filum* seed to be deterred, as for removal of plants, except for propagation programs aimed at extending the butterfly habitat. Means for approved seed collection are also suggested, confining seed collections to late summer and taking no more than 20% of available seed at any site in any year.
12. Management of direct and indirect spraying effects. Herbicide applications may be reduced, for example, by 'cut an swab' techniques rather than spraying for woody weeds. Mosquito larvicides may be applied directly to infested pools. Agricultural spray drift may be prevented in part by increasing awareness of *Gahnia* patches near croplands.

Other aspects of the recovery plan include:

Community education and awareness: increasing knowledge of *H. f. flavia* and its significance in the local community, assisting land managers and holders with information about management options for conservation, and ensuring that agencies make informed decisions on matter relevant to the butterfly's wellbeing.

Monitoring and research: inviting ecological research by university and museum personnel, identifying all potential habitat and assessing its quality, undertaking annual surveys for presence of *H. f. flavia*, monitoring and documenting any populations found, together with any translocation made.

Protection of the butterfly and its habitat; formal review of National Conservation Status; increase security of freehold sites that support potential butterfly habitat.

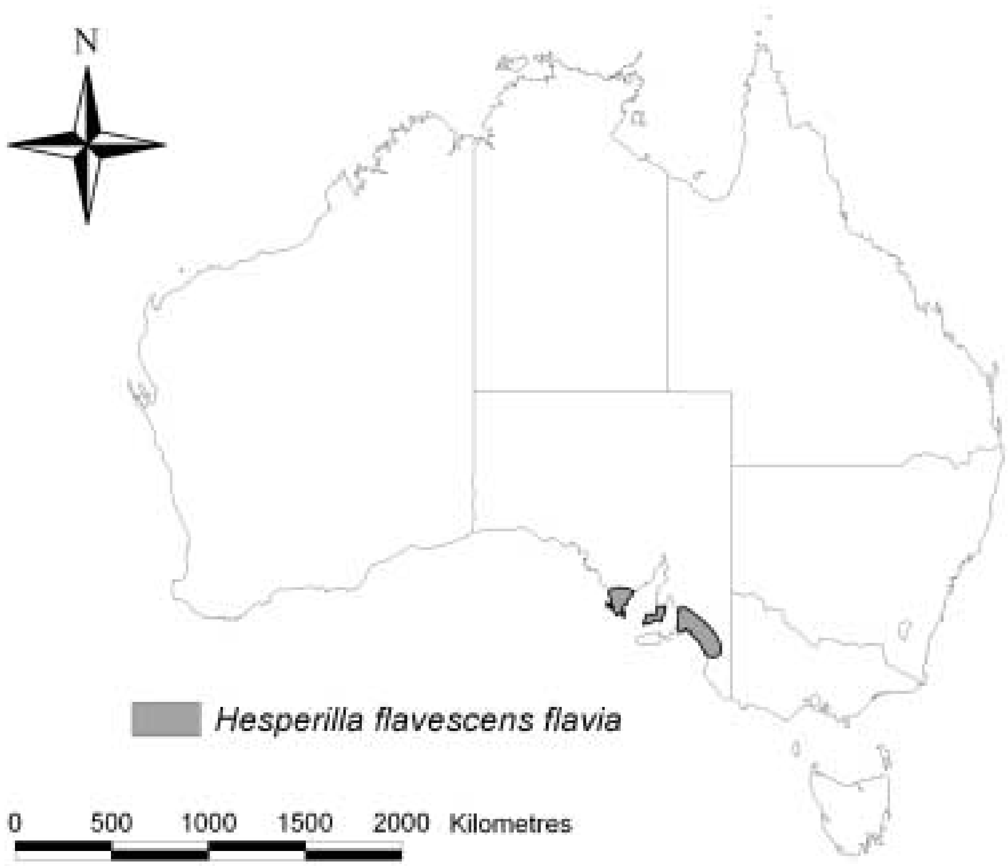
Can recovery be carried out with existing resources? Yes, to a considerable extent. Coleman and Coleman (2000) included considered implementation costs as an appendix to the recovery plan. They noted current sources of funding from four local authorities / bodies, and that the estimates to fulfil each action noted totalled $18,760. This sum, for 1999-2000, had already been committed. Continuing funding needs are at present indeterminate, and will reflect amounts of further restoration and survey needed. A priority, noted by Grund (1997) is for surveys and management in the Coorong National Park. He estimated costs associated with this work to be $15,300.

Resources required:

Action		$
2	Surveys and management in the Coorong National Park	15,300.00
3	Site restoration, involving extension of suitable *G. filum* patches	10,000.00
Total		25,300.00

Lead organisations: South Australian Dept of Environment, Heritage and Aboriginal Affairs; BCSA Inc.

Distribution of *Hesperilla flavescens flavia*



References:

BCSA Inc.,1999. Butterfly Conservation South Australia Inc.

Braby, M.F. (2000). Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Coleman, P. and Coleman, F. 2000. Local recovery plan for the yellowish sedge-skipper and thicky grass, Adelaide.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 1997. Interim Recovery Plan. Recovery of *Hesperilla flavescens flavia* (Lepidoptera: Hesperiidae), the yellowish skipper. Report to National heritage Trust, Canberra.

Grund, R. 1998. The identification of *Gahnia* Forst. and Forst. F. (Cyperaceae) eating Hesperiidae (Lepidoptera) using immature stages. Victorian Entomologist 28, 20–32.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla idothea clara* Waterhouse

National Conservation Status: No Conservation Significance; South Australia: Vulnerable [VUb,c]

Range: South Australia, Victoria.

Distribution: Mount Lofty Ranges and far southeastern South Australia, Kangaroo Island; Grampians, Victoria.

Taxonomy: One of two subspecies of *Hesperilla idothea* (Miskin).

Infra-specific relationships or variation: *H. idothea clara* is by far the more restricted of these, and the two subspecies do not overlap in range. However, their distinctiveness has been queried by Dunn and Dunn (1991), who treated *H. i. clara* as a synonym of *H. idothea idothea* on the grounds that the variation is poorly defined and clinal. Braby (2000) also noted the possible transitional nature of the characteristics of the two subspecies and regarded the Grampians populations as *H. idothea idothea*.

Habitat and key ecological features: Larvae feed on *Gahnia sieberana* and *G. trifida*, growing as ground flora in eucalypt forest habitats.

History of conservation concern: *H. i. clara* was noted as 'rare in South Australia' by Common and Waterhouse (1981) and regarded as of regional concern by Braby (2000). Fisher (1978) also noted that the butterfly is rare in South Australia, where its recorded range encompasses the southern Mount Lofty Ranges and the lower south east of the State. Grund (2001) listed it as Vulnerable in that State. It is also recorded from Flinders Chase National Park, Kangaroo Island (Fisher 1985). Grund and Hunt (2000) regarded the southeastern populations as 'probably its last bastion in South Australia'. Our ranking for South Australia as Vulnerable presupposes lack of security and threats to populations in the Flinders Chase National Park. Should it be secure there, a lower ranking may be appropriate.

Major threatening processes: Urbanisation has been implicated as a threat to *Gahnia*, with fragmentation of the butterfly's limited range. The Adelaide Hills, in particular, have undergone sufficient loss of habitat to cause concerns for *H. i. clara* as a significant species associated with remnant *Gahnia* communities in the region. Fisher (1985) commented that its habitats are restricted and that the larval food plants have declined considerably in many areas.

Is knowledge sufficient to formulate recovery actions? Yes. The biology of the species is well understood, and the major threats to *H. i. clara* in South Australia are defined, together with methods for habitat restoration. More information is needed on the number and extent of surviving colonies in the Mount Lofty Ranges, together with further exploration in the south east.

Recovery needs:

1. Documentation of all habitat patches (remnant *Gahnia* communities) in the Mount Lofty Ranges, and assessment of the vulnerability of those at which the butterfly is present.
2. Augmentation of key habitat patches, after increasing their security if necessary.
3. Determination of the present status of *H. i. clara* in the south east of the State and on Kangaroo Island, with similar measures to promote habitat security and quality.

Can recovery be carried out with existing resources? No. In the absence of designated funding, any progress in recovery, including further basic documentation, will be ad hoc. The following is required:

Action		$
1	Survey of remnant *Gahnia* in the Mount Lofty Ranges	5,000.00
2	Exploration in south eastern South Australia, over two seasons, and including expenses for travel and subsistence for two people	12,000.00
3	Habitat augmentation and restoration	15,000.00
Total		32,000.00

Lead organisations: South Australian Department of Environment, Heritage and Aboriginal Affairs; BCSA Inc.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published, Melbourne.

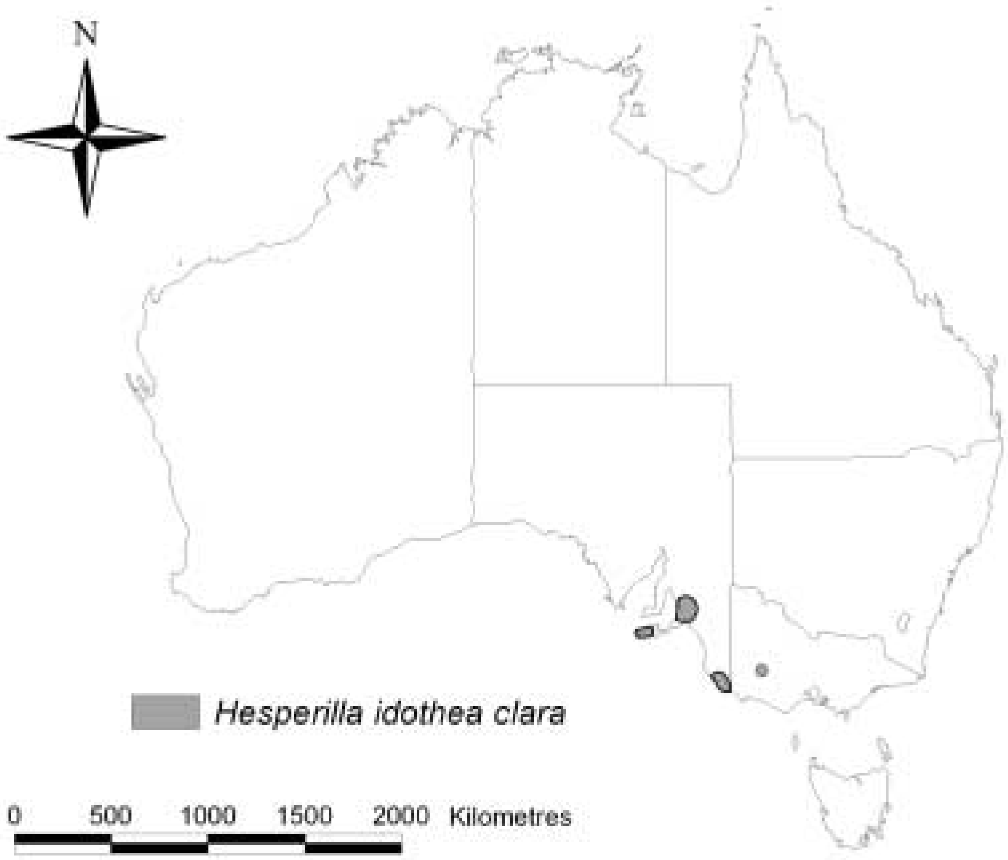
Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Fisher, R.H. 1985. Butterflies (Lepidoptera: Hesperiidae, Papilionoidea) of Kangaroo Island, South Australia. Australian Entomological Magazine 12: 1–8.

Grund, R. 2001. South Australian butterflies checklist. http://adelaide.net.au/~reid.checklist.htm (Accessed April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department of Environment Heritage and Aboriginal Affairs, South Australia.

Distribution of *Hesperilla idothea clara*



HESPERIIDAE: TRAPEZITINAE

Scientific name: *Hesperilla mastersi marakupa* Couchman

National Conservation Status: Data Deficient

Range: Tasmania.

Distribution: Bridport (?), northeastern Tasmania.

Taxonomy: *Hesperilla mastersi* is a very distinctive species, not very closely related to others in the genus.

Infra-specific relationships or variation: The sole known specimen was described as a distinct subspecies, on differences in wing markings from typical *H. mastersi* Waterhouse. However, Braby (2000) noted that the specimen is indistinguishable from the nominotypical subspecies, and did not recognise it as distinct.

Habitat and key ecological features: The sole known specimen of *H. mastersi marakupa* was reared (in 1963) from a pupa stated to have been collected near Bridport, northeastern Tasmania. The habitat was said to be swampy heathland, and the putative larval food plant was *Gahnia radula*. No other biological details are available.

History of conservation concern: There has been no formal appraisal of *H. mastersi marakupa*, other than being recognised as of excessive rarity and the only reported incidence of *H. mastersi* in Tasmania. Braby (2000) noted the species as of concern in Tasmania. Extensive searches have failed to rediscover this butterfly in Tasmania. It thus remains a tantalising challenge for documentation in the State's butterfly fauna. *H. mastersi marakupa* may be extinct, but MacQuillan (1994) noted the possibility of the record from Tasmania being erroneous. The principal mainland food plant, *Gahnia melanocarpa*, has not been recorded from Tasmania, adding to doubts that the species ever occurred in that State. Moreover, the heathland habitat reported for this species in Tasmania differs considerably from the rainforest habitat known for the species in eastern mainland Australia. Pupae of related skippers were being received from the mainland states by Tasmanian lepidopterists during the period of discovery, and it is possible that *H. m. marakupa* is simply an imported specimen of the typical mainland form, which has a wide distribution from coastal southern Queensland to eastern Victoria.

Major threatening processes: Not definitely known. The main concerns for conservation devolve on this problem of origin, and whether a possible Tasmanian endemic form has indeed become extinct.

Is knowledge sufficient to formulate recovery actions? No. The biology of the species is well understood. Clarification of the status of this ssp. is necessary before any possible recovery actions can be assessed. The main history suggesting possible extinction of *H. mastersi marakupa* is: (i) complete clearing of the Bridport habitat for cattle raising (Couchman 1965), and (ii) lack of rediscovery since the subspecies was described in 1965.

Can recovery be carried out with existing resources? No. The following action is required;

Resources required:

Action		$
1	Surveys	5,000.00
Total		5,000.00

Lead Organisation: Department of Primary Industries, Water and Environment, Tasmania.

References:

Braby, M.F. (2000). Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Couchman, L.E. 1965. Notes on some Tasmanian and Australian Lepidoptera- Rhopalocera. II. Papers and Proceedings of the Royal Society of Tasmania 99, 81–85.

MacQuillan, P.B. 1994. Butterflies of Tasmania. Tasmanian Field Naturalists Club Inc. Hobart.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Mesodina aeluropis* Meyrick

National Conservation Status: No Conservation Significance

Range: New South Wales.

Distribution: Ebor, New England, Blue Mountains to Kosciusko National Park.

Taxonomy: Five species are recognised in the genus *Mesodina*.

Infra-specific relationships or variation: None recorded

Habitat critical to survival: The species is locally abundant in the Blue Mountains, for example near Blackheath, in open eucalypt woodlands and near streams close to the breeding sites with the food plant, *Patersonia sericea*. Males sometimes congregate at the edge of roads. The species occurs mainly at altitudes above 800 m.

History of conservation concern: The subspecies was listed as rare by Dunn et al. (1994). They listed no threats and the species has not been considered elsewhere of conservation significance.

Major threatening processes: None reported. Some of the early habitats near Blackheath township have been destroyed by urban development (D.P.A. Sands). Braby (2000) suggested that the larvae were Vulnerable to fire.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is widely distributed on the Main Divide and is not threatened.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Mesodina gracillima* Edwards

National Conservation Status: No Conservation Significance

Range: Northern Territory

Distribution: Melville Island, northwestern Northern Territory

Taxonomy: The genus contains five endemic species in Australia. *M. gracillima* was initially thought to be a distinct form of *M. halyzia* (Common and Waterhouse 1981).

Infra-specific relationships or variation: None recorded.

Habitat critical to survival: *M. gracillima* occurs on sandstone ridges where the food plant for its larvae, *Patersonia macrantha*, occurs in open eucalypt plant communities (Edwards 1987).

History of conservation concern: Dunn et al. (1994) considered that the species, although insufficiently known, was probably secure in Kakadu National Park. It is now known from several localities, some near Darwin, and is likely to be widely distributed in the Northern Territory (R. Weir pers, comm.). None of the known habitats has been destroyed.

Major threatening processes: Routine annual burning has a temporary adverse effect on the abundance of *M. gracillima* but populations are able to recover during the wet season (Braby 2000). Dunn et al. (1994) recorded no threats.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Edwards, E.D. 1987. A new species of *Mesodina* Meyrick from the Northern Territory (Lepidoptera: Hesperiidae). Australian Entomological Magazine 14: 4–12.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Mesodina hayi* Edwards and Graham

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: Near Quairading, and north of the Murchison River and Kalbarri National Park.

Taxonomy: A distinctive recently-described species, separable from other species of *Mesodina* by wing characters keyed by Edwards and Graham (1995).

Habitat critical to survival: *M. hayi* occurs in heathlands and shrublands on well drained sandy loams where its food plant, a small form of *Patersonia drummondi* (Iridaceae), occurs.

History of conservation concern: Braby (2000) regarded *M. hayi* as of national conservation concern, possibly Vulnerable if no further populations are found. This species is known from three sites, all in reserves, and several additional areas on privately-owned land outside of Kalbarri National Park (P. Valentine pers. comm.). The habitat in Kalbarri National Park appears to be a stronghold for this species. Edwards and Graham (1995) postulated that it might have had a more extensive range in the now-cleared wheat belt region. Braby (2000) commented that searches have failed to locate further colonies of the skipper.

Major threatening processes: No threats have defined.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No habitats for *M. hayi* are known to have been lost but several additional areas occur on privately-owned land outside of Kalbarri National Park that could potentially be protected via vegetation conservation agreements (P. Valentine pers. comm.). Continuing monitoring of the known populations should be undertaken.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Edwards, E.D. and Graham, A.J. 1995. A new species of *Mesodina* Meyrick (Lepidoptera: Hesperiidae) from Western Australia. Australian Entomologist 22, 83–90.

HESPERIIDAE: HESPERIINAE

Scientific name: *Mimene atropatene* (Fruhstorfer)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range, Claudie River.

Taxonomy: *Mimene atropatene* is one of a large genus of about 20 species occurring mainly in New Guinea and West Papua. *M. atropatene* is the only species that occurs in Australia.

Infra-specific relationships or variation: No other subspecies of *M. atropatene* have been described but, as noted by Braby (2000), Australian specimens differ significantly from Papua New Guinea specimens in several characteristics.

Habitat critical to survival: *M. atropatene* occurs in, or at the edge of tropical rainforest, where most specimens have been taken visiting flowers (Miller 1975). Its life history is unknown but the larvae of related species in Papua New Guinea feed on Musaceae.

History of conservation concern: *M. atropatene* was listed as threatened by Hill and Michaelis (1988). It occurs at low densities in Australia where it is known from near Mount Tozer and Iron Range National Park, both secure habitats.

Major threatening processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Miller, C.G. 1975. The first record from Australia of the skipper *Mimene atropatene* Fruhstorfer (Lepidoptera: Hesperiidae) Australian Entomological Magazine 2: 50.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Motasingha trimaculata dea* Waterhouse

National Conservation Status: No Conservation Significance

Range: New South Wales.

Distribution: Blue Mountains, Patonga, Berowra, Ku-ring-gai Chase, North Shore, Sydney.

Taxonomy: Dunn and Dunn (1991) and Braby (2000) considered ssp. *dea* a synonym of ssp. *dilata.* The validity of ssp. *dea* requires formal appraisal and study of populations from type localities for sspp. *dea* and *dilata*. *M. trimaculata dea* may prove then not to be distinct.

Infra-specific relationships or variation: Said to be more yellowish than other subspecies by Common and Waterhouse (1981). They suggested that *M. trimaculata dea* extended close to the coast near Sydney. North and south of Sydney, there is considerable variation and overlap in appearance with ssp. *dilata*.

Habitat critical to survival: *M. trimaculata dea* is adapted to open forest and heathlands on Hawkesbury sandstone, usually some distance from urban disturbance. Males hilltop and females remain close to the food plants, *Lepidosperma* spp., growing on slopes and in gullies.

History of conservation concern: Said to be rare by Dunn et al. (1994). However, the subspecies is common in the Blue Mountains and in Kur-ing-gai Chase National Park, Sydney.

Major threatening processes: Near Sydney's North Shore, many habitats have been destroyed by urban development. However, in Kur-ing-gai Chase, National Park and Blue Mountains, the subspecies is secure. In the last 40 years, bushfires have temporarily destroyed local populations of *M. trimaculata dea* but sites have been recolonised within three years by dispersal from unaffected habitats. Weeds are also known to have invaded habitats, making them unsuitable for this hesperiid.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. *M. trimaculata dea* is not a threatened taxon. Its presence needs to be recorded on the fauna inventories for the national parks based on Hawkesbury sandstone.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Motasingha trimaculata trimaculata* (Tepper)

National Conservation Status: No Conservation Significance

Range: Victoria, South Australia.

Distribution: Dimboola, Little and Big Desert, Victoria; Mount Lofty and Flinders Ranges, Yorke and Eyre Peninsulas, Kangaroo Island, South Australia.

Taxonomy: *Motasingha trimaculata* was previously thought to be a subspecies of *M. dirphia* but it was shown to represent a distinct species.

Infra-specific relationships or variation: Minor variation in *M. trimaculata* was noted by Braby (2000).

Habitat critical to survival: The species occurs in a range of habitats when the food plants, *Lepidosperma* spp., are present. In South Australia, the habitat is mostly open forest and woodland (Fisher 1978). Adult males frequent hilltops, summits of ridges and large sandhills (Douglas 1993).

History of conservation concern: Listed as threatened by Hill and Michaelis (1988). *M. trimaculata trimaculata* was said by Fisher (1978) and Common and Waterhouse (1981) to be rare in South Australia. Douglas (1993) described the species as secure in Victoria.

Major threatening processes: Hill and Michaelis (1988) suggested that fire was a threat to this species in South Australia. Urban and farming activities are likely to be the main threatening processes.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is widely distributed and is secure in several national parks.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Ocybadistes knightorum* Lambkin and Donaldson

National Conservation Status: Vulnerable [VUb,c,d]

Range: New South Wales.

Distribution: Recorded from five small sub-populations south of Coffs Harbour at Bonville, Boambee Creek, Cordwell's Creek and Pine Creek.

Taxonomy: *O. knightorum* is one of five in the genus *Ocybadistes* recorded from Australia. The species is readily distinguished from other species (Lambkin and Knight 1994).

Infra-specific relationships or variation: None confirmed. DNA analysis may be required to reveal any distinctive sub-population identities.

Habitat critical to survival: Sub-saline peat supporting the grass, *Alexfloydia repens*, is an obligatory habitat for *O. knightorum*. The butterfly is confined to coastal, understorey stands of casuarina / melaleuca / *Duboisea* where the food plant *Alexfloydia repens* grows edging the upper tidal areas of mangroves (Sands 1997). Atkins (1996) recorded *Hemarthria uncinata* R. Brown, as a food plant for this species, but this was a mis-identification of *A. repens* (Braby 2000). Its flight period extends from September to May with several overlapping generations per year.

Atkins (1996) described the life history of *O. knightorum*. Eggs are deposited beneath the apex of leaves of shaded food plants and larvae draw two or three leaves together to form a shelter. Larvae construct silken shelters for pupation near the ground or among dead grass material.

History of conservation concern: Braby (2000) considered this taxon to be threatened and of national concern. *O. knightorum* has stimulated considerable interest since it was first described by Lambkin and Donaldson (1994), due to its highly restricted distribution, single restricted food plant, *Alexfloydia repens*, and unique ecology (Sands 1997). The discovery of *A. repens* by Alex Floyd, led to the recognition of a plant community of special conservation significance (Simon 1992, Sands 1997). Moreover, the association of this unique grass with the life history of the butterfly and its relationship with the ecology of the grass, provides a model for the importance of environmental impact studies before major disruption and disturbance of plant communities is undertaken. This species is not currently listed by State or Commonwealth authorities.

Insufficient secure habitat is available to sustain survival of this taxon. The species is restricted to several sub-populations within a very limited area of coastal northern New South Wales, only where its food plant *A. repens* occurs (Simon 1992). There is no history of extinctions, decline, change in distribution or area of occupancy of *O. knightorum*. However, some micro-habitats appear to have been degraded. One colony is present in the Bongil Bongil National Park. Others are not secure and land tenure is doubtful. The most important area for food plant and butterfly is close to urban land, or commercial land occupied by factories.

Two of the known sub-populations may occupy protected habitats (Braby 2000). It is possible that these are the only habitats occupied in recent years and that there has been no contraction or fragmentation in distribution of the butterfly. However, every effort should now be made to protect these fragments of habitat (one *ca* 300 sq. m. in area) for the butterfly and its food plant. Some of these are isolated by several kilometres, and have probably not had natural corridors allowing genetic interaction between colonies. This may have led to development of unique population characteristics not yet recognised.

Major threatening processes: Urbanisation or disturbance of isolated habitats, including fire and weed invasion (especially by lantana and exotic grasses). The collection of specimens is not a threatening process for *O. knightorum*. One sub-population is known to have recovered after fire.

Is knowledge sufficient to formulate recovery actions? Adequate for a preliminary list of actions. Surveys to determine additional distribution of *O. knightorum* and its food plant, *A. repens*, are required. A recovery plan has not yet been prepared for this taxon.

Recovery needs

1. Develop a Recovery Plan, appoint a Recovery Team.
2. Ensure appropriate habitat management in Bongil Bongil National Park.
3. Assess all existing habitats with *A. repens* for conservation as 'threatened ecological communities'.
4. Survey and map coastal, northeastern New South Wales for new localities for the grass, *A. repens*, supporting *O. knightorum*. Surveys should extend north of Coffs Harbour and south from Boambee and Pine Creek, concentrating on less accessible upper tidal regions.
5. Encourage exploration for new localities for *A. repens*, supporting *O. knightorum*.
6. Acquire, preserve and manage selected (i.e. all currently-known) habitats for *O. knightorum*, especially for disturbance, weeds and fire control. Provide appropriate signage. Evaluate needs for additional management if new habitats are discovered.
7. Plan long-term rehabilitation of sites for conservation and by planting with *A. repens*, followed by introduction of *O. knightorum*.
8. Ensure community participation in Recovery Plan including: site rehabilitation and protection, weed control, propagation and cultivation of *A. repens*.
9. Investigate status of sub-populations using DNA analysis and morphometric analysis.

Can recovery be carried out with existing resources? No. Except for ad hoc surveys by lepidopterists and botanists, contributing to new distribution records for *O. knightorum*.

Resources required:

Action*		$
1	Surveys and mapping	15,000.00
2	Site rehabilitation, plant propagation and cultivation, $5,000 per year over 3 years	15,000.00
Total		30,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Timeframe for Rehabilitation of Taxon

- In train 2 years
- Completed 7 years
- De-listing 8 years

Lead Organisation: Environment Australia, New South Wales National Parks and Wildlife Service.

References:

Atkins, A. 1996. The life history of *Ocybadistes knightorum* Lambkin & Donaldson (Lepidoptera: Hesperiidae). Australian Entomologist 23: 29–31.

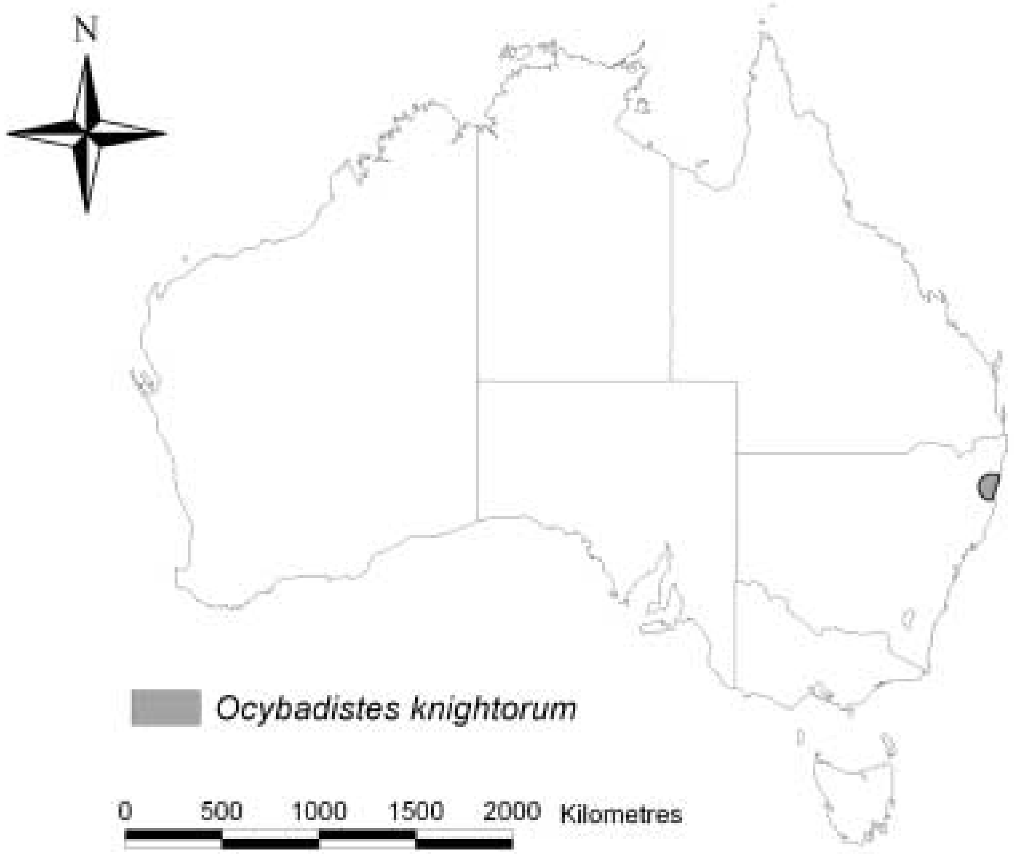
Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Lambkin, T. and Donaldson, J.F. 1994. A new species of *Ocybadistes* Heron (Lepidoptera: Hesperiidae) from Australia. Australian Entomologist 21: 15–19.

Sands, D.P.A. 1997. *Alexfloydia repens* Simon: a food plant for *Ocybadistes knightorum* Lambkin & Donaldson (Lepidoptera: Hesperiidae) and their conservation significance. Australian Entomologist 24: 117–118.

Simon, B.K. 1992. Studies on Australian grasses 6. *Alexfloydia*, *Cliffordiochloa*, *Dallwatsonia*, three new panicoid grass genera from eastern Australia. Austrobaileya 3: 669–681.

Distribution of *Ocybadistes knightorum*



HESPERIIDAE: TRAPEZITINAE

Scientific name: *Oreisplanus munionga larana* Couchman

National Conservation Status: Lower Risk (Least Concern).

Range: Tasmania.

Distribution: northwestern Tasmania: Marrawah, Stanley, near Temma.

Taxonomy: One of two subspecies of *O. munionga* (Olliff), which differ on details of wing marking. *O. m. munionga* occurs in Victoria, New South Wales and the Australian Capital Territory, and can be locally common.

Habitat and key ecological features: Larvae feed on *Carex appressa*, and form characteristic shelters on the food plant. The plant grows mainly in isolated swampy areas, and the butterfly occurs in Tasmania close to sea level.

History of conservation concern: No formal listing of *O. munionga* has been made, other than being placed as 'Indeterminate' by the IUCN (1988). Couchman (1965) considered it to be on the verge of extinction in Tasmania, and his appraisal was followed by comments on scarcity and localised distribution (Prince 1988). Dunn et al. (1994) ranked it as 'Endangered', as a species with limited distribution and Braby (2000) noted it as a subspecies of regional or local concern. The subspecies occurs only at a few sites in the far north west of Tasmania: a total of seven small sites have been reported (Prince 1988). Of these, none is in a high level reserve, such as a national park. Six are on private land (one in an Aboriginal reserve), and two are in reserves.

Major threatening processes: A variety of threats have been postulated for the butterfly: farming activities such as grazing and trampling, burning, commercial developments, and changes to water drainage, all associated with diversifying land use in the region. Cattle raising has been signalled as the most serious threat to the butterfly (Couchman 1962) (see also Braby 2000). However, I. Knight (pers. comm.) considered that this taxon was not currently threatened.

Is knowledge sufficient to formulate recovery actions? In part. The distribution of the subspecies needs confirmation, but there is sufficient information on habitat needs and potential threats for constructive conservation measures to be undertaken with little additional research on the butterfly's biology.

Recovery needs:

1. The major need is for more extensive targeted surveys for the butterfly and assessment of the viability of, and threats to, all populations.
2. Effective coordination to increase security of inhabited sites, for example by fencing them to exclude cattle.
3. Targeted conservation measures for all wetland habitats containing the food plant, *Carex appressa*.

Can recovery be carried out with existing resources? No. The major costs involved are to address the above items.

Resources required:

Action*		$
1	Surveys in north western Tasmania over three years $5,000 / year.	15,000.00
2	Investigation of site security and tenure; preliminary evaluation	5,000.00
Total		20,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead organisations: Environment Australia; Department of Primary Industries, Water and Environment, Tasmania.

References:

Braby, M.F. (2000). Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Couchman, L.E. 1962. Notes on some Tasmanian and Australian Lepidoptera-Rhopalocera. Papers and Proceedings of the Royal Society of Tasmania 96, 73–81.

Couchman, L.E. 1965. Notes on some Tasmanian and Australian Lepidoptera-Rhopalocera. II. Papers and Proceedings of the Royal Society of Tasmania 99, 81–85.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

IUCN (1988). IUCN red list of threatened animals. International Union for Conservation and Natural Resources. Gland, Switzerland.

Prince, G.B. 1988. The habitat requirements and National Conservation Status of Tasmanian endemic butterflies. Report to Tasmanian Department of Lands, Parks and Wildlife, Hobart.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Oreisplanus perornatus* (Kirby)

National Conservation Status: No Conservation Significance

Range: New South Wales, Victoria.

Distribution: Blue Mountains to Wilsons Promontory and Grampians, Victoria

Taxonomy: The genus *Oreisplanus*, contains two species which show some affinities with *Hesperilla* but males of both species do not have a sex brand.

Infra-specific relationships or variation: Variation in size, especially in females, is pronounced and the fore wing spots of females are said to vary (Braby 2000).

Habitat critical to survival: In the Blue Mountains, the habitat for *O. perornatus* is mainly sandstone plant communities forming heathlands or, occasionally, open forest. The species is sometimes very abundant where large stands of the food plants, *Gahnia sieberiana*, occur, often along stream banks.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988). However, the species was subsequently said to be secure in national parks and reserves in Victoria (Douglas 1993).

Major threatening processes: Several habitats for *O. perornatus* have been destroyed for urban development in the Blue Mountains but it remains secure over large areas and is protected in national parks. The species sporadically disappears from areas when severely burnt by bushfires, followed by recolonisation.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Pasma tasmanica* (Miskin)

National Conservation Status: No Conservation Significance

Range: Queensland, New South Wales, Australian Capital Territory, Victoria, Tasmania.

Distribution: Main Dividing Range from Stanthorpe into New South Wales, and south reaching sea level in Victoria and most of Tasmania.

Taxonomy: *Pasma tasmanica* belongs to a monotypic genus.

Infra-specific relationships or variation: Little recorded, except variation in size and sometimes bands or number of spots (Braby 2000).

Habitat critical to survival: Montane heath and open forest seem to be the preferred habitats for this species, where *Poa* spp. are its food plants.

History of conservation concern: Hill and Michaelis (1988) listed *P. tasmanica* as a threatened species. However, Douglas (1993) considered the species indeterminate, not threatened. No other references to its conservation significance have been noted. *P. tasmanica* is widespread and sometimes abundant throughout much of its range, especially in the Blue Mountains, New South Wales. In western Victoria this species occurs in the Grampians National Park (Douglas 1993).

Major threatening processes: None recognised except bush fires, which are usually followed by recolonisation from unburnt areas.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Rachelia extrusa* (C. and R. Felder)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range, Mount Tozer, Claudie River areas.

Taxonomy: Two species were recognised by Parsons (1998) from Papua New Guinea one of which, *R. extrusa,* also occurs on Cape York Peninsula.

Infra-specific relationships or variation: In Papua New Guinea the fore wing spots of *R. extrusa* are sometimes variable in size.

Habitat critical to survival: In Australia, this species is known only from lowland tropical rainforest on Cape York Peninsula (Atkins 1975). All of the known habitats are adequately protected in the Iron Range National Park or adjacent resources reserve. The life history of *R. extrusa* is not known.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1988) but no details were given.

Major threatening processes: None known or predicted.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. *R. extrusa* is not threatened in the extensive rainforest habitats of Iron Range National Park.

References:

Atkins, A.F. 1975. The first record of *Rachelia extrusa* (C. & R. Felder) (Lepidoptera: Hesperiidae: Trapezitinae). Australian Entomological Magazine 14: 237–241.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Signeta tymbophora* (Meyrick and Lower)

National Conservation Status: No Conservation Significance

Range: Queensland, New South Wales.

Distribution: Bunya Mountains, Conondale Ranges, Mount Glorious and Toowoomba, Queensland; south on the eastern slopes of Main Dividing Range to Port Macquarie and coast to Mount Dromedary, New South Wales (Peters 1965).

Taxonomy: Two species are included in the genus *Signeta*.

Infra-specific relationships or variation: The spots in the fore wings of both sexes of *S. tymbophora* are said to vary (Braby 2000).

Habitat critical to survival: *S. tymbophora* is often associated with rainforest where its larvae feed on the sedges *Carex hubbardii*, *Gahnia sieberiana* and probably *Entolasia marginata* (Atkins et al. 1991). Most adults are seen on flowers, particularly of *Marsdenia* spp., but rest at the edge of the canopy during sunny afternoons.

History of conservation concern: Dunn et al. (1994) thought that *S. tymbophora* was scarce and insufficiently known. The species is established in many reserves including Mount Warning National Park (Daniels 1976). The species is abundant near Stanwell Park and North Brother Mountain, New South Wales (Mayo 1987) and at Mount Glorious, Queensland (D.P.A. Sands).

Major threatening processes: The species is widely distributed, local and sometimes abundant but there are no confirmed threats.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. This species is not threatened.

References:

Atkins, A.F., Mayo, R. and Moore, M. 1991. The life history of *Signeta tymbophora* (Meyrick and Lower) (Lepidoptera: Hesperiidae: Trapezitinae). Australian Entomological Magazine 18: 87-90.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Daniels, G. 1976. A new locality for *Signeta tymbophora* (Meyrick and Lower) (Lepidoptera: Hesperiidae: Trapezitinae). Australian Entomological Magazine 3: 29.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Mayo, R. 1987. Notes on the distribution of two skippers (Lepidoptera: Hesperiidae) from New South Wales. Australian Entomological Magazine. 14: 49.

Peters, J.V. 1965. New locality records of *Signeta tymbophora* Meyrick and Lower (Lepidoptera: Hesperiidae). Journal of the Australian Entomological Society 4: 87–88.

HESPERIIDAE: HESPERIINAE

Scientific name: *Suniana lascivia lasus* Waterhouse

National Conservation Status: Data Deficient

Range: Northern Territory.

Distribution: Bathurst Island.

Taxonomy: Two named subspecies of *Suniana lascivia* occur in Australia and another form from the Mitchell Plateau and elsewhere in northern Western Australia, is probably undescribed.

Infra-specific relationships or variation: Only three specimens of *S. lascivia lasus* are known, insufficient to determine variation. They are bright orange with distinct markings different to other subspecies. Common and Waterhouse (1981) suggested that these specimens may be the taxon ssp. *pola* from New Guinea.

Habitat critical to survival: Likely to be similar to other subspecies. In Northern Territory, the larvae of ssp. *larrakia* feed on *Panicum maximum* (Meyer 1996), growing in open eucalypt or melaleuca woodland.

History of conservation concern: Very little is known about the three specimens of this subspecies (Waterhouse 1937). Dunn et al. (1994) nominated this subspecies as insufficiently known, based on scarcity of records.

Major threatening processes: None known or recorded. Dunn et al. (1994) suggested that wood chipping would be a potential problem.

Is knowledge sufficient to formulate recovery actions? No, insufficient information is available on this subspecies. Based on other subspecies, *S. lascivia lasus* is likely to be secure unless major natural plant communities on Bathurst Island are disturbed. However, all opportunities to obtain more specimens should be undertaken and the taxonomy of ssp. *lasus* should be reviewed.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
Total		15,000.00

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Meyer, C.E. 1996. Butterfly larval food plant list for the Northern Territory and the Kununurra district in Western Australia. Victorian Entomologist 26: 66–72.

Waterhouse, G.A. 1937. Australian Hesperiidae. VI. Descriptions of new subspecies. Proceedings of the Linnean Society of New South Wales. 62: 32–34.

HESPERIIDAE: HESPERIINAE

Scientific name: *Taractrocera ilia ilia* Waterhouse

National Conservation Status: No Conservation Significance

Range: Northern Territory.

Distribution: Melville Island, Kakadu National Park, Darwin, Alligator River, King River.

Taxonomy: *Taractrocera* is represented by five species in Australia. *T. ilia* is also known by subspecies *beta* from Papua New Guinea (Evans 1949).

Infra-specific relationships or variation: In ssp. *ilia*, the ground colour of the hind wing beneath is variable in the shade of brown and its contrast with the pale median band.

Habitat critical to survival: There is a deficiency of data on its distribution. In Kakadu National Park, *T. ilia* congregates in areas near sandstone escarpments and during the heat of the day adults shelter in nearby caves (R. Weir pers. comm.). *T. ilia* has always been regarded as rare (Common and Waterhouse 1981) and its habitat has only recently (C. Meyer, R. Weir pers. comm.) been discovered. The food plant has not been recorded.

History of conservation concern: *T. ilia* was said to be rare by Dunn et al. (1994), but it was not considered to be of conservation concern by several BAP Workshop participants who had first-hand experience with the species.

Major threatening processes: Dunn et al. (1994) stated that *T. ilia* had been probably been affected by wood chipping on Melville Island and land clearing in Darwin. No threatening processes have otherwise been identified and the species is not considered threatened in any way. The species is secure in Kakadu National Park but fire is likely to have an impact on populations and should be carefully managed for this species but also to protect other butterflies occurring in the Park.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary for *T. ilia* because a major population is secure in Kakadu National Park. However, the impact of regular fires on populations of *T. ilia* needs evaluation. Surveys in National Parks for this species should be encouraged by the appropriate authorities to ascertain its distribution.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Evans, W.H. 1949. A catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History). British Museum, London.

HESPERIIDAE: HESPERIINAE

Scientific name: *Taractrocera ina* Waterhouse

National Conservation Status: No Conservation Significance; New South Wales: Data Deficient.

Range: Northern Territory, Torres Strait Islands, Queensland, New South Wales.

Distribution: Continuous distribution from northern Australia to inland New South Wales.

Taxonomy: A genus of five species in Australia. *T. ina* is the only species without a sex brand in the male.

Infra-specific relationships or variation: The ground colour is somewhat variable from yellow to greenish-yellow and spots are variable in extent (Braby 2000).

Habitat critical to survival: Males of *T. ina* frequently congregate on hilltops in dry eucalypt plant communities. Several grasses (Poaceae), including introduced weedy species and rice (Common and Waterhouse 1981), are food plants for the larvae.

History of conservation concern: Braby (2000) suggested *T. ina* to be of conservation concern in southwestern New South Wales, based on a single specimen taken at Hay (Common and Waterhouse 1981). However, the species was not considered to be of concern by any participants at the series of BAP Workshops, and no threats were identified. It is widely distributed, often abundant (Common and Waterhouse 1981), and may be at the edge of its range in southwestern New South Wales, where it is Data Deficient.

Major threatening processes: No threatening processes are identified and the species is not considered threatened in any way.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary for *T. ina* because its populations are not considered threatened.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

HESPERIIDAE: HESPERIINAE

Scientific name: *Telicota ancilla baudina* Evans

National Conservation Status: Data Deficient

Range: Western Australia, Northern Territory.

Distribution: Parry Harbor, Admiralty Gulf islands, Western Australia, and Daly River, Northern Territory.

Taxonomy: Eleven subspecies of *T. ancilla* have been recognised, and two occur in Australia.

Infra-specific relationships or variation: No variation has been noted. Subspecies *baudina* is brighter in colour than ssp. *ancilla* from eastern Australia, the hind wing is squarer and with a distinctive post median band (Common and Waterhouse 1981).

Habitat critical to survival: Nothing is known of the biology of ssp. *baudina* but it is likely to be similar for ssp. *ancilla* with several species of Poaceae as food plants, particularly *Imperata cylindrica*. The habitat for the eastern subspecies is mainly open eucalypt plant communities, particularly near shaded water courses.

History of conservation concern: Dunn et al (1994) considered that *T. ancilla baudina* was insufficiently known, presumably due to its poorly known distribution and habitats.

Major threatening processes: None known or likely.

Recovery Actions: Surveys to identify and determine the tenure of local habitats are needed, especially on the Admiralty Gulf islands. The status should then be re-assessed.

Resources required:

Action		$
1	Surveys and mapping, $3,000 / year over 3 years	9,000.00
Total		9,000.00

Lead Organisations: Parks and Wildlife Commission of the Northern Territory, Western Australian Department of Conservation and Land Management.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: HESPERIINAE

Scientific name: *Telicota anisodesma* Lower

National Conservation Status: No Conservation Significance

Range: Queensland, New South Wales.

Distribution: Seventeen Seventy, southeastern Queensland to Gosford, New South Wales.

Taxonomy: *T. anisodesma* belongs to a large genus with species ranging from Southeast Asia, Papua New Guinea to Australia.

Infra-specific relationships or variation: Braby (2000) discussed variation in the fore wing markings of both sexes, especially the female.

Habitat critical to survival: *T. anisodesma* occurs in subtropical rainforest wherever its food plant, *Flagellaria indica*, is abundant. It occurs behind sand dunes or at moderate altitudes in coastal ranges.

History of conservation concern: Dunn et al. (1994) considered that this species was rare in New South Wales. Some of the sites referred to by these authors are known to support *T. anisodesma* — for example, Mount Tamborine, where the butterfly occurs in a national park. Loss of many habitats for *T. anisodesma*, especially in coastal southeastern Queensland, has undoubtedly reduced the abundance of the species, disrupted corridors and isolated populations. However, the species is well represented and secure in national parks and flora reserves on the eastern coast and border ranges.

Major threatening processes: *T. anisodesma* was once widely distributed but many habitats have been destroyed by clearing (Dunn et al. 1994, Braby 2000), particularly on the Sunshine and Gold Coasts, Queensland and in northern New South Wales by coastal development, especially small rainforest plant communities supporting the food plant, *F. indica*. However, sufficient populations are secure in the Border Ranges and many other national parks to ensure the species is secure.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No actions are necessary. However, national parks in Queensland should be surveyed for its presence and for the longer term security of this species.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: HESPERIINAE

Scientific name: *Telicota brachydesma* Lower

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Claudie River, Cooktown to Ingham, possibly Mackay.

Taxonomy: *T. brachydesma* also occurs in Papua New Guinea.

Infra-specific relationships or variation: The fore wing spot of females may sometimes be absent (Dunn and Dunn 1991).

Habitat critical to survival: Adults of *T. brachydesma* occur only in, or near 'dense stands of closed canopy rainforest' where its food plant, *Leptaspis banksii*, occurs (Valentine and Johnson 2000). The species is much more abundant in Papua New Guinea than Australia but the scarcity of its intact habitats is partly responsible for it being regarded as rare (C.G. Miller in Dunn et al. 1994). Both adults and immature stages are very difficult to observe in their shaded primary rainforest habitats (R. Mayo pers. comm.). Braby (2000) claimed that the species was only known from few localities but the species is likely to occur wherever the food plant, *L. banksii*, grows in undisturbed tropical rainforest.

History of conservation concern: Dunn et al. (1994) considered the species insufficiently known as it was recorded from only 17 localities. However, many more have recently been located since details of its life history were published by Valentine and Johnson (2000).

Major threatening processes: None recorded. Most localities are protected in the World Heritage rainforests of northern Queensland. Dunn et al. (1994) claimed that the locality at Mackay may have been cleared for agriculture.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary; the species is adequately conserved in the world heritage areas of northern Queensland.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Valentine, P.S. and Johnson, S.J. 2000. The life history of *Telicota brachydesma* Lower (Lepidoptera: Hesperiidae). Australian Entomologist 27: 103–108.

HESPERIIDAE: HESPERIINAE

Scientific name: *Telicota eurotas laconia* Waterhouse

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Cape York Peninsula, Cooktown to Ingham.

Taxonomy: Other subspecies of *T. eurotas* occur in countries to the north of Australia.

Infra-specific relationships or variation: Some variation in colour of the underside was noted by Braby (2000).

Habitat critical to survival: *T. eurotas laconia* occurs in grassy swamps where the food plants, *Rhynchospora corymbosa* and several species of *Scleria*, occur. The species often occurs in wetlands at the edge of rainforest.

History of conservation concern: Regarded as insufficiently known by Dunn et al. (1994) who were concerned about the continuing loss of habitat. The species is well known from wetlands in northern Queensland where some of the known habitats have been destroyed. It is abundant at Forest Beach (S.J. Johnson) and smaller habitats near Mission Beach (J.F.R. Kerr pers. comm.). Adequate habitat is protected in national parks in northern Queensland to ensure the species is unlikely to become threatened. However, the tenure of the important wetland habitat near Cable Beach should be assessed.

Major threatening processes: Drainage of swamps, fire and displacement by exotic weeds are the most likely threats. This species should be monitored near Ingham to ensure that all the habitats are not threatened, and opportunities sought to preserve areas with the appropriate ecological communities in that area to ensure it does not become locally extinct.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

HESPERIIDAE: HESPERIINAE

Scientific name: *Telicota eurychlora* Lower

National Conservation Status: Lower Risk (Least Concern); Queensland: Vulnerable [VUb,c].

Range: Queensland, New South Wales, Victoria.

Distribution: *T. eurychlora* is near the northern edge of its range in southeastern Queensland where it is currently confirmed occurring at two localities, near Beaudesert and at Stony Creek, Woodford, at the edge of the Conondale Ranges. It is believed to be extinct at Burleigh Heads where it has been recorded previously (Common and Waterhouse 1981). This species will probably be found to occur elsewhere in Queensland where the food plant, *Cladium procerum*, is sufficiently abundant. In New South Wales, several populations occur near Kingscliff, in and south of Limeburners Creek Nature Reserve, Port Macquarie and between Hastings River and Nowra. In eastern Victoria *T. eurychlora* reaches its southern limit at the Thurra River.

Possible sightings on Fraser Island and Stradbroke Islands (S.J Johnson pers. comm.), and near Beachmere (R. Eastwood) need to be confirmed by presence of the food plant and voucher specimens. A specimen from north of Toowoomba, Queensland, thought to be this species (M. Gross, J. Moss pers. comm.), proved to be another species of *Telicota* (D.P.A. Sands).

Taxonomy: *Telicota eurychlora* was previously considered to be a subspecies of *T. eurotas* but has recently been recognised as a distinct species (Braby 2000). It is one of several similar species in the genus that cannot be accurately identified unless voucher specimens are examined.

Infra-specific relationships or variation: none recognised.

Habitat critical to survival: The habitat of *T. eurychlora* is swampy or semi-aquatic grasslands and the edges of water courses, where the food plant is abundant in open areas and in wetlands behind coastal sand dunes surrounded by *Melaleuca quinquenervia*. High densities of adults sometimes occur and males outnumber females when they patrol the edge of their wetland habitats. The larval food plant is the twigrush, *Cladium procerum* (Braby 2000) and in Queensland, possibly also *Carex gaudichaudiana*, growing at the edge streams in rainforest (D.P.A. Sands and J. Moss unpublished).

History of conservation concern: Dunn et al. (1994) regarded *T. eurychlora* as Vulnerable in New South Wales and a summary of previous conservation assessments for this species was provided by Yen and Butcher (1997). Braby (2000) considered this taxon to be threatened and ‘at serious risk’, and of National concern. Dunn et al. (1994) and Braby (2000) considered this species to be Vulnerable in all states and the Victorian population at Thurra River, to be extinct. However, only part of the population outside of the Croajingolong National Park has been affected and the lower portion within the Park is considered secure (E.D. Edwards pers. comm.). *T. eurychlora* is not currently listed as threatened by State or Commonwealth authorities. Currently the most secure known habitat for this species is Limeburners Creek Nature Reserve, Port Macquarie.

Many habitats for *T. eurychlora* have been destroyed throughout its range. In Queensland, insufficient secure habitats containing the food plant are known to ensure survival of this taxon. Only two localities for *T. eurychlora* are currently known in Queensland but more than 20 occur in New South Wales (Braby 2000), some of them secure. Although *T. eurychlora* is near the edge of its range in southeastern Queensland, the potential disturbance to known habitats is cause for concern. Both populations of the butterfly are not secure with one in a forest reserve near a popular swimming hole subject to disturbance (near Woodford), and the other on privately-owned land (Beaudesert). Previous habitats near Burleigh Heads (Common and Waterhouse 1981) and near Jacobs Well (D.P.A. Sands unpublished) have been converted to urban settlements and farmlands. Although the species is of concern in New South Wales, several secure habitats are known, including south of, and in, Limeburners Creek Nature Reserve north of Port Macquarie.

A substantial colony of *T. eurychlora* at Ocean Beach occurred near Woy Woy (Haines 1961) but is thought to be now extinct (Braby 2000). Many of the habitats for *T. eurychlora* in New South Wales have been destroyed for urban and coastal development. Although several habitats are secure in National Parks, additional sites require protection to ensure that this species does not become threatened in New South Wales.

Major threatening processes: Atkins (1994) noted destruction of habitats by drainage and urban development. *T. eurychlora* has suffered from a decline in the number of its habitats supporting its food plant, from urban development, weed invasion (especially exotic grasses), draining of wetlands, filling, canal construction and crop cultivation (e.g. sugarcane). Habitats are often close to coastal melaleuca wetlands, an ecological community at risk in Queensland and New South Wales. Destruction of previously well-known habitats (e.g. at Ocean Beach, Woy Woy, New South Wales), raised concerns for this species many years ago. Other habitats remain intact in New South Wales and are sometimes inaccessible and some are protected in reserves. The presence of only two intact localities in southeastern Queensland, at Beaudesert and near Woodford, both unprotected sites, indicates the species should be considered Vulnerable until these are secured or other secure habitats located.

Two very important habitats for *T. eurychlora* and its food plant *Cladium procerum*, at Red Head Beach and Jewels Swamp, near Newcastle, are threatened by proposed development and urgent action is needed to preserve these as environmental reserves. The tenure of a habitat at Kurnell, New South Wales where the food plant is probably still common (Klaphake 1992), requires conservation assessment. Preservation and management (for drainage and weeds) of these few sites would reduce the likelihood that this species will become threatened in New South Wales in the near future.

T. eurychlora sometimes shares the same habitat with other species of conservation concern, e.g. *Argyreus hyperbius inconstans* and *Tisiphone abeona joanna* (e.g. at and near Limeburners Creek Nature Reserve near Port Macquarie), as well as several other species of interest. In this respect, the coastal wetlands with their food plants must be recognised as a priority category of threatened plant ecological communities, and the species referred to as indicators for these ecological systems.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Several known habitats require protection in three states and surveys are needed in Queensland and Victoria to find new localities for the butterfly, especially in Croajingolong National Park, Victoria, based on the distribution of the food plant, *Cladium procerum*.

Recovery needs:

1. Develop a Recovery Plan, appoint a Recovery Team for *T. eurychlora*.
2. Surveys for *T. eurychlora* in areas in Victoria and Queensland wherever *C. procerum* is known to occur. Following comprehensive surveys, preparation of a map showing the distribution of this sedge should be considered a priority.
3. Identify localities and their tenure where *Cladium procerum* occurs for long-term rehabilitation.
4. Assess two existing habitats at Beaudesert and near Woodford in Queensland for permanent conservation and management needs. Investigate a possible habitat and tenure of a site at Beachmere.
5. Investigations to determine if species of *Carex* are also utilised by larvae of this species as food plants.
6. Survey potential new habitats with food plants for presence of *T. eurychlora* and map areas where it currently occurs. Map, acquire, preserve, manage and provide signage for currently unprotected habitats, especially at Beaudesert and near Woodford, Queensland and at Red Head Beach and Jewels Swamp, Newcastle, New South Wales.
7. Survey potential new habitats with food plants for presence of *T. eurychlora* and map areas where it currently occurs in Croajingolong National Park, Victoria.
8. Establish schedules for weed and fire control for threatened habitats.
9. Encourage community participation in the Recovery Plan for long-term site rehabilitation, plant propagation and cultivation of *C. procerum* for planting at selected swampy sites.
10. Attempt translocation of *T. eurychlora* to rehabilitated or suitable protected localities.
11. Establish a schedule for recovery and de-listing of *T. eurychlora*.

Can recovery be carried out with existing resources? No.

Resources required:

Action*		$
1	Surveys and mapping, 3 years at $3,000 per year	9,000.00
2	Site rehabilitation, 3 years at $10,000 per year	30,000.00
Total		39,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisations: Queensland Parks and Wildlife Service, New South Wales National Parks and Wildlife Service, Victorian Department of Natural Resources and Environment.

References:

Atkins, A.F.1994. Biological notes and distribution records of butterflies from southern Queensland, New South Wales and South Australia. Victorian Entomologist 24: 68–70.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

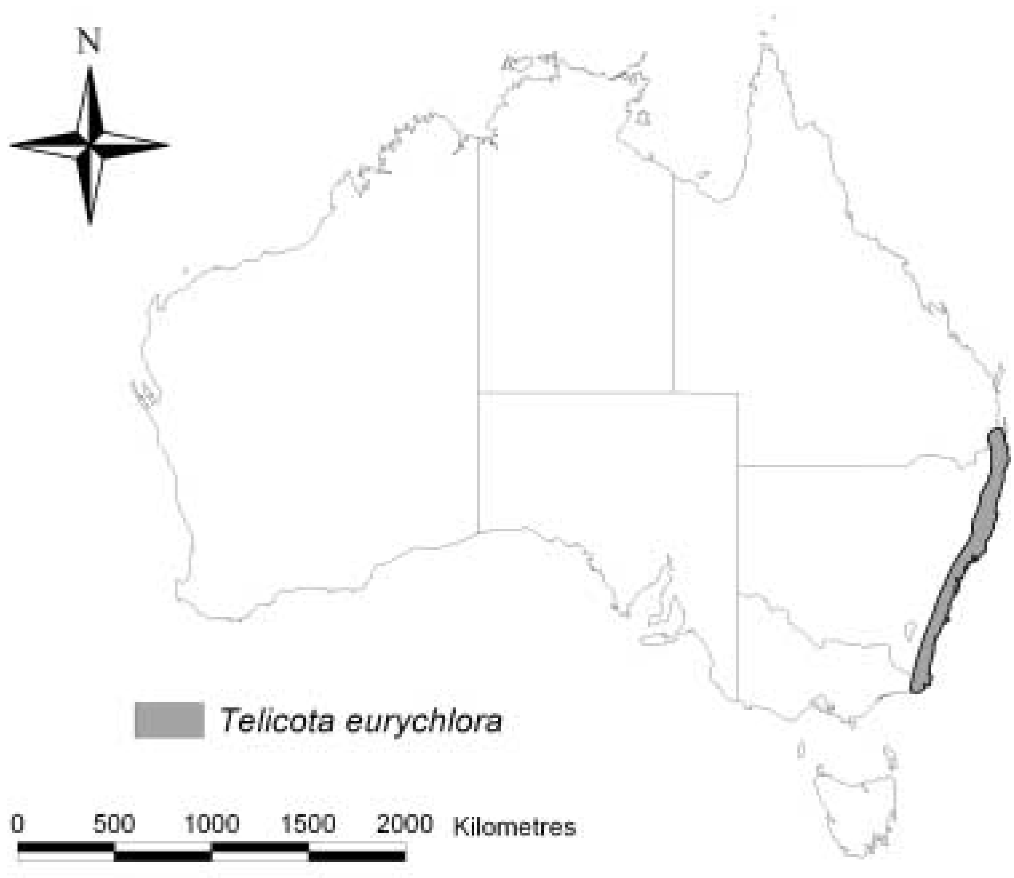
Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Haines, L.C. 1961. Discovery of the dingy skipper, *Astycus eurotas eurychlora* Lower, 1908, at Ocean Beach, New South Wales. Proceedings of the Royal Zoological Society of New South Wales. 1958–59: pp 108–110.

Klaphake, Van. 1992. Key to the sedges and rushes of Sydney. Privately published, Potts Point, NSW.

Yen, A.L. & Butcher, R. J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered Species Program, Environment Australia, Canberra.

Distribution of *Telicota eurychlora*



HESPERIIDAE: HESPERIINAE

Scientific name: *Telicota mesoptis mesoptis* Lower

National Conservation Status: No Conservation Significance; Northern Territory: Data Deficient.

Range: Torres Strait islands, Queensland, Northern Territory.

Distribution: Mackay to Cape York, Queensland, doubtfully established in Northern Territory.

Taxonomy: The species is well known from New Guinea and northern Queensland.

Infra-specific relationships or variation: Slight variation was noted in specimens from Queensland by Braby (2000).

Habitat critical to survival: In Queensland, *T. mesoptis mesoptis* occurs abundantly at the margins of lowland tropical rainforest, where its food plant occurs, possibly *Imperata cylindrica* (Common and Waterhouse 1981). The habitat in Northern Territory has not been recorded.

History of conservation concern: Braby (2000) stated that the species was considered of conservation concern in Northern Territory but no explanation for concern was provided. Only one specimen is known from Darwin, Northern Territory, lodged in the Australian Museum, Sydney (Peters 1969), and apart from the single specimen recorded in 1902, no other records are known from the Territory.

Major threatening processes: None known or likely to be identified.

Is knowledge sufficient to formulate recovery actions? Information is not adequate for Northern Territory, but apart from surveys to determine if the species is established, no action can be taken.

Resources required:

Action		$
1	Surveys	15,000.00
Total		15,000.00

Lead Organisation: Parks and Wildlife Commission of the Northern Territory.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Peters, J.V. 1969. Notes on the distribution of Australian Hesperioidea and Papilionoidea (Lepidoptera). Australian Zoologist 15: 178–184.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites atkinsi* Williams, Williams and Hay

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: *Trapezites atkinsi* was until recently known to occur at Windy Harbour, Point D'Entrecasteaux (Williams, Williams and Hay 1998). A specimen thought to be this species was known from near Bunbury (P. Valentine pers. comm.) and *T. atkinsi* has recently been collected from several national parks in southwestern Australia (P. Valentine and S. Johnson pers. comm.).

Taxonomy: *T. atkinsi* is one of 18 species in the endemic genus *Trapezites*. It is closely related to *T. sciron*, *T. argenteoornatus* and *T. waterhousei* (Williams, Williams and Hay 1998). When *Trapezites atkinsi* was first collected in 1989 by D. Yeates, it was considered to be a form of *T. sciron* (Mayo and Atkins 1992) but it was subsequently described as a distinct species (Williams, Williams and Hay 1998). The taxonomic status of *T. sciron* is currently being re-examined (P. Valentine and S. Johnson pers. comm.).

Infra-specific relationships or variation: Little variation has been recognised in the specimens collected at Windy Harbour, Point D'Entrecasteaux.

Habitat critical to survival: *T. atkinsi* occurs in coastal sand dunes and in rocky limestone vegetation above cliffs and where the food plant, *Acanthocarpus preissii*, grows at Windy Harbour, Point D'Entrecasteaux. Its life history is very similar to that of the related *T. argenteoornatus* (Williams, Williams and Hay 1998). Its flight period is limited to September and October with one generation per year.

History of conservation concern: Braby (2000) thought that this species should be considered Vulnerable until thorough surveys to search for further populations have been carried out. *T. atkinsi* is not currently listed as threatened by state or Commonwealth authorities. *T. atkinsi* was initially assessed as threatened, based on its distribution outside of the D'Entrecasteaux National Park, in an area subjected to potential disturbance and future urban development (M.R. Williams pers. comm.). Clearing of vegetation for a settlement probably destroyed part of the original habitat and subsequent weed encroachment has degraded the fore-dune areas. Construction of a lighthouse and nearby facilities has disturbed the area used for hilltopping by males (M.R. Williams pers. comm.).

Very recently *T. atkinsi* has been collected in several national parks in southwestern Australia where the species is now known to be secure (P. Valentine and S. Johnson pers. comm.).

Major threatening processes: Prior to the discovery of several localities within national parks, *T. atkinsi* was considered threatened by disturbance of the only-known habitat, just outside of D'Entrecasteaux National Park. Fire and weed management may be required in other national parks where the species has recently been discovered to minimise threats to the populations of *T. atkinsi*.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is said to be secure in several national parks (P. Valentine and S. Johnson pers. comm.).

Resources required: As part of studies needed on other taxa of conservation and taxonomic interest, support for surveys for *T. atkinsi* in appropriate national parks in southwestern Western Australia, will be required.

Recovery needs: Undertake further surveys by experienced lepidopterists for new localities for *T. atkinsi*, especially in coastal, southwestern areas between Point D'Entrecasteaux and Bunbury. The species may occur wherever the food plant is present near Point Nuyts, Irwin, Hillier and West Cape Howe. Targeted surveys near Bunbury are required to accurately determine the limit of distribution of this taxon.

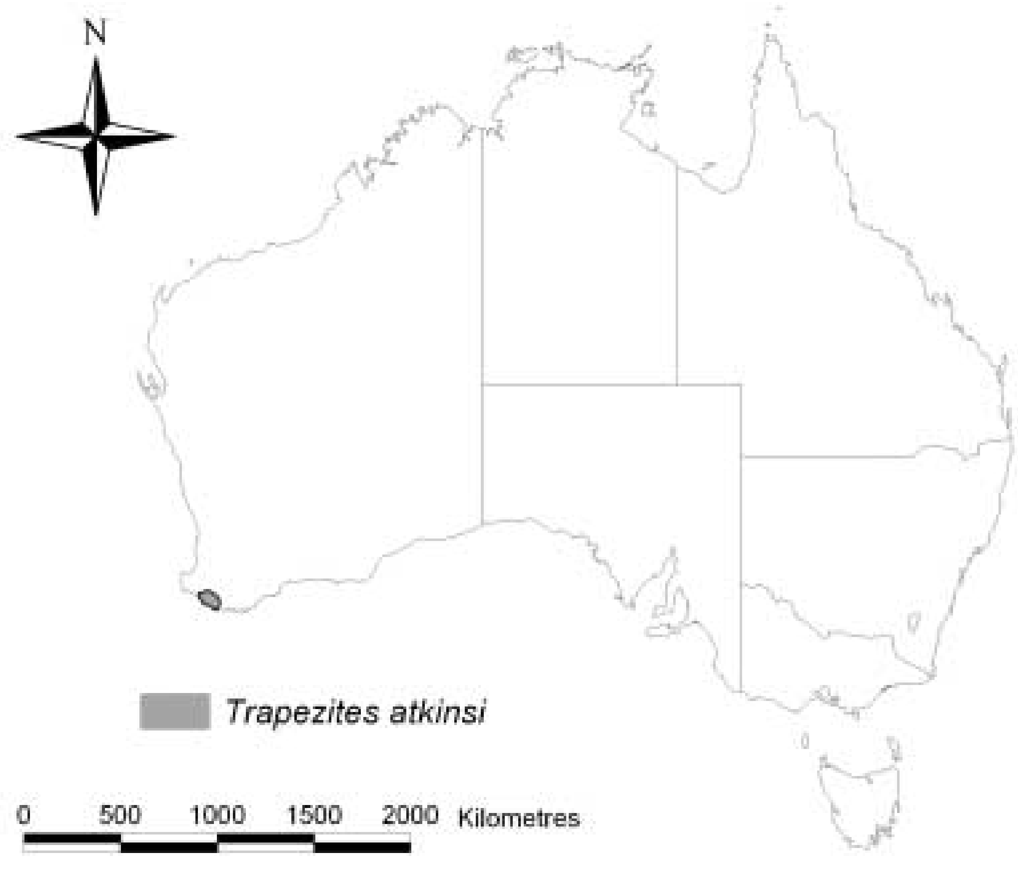
References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Mayo, R. and Atkins, A.F. 1992. *Anisyntoides* Waterhouse (Lepidoptera: Hesperiidae): a synonym of *Trapezites* Hübner, with description of a new species from Western Australia. Australian Entomological Magazine 19: 81–88.

Williams, A.A.E., Williams, M.R. and Hay, R.W. 1998. A new species of *Trapezites* Hübner (Lepidoptera: Hesperiidae) from Western Australia. Australian Entomologist 25: 7–12.

Distribution of *Trapezites atkinsi*



HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites eliena* (Hewitson)

National Conservation Status: No Conservation Significance; South Australia: Lower Risk (Least Concern).

Range: South Australia, Victoria, New South Wales, Australian Capital Territory, Queensland.

Distribution: Eastern mainland Australia, Victoria and southeastern South Australia.

Taxonomy: A well-defined species with no currently recognised distinct subspecies. Specimens in the area of conservation concern have sometimes been referred to as *T. e. monocycla* Lower.

Habitat and key ecological features: *T. eliena* is often 'common and widespread wherever *Lomandra* occurs in open woodlands and heaths' (Atkins 1999), and is ' a versatile skipper of many landscapes'. In southeastern Australia it is sometimes found flying in swampy areas where *Lomandra* grows, but also on hilltops and in a variety of heaths and woodlands. This species is at the edge of its range in South Australia.

History of conservation concern: Hill and Michaelis (1988) stated that this species was threatened in South Australia. Concerns were also expressed relating to this species at the BAP Workshop held in Adelaide. As for *T. symmomus soma*, the geographical range of this species extends only marginally into South Australia from Victoria (Fisher 1978), and concerns reflect the 'fringe nature' of this distribution. *Lomandra longifolia* occurs in the area and Fisher (1978) noted that the butterfly 'may be more abundant than the records indicate'. Grund (2001) listed *T. eliena* as Vulnerable, as did Grund and Hunt (2000). The latter authors found this species at only three sites in the southeastern part of the State, but two of these were previously unknown.

Major threatening processes: In far southeastern South Australia, habitat changes resulting from forestry activities and unsuitable burning regimes have caused concern for the butterfly's wellbeing.

Is knowledge sufficient to formulate recovery needs? Yes, based on sound understanding of the biology of *T. eliena* obtained in other States.

Recovery needs: More extensive targeted surveys in far eastern South Australia are needed to determine the distribution of *T. eliena*, and the possible susceptibility of colonies to forestry activities. More focused management may then be needed.

Possible options, as for *T. symmomus soma*, include augmentation and restoration of habitat through planting *Lomandra*, as a basis for translocation of the butterfly to found new colonies.

Can recovery be carried out with existing resources? No. Extensive surveys are needed over a wide area of far eastern South Australia, with particular attention to documenting incidences and breeding habitats of the butterfly. Costs are at present indeterminate but survey costs could be reduced effectively by combining with surveys for other taxa in the region, for example *T. symmomus soma*.

Lead organisations: Dept of Environment, Heritage and Aboriginal Affairs, South Australia; BCSA Inc.

References:

Atkins, A.F. 1999. The skippers, *Trapezites* (Hesperiidae), pp. 75–104 in Biology of Australian butterflies (eds Kitching, R.L., Scheermeyer, E., Jones, R.E. and Pierce, N.E.). CSIRO, Melbourne.

BCSA Inc.,1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss proposed nominations of threatened South Australian butterflies.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department for Environment Heritage and Aboriginal Affairs, South Australia.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites genevievae* Atkins

National Conservation Status: No Conservation Significance

Range: Queensland, New South Wales

Distribution: Main Dividing Range and lower ranges from Montville, Queensland to Mount Allyn, New South Wales.

Taxonomy: The species has been described only recently (Atkins 1997). Specimens were overlooked for many years when thought to be *T. maheta* or *T. praxedes*, somewhat similar species.

Infra-specific relationships or variation: Atkins (1997) noted Some variation in the original description of *T. genevievae*.

Habitat critical to survival: *T. genevievae* is usually associated with rainforest or rainforest regrowth, where the food plants for its larvae, *Lomandra spicata* and possibly *L. hysterix*, are abundant. The species breeds mainly in undisturbed forest and the adults are rarely seen, apparently settling out of sight and being difficult to identify on the canopy.

History of conservation concern: Atkins (1997) considered this species to be Vulnerable, due to the extensive destruction of its habitat in lower montane old growth forests. However, at the BAP Workshops held in Brisbane and Sydney, adequate habitat was said by participants to be secure.

Major threatening processes: Atkins (1997) and Braby (2000) referred to destruction of old growth forest that is habitat for this butterfly. Atkins (1997) indicated that clear felling of timber was a threat to this species and Braby (2000) considered this species was threatened by loss of habitat to forestry operations. Forestry activities have undoubtedly in the past had an impact on this species. However, most of the existing habitats, especially those in the New South Wales / Queensland Border ranges and eastern slopes of the Main Divide, are protected in the World Heritage area, national parks, forestry reserves and other reserves. *T. genevievae* is known to recolonise forestry areas after selective logging (Braby 2000).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary because the species is not threatened.

References:

Atkins, A. 1997. Two new species of *Trapezites* Hübner (Lepidoptera: Hesperiidae) from eastern Australia. Australian Entomologist 24: 7–26.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites heteromacula* Meyrick and Lower

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Torres Strait Islands, Cape York Peninsula to Bluewater State Forest, Townsville.

Taxonomy: *T. heteromacula* is one of 18 species in the genus, restricted to the dry tropics.

Infra-specific relationships or variation: The species is remarkably variable in size (Common and Waterhouse 1981), particularly specimens from near Mareeba. Braby (2000) noted variation in the colour and number of spots on the underside.

Habitat critical to survival: *T. heteromacula* occurs in open eucalypt woodland and among melaleuca plant communities (Braby 1992). Males sometimes occur commonly on hilltops, on the slopes and not usually at the summits. The food plants for larvae are *Lomanda* spp., including *L. longifolia*.

History of conservation concern: No details were provided by Hill and Michaelis (1988), who listed *T. heteromacula* as threatened.

Major threatening processes: None recorded. Near Mareeba this species has a remarkable ability to recolonise soon after bushfires.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 1992. Conservation needs of lowland, coastal paperbark woodlands and eucalypt forests in northern Queensland – notes on some rare and threatened butterflies. News Bulletin Entomological Society of Queensland 20: 76–88.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites luteus luteus* (Tepper)

National Conservation Status: No Conservation Significance; South Australia: Lower Risk (Least Concern).

Range: Queensland, New South Wales, Victoria, South Australia.

Distribution: Mainly west of the main Divide in eastern Australia. In South Australia *T. luteus* occurs in the southern Flinders Ranges (E. Edwards pers. comm.) near Quorn (Grund 1997), Peterborough (Le Souef 1976) and on the Eyre Peninsula.

Taxonomy: *Trapezites luteus* is a distinctive member of the genus with adults bearing some similarity in size and colour beneath to *T. petalia*. Three subspecies were recognised by Common and Waterhouse (1981).

Infra-specific relationships or variation: Dunn and Dunn (1991) treated subspecies *Trapezites luteus leucus* as synonym of *luteus*. This was followed by Braby (2000), but this synonymy has not been formally ratified. Braby (2000) recognised the nominotypical subspecies as distinct from ssp. *glaucus* from Tasmania, but Dunn and Dunn (1991) indicated there was some overlap in its characteristics with Victorian populations. Following these arrangements and Common and Waterhouse (1981), the South Australian populations are referred to here as the nominotypical ssp. *luteus*.

Habitat critical to survival: Unlike most other closely related species of *Trapezites*, the males of *T. luteus* do not congregate on hilltops. *T. luteus* is local and patchy in distribution and adults usually occur at low densities. Adults frequent open grasslands or open forest where the food plants are present. In South Australia the larvae feed on *Lomandra multiflora* and *M. densifolia*, the latter plant considered to be rare (Fisher 1978, Grund 1997a,b). It is not known to occur in any conservation areas in South Australia and it is estimated to be restricted to less than four localities, all subjected to grazing (Grund pers. comm). Throughout its range, the species tends to occur at low densities, affecting the assessment for its presence or absence.

History of conservation concern: *T. luteus* was listed as threatened by Hill and Michaelis (1988) and other literature relating to conservation of its subspecies was summarised by Yen and Butcher (1997). In Victoria the nominotypical subspecies is also considered to be rare (Douglas 1993) and populations have been noted to decline and were thought to be locally threatened (Braby 2000). Insufficient habitat is secure to prevent decline in South Australia, where *T. luteus* has contracted in distribution, and Grund (2001) listed it as Vulnerable for the State. It is probably extinct in the southern Eyre Peninsula (Grund 1997b), where it was last seen in 1911. Subspecies *glaucus* from Tasmania, and ssp. *leucus* from New South Wales, Australian Capital Territory and Queensland, are not considered threatened. No subspecies of *T. luteus* are currently listed as threatened by State or Commonwealth authorities.

Major threatening processes: Several of the habitats have been destroyed, resulting from urban development and farming activities. Hill and Michaelis (1988) identified fire and drought as threats. Conversion of habitat to grazing land, loss of the food plant and the insecure tenure of *T. luteus* habitats are also of concern. Habitat for *T. luteus* near Lake Alexandrina was apparently destroyed when converted to pasture. However, this species is tolerant of some grazing (Fisher 1978), providing the food plant is able to persist. *T. luteus* persists at low densities when the food plant is present in the Flinders Ranges, even where extensive grazing occurs (E.D. Edwards pers. comm.). However, Grund (1999) noted the susceptibility of the food plant to sheep grazing. This species is thought to be secure in the Flinders Range National Park (E. Edwards pers. comm.).

Is knowledge sufficient to formulate recovery actions? Yes, some information is available. However, further surveys for habitats of *T. luteus* in South Australia are recommended, since this species has always been poorly known in that State (Fisher 1978). A recovery plan has not been prepared for this taxon.

Recovery needs:

1. Develop a Recovery Plan, appoint a Recovery Team.
2. Survey potential new habitats with food plants for presence of *T. luteus*, especially in National Parks and flora reserves.
3. Assess potential to protect, acquire and manage areas where *T. luteus* is currently known to occur.
4. Establish schedules for weed and fire control, and provide signage for habitats.
5. Rehabilitate sites for long-term protection.
6. Encourage community participation in site rehabilitation, food plant propagation and enrichment at selected sites.
7. Establish a schedule for recovery of *T. luteus*.

Can recovery be carried out with existing resources? No.

Resources required:

Action*		$
1	Surveys and mapping	5,000.00
2	Site rehabilitation, plant propagation and cultivation	10,000.00
Total		15,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisation: South Australian Department of Environment, Heritage and Aboriginal Affairs.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 1997a. Additional range extensions, new food plant recording and biology for some rare South Australian butterflies, including the life history for *Candalides cyprotus cyprotus* (Oliff). Victorian Entomologist 27: 7–14.

Grund, R. 1997b. Butterfly conservation in southern Eyre Peninsula. Department for Environment Heritage and Aboriginal Affairs, South Australia.

Grund, R. 1999. Butterfly conservation in the southern Flinders region. Department of Environment Heritage and Aboriginal Affairs, South Australia.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department for Environment Heritage and Aboriginal Affairs, South Australia.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Le Souef, J.C. 1976. Collecting butterflies with a chain saw. Victorian Entomologist 6: 43–44.

Yen, A.L. & Butcher, R. J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered Species Program, Environment Australia, Canberra.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites phigalia phigalia* (Hewitson)

National Conservation Status: No Conservation Significance; South Australia: Vulnerable [VUb,c].

Range: South Australia, Victoria, New South Wales, Australian Capital Territory.

Distribution: Mount Lofty Ranges, South Australia. Widespread and abundant elsewhere in southeastern Australia.

Taxonomy: One of two subspecies *of T. phigalia*. *T. p. philus* Waterhouse (Queensland) is commonly larger than typical *T. p. phigalia*, and differs in ground colour of the wings and in that the upperside hind wing orange bands are often dissected by dark veins (Atkins 1999).

Habitat and key ecological features: The general habitat includes a variety of heathlands and sclerophyll woodlands containing one or more species of *Lomandra*, the larval food plant. The only known population of *T. p. phigalia* in South Australia is within an area of about 25 sq. km. in the Mount Lofty Ranges. The species is at the edge of its range in South Australia and it was not encountered in the lower southeastern region by Grund and Hunt (2000).

History of conservation concern: The very narrow distribution of *T. p. phigalia* in South Australia, where it is at the edge of its range, has aroused concern among local lepidopterists. However, it has not been listed formally on any protection schedule despite belief that it may be Vulnerable in the State, as listed by Grund (2001). Braby (2000) noted it as of regional or local concern in southeastern South Australia. The butterfly has apparently always been localised in that State, and may have become extinct at least one other locality.

Major threatening processes: Fisher (1978) noted that the butterfly 'now appears to have become quite rare due to the clearing of the open-forest or woodland formations which it once inhabited'. However, Grund (1997) noted its restriction to a few remnant woodlands where it is largely free from disturbance.

Is knowledge sufficient to formulate recovery action? In part. More extensive surveys are needed to determine whether other populations of *T. p. phigalia* occur in the Mount Lofty Ranges, and the extent and security of these.

Recovery needs:

1. Increase security of the habitat for the known population in the Mount Lofty Ranges.

Can recovery be carried out with existing resources? No. Although the main survey needs are not extensive, there is no allocated funding to facilitate these.

Resources required:

Action*		$
1	Survey of extent of *T. p. phigalia* in Mount Lofty Ranges, to be undertaken over two seasons.	6,000.00
Total		6,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Other needs are at present indeterminate.

Lead organisations: Department of Environment Heritage and Aboriginal Affairs, South Australia; BCSA Inc.

References:

Atkins, A.F. 1999. The skippers, *Trapezites* (Hesperiidae), pp. 75–104 *in* Biology of Australian butterflies (eds Kitching, R.L., Scheermeyer, E., Jones, R.E. and Pierce, N.E.). CSIRO, Melbourne.

BCSA Inc.,1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss proposed nominations of threatened South Australian butterflies.

Braby, M.F. (2000). Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

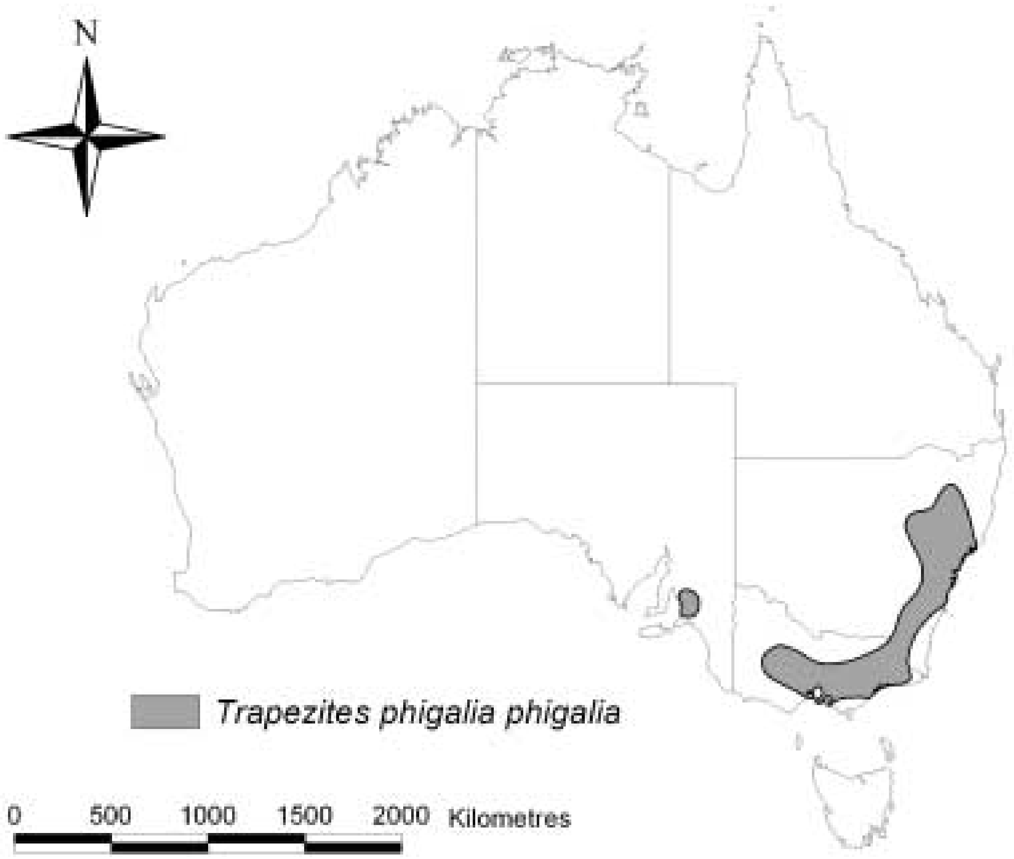
Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 1997. Additional range extensions, new food plant recording and biology for some rare South Australian butterflies, including the life history for *Candalides cyprotus cyprotus* (Oliff). Victorian Entomologist 27: 7–14.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department for Environment Heritage and Aboriginal Affairs, South Australia.

Distribution of *Trapezites phigalia phigalia*



HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites sciron eremicola* Burns

National Conservation Status: No Conservation Significance

Range: Victoria, South Australia.

Distribution: Wyperfeld National Park, Big and Little Desert National Parks, central western Victoria; Eyre Peninsula, Ngarkat and Hincks Conservation Parks, South Australia.

Taxonomy: *T. sciron* is a distinctive species most closely related to *T. atkinsi*.

Infra-specific relationships or variation: Another subspecies, the nominotypical *sciron*, from Western Australia, can be distinguished from ssp. *eremicola* by its more obscure markings and smaller hindwing spots beneath (Common and Waterhouse 1981). Variation has been reported by Braby (2000) including some geographical differences in the genitalia.

Habitat critical to survival: In both states, this species occurs in open heath communities where its food plants, *Lomandra* spp. are present.

History of conservation concern: The subspecies was listed as threatened by Hill and Michaelis (1988) and Douglas (1993) described the subspecies as rare in Victoria. Fisher (1978) noted that very few specimens of this species were known from South Australia, but subsequently (Fisher 1980, 1984) located it in Ngarkat and Hincks Conservation Parks. It occurs in at least three national parks in Victoria (Braby 2000) and Grund (1997) found it in several areas of the southern Eyre Peninsula. It was not considered threatened by participants at all BAP Workshops.

Major threatening processes: Braby (2000) mentioned that survival was dependent on unburnt patches of habitat.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

BCSA Inc.,1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss proposed nominations of threatened South Australian butterflies.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1993. The National Conservation Status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Part 3: Family Hesperiidae. Report to Department of Conservation and Natural Resources, Victoria.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Fisher, R.H. 1980. A new distribution record for *Trapezites sciron*. Victorian Entomologist 10: 64.

Fisher, R.H. 1984. Life history of the sciron skipper, *Trapezites sciron eremicola* Burns (Lepidoptera: Hesperiidae) Transactions of the Royal Society of South Australia 108: 131–132.

Grund, R. 1997. Butterfly conservation in southern Eyre Peninsula. Department for Environment Heritage and Aboriginal Affairs, South Australia.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites symmomus soma* Waterhouse

National Conservation Status: No Conservation Significance; South Australia: Lower Risk (Least Concern)

Range: Victoria, South Australia.

Distribution: Southern Victoria, west from Wilsons Promontory; Millicent area, far southeastern South Australia.

Taxonomy: *Trapezites symmomus* is the largest species of a genus endemic to Australia.

Infra-specific relationships or variation: Subspecies. *soma* is one of three subspecies of *T. symmomus*, very similar to the nominate subspecies but with larger and more prominent bluish white spots on the underside of the hind wings. These markings are strongly reduced in *T. s. sombra* Waterhouse.

Habitat and key ecological features: All forms of *T. symmomus* are associated with a variety of habitats, but depend on species of *Lomandra* growing in damp areas as larval food plants. *T. symmomus* thus occurs in areas such as coastal dunes, swamps and gullies, clearings of heathlands, and *Eucalyptus* woodlands (Atkins 1999), from sea level to about 1400 m.

History of conservation concern: Concern was raised at the BAP Workshop held in Adelaide. The subspecies has a broad distribution in southern Victoria and its range extends marginally across the border into South Australia, where it is considered to be potentially at risk because of losses of *Lomandra longifolia*, and where it is a recent discovery (Grund and Hunt 2000). Although at least two populations occur in reserves (one in a conservation park, one in reserve forest), the butterfly is very local in South Australia. Indeed, it was not reported by Fisher (1978), and Atkins (1999) noted only 'possibly also south eastern South Australia' in his comments on range. It is thus a relatively recent discovery in the State's butterfly fauna, and land clearing is feared to threaten the subspecies before its area of occupancy can be determined fully. Little formal concern has been expressed over conservation need for this taxon, and it has not been listed on any state schedule of protected taxa, although Grund (2001) regarded it as Vulnerable in South Australia. The subspecies has No Conservation Significance in Victoria.

Major threatening processes: Declines associated with clearing of vegetation containing its food plants.

Is knowledge sufficient to formulate recovery actions? Yes, with the provision that the relatively good knowledge of the species' biology must be augmented by additional appraisal of local distribution and threats.

Recovery needs: The species is considered likely to be easily recovered in gardens and parklands. The major need is for surveys in southeastern South Australia to clarify the incidence and distribution of *T. s. soma*, and the vulnerability of sites at which it occurs. Should more specific threats be found, more focused management will be needed to alleviate these. Possible options, pioneered for this subspecies in Victoria (Braby 1991), include restoration of sites by planting local *Lomandra*, and translocation of the butterfly. Examination of cultivated *L. longifolia* should be a priority for locating additional populations.

Can recovery be carried out with existing resources? No. Surveys needed are quite extensive, together with evaluation of the butterfly's status and vulnerability. Costs are at present indeterminate. Survey costs can be effectively reduced by combining with surveys for other taxa in the same region: *T. eliena* (no. 62) is an obvious candidate for conjoint surveys. Local community bush regeneration groups should be encouraged to include *L. longifolia* in their bushland rehabilitation projects, since other subspecies have responded very positively to this action.

Resources required:

Action		$
1	Surveys and mapping	5,000.00
2	Site rehabilitation, plant nursery cultivation over 2 years	10,000.00
Total		15,000.00

Lead organisations: South Australian Dept of Environment, Heritage and Aboriginal Affairs; BCSA Inc.

References:

Atkins, A.F. 1999. The skippers, *Trapezites* (Hesperiidae), pp. 75-104 in Biology of Australian butterflies (eds Kitching, R.L., Scheermeyer, E., Jones, R.E. and Pierce, N.E.). CSIRO, Melbourne.

Braby, M. 1991. City butterflies go bush. Wildlife Australia 28: 20-21.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department for Environment Heritage and Aboriginal Affairs, South Australia.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites symmomus sombra* Waterhouse

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: From near Mossman to the Bluewater State Forest, mainly above 300 m altitude. *T. symmomus sombra* may also occur near Mackay (Braby 2000).

Taxonomy: The species is the largest member of its genus. Three subspecies of *Trapezites symmomus* are recognised.

Infra-specific relationships or variation: The size of specimens and shade of the post median band on underside of *T. symmomus sombra* varies considerably. Subspecies *sombra* is paler than the nominotypical subspecies and the spots beneath the hind wing are smaller in number.

Habitat critical to survival: *T. symmomus sombra* is seasonally abundant wherever the food plant, mainly *Lomandra longifolia*, occurs in moist, shaded areas, especially near rainforest. The subspecies is sometimes common at Kuranda, breeding on cultivated *L. longifolia*.

History of conservation concern: Dunn et al. (1994) considered this subspecies to be rare. This taxon is currently listed as 'common' but is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994) (QPWS 1994). Dunn et al. (1994) remarked that this subspecies occurred in several state forests and national parks and was unlikely to be in any immediate danger. The species occurs in gardens and is now more abundant than previously (unpublished) due to extensive cultivation of its food plant, *L. longiflora*. This trend is occurring with other subspecies of *T. symmomus*, especially in southeastern Queensland.

Major threatening processes: None recognised. Fire occasionally reduces the abundance of the species (Dunn et al. 1994), but it rapidly re-colonises when the food plants regenerate.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is not threatened and recovery actions are not needed.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

QPWS (1994). Queensland Nature Conservation (Wildlife) Regulation (1994).

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites taori* Atkins

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Blackdown Tablelands, Isla Gorge and Springsure (Atkins 1997). Atkins (1997) predicted that the species probably occurs in several other national parks where sandstone flora is predominant.

Taxonomy: Based on the limited known distribution of the species, *T. taori* was initially considered to be an inland form of *T. symmomus* (Common and Waterhouse 1981) but was subsequently shown by Atkins (1997) to represent a distinct species. *T. taori* is most closely related to *T. iacchoides* and not as closely related to *T. symmomus* (Atkins 1997).

Infra-specific relationships or variation: Very little variation has been noted in *T. taori* except in size of spots and wingspan (Atkins 1997, Braby 2000).

Habitat critical to survival: On the Main Divide among open sandstone plant communities and clearings in woodland near ridges, where flowers of *Xanthorrhoea* sp., *Banksia* sp. and *Leptospermum* sp. provide nectar for adults. The food plants for larvae are not known but are likely to be *Lomanda* spp. (Atkins 1997).

History of conservation concern: Little has been documented except by Atkins (1997). None of the habitats is known to have been destroyed. The apparent restricted distribution suggests that further surveys are necessary to find the actual range of this species. Atkins (1997) considered that the species is probably much more widely distributed than currently known. The Queensland conservation authority (QPWS) is strongly urged to encourage surveys in suitable national parks in central inland Queensland so that a more accurate assessment can be made for this species.

Major threatening processes: Atkins (1997) implied that intense seasonal fires may pose a threat to this species. All known habitats for *T. taori* are secure in national parks.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Recovery actions are not needed. However, surveys in national parks with apparently suitable habitat are recommended to determine if the distribution is more widespread than currently known.

References:

Atkins, A. 1997. Two new species of *Trapezites* Hübner (Lepidoptera: Hesperiidae) from eastern Australia. Australian Entomologist 24: 7–26.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

HESPERIIDAE: TRAPEZITINAE

Scientific name: *Trapezites waterhousei* Mayo and Atkins

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: Paynes Find, Southern Cross, South Wilgoyne Nature Reserve, Koolyanobbing Range, Mount Jackson and Southern Cross (Mayo and Atkins 1992, Williams et al. 1996, Williams and Atkins 1997, Braby 2000).

Taxonomy: *T. waterhousei* is closely related to *T. sciron* and *T. argenteoornatus* (Mayo and Atkins 1992).

Infra-specific relationships or variation: The spots on both surfaces of the wings of *T. waterhousei* are said to vary in size and intensity (Braby 2000).

Habitat critical to survival: Open eucalypt woodland and acacia shrub lands where the herbaceous food plant, *Xerolirion divaricata*, occurs (Williams and Atkins 1997). Most of the known colonies for *T. waterhousei* were said by Braby (2000) to be reproductively isolated.

History of conservation concern: Dunn et al. (1994) suggested that *T. waterhousei* was insufficiently known, and it was said to be 'rare' by Williams et al. (1996). Participants at BAP Workshops agreed to this status for *T. waterhousei* but several suggested that thorough surveys are needed to determine the distribution of this species (suggested by Dunn et al. 1994) and the need to examine tenure of the habitats. The species is locally very abundant (R. Mayo pers. comm.) and 11 localities are currently known for *T. waterhousei* (Williams et al. 1996).

Major threatening processes: Dunn et al. (1994) identified no threats to *T. waterhousei* but considered that clearing of habitat and insecticidal spray drift were potentially threatening. Fire and weed invasions were identified by Williams et al. (1996) as potential threats, and Braby (2000) stated that the habitat had been fragmented by agricultural activities. However, no known habitats have been destroyed since the species was first discovered.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not currently threatened but actions are required to ensure that threats do not develop. Further surveys are required to determine if other habitats remain undiscovered and to investigate the tenure of known habitats. For known habitats (Williams et al. 1996), measures should be taken to ensure threats are minimised and if possible, secured as protected plant communities. Should habitats be privately owned or leasehold, means for their preservation should be investigated by appropriate state conservation authorities. Disturbance of any would lead to upgrading of the National Conservation Status of this species.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Mayo, R. and Atkins, A.F. 1992. *Anisyntoides* Waterhouse (Lepidoptera: Hesperiidae): a synonym of *Trapezites* Hübner, with description of a new species from Western Australia. Australian Entomological Magazine 19: 81–88.

Williams, M.R., Williams, A.A.E., Lundstrom, T.D. and Hay, R.W. 1996. The distribution of Waterhouse's skipper *Trapezites waterhousei* Mayo & Atkins (Lepidoptera: Hesperiidae) in Western Australia. Australian Entomologist 23: 83-85.

Williams, M.R. and Atkins, A.F. 1997. The life history of *Trapezites waterhousei* Mayo & Atkins (Lepidoptera: Hesperiidae: Trapezitinae). Australian Entomologist 24: 1–4.

PAPILIONIDAE: PAPILIONINAE

Scientific name: *Cressida cressida cressida* (Fabricius)

National Conservation Status: No Conservation Significance; New South Wales: Data Deficient.

Range: Queensland, New South Wales.

Distribution: Torres Strait Islands, Cape York Peninsula, Queensland to Trial Bay, New South Wales.

Taxonomy: *Cressida* is a monotypic genus, with *C. cressida* occurring in mainland Australia, Torres Strait, Papua New Guinea, Timor and Tanimbar (Parsons 1989, Braby 2000).

Infra-specific relationships or variation: Three subspecies of *C. cressida* have been described (one from Papua New Guinea), but ssp. *cassandra* from Western Australia and Northern Territory was not recognised as distinct by Braby (2000). Females of ssp. *cassandra* are variable in the extent of scaling on the hind wings, and they are more heavily marked and differ significantly from ssp. *cressida*.

Habitat critical to survival: *C. c. cressida* occurs widely in a range of habitats in Queensland including areas some distance from the coast. In northern New South Wales it occurs in open eucalypt woodlands in coastal areas, and sometimes near the edge of closed forest or rainforest. Its main native host plants are prostrate *Aristolochia* spp. (*pubera* group) and in New South Wales, occasionally small or low growing plants of *Pararistolochia praevenosa* or cultivated *Aristolochia. acuminata* (=*A. tagala*). Females sometimes deposit their eggs on leaves of the introduced weed, *Aristolochia elegans*, which is poisonous to the larvae when they attempt to feed, but occasionally larvae are able to complete development by feeding on the flowers and possibly on developing seed capsules of this plant.

History of conservation concern: Data Deficient status was proposed for New South Wales populations at the BAP Workshop held in Sydney. This subspecies is abundant and not at risk in Queensland.

The species has declined in New South Wales but is not as yet considered to be threatened. Many of the habitats in northeastern New South Wales have been destroyed from urban development and the butterfly is apparently not often seen in that State. Although very little is known about the species or its food plants south from the Clarence River to Trial Bay, subsequent evaluation has not supported a serious level of concern and isolated pockets of the butterfly continue to breed in national parks where the species is secure.

Major threatening processes: Urban development in New South Wales, especially on the coast between the Richmond and Tweed Rivers.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. The species is near the edge of its range in northern New South Wales. Although the species is not deemed threatened, surveys are recommended to determine if this species is secure in the few national parks where it is known to occur.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

PAPILIONIDAE: PAPILIONINAE

Scientific name: *Graphium macleayanum insulanum* (Waterhouse)

National Conservation Status: Data Deficient

Range: Lord Howe and Norfolk Islands.

Taxonomy: *Graphium macleayanum* occurs in eastern Australia including Tasmania, as well as very occasionally, Papua New Guinea. It is most closely related to *G. weiskei* (Ribbe) from Papua New Guinea.

Infra-specific relationships or variation: None known but ssp. *insulanum* was said to have broader dark margins and larger subterminal spots than ssp. *macleayanum* (Common and Waterhouse 1981).

Habitat critical to survival: Habitat requirements have not been defined clearly. This subspecies has not been recorded recently from Lord Howe or Norfolk Islands (Smithers 1970, Braby 2000).

History of conservation concern: At the BAP Workshop held in Sydney, C.N. Smithers informed the participants that the subspecies had not been collected for many years and that it may not be permanently established on Norfolk Island.

Major threatening processes: None known. The probable food plants are widely distributed on Lord Howe Island and most habitats are likely to be secure.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Surveys for butterflies incorporating investigations on this and other species are recommended for Lord Howe and Norfolk Islands to establish the National Conservation Status of butterflies on these islands and identify any threatening processes.

Resources required:

Action		$
1	Surveys on Norfolk Island	15,000.00
2	Taxonomic studies	5,000.00
Total		20,000.00

Lead Organisations: Environment Australia, New South Wales National Parks and Wildlife Service, Environment Australia.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Smithers, C.N. 1970. Norfolk Island butterflies. Australian Entomological Press, Greenwich, NSW.

PAPILIONIDAE: PAPILIONINAE

Scientific names: *Ornithoptera euphorion* (Gray); *Ornithoptera priamus* ssp. (Linnaeus)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: *O. euphorion* occurs from Mt Webb (north of Cooktown) to Proserpine, near Eungela and Mackay. *O. priamus* occurs throughout much of mainland New Guinea, neighbouring islands, Torres Strait islands, Solomon Islands, Maluku islands. Subspecies in Australia are discrete geographically: *O. p. macalpinei* occurs from Claudie River to Coen and Port Stewart; *O. p. pronomus* from Cape York Peninsula and Thursday Island; and *O. p. poseidon* is abundant on northern Torres Strait islands and parts of lowland New Guinea.

Taxonomy: Braby (2000) and others have regarded *O. euphorion* as a further subspecies of *O. priamus*, but opinions on this are divided. *O. priamus* (s.l.) is very variable in appearance, and some 18 subspecies have been designated in various parts of its range. It is still by no means clear whether the four taxa considered here for Australia are distinct. Hancock (1983) considered *O. euphorion* distinct, as the sister species to *O. richmondia*, and we follow this course here.

Habitat and key ecological features: These species are associated with rainforest but on the coast also often breed in open woodlands. The larval food plants include a variety of native Aristolochiaceae vines. As with *O. richmondia*, females also lay on the introduced *Aristolochia elegans*, and several other introduced species, the foliage of which is toxic to larvae. Adults are strong flyers and can be found throughout the year. *O. euphorion* has responded positively to the wide cultivation in gardens and parks of one of its larval food plants, *Aristolochia acuminata*. The species is now more abundant in urban areas than in previous years.

History of conservation concern: '*Ornithoptera* species other than *richmondia*' are currently listed for protection as 'Common' under Queensland Nature Conservation (Wildlife) Regulation (1994), in part as a historical legacy since earlier listing of '*Ornithoptera* spp.' under the Fauna Protection Act 1974 at that time. Dunn et al. (1994) or Braby (2000) did not note the species as of any conservation concern.

The current listing in Queensland of 'Common' species including *O. euphorion* and subspecies of *O. priamus* for protection is anachronistic, and confusing to those who regard listing of species of insects for protection to be a responsible action necessitated by genuine conservation need. The motivation for initial conservation concern and listing appeared to be related to fears of commercial over-exploitation of these large showy butterflies, which are adopted widely as emblems. This stemmed from perceived activities during the early 1970s, and was based on poor information and precautionary approaches. All the taxa are secure, with much suitable habitat conserved in reserves, including World Heritage Area. If it is deemed desirable to restrict collecting these species because of their significance as 'symbols for ecotourism' or some similar purpose (see also *P. ulysses*), this should be made abundantly clear by the listing authority, so that there is no public confusion of perception between these and truly deserving species in need of conservation attention. None of the Australian subspecies of *O. priamus* are of conservation significance overseas.

Major threatening processes: No specific threats have been defined beyond limited habitat clearance on the coast. As for *O. richmondia* and other species with larvae that feed on Aristolochiaceae, spread of *A. elegans* may prove a hazard, but the butterflies have not declined – and have increased in abundance somewhat in recent decades. As Sands (1990) and others have noted, fears of commercial overcollecting are poorly founded, and there is no objective evidence that this is (or has been) a threat to *O. euphorion* and *O. priamus* in Australia. Commercial breeders of these species usually rear high quality specimens from eggs and avoid collecting material from the field unless for 'starting' cultures.

Is knowledge sufficient to formulate recovery action? Yes. No recovery is needed. The sole action recommended is clarification of the reason behind any listed status if it is to be maintained or, preferably, deleted these species from any list of protected taxa in Queensland. Commercial captive breeding of the species should be encouraged as a means to alleviate any concerns relating to collecting from the wild.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Hancock, D.L. 1983. Classification of the Papilionidae (Lepidoptera): a phylogenetic approach. Smithersia 2, 1–48.

Sands, D.P.A. 1990. Australia's endangered butterflies. News Bulletin of the Entomological Society of Queensland 18, 63–68.

PAPILIONIDAE: PAPILIONINAE

Scientific name: *Ornithoptera richmondia* (Gray)

National Conservation Status: No Conservation Significance; Queensland: Lower Risk (Least Concern)

Range: New South Wales, Queensland.

Distribution: Originally from the Clarence River, near Grafton, New South Wales to Maryborough, Queensland. In Queensland extinction of *O. richmondia* occurred at Mary River Heads near Maryborough in 1959 and at Rainbow Beach and Noosa Heads in 1984. The current northern confirmed limit is a coastal site near Kin Kin. Small remnants of rainforest habitats are located mainly on creek banks from Yandina, Nambour, Mapleton, Palmwoods, Maleny, Peachester, Neurem, from Woodford to Beerburrum and Mt Mee. The current southern limit of the species in New South Wales is Blackwall Range near Wardell, the northwestern limit is Dairy Flat near Woodenbong and the southwestern limit is Cherry Tree State Forest on the Richmond Range near Mallanganee.

Taxonomy: *O. richmondia* is one of three species in the genus found in eastern Australia. It is closely related to *O. euphorion* but differs in a number of morphological characteristics as well as its biology.

Infra-specific relationships or variation: Variation in *O. richmondia* (form *reducta*) was described from the southern part of its range but its status as a subspecies has not been validated (Haugham & Low 1979). Adults differed from populations found north of the Richmond River, by lack of a green band on the inner edge of the forewing, and broader black margin of the hind wing in males. One population apparently of 'form *reducta*' has been located and needs to be investigated for its taxonomic and conservation significance.

Habitat critical to survival: Rainforest containing the vines *Pararistolochia* spp. *O. richmondia*, was once common from Grafton in northern New South Wales to Maryborough in Queensland, wherever the lowland rainforest vine, *Pararistolochia praevenosa*, the food plant for its larvae, was present. Less than 1% of the original rainforest now remains in northern New South Wales and southeastern Queensland. The vine *P. praevenosa* is also known to have occurred in small patches of rainforest growing in sand dunes where there is a high water table. These areas have been under threat from coastal development with several significant habitats in southeastern Queensland destroyed in recent years. At higher altitudes, mainly above 1000 metres on the New South Wales-Queensland Border Ranges, a second species of vine, *P. laheyana* is an important larval food plant. Although most of the rainforest containing *P. laheyana* is secure within national parks and *P. laheyana* is very abundant, the Richmond birdwing colonies in the high country experience periods of low densities or natural extinctions in some years, believed to be due to climatic stress. These extinctions are followed by gradual re-colonisation by immigrants from the lowland populations.

History of conservation concern: This was summarised by Sands et al. (1997). Dunn and Dunn (1991) and Dunn et al. (1994) considered *O. richmondia* to be 'rare' and overlooked the only temporary establishment of the species at high altitudes in national parks, while Braby (2000) considered the species was of conservation concern. It is currently listed as Vulnerable and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). This species is now assessed as Lower Risk and is recommended as a 'Rehabilitated Taxon' (see Introduction), having formerly been considered Vulnerable in Queensland. De-listing to 'Rehabilitated Species' is recommended as a priority recovery action for *O. richmondia* because the information currently available, and the highly successful recovery actions, do not support its current status as a threatened species in Queensland or New South Wales. The listing as threatened was based on the earlier contraction in distribution and the few protected habitats.

The species was once abundant and widespread throughout southeastern Queensland from Maryborough to the New South Wales border, and south to the Clarence River. The species has disappeared from about 2 / 3 of its range and until about 1997, continued to decline rapidly in areas where it was considered to be stable. Insufficient secure, lowland rainforest habitats were able to sustain survival of the butterfly prior to implementation of a recovery plan. *O. richmondia* has disappeared from about two thirds of its original range. There are no colonies north of Kin Kin, near Maryborough or Gympie in Queensland, or south of Wardell, on the Richmond River in New South Wales. *O. richmondia* is now extinct in the Grafton and lower Clarence River area of New South Wales. An area of extinction of has also occurred in the middle of the range between Caboolture and Nerang, but temporary colonies now develop in the suburbs of Brisbane following recovery actions. Near Brisbane, breeding sites at Burpengary, Mt Nebo, Bardon and near the base of Mt Coot-tha were destroyed in the mid-1980s.

Major threatening processes: Destruction of lowland rainforest containing the food plant, *Pararistolochia praevenosa*. Many of the habitats of *O. richmondia* have been destroyed from urban development, fire regimes, rainforest clearing, weed invasion and farming activities. *P. praevenosa* occurs in lowland, subtropical rainforest (<600m) on basaltic slopes, creek banks and volcanic alluvial soils bordering rivers and streams. Culture, presence and spread in bushland of the South American weed, *Aristolochia elegans*, which attracts oviposition by the butterflies but is toxic to the larvae (Straatman 1962), is a serious threatening process.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate and many actions have been implemented. *O. richmondia* should be considered a Rehabilitated species. Recovery has occurred (by 1999) on the Sunshine Coast, near Beerwah and in the Tallebudgera Valley, in southeastern Queensland, and near Alstonvillle in New South Wales.

A major effort has been made by members of community groups towards cultivation of the lowland food plant, *P. praevenosa*. The original stocks were collected from several sources including the Nerang River and at Mount Tambourine in southeastern Queensland (D.P.A. Sands) and in northern New South Wales from near Lismore (R. Moffatt pers, comm.). A reviewer was incorrect in stating that almost all plants in cultivation had descended from one plant and that the plants were liable to suffer from serious inbreeding or disease problems.

Actions required to sustain recovery:

1. Management of secure habitats, acquisition of unprotected habitats.
2. Continued surveys and mapping, acquisition and preservation of areas where land tenure of habitats are insecure.
2. Management of weeds, especially *Aristolochia elegans*, and long-term rehabilitation of habitats.
3. On-going community participation in a Recovery Plan, especially towards habitat rehabilitation, plant propagation and cultivation.

Can recovery be carried out with existing resources? Yes, to a large extent. Recovery has been achieved with funds contributed by a TSN Community Grant (NHT / WWF) and Bayer Australia. However, more remaining unprotected habitats should be preserved and management of populations is needed to maintain *O. richmondia* as a rehabilitated species.

Resources required:

Action		$
1	Management of protected habitats	15,000.00
Total		15,000.00

Timeframe for Rehabilitation of Taxon

- In train current
- Completed 3 years
- De-listing now recommended

Lead Organisations: New South Wales National Parks and Wildlife Service, Queensland Parks and Wildlife Service, CSIRO Entomology, Environment Australia.

References:

Dunn, K. L. and Dunn, L.E. 1991. Revision of the Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Haugum, J and Low, A.M. 1978–79. A Monograph of the Birdwing Butterflies. Vol. 1 (2). Scandinavian Science Press, Klampenborg.

Sands, D.P.A., Scott, S.E. and Moffatt, R. 1997. The threatened Richmond birdwing butterfly (*Ornithoptera richmondia*) [Gray]: a community conservation project. Memoirs of the Museum of Victoria 56: 449–453.

Sands, D.P.A 1999. National Conservation Status of Lepidoptera: assessment, threatening processes and recovery actions. pp. 382-387 in (eds W. Ponder and D. Lunney), The Other 99%. The Conservation and Biodiversity of Invertebrates. Transactions of the Royal Zoological Society of New South Wales, Mosman.

Straatman, R. 1962. Notes on certain Lepidoptera ovipositing on plants which are toxic to their larvae. Journal of the Lepidopterists Society 16: 99–103.

PAPILIONIDAE: PAPILIONINAE

Scientific name: *Papilio ulysses joesa* Butler

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Northeastern Queensland. The disjunct range extends from Thursday Island (Torres Strait) and northern Cape York to Townsville, Bowen, Byfield and Sarina.

Taxonomy: *P. ulysses* Linnaeus, the ulysses swallowtail, occurs throughout New Guinea and the Solomon Islands to Australia, and about 14 subspecies have been recognised over this broad range (Braby 2000). *P. u. joesa*, the only Australian representative, is endemic and varies little in appearance.

Habitat and key ecological features: Although primarily a rainforest butterfly, *P. ulysses* has recently expanded its range to become well established in some suburban areas, as a direct consequence of the planting of *Melicope elleryana*, an important larval food plant, as an ornamental. Larvae feed mainly on species of *Melicope* (formerly *Euodia*), of which several species are popular in cultivation. Braby (2000) summarised other food plant records, including *Geijera* spp., *Halfordia kendack*, *Acradenia euodiformis* and *Citrus*. Eggs are laid singly or in small groups on smaller trees. *P. ulysses* flies throughout the year, but is most abundant during the wet season. Males are attracted to blue objects (such as metallic foil). It is easily bred in captivity, but long term sustainability of colonies can be thwarted by appearance of otherwise latent viruses after several generations.

History of conservation concern: As for *Ornithoptera euphorion* and *O. priamus*, *P. ulysses joesa* is listed currently for protection as 'Common' under Queensland Nature Conservation (Wildlife) Regulation (1994), as a historical legacy from earlier listing under the Fauna Protection Act 1974. The initial listing was apparently stimulated through fears of the effects of commercial exploitation on this important 'flagship' butterfly for promoting tourism in northern Queensland. The species was not regarded as of conservation concern by Dunn et al. (1994), who reiterated earlier comments (which apply also to *O. priamus* s.l.) that they are 'common taxa present in several habitat formations including urban areas, and known from numerous sites'. The habitat (particularly upland rain forest) appears to be sufficiently secure, and includes areas within World Heritage Areas and other reserves. Recent expansion of range into suburban areas suggests that there is no need for conservation concern for *P. ulysses joesa* at the present time. As with *O. euphorion* and *O. priamus*, any continuation of protective listing for this species should be justified firmly, and confusion between this and species in need of practical conservation measures be clarified.

Major threatening processes: None recognised. The sole concern expressed has been fear of over-collecting for commercial purposes. This fear has never been quantified, and appears to be entirely without foundation, however well motivated. Protection of this and other insects when no threats can be identified, detracts from the value of the listing process for truly threatened species.

Is knowledge sufficient to facilitate recovery action? Yes. The biology of the butterfly is well known. No recovery actions are necessary. Commercial captive breeding should be encouraged as a means of alleviating any concerns about collecting specimens from the wild.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

PAPILIONIDAE: PAPILIONINAE

Scientific name: *Protographium leosthenes geimbia* (Tindale)

National Conservation Status: No Conservation Significance

Range: Northern Territory.

Distribution: Alligator River, Little Nourlangie Rock, probably Ubirr and at several other areas in Kakadu National Park (T. L. Fenner pers comm.).

Taxonomy: Two subspecies of *P. leosthenes* are recognised, ssp. *geimbia* being apparently restricted to Northern Territory.

Infra-specific relationships or variation: Subspecies *geimbia* is considerably darker than the nominotypical ssp., and the edging of the tails is without the white present on the other subspecies (Braby 2000).

Habitat critical to survival: *P. leosthenes geimbia* appears to be adapted to the sandstone escarpments where its food plant, *Melodorum rupestre* occurs in vine thickets on the steep slopes. In common with the nominotypical subspecies, pupae of ssp. *geimbia* undergo protracted development which is believed to affect the numbers seen in the field at any one time and perhaps, leading to the impression of its rarity (T.L. Fenner pers. comm.).

History of conservation concern: Dunn et al. (1994) stated that this subspecies was rare prior to the discovery of its habitat and biology. T.L. Fenner discovered its food plant and life history in Kakadu National Park. None of its known habitats has been seriously disturbed.

Major threatening processes: None recognised. The subspecies is well established and secure in specific habitats in Kakadu National Park.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. No recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

PIERIDAE

PIERIDAE: PIERINAE

Scientific name: *Appias albina albina* (Boisduval)

National Conservation Status: Data Deficient

Range: Northern Territory, Queensland. The species occurs from India, throughout South Asia, Philippines and mainland New Guinea.

Distribution: Darwin, Cobourg Peninsula, Cape Wessel, Rimbija Island, Northern Territory and Moa, Thursday and Prince of Wales Islands, Torres Strait.

Taxonomy: A number of subspecies of *A. albina* occur widely in South Asia and Papua New Guinea as well as Australia.

Infra-specific relationships or variation: Other subspecies occur in India and Taiwan. Nothing is known of variation in Australian material.

Habitat critical to survival: *A. albina* is associated with dry vine thickets. The most recent record, a very fresh specimen, was collected at East Point near Darwin at the edge of monsoon rainforest (G. Miller pers. comm.). Larvae probably feed on a *Capparis* sp., the food plants overseas (Common and Waterhouse 1981) including in Malaysia. These plants are well represented at localities where *A. albina* has been seen or collected in Northern Territory.

History of conservation concern: Very few specimens of *A. albina* are known from Australia. It has probably been overlooked and mistaken as another more common, similar species. None of the known habitats has been seriously disturbed.

Major threatening processes: None known. Participants at the BAP Workshops in Brisbane, Cairns, Darwin and Canberra, considered that no threats could be identified.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Much more information about its habitats and food plant is needed to assess its National Conservation Status.

Recovery needs: Surveys and mapping for distribution, and detailed studies on its life history are needed in Northern Territory and Torres Strait.

Resources required:

Action		$
1	Surveys in Northern Territory and Torres Strait	22,000.00
2	Biological and ecological community investigations	10,000.00
Total		32,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisation: Parks and Wildlife Commission of the Northern Territory.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

PIERIDAE: PIERINAE

Scientific name: *Delias aganippe* (Donovan)

National Conservation Status: No Conservation Significance

Range: Mainland Australia.

Distribution: Temperate and subtropical mainland Australia, south from about Townsville, Queensland and North West Cape, Western Australia, occasionally central Australia.

Taxonomy: *D. aganippe* is a distinctive endemic species, not closely related to any others in the genus.

Infra-specific relationships or variation: The grey and white areas on the upperside of males can be somewhat variable. There may be some seasonal variation and very rarely the red patches beneath are replaced by yellow.

Habitat critical to survival: *D. aganippe* is an abundant and widespread species occurring in woodlands and sometimes heathlands. It is the only member of the genus that occurs in very dry areas of inland southern Australia. Its food plants include several mistletoes as well as plants belonging to Santalaceae.

History of conservation concern: The only reference to this species as threatened was by Hill and Michaelis (1998) but no other information was provided.

Major threatening processes: None known.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. The species is of no conservation concern.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

PIERIDAE: PIERINAE

Scientific name: *Delias mysis aestiva* Butler

National Conservation Status: No Conservation Significance

Range: Western Australia, Northern Territory.

Distribution: Cape Levique and Derby, Western Australia, Darwin, Kakadu National Park and Adelaide River areas, Northern Territory.

Taxonomy: In addition to another subspecies, *D. mysis onca* Fruhstorfer, another closely-related species, *D. doylei* Sanford and Bennett, occurs in Papua New Guinea.

Infra-specific relationships or variation: Three subspecies of *D. mysis* have been described. However, ssp. *waterhousei* from Cape York Peninsula was not recognised as a distinct subspecies by Braby (2000). Very little variation has been observed in *D. mysis aestiva*. The black margins of the hind wing are broader above and narrower beneath than the nominotypical subspecies.

Habitat critical to survival: *D. mysis aestiva* has been observed in moist eucalypt woodlands at Cape Levique, Western Australia, where adults were observed feeding at flowers of eucalypts. The larvae no doubt feed on various mistletoes.

History of conservation concern: Dunn et al. (1994) described *D. mysis aestiva* as very rare and listed it with 'less threatened taxa'. However, this level of concern has not been expressed by others who have found this species to be local and not uncommon. None of the known habitats has been destroyed and the species is secure in Kakadu National Park. The species was not infrequently observed on the Mitchell Plateau in 1981 (D.P.A. Sands).

Major threatening processes: None known. However, all known habitats are intact and not currently subjected to disturbance.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. This subspecies is not threatened or of conservation concern.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

PIERIDAE: PIERINAE

Scientific name: *Elodina claudia* De Baar & Hancock

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range and Claudie River areas, Cape York Peninsula.

Taxonomy: *E. claudia* is most closely related to *E. perdita*, a species occurring further south in Queensland.

Infra-specific relationships or variation: The colour of the underside was said by Braby (2000) to be variable in females. Those examined by M. De Baar (pers. comm.) were yellow on the underside of the hind wing.

Habitat critical to survival: This species occurs in, or at the edge of rainforest, but its host plant is not known (De Baar and Hancock 1993).

History of conservation concern: Dunn et al. (1994) stated that *E. claudia* was insufficiently known. However, many participants attending the BAP Workshops agreed that the species was abundant and secure in Iron Range National Park and the nearby resources reserve. *E. claudia* has a very restricted distribution which may have led Dunn et al. (1994) to list this species with 'less threatened taxa'.

Major threatening processes: None known or recorded.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. The species is not threatened.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

De Baar, M and Hancock, D.L. 1993. The Australian species of *Elodina* C. & R. Felder (Lepidoptera: Pieridae). Australian Entomological Magazine 20: 25–43.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

PIERIDAE: PIERINAE

Scientific name: *Elodina perdita* Miskin

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Ingham to Mackay, Whitsunday and other islands (De Baar and Hancock 1993).

Taxonomy: *Elodina perdita* is one of seven species of the genus *Elodina* occurring in Australia. *E. perdita* is closely related to *E. claudia* and *E. walkeri*, both occurring further north, and the latter with a much wider distribution.

Infra-specific relationships or variation: *E. perdita* and some similar species are known for their distinctive wet and dry seasonal forms.

Habitat critical to survival: The habitat for *E. perdita* is mainly monsoon forest growing on coastal sand dunes, where the food plant, *Capparis sepiaria*, occurs adjacent to melaleuca swamps and rivers (De Baar and Hancock 1993).

History of conservation concern: *E. perdita* was considered by Braby (2000) to be of national conservation concern. Several populations on the mainland have been degraded or destroyed, especially by habitat conversion for farming. However, a number of secure habitats are known in the Whitsunday Islands, most in national parks (De Baar pers. comm.). Braby (2000) expressed concern that the plant communities supporting populations of the butterfly, mainly melaleuca woodlands, were seriously threatened by clearing. However, M. De Baar (pers. comm.) considered that the number of habitats protected in national parks ensures security of the species. It is secure at a number of localities near Proserpine and on the Whitsunday Islands.

Major threatening processes: Clearing of melaleuca woodlands, usually for planting sugarcane, containing the food plant for larvae of *E. perdita*.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not threatened but the species should be monitored, and the security of its habitats on the mainland requires assessment.

Reference

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

De Baar, M and Hancock, D.L. 1993. The Australian species of *Elodina* C. & R. Felder (Lepidoptera: Pieridae). Australian Entomological Magazine 20: 25–43.

PIERIDAE: PIERINAE

Scientific name: *Elodina tongura* Tindale

National Conservation Status: No Conservation Significance

Range: Northern Territory.

Distribution: Northern coast from Coburg Peninsula to Groote Eylandt, and local islands.

Taxonomy: This species was described as a subspecies of *E. perdita* but was subsequently shown by De Baar and Hancock (1993) to be a distinct species. Braby (2000) considered *E. tongura* to be a wet season form of *E. walkeri*. However, M. De Baar and D. Hancock (pers. comm.) recommend that *E. tongura* should be retained as a separate species until taxonomic studies have been completed on this taxon and the forms of *E. walkeri*. De Baar and Hancock (1993) earlier noted important differences between the two species, in the male genitalia (vesica, cornuti). They considered that *E. tongura* and *E. walkeri* may be sympatric in distribution in Arnhem Land, a concept supported by the collection of specimens identified as both species (De Baar and Hancock pers. comm.) at one coastal locality east of Darwin in October 2000 (D.P.A. Sands pers. comm.).

Infra-specific relationships or variation: *E. tongura* may have wet and dry season forms but insufficient data are available to distinguish them. This will be deferred until its relationship with *E. walkeri* has been elucidated. Specimens from McCluer Island have faint brown subapical markings on the underside of the fore wing (De Baar and Hancock 1993).

Habitat critical to survival: Very little has been recorded about the habitat of *E. tongura* and its food plant has not been discovered. In October 2000, adults agreeing with the figures of De Baar and Hancock (1993) were observed north of Woolner Station flying among the thorny branches of a species of *Capparis*, on which the larvae no doubt feed. They occurred very close to the sea behind coastal marshlands, at the edge of dry monsoon rainforest (D.P.A. Sands).

History of conservation concern: Dunn et al. (1994) considered that *E. tongura* was insufficiently known and listed it with 'less threatened taxa'.

Major threatening processes: No threats have been recorded. Dunn et al. (1994) stated that clearing of land on Groote Eylandt is a potential threat.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

De Baar, M and Hancock, D.L. 1993. The Australian species of *Elodina* C. & R. Felder (Lepidoptera: Pieridae). Australian Entomological Magazine 20: 25–43.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

PIERIDAE: COLIADINAE

Scientific name: *Eurema alitha amplexa* (Butler)

National Conservation Status: Data Deficient

Range: Christmas Island

Taxonomy: About 20 subspecies of *Eurema alitha* have been described but the subspecific status of the Australian populations has not yet been resolved, and the mainland subspecies may be *novaguineensis* Shirôzu and Yata (Braby 2000). *E. alitha amplexa* is recorded from Christmas Island (Moulds and Lauchlan 1987).

Infra-specific relationships or variation: Not recorded.

Habitat critical to survival: Not recorded, but probably grasslands similar to the habitats of the other species in the genus.

History of conservation concern: Only known by the records of Moulds and Lachlan (1987). Participants attending the BAP Workshop in Sydney stated that the conservation significance of this subspecies was unknown. Based on the ecology of other subspecies of *E. alitha* it is unlikely that this subspecies will eventually be of any conservation concern.

Major threatening processes: None identified.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. An assessment can only be made when further specimens and information becomes available.

Resources required:

Action		$
1	Surveys for distribution and life histories	6,000.00
Total		6,000.00

Lead Organisation: Environment Australia.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Moulds, M.S. and Lachlan, R.B. 1987. The butterflies (Lepidoptera) of Christmas Island, Indian Ocean. Australian Entomological Magazine 14: 57–66.

PIERIDAE: PIERINAE

Scientific name: *Leptosia nina comma* Fruhstorfer

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: Mitchell Plateau, Admiralty Gulf, Kalumburu and Cape Bougainville.

Taxonomy: *Leptosia nina* is widely distributed in South Asia but its distribution in Australia is limited to far northwestern Western Australia.

Infra-specific relationships or variation: A number of subspecies of *Leptosia nina* have been described overseas. The Australian subspecies, *comma*, also occurs in Timor and several Indonesian islands southwest of mainland New Guinea (Braby 2000).

Habitat critical to survival: *L. nina comma* occurs on ridges where dry monsoon rainforest grows on bauxite with groundwater seepage, and along creek beds where the food plant, *Capparis* sp. is present. At Mitchell River females were seen ovipositing on a very low and prickly species of another food plant, Capparaceae but not a *Capparis* sp. (G. Tracy pers. comm.)

History of conservation concern: *L. nina comma* was listed as threatened by Hill and Michaelis (1998). None of the known habitats have been destroyed and most are in remote locations some distance from urban or intensive farming activities.

Major threatening processes: Hill and Michaelis (1988) listed bauxite mining as a threat.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. The species is not threatened.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

NYMPHALIDAE: NYMPHALINAE

Scientific name: *Apaturina erminia papuana* Ribbe

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range, Claudie River, Coen.

Taxonomy: The subspecific name, *papuana* is applied provisionally to the Australian population until more material is known from Australia.

Infra-specific relationships or variation: None known. Very few specimens are available for examination.

Habitat critical to survival: The only sightings of *Apaturina erminia papuana* have been made in, or at the edge of, lowland rainforest near Iron Range. In Papua New Guinea the larvae of this species feed on *Celtis latifolia* and are attracted to sap flows. Other native *Celtis* spp. are known from Australia. On Mount White, Coen, a male was observed resting head downwards on a smooth barked tree, a behaviour also observed in Papua New Guinea. On Lamond Hill they have been seen flying along tracks in rainforest, occasionally settling on branches.

History of conservation concern: *A. erminia papuana* was listed as threatened by Hill and Michaelis (1998). However, although very few specimens have been taken (Wood 1981), many have been seen in Iron Range National Park and the resources reserve including Lamond Hill.

Major threatening processes: None reported and none likely to occur. All observations have been in the Iron Range National Park or the nearby protected resources reserve.

Is knowledge sufficient to formulate recovery actions? Yes. No recovery actions are necessary. The Queensland Parks and Wildlife Service should actively encourage studies at Iron Range in an attempt to gain more information about the biology of this interesting species.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Wood, G.A. 1981. First record of *Apaturina erminia* (Cramer) (Lepidoptera: Nymphalidae) from Australia. Australian Entomological Magazine 8: 16.

NYMPHALIDAE: NYMPHALINAE

Scientific name: *Argyreus hyperbius inconstans* (Butler)

National Conservation Status: Data Deficient; Queensland: Vulnerable [VUb].

Range: Queensland, New South Wales.

Distribution: *Argyreus hyperbius inconstans* is recorded (1 specimen) from the vicinity of Mount Bellenden-Ker, northern Queensland (Olliff 1888), and from Rockhampton, Queensland to the Hunter River, New South Wales (Olliff 1889, Rainbow 1907). Most recently it has been recorded in Queensland from Gympie (Lambkin and Lambkin 1977), Eumundi (ANIC), Coolum (I. Knight unpublished) and was reported from the vicinity of Bribie Island (unpublished) between April and July 2001. In New South Wales it is recorded from Condong (Johnston and Johnston 1984), Coraki (ANIC), Dorrigo (ANIC) and near Port Macquarie (Sundholm 1978). Individuals were observed at Billinudgel in November 1994 and April 1998 (D.P.A Sands and S. Scott), and Byron Bay in June 2000 (unpublished). It has been seen and / or collected every year over a period of 16 years, in and south of Limeburners Creek Nature Reserve, Port Macquarie, most recently in June 2000 and 16 April 2001 (R. Mayo). A male was collected south of Limeburners Creek Nature Reserve, Port Macquarie, in April 2001 (J. Moss pers. comm.).

A. hyperbius inconstans was reported to be abundant in Queensland at Gympie at intervals between 1977 and 1994, and in New South Wales near Port Macquarie in 1977, 1985 and 1994.

Taxonomy: *A. hyperbius inconstans* is the only representative of the genus occurring in Australia.

Infra-specific relationships or variation: The subspecies *A. hyperbius inconstans* occurs only in Australia and no geographical variation has been observed. Others include the nominotypical subspecies *hyperbius* L. (from Taiwan), *neumanni* (Rothschild), *taprobana* Moore, *castetsi* Oberthur, *sumatrensis* Fruhstorfer, *javanicus* Oberthur, *sagada* Fruhstorfer and *niugini* Samson. These subspecies are distributed from Ethiopia, Pakistan, India, Sri Lanka, southern China, most of South Asia, Japan, Taiwan to New Guinea. In Papua New Guinea, ssp. *niugini* is abundant in grasslands at altitudes from 1200 to 3000m where the basic life history and the food plant, *Viola betonicifolia*, appear to be the same as the Australian subspecies (M.C. and D.P.A. Sands unpubl.).

Habitat critical to survival: Lambkin and Lambkin (1984) described the biology of *A. hyperbius inconstans*. Its habitat is open, coastal grassy sedgelands and wetlands but it also occasionally occurs in disturbed areas where the food plant *Viola betonicifolia* is abundant, for example, edging the drainage ditches of sugarcane farms. The species may be associated with water course plant communities when its food plant *Viola betonicifolia* is present, sometimes when edged by stands of *Melaleuca quinquinervia*. In the last 10 years it has been observed on occasions between Noosa (previous records from Rockhampton), Queensland and Port Macquarie (early records from Newcastle) New South Wales. Although the food plant occurs widely on the Atherton Tablelands the butterfly has not been recorded from there (G. Wood pers. comm.). *A. hyperbius inconstans* occurs at very low observable densities but sometimes becomes abundant after periods of wet weather and fire (unpublished). Adults are most frequently observed during the cooler winter months.

The ecology of *A. hyperbius inconstans* is perhaps the least understood for any widely distributed Australian butterfly. Although its biology and its food plant (only *Viola betonicifolia*) are well known, the ecological basis for the 'boom and bust' cycles of adult abundance, which are characteristic for this species, are not understood. Adults of this species usually occur at low densities, but on occasions they are locally very abundant (R. Mayo, E. Petri, J. Kerr, S. Johnson, M. DeBaar, T. Lambkin, P. Valentine pers. comm.). It is thought that moderate densities of the food plant, *V. betonicifolia*, in coastal wetlands are necessary to sustain breeding and that the plant responds with major cycles of variation in density following drought. However, the plant is not uncommon, its abundance alone does not influence the abundance of the butterfly and it is widely distributed from sea level to altitudes of more than 1000m. *A. hyperbius inconstans* has also been observed some distance from the coast, for example at Coraki (1958) and at Dorrigo (1974), northern New South Wales. This species was once common in Queensland (Olliff 1889) and it was recorded near Mount Bellenden-Ker (Olliff 1888) before the changes to current land usage of wetlands (mostly sugarcane). The predisposing factors for its 'boom and bust' cycles, mechanisms of its persistent at low densities, its potential for dispersal and re-colonisation, are not understood. Its appearance has always been erratic — hence the name *inconstans* applied to this subspecies for this reason.

History of conservation concern: *A. hyperbius inconstans* is currently listed as Endangered and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). The species was listed as threatened by Hill and Michaelis (1998), and Dunn and Dunn (1991) considered it to be endangered. Dunn et al. (1994) added that this species was of 'of great conservation concern' and estimated that over 80% contraction had occurred in its distribution. Braby (2000) considered this species to be nationally threatened. A meeting of interested parties for *A. hyperbius inconstans*, was held by the 'Butterfly & Other Invertebrates Club Inc.' on 12 November 1998 in Brisbane.
A document was prepared (Schwencke and Jordan 1998), 'Australian Fritillary (*Argyreus hyperbius*) Draft Interim Recovery Plan', based on contributions from people who attended the meeting, and from earlier meetings of contributors ('Australian Fritillary Recovery Project Team').

At the BAP Workshop in Sydney, all participants considered the species was Data Deficient in New South Wales. However, an accurate National conservation assessment cannot be made due to the lack of ecological data for this species. In Queensland insufficient known secure habitats are known to sustain its survival. However, in New South Wales several habitats are secure in reserves. In Queensland, specimen records have been few since 1995, due in part to restrictions on collecting and recording data for this protected species. The Vulnerable status for Queensland proposed here, is provisional but it is also seriously Data Deficient in this State. The recommendation for Queensland is based on observed disturbance of its few known recent habitats, the lack of their secure tenure and few reported sightings of the species over the last five years. Throughout the range, the species has been considered 'rare' (Waterhouse 1932, Barrett and Burns 1951) but was once common in the early 1900s in Queensland (Rainbow 1907).

In New South Wales *A. hyperbius inconstans* has been seen almost every year, over a period of about 16 years (R. Mayo pers. comm.), in and near Limeburners Creek Nature Reserve, Port Macquarie. This habitat must be regarded as an important conservation area for the species in New South Wales until more is known of this species elsewhere. The last occasion when *A. hyperbius inconstans* was abundant at Port Macquarie was in June 1994 (R. Mayo and others, pers. comm.). In New South Wales much potential and several known habitats for *A. hyperbius inconstans* are intact and protected. It has recently (1997-2001) been seen at Billinudgel Nature Reserve, at Byron Bay, and in other Flora and Fauna reserves (unpublished), indicating that the species is not threatened in New South Wales, but it is Data Deficient. The occasional sightings since 1994 (a 'boom' year for the butterfly) indicate that the species survives at low densities in well protected localities. Adults of this species are said (by S. Johnson and R. Mayo) to characteristically occur at very low densities in most years. One reviewer considered the relatively infrequent sightings of the butterfly were justification to regard the species as 'Endangered' in New South Wales and Queensland. However, in addition to the recommendation at the BAP Workshop in Sydney, three other reviewers with extensive experience (two > 18 years) of this species, considered that it is Data Deficient in New South Wales and is not considered to be a threatened species in that State. The natural low density of the species in most years has led to a bias developing in the assessment for its threatened status.

Major threatening processes: In Queensland, urban and other disturbance including vegetation clearing, weed invasion (mainly by grasses and *Baccaris halimifolia*), burning, drainage of water courses and their embankments, and farming (sugarcane, herbicides) of coastal wetlands has affected habitats for the butterfly. This disturbance has had a major impact on areas where the food plant, *V. betonicifolia*, occurred in adequate densities, near and in the melaleuca wetlands edging moist grasslands and sedgelands. These wetlands are without doubt threatened plant communities in Queensland. Recent disturbance of the few habitats known to have supported the species over the last 10 years (e.g. Gympie, Coolum), justifies its provisional status as Vulnerable in that State, provided this status does not inhibit surveys and the collection of much needed data. Collecting of specimens is not considered to be a threatening process.

Is knowledge sufficient to formulate recovery actions? No, information on *A. hyperbius inconstans* is not adequate. More information is needed on the ecology of *A. hyperbius inconstans* (especially diapause in immature stages) before an understanding of its National conservation significance can be established, or a plan developed which is likely to succeed in recovering the species. Its basic ecology is unknown although immature development (in the laboratory) and its dependence on the food plant, *Viola betonicifolia* is well known. Experience has shown that although the adults are adapted to open grassland, they are very difficult to observe due to cryptic behaviour in the field (especially females which are sedentary and very rarely observed even when males are abundant, and despite an equal sex ratio).

Useful information available from other subspecies of *A. hyperbius* occurring overseas, especially from Papua New Guinea, needs to be integrated into an ecological profile for the Australian subspecies.

Recovery needs: Surveys for the presence of breeding colonies and studies on probable diapause of the immature stages, are the highest priorities, since insufficient information is currently available to develop a recovery plan for this species. It is essential that the surveys extend to coastal areas north of Noosa in Queensland and between Port Macquarie and the Clarence River, New South Wales. In particular some basis for the nature of the 'boom and bust cycles' of appearance is needed to confirm the way that the species is capable of persistence at very low densities in some years. More ecological information (seed survival, effects of burning) on *A. hyperbius inconstans* and its food plant, *V. betonicifolia*, obtained from the two range States, Queensland and New South Wales is required. Experienced collectors need to be encouraged to make available their unpublished records for sightings and specimens for developing a Recovery Plan.

The Recovery Plan should include the following:

1. Preparing a draft Action Plan rather than a Recovery Plan. Appoint an Advisory Team to compile advice from people with first-hand experience with *A. hyperbius inconstans*. At least one ecologist with experience in insect population dynamics and mechanisms of insect diapause is needed for advice and appointed to the team. Undue emphasis on mimicry, migrations overseas and other factors that have little relevance to conservation and recovery, should be avoided in the Plan.
2. In Queensland, commence surveys in coastal grasslands between Rockhampton and Noosa where habitats (with food plants) are most likely to remain intact. Agnes Waters, Town of Seventeen Seventy, Port Alma, Fraser Island, Tin Can Bay, Stradbroke Island, and Cooloola, and the vicinity of, and south of Ningi, all need surveys. National Parks requiring surveys include Eurimbula, Deepwater, Burrum Coast, Great Sandy, Poona, Bribie Island and Moreton Island. Surveys in these areas should take precedence over earlier habitats now known to be seriously disturbed and unlikely to be amenable to protection.
3. In New South Wales, surveys are required in the following National Parks: Broadwater, Bundjalung, Yaraygir, Bongil Bongil, Hat Head, Crowdy Bay; and Limburners Creek and Lake Innes Nature Reserves.
4. Commence detailed biological studies on the development of immature and adult stages, to elucidate any protracted development mechanisms such as diapause, aestivation or over-wintering. This work could be undertaken by a supervised post graduate student working with a captive breeding colony of *A. hyperbius inconstans*. One reviewer recommended controlled experiments to investigate details of the biology and possible diapause, using material from secure populations, a proposal we support.
5. Commence comprehensive surveys of coastal wetlands in Queensland and New South Wales, to map distribution of *Viola betonicifolia* (determination of the northern limit is needed) with the cooperation of national parks authorities for past and present records of *A. hyperbius inconstans*, particularly over the past 20 years.
6. Develop links with overseas fritillary projects, especially for species of conservation concern such as the Regal Fritillary program in the USA. Document information on the abundant subspecies (ssp. *niugini*) in Papua New Guinea.

With these basic data the following information can be integrated in a Recovery Plan if the need is validated:

1. Assess land tenure, potential to protect and acquire if necessary, and manage localities where *A. hyperbius inconstans* is currently known to occur, especially near Port Macquarie, New South Wales. This area extends from 2.5 km north of the mouth of the Hastings River to the southeastern edge of Limeburners Nature Reserve. If confirmed as privately-owned, options for permanent protection should be investigated and if possible, managed for the fritillary and other species of conservation interest in the area (Reviewer's recommendation)

2. Establish schedules for long-term rehabilitation, weed and fire management for existing habitats, especially in New South Wales (particularly south of Limeburners Nature Reserve at Port Macquarie and Billinudgel).
3. Encourage community participation in site rehabilitation of reserves, if necessary by propagation and planting (local origin) *Viola betonicifolia* at sites where the fritillary has been found to occur, and where food plant numbers have declined. This activity has already been proposed by Schwencke and Jordan (1998). Should any replanting of *V. betonicifolia* be carried out in reserves or national parks, only plants form the same local sources should be used. However, one of the reviewers considered it doubtful whether planting *Viola betonicifolia* would have a long-term benefit for recovery of the butterfly.
4. Establish a Recovery Plan with actions aimed towards preserving sufficient habitat to enable permanent recovery and a timetable for de-listing of *A. hyperbius inconstans* in Queensland.

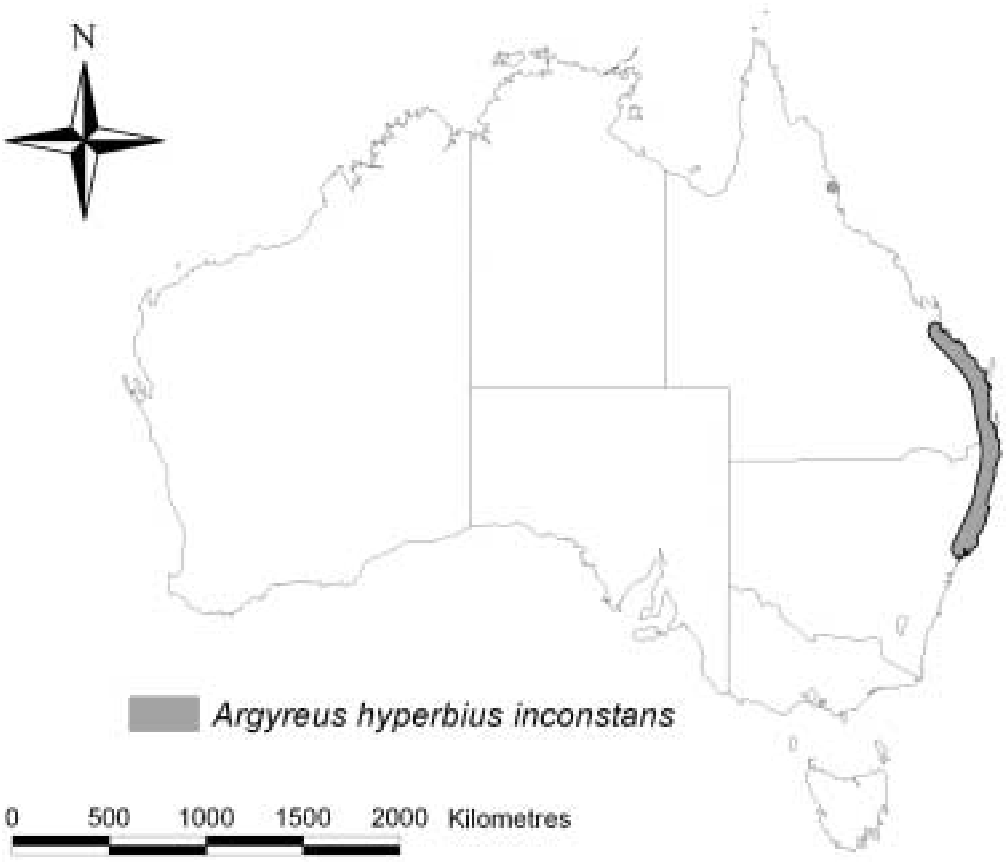
Can recovery be carried out with existing resources? No. Although the species and known habitats are threatened in Queensland, the species is largely Data Deficient over its range in Australia.

Resources required:

Action*		$
1	Establish tenure of existing habitats	3,000.00
2	Surveys and mapping in eastern Australia $4,000 per year for 3 years	12,000.00
3	Controlled experiments to study developmental biology	10,000.00
4	Site rehabilitation and management, $5,000 per year over 3 years	15,000.00
Total		40,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Distribution of *Argyreus hyperbius inconstans*



Timeframe for Rehabilitation of Taxon

- In train 3–5 years
- Completed 6 years
- De-listing as soon as possible thereafter

Lead Organisations: Queensland Parks and Wildlife Service, New South Wales National Parks and Wildlife Service, Environment Australia.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Barrett, C. and Burns, A.N. 1951. Butterflies of Australia and New Guinea. N.H. Seward, Melbourne.

Dunn, K. L. and Dunn, L.E. 1991. Revision of the Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Johnston, L.M. and Johnston, D.R. 1984. Further observations on the life history of *Argyreus hyperbius inconstans* Butler (Lepidoptera: Nymphalidae) in captivity. Australian Entomological Magazine 11: 75–78.

Lambkin, T.A. and Lambkin, K.J. 1977. Observations of the life history of *Argyreus hyperbius inconstans* Butler (Lepidoptera: Nymphalidae). Australian Entomological Magazine 4: 13–16.

Olliff, A.S. 1888. On Rhopalocera from the vicinity of Mt Bellenden-Ker, Queensland. Proceedings of the Linnean Society of New South Wales 3: 394–396.

Olliff, A.S. 1889. Australian butterflies. A brief account of the native families, with a chapter on collecting and preserving insects. Natural History Association of New South Wales, Sydney.

Rainbow, W.J. 1907. A guide to the study of Australian butterflies. T.C. Lothian, Melbourne.

Schwencke, H. and Jordan, F. 1998, 'Australian Fritillary (*Argyreus hyperbius*). Draft Interim Recovery Plan'. Butterfly & Other Invertebrates Club Inc., Brisbane.

Sundholm, A. 1978. Extension of the known range of the Australian fritillary, *Argynnis hyperbius inconstans* Butler (Lepidoptera: Nymphalidae). Australian Entomological Magazine 5: 34.

Waterhouse, G.A. 1932. What butterfly is that? Angus and Robertson, Sydney.

NYMPHALIDAE: NYMPHALINAE

Scientific name: *Charaxes latona papuana* Butler

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range, Coen.

Taxonomy: Thirteen subspecies of *C. latona* have been described, including ssp. *papuana* which occurs in Papua New Guinea as well as Australia.

Infra-specific relationships or variation: Some variation has been noted in the number and size of black areas and spots on the upperside of both sexes.

Habitat critical to survival: This species occurs in lowland rainforest and males congregate on hilltops. Females have been seen near the Claudie River and most males have been observed near Mount Lamond, Iron Range. In Papua New Guinea larvae of this species feed on Lauraceae.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1998). None of the known habitats has been destroyed and the species is regularly seen at Iron Range. One specimen was seen on the summit of Mount White, Coen (D.P.A. Sands).

Major threatening processes: None known or recorded.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. The species is not threatened.

Reference

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

NYMPHALIDAE: DANAINAE

Scientific name: *Danaus affinis gelanor* (Waterhouse & Lyell)

National Conservation Status: No Conservation Significance

Range: Torres Strait Islands.

Distribution: Darnley, Getullai and Dauan Islands. It also occurs in Papua New Guinea and may not be established on Australian islands. *Danaus affinis* occurs widely from South Asia to Papua New Guinea and Australia, represented by many subspecies.

Taxonomy: *D. affinis gelanor* was shown by Ackery and Vane-Wright (1984) to be a subspecies of the widespread *D. affinis*. However, it is doubtful if *D. affinis gelanor* is a distinct subspecies and it is probably a synonym of *D. affinis philene* Stoll (Dunn et al. 1994).

Infra-specific relationships or variation: *D. affinis gelanor* is easily separated from ssp. *affinis* from the southern Torres Strait islands and mainland Australia.

Habitat critical to survival: In Australia and coastal Papua New Guinea, *D. affinis* is often associated with melaleuca wetlands and mangroves where the food plant, *Ischnostemma carnosum* grows. Subspecies *gelanor* probably utilises the same habitat.

History of conservation concern: *D. affinis gelanor* was said by Dunn et al. (1994) to be insufficiently known and was listed with less threatened taxa. This subspecies is believed to be a 'political incidental' and is probably an occasional migrant from Papua New Guinea.

Major threatening processes: None known.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. The subspecies is of no conservation concern.

References:

Ackery, P.R. and Vane-Wright, R.I. 1984. Milkweed butterflies: their cladistics and biology. British Museum (Natural History), London.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

NYMPHALIDAE: DANAINAE

Scientific name: *Euploea alcathoe monilifera* (Moore); *Euploea alcathoe enastri* Fenner

National Conservation Status: Data Deficient

Range: Queensland, Northern Territory.

Distribution: *E. alcathoe monilifera*: Torres Strait Islands and Cape York Peninsula, Q.; *E. alcathoe enastri*: Darwin, NT.

Taxonomy: About 30 names have been applied to *E. alcathoe*, many of them subspecies from the region of New Guinea. It is possible that *monilifera* and *enastri* are not subspecies of *E. alcathoe* and they may represent distinct species (T.L. Fenner, M. DeBaar pers. comm.).

Infra-specific relationships or variation: Subspecies *monilifera* differs from the southern ssp. *eichhorni* by the absence the absence of fore wing spots, and from ssp. *enastri* by the smaller fore wing spots in the male (Fenner 1991). However, these spots are variable and sometimes almost absent (Lambkin and Knight 1990).

Habitat critical to survival: Recently the life history of *E. alcathoe monilifera* was discovered on Boigu Island, where its larvae were found feeding on *Gymnanthera oblonga* (Asclepiadaceae) (Lambkin 2001). Subspecies *enastri* has been found abundantly in pockets of forest growing on groundwater (Fenner 1991). In Papua New Guinea *E. alcathoe* occurs mainly near breaks in undisturbed rainforest (Fenner pers. comm.). This subspecies may be seasonal in its appearance or migratory (Lambkin and Knight 1990, Braby 2000).

History of conservation concern: Subspecies *monilifera* and *enastri* were listed with less threatened taxa by Dunn et al. (1994). They stated that ssp. *enastri* was indeterminate while ssp. *monilifera* was said to be insufficiently known. However, T. Lambkin (pers. comm.) has seen *alcathoe* on the northern Torres Strait islands on several occasions.

Major threatening processes: None known. However, the management of plant communities on Torres Strait islands is likely to be important for maintaining the presence of these taxa in Australian waters.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Both subspecies *enastri* and *monilifera* are Data Deficient and require surveys for establishment, distribution and biological studies to determine their National Conservation Status.

Resources required:

Action		$
1	Surveys on Torres Strait Islands	10,000.00
2	Taxonomic and life history studies	5,000.00
Total		15,000.00

Lead Organisations: Queensland Parks and Wildlife Service, Environment Australia.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Lambkin, T.A. 2001. The life history of *Euploea alcothoe monilifera* (Moore) and its relationship to *E. a. eichorni* Staudinger (Lepidoptera: Nymphalidae: Danainae). Australian Entomologist 28: 129–136.

Lambkin, T.A. and Knight, A.I. 1990. Butterflies recorded from Murray Island, Torres Strait, Queensland. Australian Entomological Magazine 17: 101–112.

Fenner, T.L. 1991. A new subspecies of *Euploea alcathoe* (Godart) (Lepidoptera: Nymphalidae) from the Northern Territory, Australia. Australian Entomological Magazine 18: 149–155.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

NYMPHALIDAE: DANAINAE

Scientific name: *Euploea climena macleari* Butler

National Conservation Status: Data Deficient

Range: Western Australia, Cocos and Christmas Islands.

Distribution: Derby, Roebourne, Western Australia.

Taxonomy: This subspecies is one of about 31 names that have been applied to *E. climena* throughout its range from Indonesia to the New Guinea region.

Infra-specific relationships or variation: At least 8 subspecies have been listed from the region (Parsons 1989). No variation has been recognized from Australia.

Habitat critical to survival: Nothing is known of its habitat or food plants. On Manus Island the species is recorded from '.. shady damp woods..' (Wagner and Grether 1948, *in* Parsons 1998). The food plants are not recorded.

History of conservation concern: Proposed as Data Deficient by participants at three of the BAP Workshops. Very few specimens of this subspecies are known from Australia. Braby (2000) considered that it may not be established on the mainland and is possibly an occasional migrant from Indonesia or from Christmas Island.

Major threatening processes: None recognised.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate from any of the Australian localities. Much more is needed in relation to its ecological requirements before conservation assessment of the butterfly can be made.

Resources required:

Action		$
1	Surveys to investigate ecological requirements, including food plants and the security of its habitats.	8,000.00
Total		8,000.00

Lead Organisations: Western Australian Department of Conservation and Land Management, Environment Australia.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Parsons, M. 1998. The butterflies of Papua New Guinea. Their systematics and biology. Academic Press, London.

NYMPHALIDAE: DANAINAE

Scientific name: *Euploea modesta* Butler (? ssp.)

National Conservation Status: Data Deficient

Range: Torres Strait Islands. *Euploea modesta* species occurs throughout South Asia and Papua New Guinea.

Distribution: Thursday Island.

Taxonomy:

Infra-specific relationships or variation: According the M. De Baar (pers. comm.), the unique specimen of *E. modesta* is very distinct and is not similar to ssp. *lugens* Butler from Papua New Guinea.

Habitat critical to survival: Not known. It is not known if *E. modesta* is established on Australian islands and it may be a migrant from a neighbouring country. However, the environment of Thursday Island is well documented and parts of this are, or were, the habitat.

History of conservation concern: Participants at the BAP Workshop in Brisbane indicated that nothing was known of the conservation significance of *E. modesta.* Only one male specimen of *E. modesta* is known, collected by H. Elgner on Thursday Island and it was previously held by the Queensland Department of Primary Industries, Indooroopilly (M. De Baar 1988).

Major threatening processes: None known.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. There is no evidence available to determine the National Conservation Status of this species in Australia.

Resources required:

Action		$
1	Surveys for distribution in Torres Strait	8,000.00
2	Taxonomic investigations	2,000.00
Total		10,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

De Baar, M. 1988. Insects collected during a trip to Torres Strait 27 March to 10 April 1987. News Bulletin, Entomological Society of Queensland 15: 107–117.

NYMPHALIDAE: DANAINAE

Scientific name: *Euploea netscheri erana* (Fruhstorfer)

National Conservation Status: Data Deficient

Range: Torres Strait Islands

Distribution: Saibai, Boigu and Dauan, northern Torres Strait Islands.

Taxonomy: *Euploea netscheri* occurs from the western Indonesian islands to Papua New Guinea. Several subspecies have been described, including ssp. *erana* in Papua New Guinea. The same subspecies occurs on the Torres Strait Islands.

Infra-specific relationships or variation: Insufficient specimens from Australian islands are available to provide data on variation.

Habitat critical to survival: Not identified. In Papua New Guinea this species occurs in rainforest regrowth or secondary forest (Parsons 1998).

History of conservation concern: Identified as Data Deficient at the BAP Workshops. Known from very few specimens from Boigu, Dauan and Saibai islands (Braby 2000).

Major threatening processes: None identified. Insufficient information is available to assess conservation concerns.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Evaluation of this and other species that occur only on the northern Torres Strait Islands requires further surveys and an assessment of the security and tenure of the habitats, especially the remnants of native vegetation supporting the butterflies. The surveys require botanical inventories to determine if those species are breeding on the islands or are migrants from the nearby mainland of Papua New Guinea.

Resources required:

Action*		$
1	Surveys for distribution in Torres Strait	8,000.00
2	Assessment of tenure and management of habitats	2,000.00
Total		10,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

NYMPHALIDAE: SATYRINAE

Scientific name: *Geitoneura klugii mulesi* (Burns)

National Conservation Status: No Conservation Significance

Range: South Australia.

Distribution: Wardang Island, Spencer Gulf.

Taxonomy: One of three described subspecies of *G. klugii* (Guerin-Méneville). The genus *Geitoneura* contains two other species.

Infra-specific relationships and variation: *G. k. mulesi* was recognised as a distinct subspecies by Fisher (1978) and Dunn et al. (1994), but it is not well defined. Braby (2000) discussed the pattern of variation in *G. klugii*, and recognised a ‘dark form’ and a ‘pale form’. He regarded *G. k. mulesi* as representing the more widespread pale form and did not recognise the Wardang Island population (or the western Australian *G. k. insula* Burns) as distinct. The ‘pale form’ in Braby’s (2000) sense extends from southern South Australia at intervals across the Nullarbor Plain to southeastern Western Australia, with transitions to the ‘dark form’ to either side of this range.

Habitat and ecological characteristics: *G. k. mulesi* is known only from open ground on Wardang Island. Its biology has not been studied in detail, but that of the mainland *G. k. klugii* is reasonably well-known (Braby and New 1989a,b), and there is little reason to doubt that the Wardang population differs significantly from this. Larvae feed on a variety of grasses, including some introduced species of Poaceae.

History of conservation concern: *G. k. mulesi* was noted by Dunn et al. (1994) as Vulnerable, but it has not been regarded as of conservation significance by other commentators. Dunn et al.’s (1994) categorisation was based on very small distribution of the isolated subspecies. No data on populations, contractions and vulnerability are available.

Major threatening processes: No major threatening processes have been designated. Dunn et al. (1994) noted that the small area of occupancy of the subspecies on Wardang Island may render it susceptible to stochastic effects, and to any broader effects (such as off-road vehicles and human trampling) on the sensitive dune ecosystem.

Is knowledge sufficient to formulate recovery actions? In part, but with substantial gaps in detailed knowledge of the Wardang Island population. If this subspecies is indeed distinct, some further appraisal is warranted to determine the security of the habitat.

Can recovery be carried out with existing resources? Yes. No recovery actions are considered necessary at present.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Braby, M.F. and New, T.R. 1989a. Population biology of adult *Geitoneura klugii* and *G. acantha* (Lepidoptera: Satyrinae) near Melbourne, Australia. Australian Journal of Zoology 36, 141–158.

Braby, M.F. and New, T.R. 1989b. Adult reproductive biology of *Geitoneura klugii* and *G. acantha* (Lepidoptera: Satyrinae) near Melbourne, Australia. Australian Journal of Zoology 36, 397–409.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

NYMPHALIDAE: SATYRINAE

Scientific name: *Heteronympha cordace comptena* L.E. Couchman

National Conservation Status: No Conservation Significance

Range: Tasmania.

Distribution: western and southern Tasmania, from Mount Agnew, Zeehan, Dover, South Bruny Island; probably further north to near Marrawah.

Taxonomy: *H. cordace* is a distinctive species.

Infra-specific relationships and variation: *H. cordace comptena* is a strongly coloured subspecies, with the 'eyespots' on the wings much larger than in other Tasmanian subspecies of *H. cordace*.

Habitat and ecological characteristics: Restricted to coastal areas, where larvae feed on *Carex*, especially *C. appressa* in swampy habitats.

History of conservation concern: This subspecies was regarded by Dunn et al. (1994) as 'secure', following its inclusion on a list of species regarded as threatened compiled by Hill & Michaelis (1988), and listing as 'Indeterminate' by IUCN (1988). Reasons given were uncertainty over more precise status, as implied above, with presumed threats to some sites.

Major threatening processes: Couchman & Couchman (1977) noted burning of button grass swamps, inundation and trampling or grazing by cattle as possible threats to some sites. Some populations are in the southwestern National Park.

Is knowledge sufficient to formulate recovery actions? Yes. No recovery actions are needed.

References:

Couchman, L.E. and Couchman, R. 1977. The butterflies of Tasmania. Tasmanian Year Book 1977, 66–96.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service, Canberra. Occasional paper no. 13.

IUCN 1988. Red List of Threatened Animals. IUCN, Gland.

NYMPHALIDAE: SATYRINAE

Scientific name: *Heteronympha cordace legana* L.E. Couchman

National Conservation Status: No Conservation Significance

Range: Tasmania.

Distribution: Northeastern Tasmania, around Lake Leake, near Andover, Lilydale, Frankford.

Taxonomy: *Heteronympha cordace* (Geyer) is a distinctive species.

Infra-specific relationships and variation: One of three endemic subspecies of *H. cordace* in Tasmania, *H. cordace legana* is a small form, with the eyespots on the wings reduced greatly in size, and the upperside orange terminal spots large.

Habitat and ecological characteristics: Found in swampy areas, where the larval food plant (*Carex appressa*) grows, and ranging from sea level to about 750 m in altitude.

History of conservation concern: Dunn et al. (1994) categorised this subspecies as 'rare', and noted that this subspecies was considerably scarcer than other Tasmanian subspecies of *H. cordace*, and was known from only 15 sites.

Major threatening processes: Dunn et al. (1994) noted that populations may be threatened by overgrazing by cattle, including inadvertent consumption of early stages, although there has been no confirmed incidence of this in Tasmania.

Is knowledge sufficient to formulate recovery actions? Yes. No recovery actions are needed.

Reference

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

NYMPHALIDAE: SATYRINAE

Scientific name: *Heteronympha cordace wilsoni* Burns

National Conservation Status: Critically Endangered [CRa,b,c]

Range: Victoria, South Australia.

Distribution: *H. c. wilsoni* is found in small areas of western Victoria and eastern South Australia.

Taxonomy: *H. cordace* is a geographically variable satyrine butterfly, with three of the five named subspecies restricted to Tasmania.

Infaspecific relationships or variation: *H. cordace wilsoni* is smaller and paler than *H. c. cordace*, and the 'ocelli' on the wings are smaller or absent. Specimens from the Grampians are often difficult to allocate to one or other subspecies, and there appears to be clinal transition between the two subspecies.

Habitat and key ecological features: *H. c. wilsoni* was known from a few swampy localities frequented by the larval food plant, *Carex appressa*. Adults do not move far from the breeding sites.

History of conservation concern: The subspecies has been regarded widely as threatened in Victoria: DCNR (1995) assessed it as Vulnerable. Dunn et al. (1994) ranked it as Vulnerable. Braby (2000) listed it as of regional or local concern and reiterated that the butterfly now appears to be extinct in the lower Glenelg River area. There is little doubt that a substantial decline in areas of occupancy has occurred, with searches in the last 20 years or so failing to find the butterfly at sites where it was formerly common (Dunn et al. 1994). In South Australia, Grund (2001) listed it as Endangered. A reviewer suggested that it might already be extinct in that State, not having been seen for 20 years.

Major threatening processes: The areas of the few historically known colonies in Victoria, mainly on the lower Glenelg River around Nelson and Dartmoor, are subject to drainage and changes for various agricultural activities, so that apparent decline of the butterfly is associated directly with loss of suitable habitat. Recent searches for *H. c. wilsoni* suggest that it has become more elusive during the last few decades. The apparently poor dispersal ability of adults renders localised colonies susceptible, and with little chance of natural recolonisation.

No populations confirmed as this subspecies are known in national parks in Victoria, and Grund and Hunt (2000) failed to find the butterfly in their surveys in South Australia.

Is knowledge sufficient to formulate recovery actions? Yes. Despite limited knowledge of its developmental biology, threats to breeding habitats are definable, so that management actions may be feasible, should surveys reveal the presence of the butterfly. *H. c. wilsoni* is associated closely with a well-defined habitat in swampy sedge areas, and the food plant is well known.

Recovery needs:

1. More extensive surveys of swampy areas in far southwestern Victoria and southeastern South Australia to determine the presence of *H. c. wilsoni* at all historical localities and to detect any new colonies in the region.
2. Surveys for colonies in national parks in the region. This should be conjoint to include other significant satyrine butterflies, including certain *Oreixenica* spp.
3. Increase security of remaining *Carex* swamps in the area, especially on the Lower Glenelg River, including fencing to exclude stock and resist changes in land use that will lead to further habitat degradation.
4. For any secure habitats, clarify needs to augment habitat quality for *H. c. wilsoni* by augmenting food plant numbers / density. Undertake this if needed.

More detailed recovery measures are at present indeterminate, pending discovery of breeding colonies of *H. c. wilsoni*.

Can recovery be carried out with existing resources? No. The initial needs are for survey and appraisal of habitat security of places where colonies have been found in southwestern Victoria and South Australia.

Resources required:

Action*		$
1	Surveys should be undertaken over 3 consecutive years @ $10,000 / year	30,000.00
Total		30,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisations: Victorian Department of Natural Resources and Environment; Department of Environment Heritage and Aboriginal Affairs, South Australia.

References:

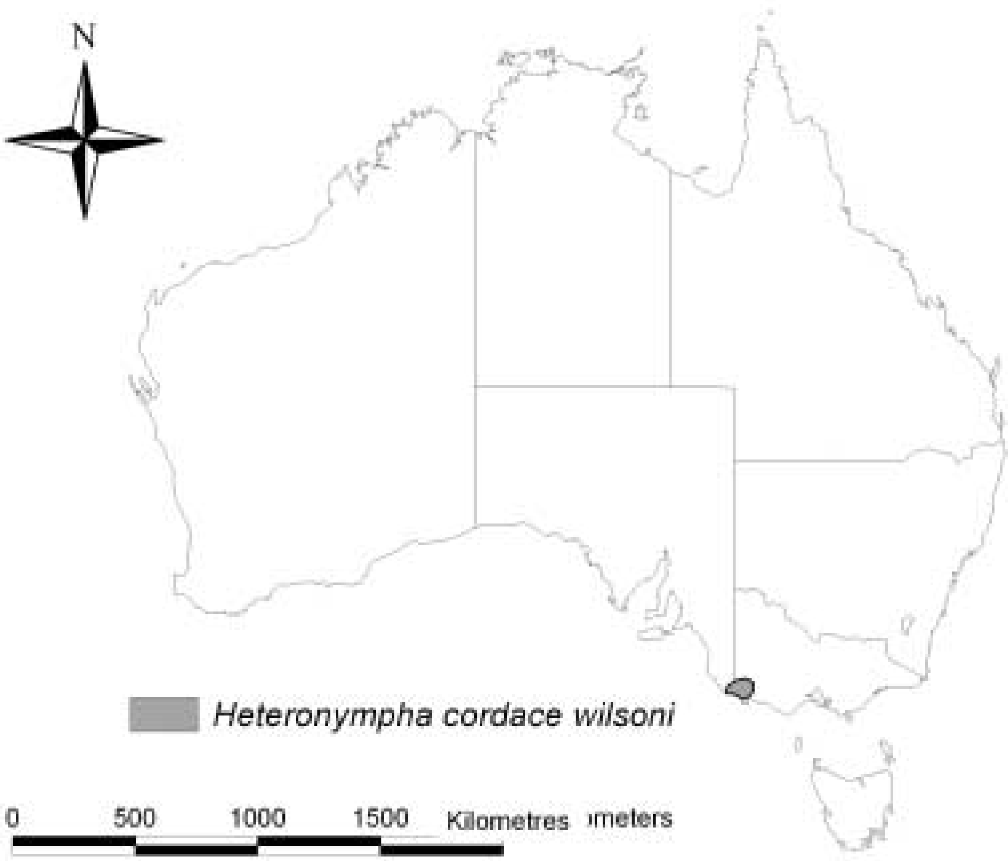
Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Grund, R. 2001. South Australian butterflies checklist. http: / / www.adelaide.net.au / ~reid / checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department of Environment and Aboriginal Affairs, South Australia.

Distribution of *Heteronympha cordace wilsoni*



NYMPHALIDAE: SATYRINAE

Scientific name: *Heteronympha penelope maraia* Tindale

National Conservation Status: No Conservation Significance

Range: Victoria.

Distribution: Grampians National Park and nearby areas, western Victoria.

Taxonomy: *Heteronympha penelope* Waterhouse is a distinctive large species. Males most resemble those of *H. merope* (F.), but differ in having a pronounced 'shoulder' of dark scales at the anterior base of the fore wing.

Infra-specific relationships and variation: *Heteronympha penelope* Waterhouse is a very variable species, with six described subspecies. *H. p. maraia* was regarded by Tindale (1952) as a large, brightly coloured form with reduced black markings on the hind wing upperside. Braby (2000) noted the probable clinal form of variation in the widely distributed nominotypical subspecies from southern Queensland to western Victoria, and included *H. p. maraia* as a synonym of *H. p. penelope*. *H. penelope alope*, found around Lorne in southern Victoria and in far southeastern South Australia, is slightly smaller than typical *H. p. penelope*, and Braby (2000) considered that this subspecies might also be regarded eventually as *H. p. penelope*.

Habitat and ecological characteristics: Larvae feed on a range of native grasses, Poaceae in open woodland, with specific records from *Austrodanthonia*, *Poa* and *Themeda* in the Grampians (Tindale 1952).

History of conservation concern: *H. p. maraia* was perceived as a distinctive local subspecies, and confused with putative *H. penelope alope* in South Australia. The subspecies was included in a compiled list of invertebrates of conservation concern (Yen & Butcher 1997), following a general comment by Watts (1992). No more specific evaluation has occurred. Watts' comments referred particularly to South Australia, and thus may not involve *H. p. maraia* as considered here. Fisher (1978) then regarded specimens from the Millicent area as belonging to this subspecies, but Braby (2000) included this population as within part of the range of *H. p. alope*.

Major threatening processes: Fisher (1978) noted habitats of putative *H. p. maraia* in South Australia as being small remnant patches in areas largely cleared for rural and industrial development. Such clearing has potential to harm species that depend on native vegetation. True *H. p. maraia* appears to be secure within the Grampians National Park, where it is common.

Is knowledge sufficient to formulate recovery actions? Yes. No recovery actions are needed.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Tindale, N.B. 1952. On a new form of *Heteronympha penelope* Waterhouse (Lepidoptera Rhopalocera, Family Satyridae). Transactions and Proceedings of the Royal Society of South Australia 75, 25–29.

Watts, C.H.S 1992. Conservation of non-commercial invertebrates in South Australia. Chapter 8 in Soon Poh Tay (compiler) Threatened species and habitats in South Australia, a catalyst for community action. Conservation Council of South Australia.

Yen, A.L. & Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered Species Program, Environment Australia, Canberra.

NYMPHALIDAE: NYMPHALINAE

Scientific name: *Junonia erigone walkeri* (Butler)

National Conservation Status: Data Deficient

Range: Northern Territory.

Distribution: Rimbija Island, Wessel Islands.

Taxonomy:

Infra-specific relationships or variation: The specimen from Rimbija Island is not very similar to any other documented subspecies of *J. erigone* and it may represent an undescribed subspecies. Edwards (1977) stated it was closest to ssp. *walkeri,* otherwise known from Timor where it is apparently geographically variable (T.L. Fenner pers. comm.).

Habitat critical to survival: *J. erigone walkeri* was collected by E.D. Edwards at the margin of monsoon rainforest and in Papua New Guinea, another subspecies occurs in rainforest, often near heavily shaded creeks. This species has not been detected on the Wessel Islands since its first record, despite several surveys (>5) since 1986, conducted by the Northern Territory Quarantine & Inspection Branch (T.L. Fenner pers. comm.).

History of conservation concern: Based on the comments by Sands (1990) and reference by Yen and Butcher (1997). Only one specimen has been recorded from Australia, collected by Edwards (1977) from Rimbija Island, one of the Wessel Islands. Sands (1990), referred to in Yen and Butcher (1997), suggested that the subspecies was restricted in distribution and that its survival would depend on the habitat remaining intact. However, according to T.L Fenner (pers. comm.) no further specimens have been collected at this locality despite little disturbance of this habitat.

Major threatening processes: None identified.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Only one specimen has been recorded from Australian territory, from Rimbija Island. The tenure of the island habitat requires investigation to determine if it will remain stable and if it is unlikely to be disturbed. Rimbija Island, or the parts of the island with monsoon forest, needs national park status to preserve this taxon and other potentially endemic insect fauna.

Recovery needs and Resources Required: Surveys and mapping for the distribution of *J. erigone walkeri*, investigate tenure of Rimbija and Marchibar Islands

Resources required:

Action		$
1	Surveys, mapping & tenuredetermination for the distribution and habitats of *J. erigone walkeri*	16,000.00
Total		16,000.00

Lead Organisation: Parks and Wildlife Commission of the Northern Territory.

References:

Edwards, E.D. 1977. *Junone erigone* (Cramer) (Lepidoptera; Nymphalidae) recorded from Australia. Australian Entomological Magazine 4: 41–43.

Sands, D.P.A. 1990. Australia's endangered butterflies. News Bulletin of the Entomological Society of Queensland 18: 63–68.

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

NYMPHALIDAE: NYMPHALINAE

Scientific name: *Lexias aeropa eutychius* (Fruhstorfer)

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Captain Billy Creek, Iron Range, eastern Cape York Peninsula.

Taxonomy: Eleven subspecies of *Lexias aeropa* have been described but only ssp. *eutychius* has been recorded from Australia. Although its subspecific identity has not been confirmed, both sexes resemble specimens of this subspecies (although they may be smaller) from southern Papua New Guinea.

Infra-specific relationships or variation: No variation is known from Australian *L. aeropa eutychius*. In Papua New Guinea, the spots near the apex of the fore wing upperside vary in size and the females appear to be dimorphic (T.L. Fenner pers. comm.).

Habitat critical to survival: The few specimens of *L. aeropa eutychius* from Australia were collected near a moist creek bed at the edge of monsoon rainforest, one while feeding on the discarded skin of a banana (Monteith and Kerr 1977 and J.F. R. Kerr pers. comm.). In Papua New Guinea the larvae feed on *Calophyllum* spp., often growing near water courses and usually at the edge of rainforest.

History of conservation concern: Sands (1990), referred to in Yen and Butcher (1997), suggested that *L. aeropa eutychius* was restricted in distribution and that its survival would depend on the habitat remaining intact.

Major threatening processes: None known. The sighting of a specimen at Iron Range indicates that this population is likely to be secure in the National Park.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate.

Recovery needs and Resources Required: Surveys and mapping for the distribution of *L. aeropa eutychius*, investigate tenure of Heathlands site.

Resources required:

Action		$
1	Surveys and mapping for tenure of Heathlands site	6,000.00
Total		6,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Monteith, G.B. and Kerr, J.F.R. 1977. First record of the nymphalid butterfly *Lexias aeropa* (L.) from Australia. Australian Entomological Magazine 3: 107–111.

Sands, D.P.A. 1990. Australia's endangered butterflies. News Bulletin of the Entomological Society of Queensland 18: 63–68.

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

NYMPHALIDAE: LIBYTHEINAE

Scientific name: *Libythea geoffroy genia* Waterhouse

National Conservation Status: No Conservation Significance

Range: Western Australia, Northern Territory.

Distribution: Cape Leveque, Western Australia to Northern Territory

Taxonomy: This and related species have sometimes been placed in a separate family, Libytheidae (Common and Waterhouse 1981). This is one of two subspecies in Australia. Another subspecies of *Libythea geoffroy* occurs in Queensland.

Infra-specific relationships or variation: The extent of violet and size of spots on the upper side of males is very variable, their appearance sometimes overlapping with that of ssp. *nicevillei*.

Habitat critical to survival: Larvae of this subspecies are said to feed on *Celtis philippinensis* (Braby 2000), a widely distributed plant in monsoon forests of northern Australia. The butterfly undoubtedly breeds in the refuge areas free of intense burning. *L. geoffroy genia* is not often seen in Northern Territory but is much more abundant in north Western Australia (Johnson 1993). Related subspecies in Papua New Guinea are renowned for their 'boom and bust' cycles of abundance, which are dependent on rainfall. Adults frequently shelter during the day on rock faces and rock overhangs.

History of conservation concern: The subspecies was said to be 'indeterminate' by Dunn et al. (1994).

Major threatening processes: No threatening processes were identified by Dunn et al. (1994) other than parasitic flies, which are a natural occurrence, not considered a threat until their environmental interactions have been modified. There is no evidence that this has occurred.

Is knowledge sufficient to formulate recovery actions? Yes. Recovery actions are not required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. *Butterflies of Australia*. Angus and Robertson.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Johnson, S.J. 1993. Butterfly records of interest from northern Australia. Australian Entomologist 20: 75–76.

NYMPHALIDAE: LIBYTHEINAE

Scientific name: *Libythea geoffroy nicevillei* Olliff

National Conservation Status: No Conservation Significance

Range: Torres Strait Islands, Queensland.

Distribution: Moa Island, Prince of Wales Island; several localities between Cape York and Rockhampton.

Taxonomy: *Libythea geoffroy nicevillei* and related species have sometimes been placed in a separate family, Libytheidae (Common and Waterhouse 1981). Another subspecies of *Libythea geoffroy* occurs in northern Australia.

Infra-specific relationships or variation: The extent of violet sheen and spots on the upper side of males sometimes overlaps with ssp. *genia*.

Habitat critical to survival: Little is known of *Libythea geoffroy* in Australia. It is adapted mainly to dry eucalypt environments, often on granitic soils where the food plant, *Celtis paniculata*, occurs near riverine fringes or in dry water courses. It has been seen in numbers on Magnetic Island, Townsville and at Coen and Silver Plains, Cape York Peninsula, sheltering in the embankments of dry creek beds. The species also occasionally shelters under the eaves of houses and verandahs during the day (e.g. on Magnetic Island). In Papua New Guinea another subspecies commonly visits moist sand at the edge of pools of water on roadways.

History of conservation concern: Dunn et al. (1994) considered that *L. geoffroy nicevillei* was Vulnerable. *L. geoffroy nicevillei* is currently listed as Vulnerable under the Queensland Nature Conservation (Wildlife) Regulation (1994). Due to the naturally low densities of the subspecies *nicevillei*, conservation concerns appear to have developed from lack of understanding its ecological requirements.

Major threatening processes: No threats have been identified, other than general loss of habitats that affect all species. Moreover, substantial areas suitable for this species are protected in national parks and these are sufficient to sustain the species. Dunn et al. (1994) considered loss of habitat by clearing for farming activities as the main threatening process and stated that some habitats on privately-owned land should be protected to prevent the loss of riparian breeding sites containing the food plants. They cited Mount White, Coen as at risk but protected by the steep terrain. The current owner of this locality (Mr P. Shephard) is well aware of the significance of this locality for butterfly conservation and intends to protect Mount White from serious environmental disturbance. However, change in ownership could alter this perspective in the future.

Is knowledge sufficient to formulate recovery actions? Yes. No recovery actions are currently necessary for this species. A vegetation protection agreement is recommended for Mount White, based on its importance as an ecological community for all its fauna and flora.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

NYMPHALIDAE: SATYRINAE

Scientific name: *Melanitis amabilis valentina* Fruhstorfer

National Conservation Status: Data Deficient

Range: Torres Strait Islands.

Distribution: Darnley Island, Torres Strait; Papua New Guinea.

Taxonomy: Parsons (1998) noted that subspecies *valentina* may not be distinct from the nominotypical subspecies, and Braby (2000) also doubted its validity.

Infra-specific relationships or variation: Only one specimen is known from Darnley Island (Braby 2000) but in Papua New Guinea, the subspecies varies in the size of markings on the fore wings.

Habitat critical to survival: Not known. However, In Papua New Guinea *M. amabilis valentina* occurs at the edge of rainforest. Adults fly mainly in the late afternoon or at dusk.

History of conservation concern: *M. amabilis valentina* was listed as threatened by Hill and Michaelis (1998). Lack of information probably prompted their suggestion that this species was threatened.

Major threatening processes: None identified but fire lighting is a major possible threat on Darnley Island (S.J. Johnson pers. comm.).

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Surveys for *M. amabilis valentina* and other species should be conducted on the northern Torres Strait islands to develop a profile for the taxa that either migrate from mainland New Guinea, or are established just inside Australian waters. Work is then needed to determine any threatening processes for this and the other species on those islands.

Recovery needs: Surveys to investigate the presence of *M. amabilis valentina* on Darnley Island and its ecological requirements, including food plants and the security of its habitats.

Resources required:

Action		$
1	Surveys to investigate presence and requirements on Darnley Island	8,000.00
Total		8,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

NYMPHALIDAE: SATYRINAE

Scientific name: *Melanitis constantia constantia* (Cramer)

National Conservation Status: No Conservation Significance

Range: Torres Strait Islands.

Distribution: Murray Island, Torres Strait; Papua New Guinea.

Taxonomy: Australian specimens are placed with the nominotypical subspecies.

Infra-specific relationships or variation: Said to be variable (Johnson et al. 1994), particularly in the spots on the fore wings of males (S.J. Johnson pers. comm.).

Habitat critical to survival: The species is abundant on Murray Island in tall grassy areas near rainforest, when kept free of recent burning.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1998). BAP Workshop participants in Hobart and Canberra thought that this species was Data Deficient, but it has been pointed out (S.J. Johnson, C.G. Miller pers. comm.) that much more information has recently become available for this species, including the suggestion that it has been overlooked as *M. leda*.

Major threatening processes: Use of fire and weed invasions, esp. climbing legumes and poincianas, which are invading the remnant native rainforest vegetation.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. No recovery actions are necessary. However, for the management of this and other species that might become threatened in the future, there is a need to develop agreements with local landowners to prevent the uncontrolled use of fire and the clearing of remnant vegetation on Murray Island.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Johnson, S.J., Johnson, I.R. and Valentine, P.S. 1994. New and interesting butterfly records (Lepidoptera) from Torres Strait islands. Australian Entomologist 21: 121–124.

NYMPHALIDAE: SATYRINAE

Scientific name: *Mycalesis sirius sirius* (Fabricius)

National Conservation Status: No Conservation Significance

Range: Northern Territory, Torres Strait islands, Queensland, western Indonesia and Papua New Guinea.

Distribution: North from about Mackay, coast and northern tablelands and Torres Strait islands in Queensland; Darwin, Northern Territory

Taxonomy: *Mycalesis sirius* is widely distributed on islands to the north of Australia with several subspecies described.

Infra-specific relationships or variation: Dry and wet season forms are known to differ in appearance (Braby 2000). Subspecies *sirius* also occurs in Papua New Guinea (Parsons 1998).

Habitat critical to survival: This species prefers coastal woodlands where the food plants for its larvae, *Ischaemum australe*, *Themeda triandra*, *Imperata cylindrica* and the introduced Guinea Grass, *Panicum maximum* occur in shady woodlands.

History of conservation concern: The species was listed as threatened by Hill and Michaelis (1998), and Braby (2000) suggested this species was of regional or local concern in northern Queensland. However, participants at the BAP Workshops considered that this species was of no conservation concern throughout its range, despite its contraction in habitats. Concerns were expressed mainly by Braby (2000) about loss of habitats, particularly moist, coastal woodlands. However, there is no evidence that this species has disappeared from the southern parts of its range near Mackay, as suggested by Braby (2000).

Major threatening processes: This species has suffered from degradation of many of its habitats in Queensland, largely as a result of clearing of melaleuca wetlands for sugarcane (Braby 2000). Sugar cane farming has also affected several other species by fragmentation and loss of corridors between existing habitats.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. Although the species is not considered to be threatened, continuing loss of its habitat on a wide scale is symbolic of the destruction of tropical coastal wetlands that has occurred in Queensland.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

NYMPHALIDAE: SATYRINAE

Scientific name: *Oreixenica kershawi ella* (Olliff)

National Conservation Status: No Conservation Significance

Range: New South Wales.

Distribution: Barrington Tops area, including Gloucester Tops, above about 900m.

Taxonomy: *O. kershawi* (Miskin) is a distinctive species of *Oreixenica*, and the hind wing is much more elongated than in any other species in this genus.

Infra-specific relationships and variation: *O. kershawi ella* has more pronounced brownish orange upperside markings than in *O. k. kershawi* (Miskin). Braby (2000) noted the likelihood of clinal variation in this species.

Habitat and ecological characteristics: Larvae feed on several genera of Poaceae, including *Poa* and *Tetrarrhena*. The butterfly is largely confined to boggy areas to the north of Barrington Tops.

History of conservation concern: Ranked as secure by Dunn et al. (1994) but Yen & Butcher (1997) noted two very general secondary references to possible conservation concern. Dunn et al. (1994) noted that about seven sites isolated populations were known from the Barrington Tops. It has not been found in other nearby localities, despite targeted surveys.

Major threatening processes: No threats are known for the subspecies, and it appears to be strongly represented and secure in the Barrington Tops National Park.

Is knowledge sufficient to formulate recovery actions? Yes. No recovery actions are necessary.

References

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

Yen, A.L. & Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered Species Program, Environment Australia, Canberra.

NYMPHALIDAE: SATYRINAE

Scientific name: *Oreixenica kershawi kanunda* Tindale

National Conservation Status: Lower Risk (Least Concern); South Australia: Vulnerable [VUb,c].

Range: Victoria, South Australia.

Distribution: Mount Richmond National Park, Cobbobonee State Forest, Dartmoor, Nelson area, southwestern Victoria; Canunda swamp in Canunda National Park, near Millicent, South Australia.

Taxonomy: *O. kershawi* (Miskin) is a distinctive species of *Oreixenica*, and the hind wing is much more elongated than in any other species in this genus. Braby (2000) treated populations of *O. kershawi kanunda* in the Otway Ranges and the Grampians as *O. k. kershawi*.

Infra-specific relationships and variation: Four subspecies have been described, of which one (*O.k. phryne* Tindale) was not recognised by Braby (2000). *O. k. kanunda* is the smallest subspecies, and is considerably brighter than other subspecies.

Habitat and ecological characteristics: Swamps with *Gahnia clarkei*, silky oak associations. Larvae feed on native grasses, Poaceae.

History of conservation concern: Noted on a list of species nominated as of conservation concern (Hill and Michaelis 1988), and by Watts (1992) for South Australia. It was categorised as rare in Victoria (Dunn et al. 1994) and Vulnerable in South Australia (Grund 2001). Concern has centred on the small distribution of the subspecies in southwestern Victoria and far southeastern South Australia, a region in which suitable habitats have been lost by clearing of vegetation. The National Conservation Status is based on the greater knowledge and security of this subspecies in Victoria.

Major threatening processes: Dunn et al. (1994) noted extensive habitat loss to grazing and drainage, and this may be continuing outside reserve areas.

Is knowledge sufficient to formulate recovery actions? Yes. In South Australia where *O. kershawi kanunda* occurs the *Gahnia clarki* habitats are a high conservation priority (Grund and Hunt 2000). It was not found by Grund and Hunt (2000) in the Canunda National Park, who noted the urgent need to preserve and revegetate the Canunda Fenlands, in particular. The original site for discovery of the butterfly has been cleared. Some further investigation of the security of the Victorian populations is warranted, together with clarification of the taxonomic status of anomalous populations in the Otways and Grampians.

Recovery needs:

1. More extensive surveys of suitable habitat (swamps with *Gahnia clarkei* – silky oak associations) in both states to determine and map distribution of breeding populations and evaluate levels of current protection. These should be conjoint with surveys for other satyrine species, such as *O.l. herceus.*
2. Ensure adequate protection of known habitats. Other recovery means are at present indeterminate.
3. Determine needs to protect habitats in Canunda National Park and Canunda Fens from further degradation, and plan restoration if the butterfly still occupies this area.

Can recovery be carried out with existing resources? No.

Resources required:

Action*		$
1	Surveys in Victoria and South Australia ($5,000 for 2 years)	10,000.00
2	Habitat protection and restoration in Canunda National Park	5,000.00
Total		15,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisations: Victorian Department of Natural Resources and Environment; Department of Environment Heritage and Aboriginal Affairs, South Australia.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

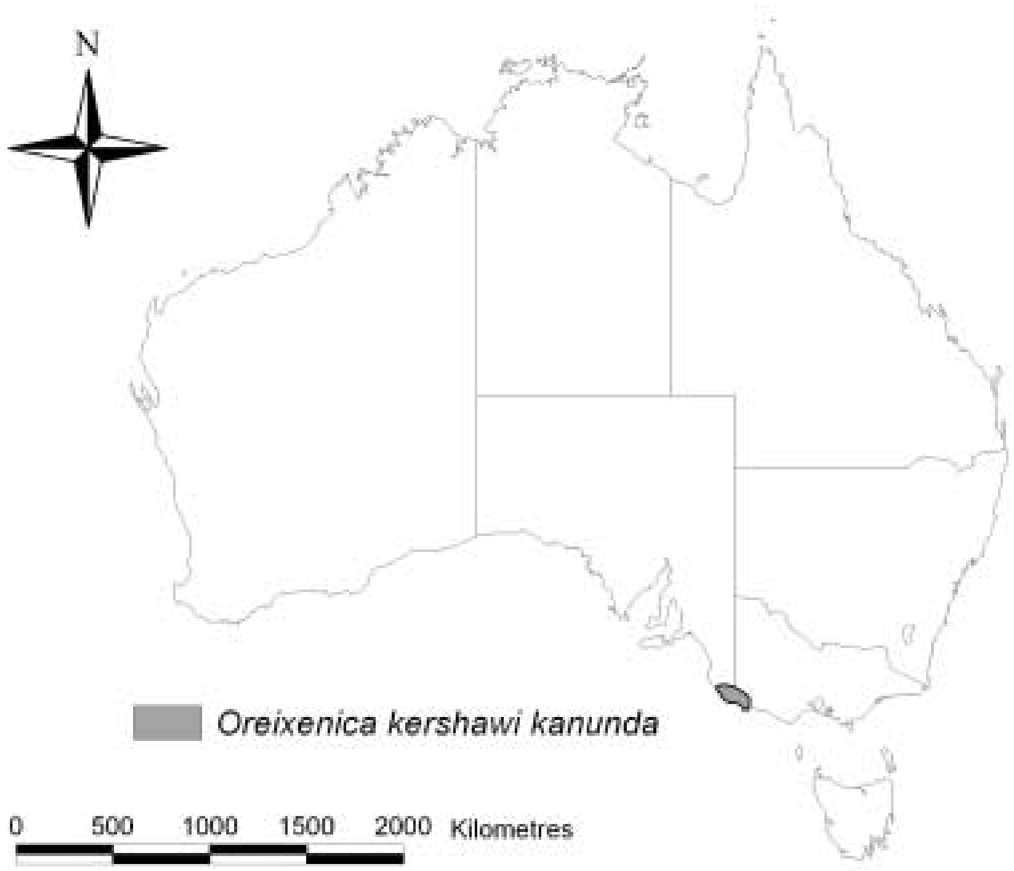
Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department of Environment and Aboriginal Affairs, South Australia.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service, Canberra. Occasional paper no. 13.

Watts, C.H.S. 1992. Conservation of non-commercial invertebrates in South Australia. Chapter 8 in Soon Poh Tay (compilor) Threatened species and habitats in South Australia, a catalyst for community action. Conservation Council of South Australia.

Distribution of *Oreixenica kershawi kanunda*



NYMPHALIDAE: SATYRINAE

Scientific name: *Oreixenica lathoniella barnardi* Turner

National Conservation Status: No Conservation Significance

Range: Tasmania.

Distribution: Central northern Tasmania: Middlesex Plains, Great Lake, Shannon River.

Taxonomy: A variable species found over much of the southeastern mainland of Australia, and Tasmania.

Infra-specific relationships and variation: One of four subspecies of *O. lathoniella* (Westwood). *O. l. barnardi* is a small dark subspecies, with the upperside orange markings smaller than in O *.l. lathoniella*. The pale greenish brown underside contrasts with the brighter reddish brown of the other Tasmanian endemic subspecies, *O. l. laranda* Waterhouse & Lyell. Dunn et al. (1994) noted *O.l. barnardi* as ' a transitional form of questionable taxonomic status'; it was recognised as distinct by Braby (2000).

Habitat and ecological characteristics: *O. l. barnardi* occurs on alpine steppe land. The life history of this subspecies has not been described but, in common with those of the mainland forms, larvae are presumed to feed on Poaceae.

History of conservation concern: Dunn et al. (1994) categorised the subspecies as 'Rare', but noted that no threats have been documented. The subspecies is confined to a small area of northern central Tasmania (Dunn et al. 1994).

Major threatening processes: Dunn et al. (1994) suggested that some sites may be grazed to varying extents, but no major threats have been designated for *O. lathoniella barnardi*.

Is knowledge sufficient to formulate recovery actions? Yes. No recovery actions are necessary, but basic research is needed to clarify further the relationships and biology of this subspecies. Populations are apparently secure in the Cradle Mountain / Lake St Clair National Park.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

NYMPHALIDAE: SATYRINAE

Scientific name: *Oreixenica lathoniella herceus* (Westwood)

National Conservation Status: No Conservation Significance; South Australia: Data Deficient.

Range: Queensland, New South Wales, Australian Capital Territory, Victoria, South Australia.

Distribution: From Dorrigo, New South Wales to much of eastern, south-central and southwestern Victoria, from sea level to 1,500 m; and southeastern South Australia.

Taxonomy: *O. lathoniella herceus* is a distinctive species of *Oreixenica*, and the most widely distributed member of the genus on the Australian mainland.

Infra-specific relationships and variation: *O. lathoniella herceus* is very variable but all mainland populations are referred to a single subspecies. Three other subspecies occur in Tasmania.

Habitat and ecological characteristics: Larvae of *O. lathoniella herceus* feed on native Poaceae, including *Poa* spp. and *Microlaena stipoides*. It is univoltine and locally common in Queensland, New South Wales and Victoria, associated mainly with grasses and open forests with grassy understorey. The butterfly is at the edge of its range in South Australia where it has recently been discovered. Grund and Hunt (2000) noted that it is uncertain whether the butterfly breeds in South Australia in the Piccaninnie Ponds Conservation Park, or is a vagrant from nearby parks (within 2 km) in Victoria.

History of conservation concern: No formal history of conservation concern but *O. lathoniella herceus* has recently been considered to be Endangered in South Australia (Grund 2001), and is included on advice from reviewers who noted that it is known from only one site in that State.

Major threatening processes: None known. Grund and Hunt (2000) noted some recent disturbance by bulldozing of vegetation in Piccaninnie Ponds Conservation Park.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate for *O. lathoniella herceus* in South Australia and there is a need to clarify the butterfly's breeding status at Piccaninnie Ponds Conservation Park, and to undertake further surveys in the southeast. Surveys over a wide area of suitable habitats in the region by Grund and Hunt (2000) failed to find additional populations. They also noted the considerable conservation value of the Park to butterflies, noted it as one of the most significant remnants of its type in the region with 'the vegetation in excellent condition'.

Can recovery be carried out with existing resources? No.

Recovery needs:

1. Clarify the breeding status of *O. lathoniella herceus* at Piccaninnie Ponds Conservation Park, South Australia
2. Take all recovery steps to safeguard the Park, and to protect it from further degradation
3. Survey nearby sites in the southestern region for additional populations of *O. lathoniella herceus*; as a conjoint survey for other butterflies of the region, such as *O. kershawi kanunda* (q.v.) and *H. cordace wilsoni* (q.v.).

Can recovery be carried out with existing resources? No.

Resources required:

Action*		$
1	Surveys in South Australia ($5,000 for 2 years)	10,000.00
2	Determine needs for habitat protection and restoration	5,000.00
Total		15,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisation: Department of Environment Heritage and Aboriginal Affairs, South Australia.

References:

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Grund, R. and Hunt, L. 2000. Butterfly conservation in the lower south-east region. Department of Environment and Aboriginal Affairs, South Australia.

NYMPHALIDAE: SATYRINAE

Scientific name: *Oreixenica latialis theddora* Couchman

National Conservation Status: Lower Risk (Near Threatened).

Range: Victoria.

Distribution: Mount Buffalo.

Taxonomy: One of three named subspecies of *O. latialis* Waterhouse & Lyell. It is very similar to *O. lathoniella* (Westwood), with which it occurs on Mount Buffalo.

Infraspecific relationships or variation: Larger and brighter than the other subspecies, and with non-overlapping geographical range.

Habitat and key ecological features: *O. latialis theddora* is an alpine satyrine found only on the Mount Buffalo Plateau, as an isolated habitat separated by intervening low ground from all other alpine areas in Victoria. It appears to be a distinctive geographical isolate of the more widespread *O. latialis*. *O. l. theddora* occupies predominantly flatter, less rocky grassy heathlands and alpine meadows on the Plateau. The butterfly is widespread with colonies on several patches of grassy heathland on the summit, and is well established around Lake Catani. It is not found below about 1,230 m. Larvae feed on *Poa* grasses, and adults take nectar from a variety of native and exotic vegetation during a short flight season extending over parts of February and March. *O. l. theddora* already occupies the 'highest possible habitats' on Mount Buffalo, but extends over only a narrow altitudinal range of about 100 m. Extensive searches in Victoria's alpine areas have not revealed any similar phenotype elsewhere.

History of conservation concern: Recognised as of conservation significance, but without formal status evaluation in Victoria. Dunn et al. (1994) ranked it as 'secure'.

Major threatening processes: Commercial pressures for development will affect *O. l. theddora*. Alpine environments generally in southeastern Australia are under considerable human pressures and Mount Buffalo is no exception, with increased development to accommodate higher usage for winter sports and diversifying summer tourism. Some colonies are close to existing buildings and any expansions for human uses have the potential to affect the butterfly's habitat, since the areas are most suitable for construction of additional buildings, roads, car parks and other amenities. *O. l. theddora* appears thus to be a highly adapted alpine specialist whose habitat would contract further with climate change.

In the longer term, global warming must be viewed as a potential threat to this butterfly. *O. l. theddora* can be viewed realistically as an umbrella species for sensitive alpine ecosystems on the plateau.

Is knowledge sufficient to formulate recovery action? In part. The biology of the butterfly, and its distribution pattern are sufficiently well known to define areas of critical habitat on Mount Buffalo. It is thereby possible to evaluate the proximal effects of specific building developments and the like on habitat, and to consider their siting at the planning stages, together with effects of access. The whole of the plateau is included in a National Park, so that the entire range of the butterfly could potentially be accorded a high level of protection.

Recovery needs: No specific needs for recovery are present. The main aim of management for *O. l. theddora* is to preserve its current state of wellbeing by preventing habitat loss and degradation, ensuring against fragmentation of the butterfly populations. Security of the butterfly may depend heavily on maintaining the Mount Buffalo environment as close as possible to its present healthy conditions.

1. A regular monitoring programme is needed, to determine present distribution of *O. l. theddora* on Mount Buffalo (with preparation of a detailed distribution map) as a baseline against which to assess future changes and for correlation with previous changes to habitat.
2. Presence of *O. l. theddora* in disturbed areas should be determined, and the extent of changes correlated with its absence assessed. In particular, loss of *Poa* and invasion by exotic grasses, and dependence on native nectar plants, seem likely to be important factors influencing butterfly decline.
3. A formal consultation process is needed in regard to any proposed commercial / recreational expansion of activities on the

plateau and impacts on *O. l. theddora*. The tenure of the area should facilitate this considerably, and such developments should be allowed only with great caution on sites where *O. l. theddora* is present at high levels and / or extensive areas of *Poa* are to be removed or damaged.

Can recovery be carried out with existing resources? Yes, in part. No urgent recovery actions are needed at present. More pro-active appraisal of the subspecies, as advocated above, needs additional support. Surveys of the butterfly over the Mount Buffalo plateau, to determine its distribution in relation to habitat quality should be undertaken over two seasons.

Resources required:

Action		$
1	Surveys of the butterfly and estimates of threats over the Mount Buffalo plateau, 8,000 / year / 2 years	16,000.00
Total		16,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead organisations: Environment Australia, Victorian Department of Natural Resources and Environment.

Reference

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

NYMPHALIDAE: SATYRINAE

Scientific name *Oreixenica ptunarra angeli* L.E.Couchman; *O. ptunarra ptunarra* L.E. Couchman; *O. ptunarra roonina* L.E. Couchman; *O. ptunarra* ssp.

National Conservation Status: *O. p. roonina*: Vulnerable [VUb,c]; *O. p. angeli*, *O. ptunarra* ssp., *O. p. ptunarra*: Lower Risk (Least Concern).

Range: Tasmania.

Distribution: (ssp. *angeli*) east coast and Eastern Tiers region; (ssp. *ptunarra*) Central region: the 'Central plateau' mainly around Great Lake and Arthurs Lake; (ssp. *roonina*), Steppes and Southern Midlands, Oatlands; (ssp.) North West Plains and Valentines Peak.

Taxonomy: The taxonomy of this species is both confused and confusing, and necessitates joint consideration of the four possible forms recognised in this complex, not least to avoid considerable repetition and overlap. *O. ptunarra* is an endemic Tasmanian satyrine, separated by Couchman (1953) into three subspecies on the basis of geographically related differences in colour pattern and size of individuals from a limited number of sites. More recent appraisal has led to recognition of another, unnamed, subspecies.

Infra-specific relationships and variation: *O. p. roonina* Couchman was differentiated as the largest and palest subspecies (Common and Waterhouse 1981), but many populations of *O. ptunarra* can not be attributed satisfactorily to a particular subspecies (Couchman and Couchman 1977, Neyland 1992). Although the subspecific names persist in the literature, a detailed phenotypic analysis of adult features led McQuillan and Ek (1997) to propose that the subspecies *roonina* and *angeli* Couchman should be reduced to synonymy with nominotypical *ptunarra* Couchman, and that the disjunct northwestern populations of small dark butterflies merit recognition as a (new) subspecies.

The step recommended by McQuillan and Ek has not yet been formalised, and the northwestern populations are referred to here as '*O. ptunarra* ssp.'. Braby (2000) did not recognise the distinction of either sspp. *roonina* or *angeli*. However, the 'conventional' subspecies categories provide the most constructive basis for appraising this species, and have been employed widely in accumulating the considerable information on *O. ptunarra* now available. A major concern of McQuillan and Ek was that the 'existing' classification did not accommodate the full range of variation in this extremely variable butterfly.

Habitat and key ecological features: Patchily distributed over higher altitudes (ca 320–910m asl) native grasslands and grassy woodlands in central Tasmania. Largely absent from forested areas, and favours regions with dense cover of native grasses and absence of vegetation more than I m high. All subspecies of *O. ptunarra* are univoltine and have a short flight season, of only around two weeks. Females have low fecundity, and larvae can feed on several species of *Poa*. Adults are feeble dispersers and poor colonisers, and most populations are strongly localised. The species does not extend into drier lowland grasslands or into high altitude grasslands of the western Central Plateau. Strongest colonies occur in larger areas of habitat, and a key requirement is an area of *Poa* of at least 1 ha (Neyland 1993).

History of conservation concern: *O. ptunarra* was noted as of national concern by Braby (2000). Dunn et al. (1994) categorised all three named subspecies as 'Endangered', commenting that *O. p. ptunarra* 'faces continued decline' without action to save their habitats. All subspecies of *O. ptunarra* were listed as Vulnerable by IAC (1994) on the grounds of 'Dramatic loss of habitat and decline in density', with threats noted as 'forestry, clearing, overburning and grazing of grassland'. Neyland (1992, 1993); Prince (1988) and Neyland (1992) considered all three named subspecies 'Endangered'. *O. ptunarra* is recognised as an important umbrella species for *Poa* grassland communities in central Tasmania. The butterfly has disappeared from many sites on which it was formerly abundant (Neyland 1993); although more than 150 colonies (some metapopulations) of *O. ptunarra* are known, many are insecure and appear threatened. Some have become extinct in recent years.

Some commentators on *O. ptunarra* have not differentiated between the subspecies in their appraisals of National Conservation Status. Participants in the Hobart BAP Workshop suggested that there is no case for Endangered status for any subspecies; that *O. p. roonina* may be the least secure form, and that *O. ptunarra* ssp and some populations of *O. p. angeli* are probably Vulnerable. *O. p. ptunarra* appears to be relatively secure, although some colonies are threatened. On an 'amalgamated taxon' of the three named subspecies, the composite entity may be Vulnerable to losses of some of the extreme clinal forms categorised above as subspecies.

Major threatening processes: Many remnant grasslands are on private land, and may be grazed by stock or replaced by pulpwood forests. Typical *O. p. roonina* is centred on the Oatlands area of the Midland lowlands, where about 90% of its habitat is on private land, and thereby Vulnerable to loss from overgrazing, transition to cropping (or example, of opium poppies), and spraying of fenitrothion for grasshopper control. *O. p. roonina* is therefore regarded by Tasmanian lepidopterists as the least secure of the described subspecies. Habitats suitable for all subspecies of *O. ptunarra* are commonly disjunct, because of widespread clearing of native vegetation for agriculture and forestry. The butterfly disappears rapidly from sites changed in such ways, including the replacement of native grasses by exotic pasture species. When sites are subsequently abandoned, recolonisation by natural dispersal of *O. ptunarra* does not usually occur (P. McQuillan pers. comm.).

O. ptunarra ssp. is centred on Valentine's Peak, in the northwestern part of its range. The major threat to this localised subspecies is from clearing and replacement of native vegetation by plantation forests, particularly of eucalypts. About half of its total suitable habitat may be affected eventually. However, this subspecies may be more widely distributed than documented at present. Some of its range is in the Cradle Mountain / Lake St Clair National Park; and it is also found on nearby crown land including Forest Reserves, in some of which logging is restricted to help conserve the subspecies.

Despite being potentially Vulnerable to decline from the above factors, and that some colonies have indeed disappeared, *O. p. ptunarra* and *O. p. angeli* are regarded as more secure. *O. p. angeli* is not represented in national parks, but much of its range is in State Forests or on crown land, and includes some relatively pristine areas. It could become more threatened by unsuitable fire regimes, road building and forestry activities, but is currently not threatened to any major extent. Some authorities suggest that it should be classed as Vulnerable in at least parts of its range. Neyland (1993) noted that 'numbers are very low at many sites'.

Is knowledge sufficient to formulate recovery actions? Yes. Detailed surveys of all subspecies of *O. ptunarra* in recent years have led to considerably increased knowledge of their biology, distribution, and key features of good habitats, together with a clear perception of the factor involved in habitat loss and butterfly decline and extirpation (I. Knight pers. comm.). Neyland (1992) prepared a recovery plan for the species. Further research is needed on the detailed effects of fire, and the colonisation abilities of the butterfly, but this should not delay constructive management from occurring.

Recovery needs:

1. Increase long term security of as many currently occupied sites as possible, with priority given to larger sites and increasing representation throughout the range of the subspecies. Establishment of grassland reserves in the north west areas subject to increasing plantation forestry is a high priority.
2. Reduce threats from changes in land use, as an integral part of arresting further declines. As examples, of a wide variety of steps needed:
   a. reducing frequency, timing and extent of burning for grazing management, on grasslands throughout the range of the butterfly.
   b. controlling stocking rates on butterfly colonies (by fencing or direct reduction of stock numbers). This was noted as a key need by Neyland (1992).
3. Maintenance of native *Poa* and nectar plants on selected sites, if necessary by restoration of impoverished sites.
4. Restoration of *O. p. roonina* to sites of historical significance, using stock from local, phenotypically similar colonies for translocation.
5. Foster increased awareness of the butterfly and its needs, particularly amongst owners and managers of land, which supports significant colonies.

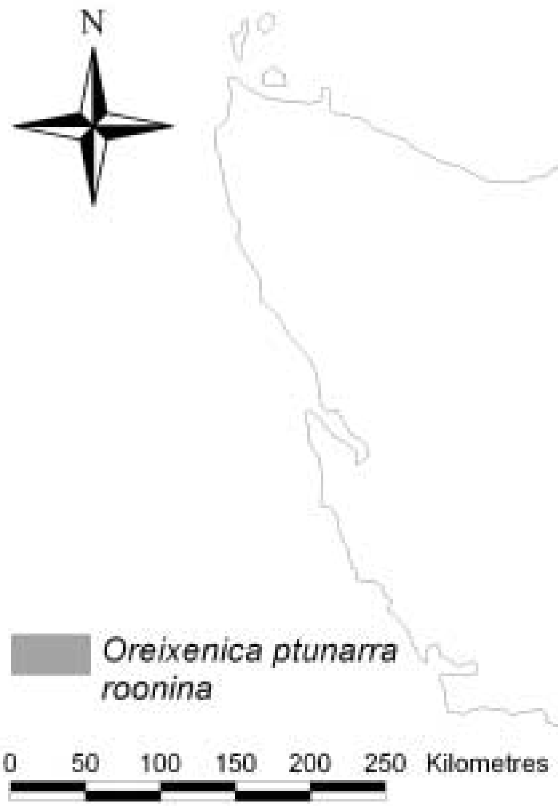
Can recovery be carried out with existing resources? No. Unlike most other taxa, the major needs are not for more extensive surveys but to increase site security and reduce threats, through changing patterns of land use and promoting restoration. Costs of these measures are at present largely indeterminate. The predominant need is for a consolidated State plan to set priorities through determining and protecting the 'most significant' colonies, through specific measures for each, whilst preventing more general decline across the butterfly's range. The initial budget item is therefore to provide information to update the report by Neyland (1992) in the context of revised opinion of intraspecific taxonomy, changes in status and increased knowledge over the last decade. A comprehensive budget will be required for a recovery plan.

Resources required:

Action*		$
1	Develop schedule and methods for increasing site security and reduce threats, through changing patterns of land use and promoting restoration.	30,000.00
2	Taxonomic investigations	5,000.00
Total		35,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Distribution of *Oreixenica ptunarra roonina*



Lead organisations: Environment Australia, Department of Primary Industries, Water and Environment, Tasmania.

Timeframe for Rehabilitation of Taxon

- In train 2 years
- Completed 6 years
- De-listing 6–8 years

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO Melbourne.

Couchman, L.E. 1953. Notes on some species of *Oreixenica* Waterhouse and Lyell (Lepidoptera, Satyridae), with descriptions of new forms. Proceedings of the Royal Entomological Society of London (B) 22, 73-84.

Couchman, L.E. & Couchman, R. 1977. The butterflies of Tasmania. Tasmanian Year Book 1977, 66–96.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

McQuillan, P.B. & Ek, C.J. 1997. A biogeographical analysis of the Tasmanian endemic ptunarra brown butterfly, *Oreixenica ptunarra* Couchman 1953 (Lepidoptera: Nymphalidae: Satyrinae). Australian Journal of Zoology 44, 21–37.

Neyland, M. 1992. The ptunarra brown butterfly *Oreixenica ptunarra*. Conservation Research Statement. Department of Parks, Wildlife and Heritage, Hobart. Scientific report 92/2.

Neyland, M. 1993. The ecology and conservation management of the ptunarra brown butterfly *Oreixenica ptunarra* (Lepidoptera; Nymphalidae; Satyrinae) in Tasmania, Australia. Papers and Proceedings of the Royal Society of Tasmania 127, 43–48.

Prince, G.B. 1988. The habitat requirements and National Conservation Status of Tasmanian endemic butterflies. Report to Tasmanian Department of Lands, Parks and Wildlife, Hobart.

NYMPHALIDAE: SATYRINAE

Scientific name: *Orsotriaena medus moira* Waterhouse & Lyell

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Torres Strait Islands and northern Cape York Peninsula.

Taxonomy: This species is closely related to species of *Mycalesis*, from which it can be separated by the number of eyespots on the underside of the wings, and the hairless eyes (Braby 2000).

Infra-specific relationships or variation: Other subspecies of *Orsotriaena medus* occur in India, Asia, South Asia and Papua New Guinea. The species is at the southern edge of its range on Cape York Peninsula.

Habitat critical to survival: *O. medus* is a grass and wetland-frequenting species and is confined to the far north of the mainland and Torres Strait Islands (Johnson et al. (1995). It occurs near streams, ponds and in immersed grasslands. The species is abundant on the mainland of New Guinea and is only occasionally seen on northern Cape York Peninsula. In 1976, many specimens were seen in wet grasslands edging a swamp, southeast of Somerset near the tip of Cape York (D.P.A. Sands). Larvae feed mainly on wild rice, *Oryza* spp., and near Lae, Papua New Guinea they sometimes defoliate cultivated rice, *O. sativa* (D.P.A. Sands).

History of conservation concern: Dunn et al. (1994) stated that *O. medus* was endangered, due to the frequent burning of grassland on Murray Island. This taxon is currently listed as Endangered and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). Concerns were probably due to the few specimens recorded from the Australian mainland and islands, and failure of lepidopterists to recognise its close adaptation to wetlands.

Major threatening processes: *O. medus* was thought by Dunn et al. (1994) to be threatened by fire and by clearing of vegetation, especially on Torres Strait Islands. However, occasional fires are normal in the habitat for this butterfly and have not affected its survival in Papua New Guinea. The species may also be capable of breeding at the margins of rainforest where it is protected from fire (Braby 2000). Threatening processes were not identified for the species on Cape York Peninsula.

Is knowledge sufficient to formulate recovery actions? Recovery actions are not required. The species is likely to sustain itself in wetlands of northern Cape York Peninsula and on several Torres Strait Islands.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Johnson, S.J., Johnson, L.R. and Valentine, P.S. 1995. Notes on the early stages of *Orsotriaena medus moira* Waterhouse & Lyell and *Melanitis constantia* Cramer (Lepidoptera: Nymphalidae: Satyrinae) from Torres Strait, Australia. Australian Entomologist 22: 65–68.

NYMPHALIDAE: CHARAXINAE

Scientific name: *Polyura andrewsi* (Butler)

National Conservation Status: Data Deficient

Range: Christmas Island.

Taxonomy: *Polyura andrewsi* is an endemic member of a mainly Southeast Asian and Pacific genus.

Infra-specific relationships or variation: No variation recorded.

Habitat critical to survival: Not known and the records are known only from documentation by Moulds and Lachlan (1987).

History of conservation concern: None recorded.

Major threatening processes: None known.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Surveys for butterflies incorporating investigations on this and other species are recommended for Christmas Island, to establish their National Conservation Status and identify any threatening processes.

Resources required:

Action		$
1	Surveys for distribution and ecology on Christmas Island	13,000.00
Total		13,000.00

Lead Organisations: Environment Australia.

References:

Moulds, M.S. and Lachlan, R.B. The butterflies (Lepidoptera) of Christmas Island, Indian Ocean. Australian Entomological Magazine 14: 57–66.

NYMPHALIDAE: CHARAXINAE

Scientific name: *Polyura sempronius tiberius* (Waterhouse)

National Conservation Status: Data Deficient

Range: Lord Howe Island.

Taxonomy: *Polyura sempronius* was formerly considered to be a subspecies of *P. pyyrrhus* but has recently been treated as a distinct species.

Infra-specific relationships or variation: *Polyura sempronius tiberius* was said to have a more concave termen, yellowish central areas, colour differences beneath and broader dark margins than the mainland Australian subspecies, *sempronius* (Common and Waterhouse 1081).

Habitat critical to survival: The habitat has not been defined. Males apparently congregate on hilltops (Smithers 1970).

History of conservation concern: Dunn et al. (1974) considered this subspecies to be insufficiently known. It is known from very few specimens from Lord Howe Island recorded from November to December and February to April (Smithers 1971).

Major threatening processes: None known. Probable food plants are widely distributed on Lord Howe Island and most habitats are likely to be secure.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Surveys for butterflies incorporating investigations on this and other species are recommended for Lord Howe Island, to establish their National Conservation Status and identify any threatening processes.

Resources required:

Action		$
1	Surveys for distribution and ecology on Lord Howe Island	10,000.00
Total		10,000.00

Lead Organisations: New South Wales National Parks and Wildlife Service, Environment Australia.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Smithers, C.N. 1970. Observations on Lord Howe Island butterflies. Australian Zoologist 15: 377–379.

Smithers, C.N. 1971. A note on Lord Howe Island butterflies. Journal of the Australian Entomological Society 10: 299–300.

NYMPHALIDAE: CHARAXINAE

Scientific name: *Polyura* ? *jupiter* (Butler)

National Conservation Status: Data Deficient

Range: Murray Island.

Taxonomy: *Polyura* spp. are known from two adjacent regions of Torres Strait, *P. sempronius* (from southern Islands) and *P. jupiter* from mainland Papua New Guinea. Its presence in Torres Strait Islands, is only known from a sighting by Johnson, in Lambkin and Knight (1990). Specific identification has not been confirmed.

Infra-specific relationships or variation: Unknown.

Habitat critical to survival: Unknown. The species is known in Australia only from documentation by Lambkin and Knight (1990).

History of conservation concern: None recorded.

Major threatening processes: None known.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Surveys and continuing investigations on this and other species are recommended for Murray Island, to establish their National Conservation Status and identify any threatening processes.

Resources required:

Action		$
1	Surveys and taxonomic studies on specimens from Murray Island	12,000.00
Total		12,000.00

Lead Organisations: Queensland Parks and Wildlife Service and Environment Australia.

Reference:

Lambkin, T.A. and Knight, A.I. Butterflies recorded from Murray Island, Torres Strait, Queensland. Australian Entomological Magazine 17: 101–112

NYMPHALIDAE: AMATHUSIINAE

Scientific name: *Taenaris artemis jamesi* Butler

National Conservation Status: Data Deficient.

Range: Torres Strait Islands. *T. artemis jamesi* also occurs in southern Papua New Guinea.

Distribution: Cape York, eastern Torres Strait islands.

Taxonomy: About 17 subspecies of *T. artemis* have been described (Braby 2000), mainly from Papua New Guinea.

Infra-specific relationships or variation: Braby (2000) indicated that the identity of the Australian subspecies is uncertain.

Habitat critical to survival: Pandanus plant communities in rainforest may be critical habitat for the butterfly in Australia. *Pandanus* sp. and *Cocos nucifera* have been reported as food plants for larvae in Papua New Guinea (Braby 2000).

History of conservation concern: Sands (1990) considered this species was of concern and was likely to be dependent on the habitat remaining intact, as well as stability of vegetation surrounding the habitat. Very few specimens are known from Murray and Darnley Islands, and Bamaga and Lockerbie Scrub on Cape York Peninsula.

Major threatening processes: None recognised. The concerns by Sands (1990) were based on the very limited distribution and possible threats to the rainforest fragments at Bamaga and Lockerbie Scrub.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. There is no evidence for determining the National Conservation Status of this species in Australia.

Resources required:

Action		$
1	Surveys for the butterfly and estimates of threats on Cape York Peninsula and on Torres Strait Islands	16,000.00
Total		16,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Sands, D.P.A. 1990. Australia's endangered butterflies. News Bulletin of the Entomological Society of Queensland 18: 63–68.

NYMPHALIDAE: SATYRINAE

Scientific name: *Tisiphone abeona*, ssp. 'Comboyne'

National Conservation Status: Data Deficient

Range: New South Wales.

Distribution: Comboyne Plateau.

Taxonomy: This population of *T. abeona* occurs on the Comboyne Plateau and was previously included by Waterhouse (1932) as ssp. *joanna*.

Infra-specific relationships or variation: The population from the Comboyne Plateau appears to be much less variable than coastal populations of '*joanna*' and most specimens are characterised by the large white patch on the fore wing (R. Mayo pers. comm.). Until further studies are carried out, this isolated population is dealt with separately from other subspecies of *T. abeona*, and it may eventually be found to be a distinct taxon.

Habitat critical to survival: This population is apparently confined to one small area in a deep gully where sword grass is growing.

History of conservation concern: This population was identified as Data Deficient during interviews and by participants at the BAP Workshops. The security of the single known habitat for this population is not certain. The population is certainly of considerable scientific interest, forming part of the complex of subspecies and hybrids in *T. abeona*.

Major threatening processes: None recognised. However the tenure of the habitat may be subject to disturbance.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Surveys and taxonomic studies are needed to establish the distribution, identity and security of this unique population of *T. abeona*. Recovery actions for hybrid '*joanna*' should also include studies on this population.

Recovery needs:

1. Surveys and mapping, preservation and management of areas where population '*joanna*' of *T. abeona* occurs near Port Macquarie.
2. Inclusion of populations and habitats in national parks, especially 5–8 km north from Port Macquarie.
3. Managing weeds and fire control for habitats selected for protection.
4. Community participation in site rehabilitation, plant propagation and cultivation of the food plant.
5. Populations analysis by DNA as part of the identification and delimitation of the unique butterfly.

Can recovery be carried out with existing resources? No.

Resources required: Surveys and mapping are needed. Land acquisition has not been estimated in the budget (below) but is recognised as of likely importance.

Action		$
1	Surveys and mapping, $2,000 / year over 2 years	4,000.00
2	DNA profiles for isolated populations prior to translocation	4,000.00
Total		8,000.00

Timeframe for Rehabilitation of Taxon

- In train 2 years
- Completed 3 years

Lead Organisation: New South Wales National Parks and Wildlife Service.

References:

Waterhouse, G.A. 1932. What butterfly is that? Angus and Robertson, Sydney.

NYMPHALIDAE: SATYRINAE

Scientific name: *Tisiphone abeona* '*joanna*' Butler

National Conservation Status: Lower Risk (Least Concern).

Range: New South Wales.

Distribution: Approximately 20 km to the north and south of Port Macquarie.

Taxonomy: Two species of *Tisiphone*, *T. abeona* and *T. helena* occur in eastern and southern Australia. The population known as '*joanna*', has in recent years (e.g. Common and Waterhouse 1981), been considered to be a natural hybrid population between sspp. *aurelia* Waterhouse and *morrisi* Waterhouse of *T. abeona*.

Infra-specific relationships or variation: The hybrid population '*joanna*' is very variable with extremes ranging in form from sspp. *aurelia*, to *morrisi* and sometimes approaching *rawnsleyi*.

Habitat critical to survival: This hybrid population occurs in open and melaleuca woodlands, and in wetlands where *Gahnia* is sufficiently abundant to support breeding colonies. The most important food plant is *Gahnia clarkei*, but other *Gahnia* spp. are occasionally utilised.

History of conservation concern: The 'hybrid' population was listed as threatened by Hill and Michaelis (1998) and Dunn et al. (1994), and Braby (2000) considered that this hybrid population '*joanna*' was of regional or local concern. This hybrid population is of considerable scientific importance and provides an unusual example of intermediates and morphological mixtures of two distinctive subspecies. The habitat includes Limeburners Creek Nature Reserve, Port Macquarie, shared with at least two other species of conservation interest, *Argyreus hyperbius inconstans* and *Telicota eurychlora*.

Major threatening processes: Hill and Michaelis (1988) identified urban development and agricultural clearing as threats for this hybrid population. Disturbance and destruction of the wetland habitats within a radius of about 20 km of Port Macquarie, including vegetation clearing, weed invasion (mainly grasses and *Baccaris halimifolia*), burning, sand mining, drainage of water courses and farming practices (sugarcane, herbicides). Urban development is an important threat, especially for isolated pockets of breeding butterflies and the species is very susceptible to fire. Common and Waterhouse (1981) stated that urbanisation, beach mining and agricultural development threatened the breeding grounds for '*joanna*'.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. The population is considered to be of immense genetic interest. The hybrid population is secure at Limeburners Creek Nature Reserve, Port Macquarie but requires management and the conservation of other suitable habitats to ensure it does not become threatened. In particular, the area south of the Nature Reserve near urban settlement needs protection.

A community project on *T. abeona albifascia* in the Dandenong Ranges in Victoria has proven to be very effective in restoring and enhancing its local breeding habitats, and by planting the food plants. This project makes an excellent model for a similar community-based project on '*joanna*' in the Port Macquarie area (Anon. 2000).

Recovery needs:

1. Surveys and mapping, preservation and management of areas where population '*joanna*' of *T. abeona* occurs near Port Macquarie.
2. Special recognition of the importance of Limeburners Creek Nature Reserve, and adjacent areas further south at Port Macquarie, for the purpose of management of this subspecies.
3. Inclusion of populations and habitats in national parks or nature reserves, especially within a radius of 5–8 km from Port Macquarie.
4. Managing weeds and fire control for habitats selected for protection.
5. Community participation in site rehabilitation, plant propagation and cultivation of the food plant.
6. Populations analysis by DNA as part of the identification and delimitation of the unique subspecies.

Can recovery be carried out with existing resources? No.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance, especially coastal areas 3–5 km south of Limeburners Creek National Park.

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
2	Site rehabilitation, plant propagation and cultivation, $15,000 per year over 3 years	45,000.00
Total		60,000.00

Timeframe for Rehabilitation of Taxon

- In train 2 years
- Completed 5 years

Lead Organisations: New South Wales National Parks and Wildlife Service, Port Macquarie Municipal Council.

References:

Anon. (2000). Gahnia, The Newsletter of the Sword-grass Brown Butterfly Project, Knox Environmental Society, Boronia, Victoria.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. Report to Australian National Parks and Wildlife Service, Canberra.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service, Canberra. Occasional paper no. 13.

NYMPHALIDAE: SATYRINAE

Scientific name: *Tisiphone abeona antoni* Tindale

National Conservation Status: No Conservation Significance

Range: Victoria, South Australia.

Distribution: Grampians, Dartmoor, Portland districts, Victoria; Lake Edward, Port Macdonnell and southeastern South Australia.

Taxonomy: *T. abeona antoni* is one of seven subspecies of *T. abeona* and, apart from ssp. *rawnsleyi*, is the only subspecies geographically isolated from other subspecies.

Infra-specific relationships or variation: Subspecies *antoni* is most similar to ssp. *albifascia* from which it can be distinguished by the cream subocellar costal band (Common and Waterhouse 1981). Subspecies *antoni* was not recognised as a distinct subspecies by Braby (2000).

Habitat critical to survival: *T. abeona antoni* is very local and was considered to be rare by Common and Waterhouse (1981). It occurs only in shaded gullies where the food plant, *Gahnia sieberiana*, occurs is sheltered from bush fires.

History of conservation concern: This subspecies was listed as threatened by Hill and Michaelis (1998) but no reasons were provided for this listing. Participants at the BAP Workshops in Melbourne and Adelaide did not consider ssp. *antoni* was threatened, indicating it was secure in the Grampians National Park and Germain Wetland Reserve (Grund pers. comm.). However, for South Australia, Fisher and Watts (1994) considered it Endangered, with Grund (2001) allocating it (as ssp. *albifascia*) as Vulnerable. Concern in South Australia arose from its presence at only three localities, and it being abundant at only one of these (Lake Leake), with strong implications that these colonies are remnants of a formerly much wider distribution (Fisher and Watts 1994).

Major threatening processes: Hill and Michaelis (1988) identified road works as a threat to this subspecies. Bush fires may be a threat since the subspecies is not very mobile and pockets of breeding colonies are liable to isolation.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. This subspecies is not threatened. However, local conservation activities should be encouraged for community and school involvement, involving cultivation and planting the food plant.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Fisher, R.H. and Watts, C.H.S. 1994. The swordgrass brown butterfly (*Tisiphone abeona antoni*) in South Australia. Recovery Plan. Australian Nature Conservation Agency, Canberra.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

NYMPHALIDAE: SATYRINAE

Scientific name: *Tisiphone abeona morrisi* Waterhouse

National Conservation Status: No Conservation Significance; Queensland: Critically Endangered [CRa,b].

Range: Queensland, northeastern New South Wales

Distribution: *T. abeona morrisi* originally occurred in Queensland from the New South Wales border to Yatala (D.P.A. Sands unpublished). One population survives at Jacobs Well, near Yatala. In Queensland it was once abundant from Coolangatta to Southport (Waterhouse 1932), but these populations are now extinct. This subspecies currently occurs from the Macleay River to Coolangatta, New South Wales.

Taxonomy: Two species are represented in the genus, *Tisiphone abeona* and *T. helena*, both from eastern and southern Australia.

Infra-specific relationships or variation: *T. abeona morrisi* is one of nine subspecies of *T. abeona* (one undescribed). They occur in southeastern South Australia, Victoria, New South Wales and in southeastern Queensland as far north as Fraser Island (J. Moss unpublished). The subspecies comprise distinctive populations, sometimes with hybrid zones or occasionally they are separated geographically. The subspecific status of two populations of *T. abeona* in Queensland require evaluation: one at Mount Maroon may be ssp. *morrisi* and one at Mount Barney National Park is probably ssp. *regalis* (M.C. Sands, pers. comm.). The conservation status of ssp. *morrisi* in Queensland may require revision once these subspecies are identified.

Habitat critical to survival: *T. abeona morrisi* is mostly dependent on the swordgrass *Gahnia clarkei* to sustain breeding colonies. However, it has also been found to breed on other species of *Gahnia*, for example, *G. sieberiana*, in the southern part of its range or in the northern areas during warm wet summer periods when leaves are sufficiently soft for the larvae to feed.

History of conservation concern: *Tisiphone abeona morrisi* is not currently listed as threatened by State or Commonwealth authorities. It was thought to have become extinct in Queensland in the 1930s (Waterhouse 1932) and recent literature (e.g Common and Waterhouse 1981) stated that it was probably extinct in Queensland, although known to be not common in northeastern New South Wales. Dunn and Dunn (1991), Dunn et al. (1994) and Braby (2000) considered that this subspecies had become extinct in Queensland. However, subspecies *morrisi* was re-discovered at Jacobs Well in early 2000, 50 km south of Brisbane (G. Leiper pers. comm.), on private property owned by a sugar cane farmer.

T. abeona morrisi previously occurred in Queensland from Southport to Coolangatta but all its habitats and food plants in this area were destroyed during development of the Gold Coast City. However, occasional reports of its existence suggested that small pockets have survived. For example, a small colony was reported in the 1950s from near Mount Tambourine (A. Burns pers. comm.), and many adults were observed at Yetala in 1969 (D.P.A. Sands unpublished).

The subspecific status of two other populations in southeastern Queensland requires evaluation. One at Mount Maroon may be ssp. *morrisi* and one at Mount Barney is probably ssp. *regalis.* The Conservation Status of ssp. *morrisi* in Queensland may require revision once these populations are identified to subspecies. Another subspecies, *T. abeona rawnsleyi*, found from Beerwah north of Kin Kin and on Fraser Island, is not threatened in Queensland.

Major threatening processes: Insufficient secure habitat is available to sustain survival of this taxon in Queensland. Previous habitats have been destroyed in Queensland, resulting from urban development. The only known remaining habitat in Queensland for *T. abeona morrisi* is threatened by change in land ownership and use, and fire. After habitat clearing, fire is a key threatening process for *T. abeona morrisi*. The subspecies survives in Queensland only at one site on privately owned land at Jacobs Well which is likely to be developed, used for planting sugar cane or sand mining.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. A recovery plan has been prepared for this taxon, submitted in May 2000. It has been prepared as a translocation project. Translocation of *T. abeona morrisi* from Jacobs Well to other protected localities south of Brisbane is considered to be a priority action since translocation of another subspecies of *T. abeona* has been successfully carried out in Victoria. The same translocation methods are expected to be applicable to ssp. *morrisi*. Site enrichment has also been undertaken in Victoria (Belvedere et al. 1998).

Recovery needs:

1. Listing of this subspecies in Queensland as Critically Endangered.
2. Urgent assessment for the future tenure of the only known coastal habitat for *T. abeona morrisi* at Jacobs Well.
3. For southeastern Queensland, protect by all means possible the existing habitat at Jacobs Well, if possible by acquisition or other means. In June 2001 negotiations with the Gold Coast City Council were progressing towards preserving the site as an endangered ecosystem, under a vegetation protection order. The site must be monitored as a collaboration venture between the Council with the Queensland Parks and Wildlife Service.
4. Develop a Recovery Plan, appoint a Recovery Team
5. Establish a translocation program (accompanied by DNA identification) of the Jacobs Well population. **Note**: no populations should be introduced from New South Wales into southeastern Queensland, unless attempts to translocate populations from Jacobs Well to another site in southeastern Queensland prove to be unsuccessful.
6. Select for rehabilitation other sites with *Gahnia clarkei*, within the original range of *T. abeona morrisi*, for translocation and long-term protection.
7. Establish signage and schedules for weed and fire control at Jacobs Well.
8. Encourage community participation in the Recovery Plan for site rehabilitation, *Gahnia clarkei* propagation and planting.
9. Establish a schedule for recovery and de-listing of *T. abeona morrisi* to 'conservation dependent'.

Can recovery be carried out with existing resources? No.

Resources required:

Action*		$
1	Surveys and mapping, $5,000 / year over 2 years	10,000.00
2	DNA and taxonomic studies to precede interstate translocation to Qld	2,000.00
3	Fire protection, 1,000 / year, on-going (5 years initially)	5,000.00
4	Translocation program, 3 suitable sites for rehabilitation	18,000.00
5	Plant propagation and cultivation, $15,000 per year over 3 years	45,000.00
Total		80,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Timeframe for Rehabilitation of Taxon

- In train — within 1 year
- Completed — 7 years
- De-listing — 7 years

Lead Organisations: Queensland Parks and Wildlife Service, Environment Australia.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Belvedere, M., Bain, G. & Steller, P. 1998. Sword grass brown butterfly project. Victorian Naturalist 115: 142–145.

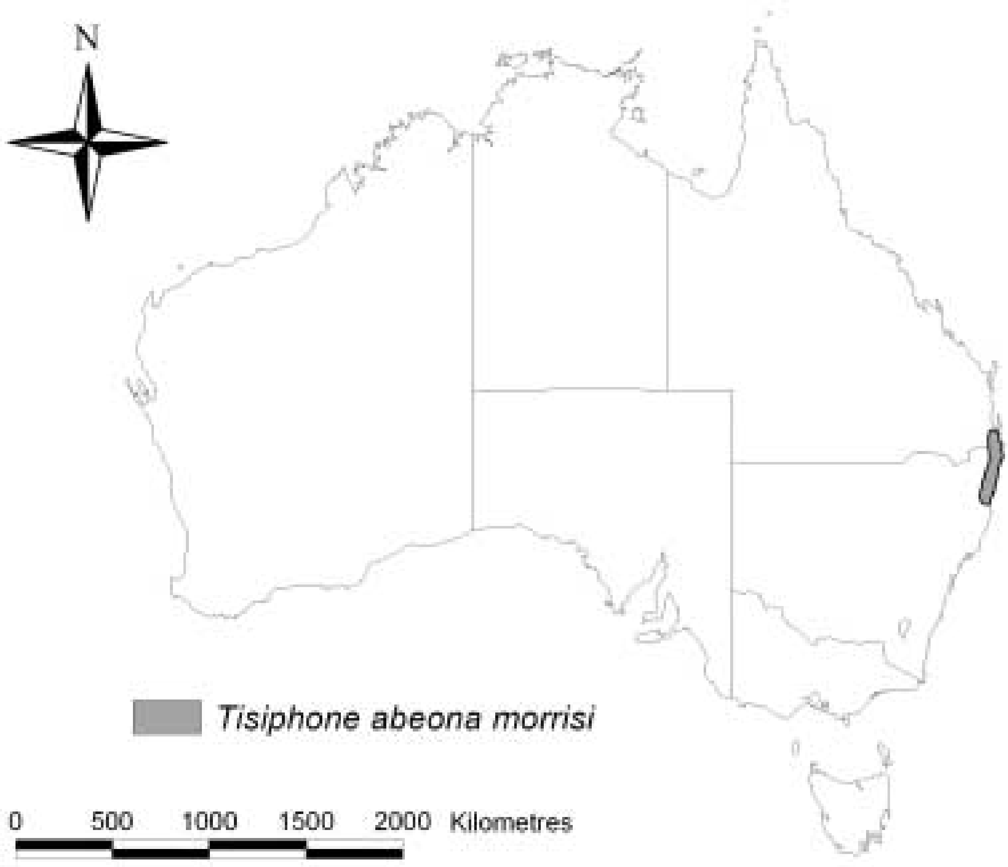
Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K. L. and Dunn, L.E. 1991. Revision of the Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Waterhouse, G.A. 1932. What butterfly is that? Angus and Robertson, Sydney.

Distribution of *Tisiphone abeona morrisi*



LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas arcana* (Miller and Edwards)

National Conservation Status: Data Deficient

Range: Queensland, New South Wales.

Distribution: *Acrodipsas arcana* has been recorded from Mount Moffatt, Theodore and Leyburn, Queensland, and west of Grafton, New South Wales.

Taxonomy: Nine species of *Acrodipsas* occur in Australia, most of them in the east. Species also occur in South Australia, Western Australia, and Northern Territory.

Infra-specific relationships or variation: *A. arcana* is most closely related to *A. mortoni* and *A. hirtipes*, and belongs in the *illidgei* species group, based on leg morphology. The position of underside bands of *A. arcana* varies a little according to locality. A female from Leyburn differs from others in several characteristics and more specimens are required to confirm its identity.

Habitat critical to survival: Not well understood. *A. arcana* was first taken on a single hilltop about 24 km west of Grafton, New South Wales. Many specimens have since been taken there but there are few other localities, and none elsewhere in New South Wales. In common with other members of the genus, larvae of *A. arcana* are probably predatory on the immature stages of ants, but the life history is unknown. Both sexes occur on hilltops and one female was collected in a mono-stand of casuarinas, far from the nearest hilltop.

History of conservation concern: Hill and Michaelis (1988) considered this species to be threatened. Sands (1990) referred to its few habitats and its dependence on the stability of vegetation surrounding its hilltop habitats. Very few localities are known for *A. arcana* and its ecological requirements are unknown. More information is needed before its National Conservation Status can be determined.

Major Threatening Processes: None known. Most known habitats of *A. arcana* are reasonably secure but particular attention should be given to protect the hilltop habitat near Grafton, the only known locality in New South Wales. This hilltop is a habitat for several other species at the southern edge of their range and of conservation interest. Mount Moffatt National Park, Queensland is likely to be free of threatening processes.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate and data on *A. arcana* are insufficient to determine its National Conservation Status. Surveys are required to determine its distribution and environmental requirements. Conservation authorities in Queensland should encourage surveys to determine if this species occurs in several potentially suitable national parks under their administration.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
Total		15,000.00

Lead Organisations: Environment Australia, New South Wales National Parks and Wildlife Service, Queensland Parks and Wildlife Service.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Sands, D.P.A. 1990. Australia's Endangered butterflies. News Bulletin, Entomological Society of Queensland. 18: 63–68

LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas brisbanensis brisbanensis* (Miskin)

National Conservation Status: No Conservation Significance; Western Australia: Data Deficient

Range: Queensland, New South Wales, Victoria, Australian Capital Territory, Victoria, South Australia, Western Australia.

Distribution: *A. brisbanensis brisbanensis* occurs in all mainland States but is apparently absent from Northern Territory. Known from western slopes of the northern Tablelands near Mount Garnet, and several localities further south including Eungella, Blackdown Tablelands, Bunya Mountains, Beerwah, Brisbane and Moreton Island. In New South Wales known from between Grafton and the Victorian border including the Blue Mountains. Subspecies *brisbanensis* also occurs near Canberra, ACT, in eastern Victoria, and near Yanchep, Western Australia, where it appears to be highly localised (R. Hay pers comm.).

Taxonomy: *A. brisbanensis brisbanensis* shares a sympatric distribution with the similar *A. cuprea* over much of southeastern Australia. Both species are placed in the *myrmecophila* species group (Sands 1980).

Infra-specific relationships or variation: Two subspecies of *A. brisbanensis* have been recognised from Victoria, ssp. *brisbanensis* from eastern localities and ssp. *cyrilus* from central and western Victoria, and northern South Australia. Males of ssp. *brisbanensis* vary in the shade of brown above and the bands beneath are sometimes variable in their position on the fore wing. Specimens from far eastern Victoria are placed with ssp. *brisbanensis*, rather than with ssp. *cyrilus*.

Habitat critical to survival: *A. brisbanensis brisbanensis* is associated mainly with eucalypt plant communities and frequently low eucalypt heathlands. Its larvae are thought to be predatory on the immature stages of an ant, *Papyrius* sp. (*nitidus* group).

History of conservation concern: Hill and Michaelis (1988) referred to *A. brisbanensis brisbanensis* as threatened, and (as *Acrodipsas* sp.) threatened in Western Australia, otherwise this subspecies was not considered of conservation significance. They may have been referring to populations of ssp. *cyrilus*. *A. brisbanensis* (both subspecies) is included as a 'Threatened taxon' on Schedule 2 of Victoria's Flora and Fauna Guarantee Act 1988, because it is 'threatened by habitat disturbance and fragmentation'. In Western Australia this species is only known from two adjacent hilltops near Yanchep, where it was considered to be vulnerable (Reviewer pers. comm.).

Major Threatening Processes: None recognised. Hill and Michaelis (1988) listed agricultural clearing as a threat for the populations of *A. brisbanensis brisbanensis* in Western Australia. As with many other uncommon butterflies, habitats in eastern Australia have been destroyed by urban development. No threats were recognised in eastern Victoria for this subspecies.

Is knowledge sufficient to formulate recovery actions? Yes, no recovery actions are required, but further surveys for habitats are required in Western Australia to establish if any threats are likely to occur.

Resources required:

Action		$
1	Surveys and mapping in Western Australia, $5,000 / year for 3 years	15,000.00
Total		15,000.00

Lead Organisations: Western Australian Department of Conservation and Land Management.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Sands, D.P.A. 1980. A new genus, *Acrodipsas*, for a group of Lycaenidae (Lepidoptera) previously referred to *Pseudodipsas* C. and R. Felder, with descriptions of two new species from northern Queensland. Journal of the Australian Entomological Society 18: 251–265.

LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas brisbanensis cyrilus* (Anderson and Spry)

National Conservation Status: Vulnerable [VUb,c]

Range: Victoria, South Australia.

Distribution: central and western Victoria, northeastern South Australia.

Taxonomy: One of two named subspecies of *A. brisbanensis*, which are not always easy to distinguish, and whose distinctiveness has been disputed (Dunn and Dunn 1991, Braby 2000). Individuals of *A. b. brisbanensis* usually have the spots and bands in the underside of the wings broader than in *A. b. cyrilus*, but there is considerable individual variation. The two subspecies apparently do not overlap in range, with *A. b. brisbanensis* occurring in southern Queensland, eastern and southern New South Wales and far eastern Victoria.

Infra-specific relationships or variation: Considerable variation occurs in the characteristics of ssp. *cyrilus* (Common and Waterhouse 1981) and it may be an invalid subspecies (Braby 2000). Subspecies *cyrilus* requires formal re-assessment but ssp. *cyrilus* remains valid until it is formally synonymised, based on detailed studies of specimens from all available localities, including the two type localities, and on Victorian specimens considered to be ssp. *brisbanensis*. Only one locality is known for *A. brisbanensis* in South Australia, a population said by a South Australian reviewer to belong to ssp. *cyrilus*, and referred to as such by Grund (1999).

Habitat and key ecological features: The few known populations of *A. b. cyrilus* are confined to remnants of open forest and woodland, mainly in central Victoria. The western Victorian population (Mount Moffat, Little Desert National Park) is in an open woodland of *Eu*ca*lyptus arenacea* with a varied heathland understorey (Douglas 1995). This appears to be the largest and most secure population known. Most records of the butterfly are of hilltopping individuals, with the possibility that they may have assembled from a considerable distance away from the capture sites. Details of developmental biology have not been described. *A. brisbanensis* is believed to have an obligate mutualism with ants of the *Papyrius* sp. (*nitidus* group) of 'coconut ants', with the larvae living largely or wholly within the ant nests and putatively myrmecophagous. The ants are very patchy in incidence, nest in the ground and dead / old timber, and forage on young eucalypts and *Acacia*s for honeydew, mainly in open woodland environments. See notes on *A. myrmecophila*.

The two main hilltopping localities for *A. b. cyrilus* in central Victoria are both within small public land reserves of natural vegetation. The western Victorian colony is in a larger area of native vegetation. In South Australia the only known habitat for *A. b. cyrilus* is said to be secure (Reviewer pers. comm.).

History of conservation concern: *A. brisbanensis* (both subspecies) is included as a 'Threatened taxon' on Schedule 2 of Victoria's Flora and Fauna Guarantee Act 1988, said to be 'threatened by habitat disturbance and fragmentation'. SAC (1991) determined that the species in Victoria is 'in a demonstrable state of decline which is likely to lead to its extinction' and 'significantly prone to future threats that are likely to result in its extinction, primarily because of its restricted occurrence, sensitivity to environmental conditions and likely dependence on other invertebrate species'. These remarks refer essentially to *A. b. cyrilus* only, as the major representative of the species in Victoria. An Action Statement has been prepared for the species (Jelinek and White 1996). Dunn et al. (1994) included *A. b. cyrilus* in their 'less threatened taxa' with a ranking of 'Rare'. *A. b. cyrilus* has apparently disappeared from more than half the sites in Victoria for which historical records of its capture exist (Douglas and Braby 1992, Field 1978), and most surviving populations are associated with small remnant woodland patches in largely cleared pastoral landscapes. It is regarded as endangered in South Australia (Grund 1999, 2000), where it is known from one site.

Major Threatening Processes: The loss of several colonies of *A. b. cyrilus* near Melbourne. was associated with urbanisation and housing development. The remaining populations are highly disjunct, and continued clearing of native vegetation is regarded as the major feature of habitat loss. At Mount Piper less well-defined threats include: losses of *Papyrius* ants, collecting of firewood, removal of dead stumps, replacement of wooden fence posts, and stock grazing preventing regeneration of seedling *Acacia*s and eucalypts used as hosts by honeydew-producing Homoptera sought by the ants. In addition, weed invasion and development of tall pasture grasses can affect the ants by changing the microclimate of nest sites, as by reducing insolation. Changes in vegetation brought about by grazing, unsuitable burning (for fuel reduction and vegetation clearing), and recreational and mineral exploration activities have also been suggested as factors in the butterfly's decline. Despoliation of critical hill top sites is also of concern. Threats at Mount Moffatt in the Little Desert National Park, have not been identified.

Is knowledge sufficient to formulate recovery actions? In part. Lack of knowledge of the biology of immature stages is an important lacuna in formulating detailed management needs, and additional studies of the systematics and biology of *Papyrius* ants, as the key resource for the butterfly, are needed. Management needed for the butterfly is thus based at present on knowledge of the adult stage, much of it from inferences from observations at a small number of hilltopping sites and their nearby environments. Management actions projected by Jelinek and White (1996) were thus developed in the context mainly of observations at Mount Piper (e.g. by New et al. 1994, 1996). At present, many of the needs are formulated only in general terms, reflecting lack of detailed biological knowledge.

Recovery needs:

1. Additional surveys, with the twin purposes of (a) exploring likely new sites for the butterfly in central and western Victoria and (b) confirming its status at sites from which tentative or historical records exist, to give a more reliable estimate of the subspecies' distribution and status in Victoria.
2. Clarification of the butterfly's developmental biology. The colony at Mount Moffatt appears to provide the best opportunity for this to be achieved.
3. Items specified under *A. myrmecophila* in relation to enhancement of the host ant populations, potential for translocation of the butterfly and for more effective surveillance of hilltopping butterflies are also needed.

Can recovery be carried out with existing resources? No. Although the security of the Mount Piper site seems assured, factors needed to sustain and expand *Papyrius* may need proactive management based on further research. New (1998) estimated costs over five years (1998-2002) for specific actions needed to conserve *A. b. cyrilus* and *A. myrmecophila*, together with increasing available information on *Papyrius*.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance.

Action*		$
1	Monitoring and investigations at Mount Moffatt	16,000.00
2	Surveys to discover other sites in Victoria	10,000.00
3	Surveys to discover other sites in South Australia	10,000.00
3	Investigations of *Papyrius* biology and systematics	10,000.00
4	Baiting trials to increase effectiveness of surveys for adult butterflies	12,000.00
Total		58,000.00

* Several of these items (2–4) are in common with needs for *A. myrmecophila* and should be approached as a joint exercise.

Lead organisations: Environment Australia; Victorian Department of Natural Resources and Environment; South Australian Department of Environment, Heritage and Aboriginal Affairs.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Douglas, F. and Braby, M.F. 1992. Notes on the distribution and biology of some Hesperiidae and Lycaenidae (Lepidoptera) in Victoria. Australian Entomological Magazine 19, 117–124.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Field, R.P. 1978. Rediscovery of *Pseudodipsas brisbanensis* in Victoria. Victorian Entomologist 8, 5–7.

Grund, R. 1999. Butterfly conservation in the southern Flinders region. Department of Environment Heritage and Aboriginal Affairs, South Australia.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Jelinek, A. and White, M. 1996. Action Statement no. 70. Large ant-blue butterfly, *A. brisbanensis*. Department of Natural Resources and Environment, Victoria.

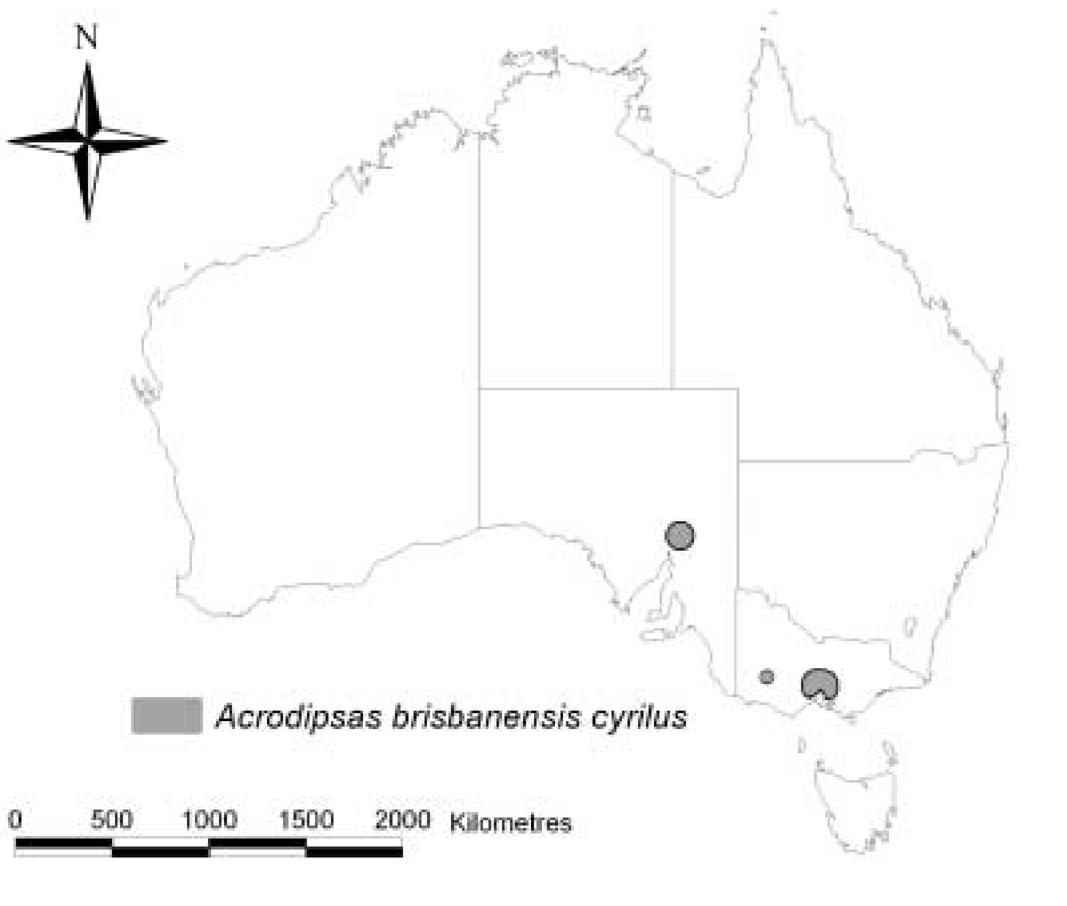
New, T.R. 1998. Recovery plan for 'Butterfly Community No. 1', a threatened butterfly community at Mount Piper in central Victoria. Department of Natural Resources and Environment, Victoria.

New, T.R., Britton, D.R. and Hinkley, S. 1994. Recovery plan, research phase for a rare and threatened butterfly community. Department of Conservation and Natural Resources, Victoria.

New, T.R., Britton, D.R., Hinkley, S.D. and Miller, L.J. 1996. The ant fauna of Mount Piper, Broadford, and its relevance to environmental assessment and the conservation of a threatened butterfly community. Flora and Fauna Technical Report, no 143.

SAC 1991. Scientific Advisory Committee, Flora and Fauna Guarantee Act. Final recommendation on a nomination for listing. Nomination No. 91.

Distribution of *Acrodipsas brisbanensis cyrilus*



LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas hirtipes* Sands

National Conservation Status: No Conservation Significance

Range: Northern Territory, Queensland

Distribution: West of Daly River (Burrells Trig), Northern Territory; Coen and Palmer River, Cape York Peninsula.

Taxonomy: *Acrodipsas hirtipes* is one of nine species in the genus. It has been placed in the *illidgei* species group, based on leg morphology. The species often occurs at the same localities as *A. melania*.

Infra-specific relationships or variation: *A. hirtipes* is most closely related to *A. arcana* and *A. mortoni* (Sands 1980). Specimens of *A. hirtipes* from the Northern Territory differ from those from Cape York: the bands of the underside are slightly different in position and the females possess small areas of blue at the bases of both wings of the upperside.

Habitat critical to survival: Both sexes of *A. hirtipes* have been taken on hilltops associated with eucalypt plant communities, near Palmerville (L. Ring pers. comm.), at Mount White near Coen, and north of Coen on several hills including Mount Croll (G. Miller pers. comm.). The life history is not known but larvae are probably predatory on the immature stages of ants. Surrounding vegetation at Mount White is mainly eucalypts and patches of deciduous vine thicket.

History of conservation concern: *A. hirtipes* is currently listed as Vulnerable and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994). Sands (1990) referred to this species as having few habitats, and to its dependence on the stability of vegetation surrounding its habitat. However, several new localities have been discovered since then. Dunn et al. (1994) considered that the species is Vulnerable, based on the supposed hilltops where the species occurs. Dunn et al. (1994) considered that site clearing and other threats to hilltops would affect this species. However, participants at BAP Workshops agreed that few if any of the extensive habitats now known for this species were at risk.

Major Threatening Processes: None recognised. The type locality, Mount White, is owned and managed by Mr P. Shephard, and is not likely to be subject to future environmental threats. Attempts were made by the Queensland Main Roads Department in the 1990s, to cut into the hill but these plans were changed in a way that minimised environmental disturbance. Other hilltops are secure near Coen where the butterfly occurs.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate and no recovery actions are necessary.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

Sands, D.P.A. 1980. A new genus, *Acrodipsas*, for a group of Lycaenidae (Lepidoptera) previously referred to *Pseudodipsas* C. and R. Felder, with descriptions of two new species from northern Queensland. Journal of the Australian Entomological Society 18: 251–265.

Sands, D.P.A. 1990. Australia's Endangered butterflies. News Bulletin, Entomological Society of Queensland 18:63–68

LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas illidgei* (Waterhouse and Lyell)

National Conservation Status: No Conservation Significance; New South Wales: Data Deficient.

Range: Queensland, New South Wales

Distribution: Mary River Heads, Qld, south to Brunswick Heads, possibly Nambucca Heads, New South Wales.

Taxonomy: *A. illidgei* was originally described from near Brisbane as a subspecies of *A. myrmecophila*. Smales and Ledward (1942) noted that *A. illidgei* might be a species distinct from *A. myrmecophila*, with which it was previously placed as a subspecies. *A. illidgei* was formally identified as a distinct species by Kerr et al. (1968) but little attention was previously paid to its distribution or abundance in Queensland.

Infra-specific relationships or variation: Other than variable size in both sexes, females vary by the extent of blue on the upperside of the fore wing. Variation does not appear to be related to particular populations. The shade of brown of bands on the underside varies considerably in both sexes.

Habitat critical to survival: The larvae of *A. illidgei* are predatory on the immature stages of an ant, *Crematogaster* sp. (*laeviceps* group), the same species that tends the larvae of another lycaenid, *Hypochrysops apelles*. Smales and Ledward (1942) discovered part of the life history at Southport and found that the species was associated with mangrove habitats. The immature stages were found with the ant in mangroves as well as under the bark of bloodwood. Samson (1989) contributed much more information about its life history and confirmed its predatory behaviour. Except for one female collected near Toowoomba, all breeding colonies have been located in, or at the edge of stands of old growth mangroves, mainly *Avicennia marina*. Beale and Zalucki (1995) discovered further details of the life history of *A. illidgei* and found larvae in the hollow branches of *Casuarina glau*ca growing close to mangroves.

History of conservation concern: *A. illidgei* was referred to as threatened by Hill and Michaelis (1988) and the history of conservation interest may be found in the literature referred to by Yen and Butcher (1997). *A. illidgei* is currently listed as Endangered and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). QPWS 1994. The species was considered it to be Endangered by Dunn and Dunn (1991) and Dunn et al. (1994) added that this species was of 'of great conservation concern' and estimated over 80% contraction had occurred in its distribution. Braby (2000) considered this species to be nationally threatened and conservation issues relating to *A. illidgei* were discussed in detail by Beale (1997). This species was listed as Endangered by IUCN (2000).

A. illidgei attracted attention when a locality at Redland Bay, near one discovered by Hagen (1980), was proposed for canal development. This was opposed by the municipal Council but became the topic of a court hearing in which the butterfly was referred to as a 'threatened species'. Threat to the colony of the butterfly was then recognised as a major reason for rejection of the development proposal (The Courier Mail, 17 June 1989). Soon after this court hearing (1990), *A. illidgei* was listed as 'Permanently Protected Fauna' under the Queensland Fauna Conservation Act 1974-79. Samson (1993) and Beale (1998) discussed the disadvantages that developed from this legislation.

DeBaar collected a specimen near Hay's Inlet in about 1974. Further populations were located at Redland Bay (Hagen 1980) and Burleigh (S.J. Johnson) in the 1970s, at Mary River Heads in the late 1980s (R. Manskie), and at Coomera Island in 1999 (M. Breitfuss pers. comm.). The species has been seen at Boondall Wetlands (J. Moss) and on at least two other islands in Moreton Bay (BAP Workshop Brisbane, Unpublished). In New South Wales a specimen was collected at Brunswick Heads (G. Miller) and there was a possible sighting at Nambucca Heads in 1982 (D.P.A. Sands unpublished).

The species is considered to be 'rare' because it is characterised by the low density of adults observed in the field. However, this may be a behavioural anomaly because the adults remain settled on the upper branches of mangroves and fly infrequently. Several other sightings suggest that the species is fairly widespread, although adults seem to be low in density, in the mangroves on Moreton Bay Islands. The rarity of observations may have influenced opinions expressed about its threatened status in the past. Braby (2000) was incorrect when he stated that '..little or no habitat remains..' and provided no basis for stating that the butterfly was extinct on Goat Island. Dunn and Dunn's (1991) suggestion that extensive habitat for *A. illidgei* remained between Maaroom and near Redland Bay, has since proven to be accurate. At least five populations are known to exist and many more are said to be stable on several Moreton Bay Islands, including a reserve on Coomera Island (M. Breitfuss pers. comm.; Brisbane and Cairns BAP Workshops).

Beale (1997) and Samson (1999) both expressed concerns that the regulations in Queensland would hamper the conservation of *A. illidgei* by limiting observations and the disclosure of information, predictions proven to be correct by information that became available at the BAP Workshops in Cairns and Brisbane.

Major Threatening Processes: Hill and Michaelis (1988) identified urbanisation and insecticidal control of mosquitoes as threats. Dunn et al. (1994) identified clearing, insecticide fogging, marina construction and land reclamation as threats. Damage and disturbance to mangrove habitats has affected *A. illidgei*, especially removal of old growth *Avicennia marina* (> ca 12 cm B.D.) and other vegetation (e.g eucalypts and casuarinas) growing near, or at the edge of, mangroves. Occasionally mangroves are illegally cut to 'improve' views from houses built near the waters edge. Populations of *A. illidgei* are able to persist when mangrove plant communities are kept intact, despite the disturbance of vegetation further from the saline areas.

Collecting adults is not a threatening process for *A. illidgei* since very few are observed and fewer collected, due to their cryptic behaviour. Collecting of immature stages has been suggested as a threatening process, since it requires the splitting of dead and hollow twigs and branches in search for ant nests. However, there is no evidence at any known localities, that this activity has had an impact on the butterfly. Damage to mangrove plants is a potential threatening process and requires attention in management plans. This factor is addressed under the Code of Conduct. It should be noted that mangrove conservation falls under Fisheries legislation in Queensland. Far more importantly the use of broad-spectrum insecticides in mangroves may be a threatening process *A. illidgei*. Seriously toxic substances such as malathion are still used near Brisbane for midge and mosquito control within mangrove communities. This is also considered to a threatening process for the butterfly at the Mary River habitat.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate but further surveys are required to determine accurately the distribution of this species.

Recovery needs

1. Modify the regulations relating to the collection of protected butterfly taxa in Queensland, so that fresh surveys can be carried out and the results properly recorded without recriminations.
2. Carry out survey for further habitats and ensure they are managed as protected plant communities.
3. Overhead applications of insecticides in mangroves must be avoided near breeding colonies.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 2 years	10,000.00
Total		10,000.00

Lead Organisation: New South Wales National Parks and Wildlife Service.

References:

Beale, J.P. 1997. Comment on the efficacy of Queensland nature conservation legislation in relation to *Acrodipsas illidgei* (Waterhouse and Lyell) (Lepidoptera: Lycaenidae: Theclinae). Pacific Conservation Biology 3: 392–396.

Beale, J.P. 1998. Temporal and spatial distribution of the rare, myrmecophagous Illidge's ant-blue butterfly, *Acrodipsas illidgei* (Lycaenidae) (Waterhouse and Lyell). Journal of the Lepidopterists Society 52: 139–150.

Beale, J.P. and Zalucki, M. P. 1995. Status and distribution of *Acrodipsas illidgei* (Waterhouse and Lyell) (Lepidoptera: Lycaenidae) at Redland Bay, southeastern Queensland, and a new plant-association record. Journal of the Australian Entomological Society 34: 163–168.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Hagen, C. E. 1980. Recent records of *Acrodipsas illidgei* (Waterhouse and Lyell) (Lepidoptera: Lycaenidae) from the Brisbane area, Queensland. Australian Entomological Magazine 7: 39.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

IUCN. 2000. Red list of threatened species, IUCN, Gland, Switzerland and Cambridge.

Kerr, J.F.R, Macqueen, J. and Sands, D.P. 1968. The specific status of *Pseudodipsas illidgei* Waterhouse and Lyell stat. n. (Lepidoptera: Lycaenidae). Journal of the Australian Entomological Society 7: 28.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

Samson, P.R 1989. Morphology and biology of *Acrodipsas illidgei* (Waterhouse and Lyell), a myrmecophagous lycaenid (Lepidoptera: Lycaenidae: Theclinae). Journal of the Australian Entomological Society 28: 161–168.

Samson, P.R. 1993. Illidge's ant blue, *Acrodipsas illidgei* (Waterhouse and Lyell). Pp. 163–165 in New, T.R. (ed.) Conservation biology of Lycaenidae (butterflies) IUCN, Switzerland.

Smales, M. and Ledward, C.P. 1942. Notes on the life histories of some lycaenid butterflies. Part 1. Queensland Naturalist 12: 14–18.

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas melania* Sands

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Cape York Peninsula, Coen, Holroyd and possibly Palmer Rivers.

Taxonomy: *Acrodipsas melania* is one of nine species in the genus and placed in the *illidgei* species group, based on leg morphology. The species often occurs at the same localities as *A. hirtipes*

Infra-specific relationships or variation: *A. melania* is most closely related to *A. illidgei* (Sands 1980). Little variation has been observed but in females, the size and extent of blue on the upperside near the tornus is variable.

Habitat critical to survival: Both sexes of *A. melania* have mostly been taken on hilltops near Mount White and at Mount Croll (G. Miller pers. comm.), near Coen. The species has probably seen near Palmerville (D.P.A. Sands). The life history is not known but larvae are probably predatory on the immature stages of ants. Vegetation surrounding hilltops where this species occurs is mainly eucalypt communities and patches of deciduous vine thicket.

History of conservation concern: Dunn et al. (1994) considered that the species was Vulnerable, based on supposed threats to hilltops where the species occurs. *A. melania* is currently listed as Vulnerable under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994). Participants attending BAP Workshops considered that the habitats for this species were not at risk.

Major Threatening Processes: None has been recognised, but see comments for the habitats of *A. hirtipes*.

Is knowledge sufficient to formulate recovery actions? Yes, no recovery actions are necessary.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

Sands, D.P.A. 1980. A new genus, *Acrodipsas*, for a group of Lycaenidae (Lepidoptera) previously referred to *Pseudodipsas* C. and R. Felder, with descriptions of two new species from northern Queensland. Journal of the Australian Entomological Society 18: 251–265.

LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas mortoni* Sands, Miller and Kerr

National Conservation Status: No Conservation Significance; Queensland: Data Deficient.

Range: Queensland, New South Wales

Distribution: Warwick, Queensland; Gunnedah, Albury, New South Wales.

Taxonomy: *A. mortoni* is one of nine species in the genus and is placed in the *illidgei* species group, based on leg morphology. The wings beneath are paler than most other species in the genus.

Infra-specific relationships or variation: *A. mortoni* is most closely related to *A. arcana*. Little variation has been observed in either sex, except in males where the black scales on veins of the fore wings are variable.

Habitat critical to survival: This species was recently described (Sands et al. 1997) from hilltops at Gayndah and one male from near Warwick, New South Wales. More recently the species has been taken near Albury, New South Wales. Until recently it was thought that *A. mortoni* was restricted in its distribution and that its habitats may have been threatened by farming activities. Very little is known about this species but it is currently secure on many hilltops in the Gunnedah area. Its distribution will undoubtedly prove to extend over a considerable area west of the Main Divide. The life history is not known but larvae are probably predatory on the immature stages of ants. Vegetation surrounding hilltop habitats is mainly eucalypt plant communities.

History of conservation concern: Dunn et al. (1994) considered that threats to hilltops would affect this species. Participants attending the BAP Workshops considered that the habitats for this species were not at risk.

Major Threatening Processes: None recognised.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
Total		15,000.00

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Sands, D.P.A., Miller, C.G. and Kerr, J.F. R. 1997. A new species of *Acrodipsas* Sands (Lepidoptera: Lycaenidae) from inland New South Wales and southern Queensland. Australian Journal of Entomology 36: 19–23.

LYCAENIDAE: THECLINAE

Scientific name: *Acrodipsas myrmecophila* (Waterhouse and Lyell)

National Conservation Status: No Conservation Significance; Victoria: Endangered [ENb]; Northern Territory: Data Deficient.

Range: Northern Territory, Queensland, New South Wales, Australian Capital Territory, Victoria

Distribution: Burrells Trig, Northern Territory, Palmer River to Mount Nebo, Queensland, Grafton to Ulladulla, New South Wales; Ocean Grove, Mount Piper, Victoria.

Taxonomy: A clearly defined species, with no additional subspecies designated.

Habitat and key ecological features: Most locality records of *A. myrmecophila* in Victoria are of hilltopping individuals. Other biological knowledge of the species has been derived from studies on two populations. Early work on a colony (now extinct) at Ocean Grove in the 1960s revealed the close and obligate relationship between the butterfly and *Papyrius* ants, which nest in chambers in the ground and in dead and aging timber, and forage for honeydew on young *Acacia*s and eucalypts. The *Papyrius* colony at Ocean Grove yielded most of the specimens of *A. myrmecophila* now in collections in the State, and still persists without the butterfly. Later studies at Mount Piper, near Broadford (Britton et al. 1995, New and Britton 1997) emphasised the highly localised nature of the butterfly and the host ant (New et al. 1996), the highly serendipitous discovery of breeding colonies, and confirmed that the larvae are myrmecophagous and apparently pass the whole of their development within ant nests. Female *A. myrmecophila* oviposit close to the nest entrances, probably responding to chemical characteristics of *Papyrius*, and all early stages are tended by the ants, with neonate larvae carried or escorted into the nest.

History of conservation concern: CNR (1995) ranked *A. myrmecophila* as 'Endangered' in Victoria. An Action Statement has been prepared for it in Victoria (Jelinek and White 1996). Dunn et al. (1994) noted *A. myrmecophila* as a 'political incidental' in Victoria and it was said to be of regional or local concern in Victoria by Braby (2000). *A. myrmecophila* is listed as a threatened taxon on Schedule 2 of Victoria's Flora and Fauna Guarantee Act 1988. SAC (1991) determined that, in Victoria, *A. myrmecophila* is 'in a demonstrable state of decline which is likely to result in extinction' and that it is 'significantly prone to future threats that are likely to result in its extinction, primarily because of its restricted occurrence, sensitivity to environmental conditions, and dependence on the coconut ant, *Papyrius 'nitidus'*.

Because it has only been collected on one occasion in the Northern Territory, participants at the BAP Workshop held in Darwin considered it to be Data Deficient in that locality. *A myrmecophila* is known at present from only one site in Victoria, and has apparently disappeared from at least seven other places from which historical records exist. The assessment of *A. myrmecophila* as Endangered in Victoria reflects this decline, but it must be emphasised that apparently suitable habitat for the species is widespread in central Victoria, and sites such as the Tallarook ranges have not yet been explored adequately. The butterfly and its ecological community represent one of the most threatened for a species in Victoria, and its incidence at Mount Piper is markedly disjunct from other parts of the species range in other states.

Major Threatening Processes: The apparent remnant population of *A. myrmecophila* at Mount Piper in Victoria is small; it is subject to a variety of putative threats. The management is not adequate to alleviate threats including loss of ants caused by removal of dead wood, weed and pasture grass invasion, and successional change.

Is knowledge sufficient to formulate recovery actions? Yes, for targeting the sole known population in Victoria. There is a priority to upgrade the tenure of Mount Piper from education reserve to the status of a national park, to facilitate adequate management of the butterfly community in which *A. myrmecophila* is a part. Extensive surveys are needed to clarify the status of the species more precisely in the State. A Draft Recovery Plan (New 1998) focused on the needs of the two species at Mount Piper.

Recovery needs: Based, in part, on recommendations in New (1998).

1. Enhancement of populations of the *Papyrius nitidus* group. Steps in this are provision of increased amounts of dead wood around known colonies, and the use of wooden trap nests (Britton 1997).
2. Clarify taxonomy of the ant complex to avoid possible misplaced effort through unrecognised host specificity.
3. Colonised trap nests have the potential to be used as translocation units for ant colonies and *A. myrmecophila*; additional suitable sites for this should be selected for evaluation.
4. Site management to sustain the host ant, *Papyrius* sp. For example, grazing or mowing might be needed to prevent colonies being 'shaded out' by succession or to sustain high insolation.
5. Enhanced monitoring of adult butterflies on hilltops. Simple visual observation is chancy, and it may be possible to utilise natural attractants from *Papyrius* as baits for the butterflies (New and Britton 1997), to increase efficiency of surveys.
6. Ensure the integrity of the Mount Piper site, including the hill top, by prevention of disturbances involving changes to land use such as by mining activities.
7. Survey for *A. myrmecophila* in association with documented colonies of *Papyrius* within the species' historical range in Victoria.
8. Note that measures 2-6 above may be undertaken more effectively in parts of Australia where the butterfly is less elusive and more secure, so that cooperative studies are warranted.

Can recovery be carried out with existing resources? No, other than for the assured safety of Mount Piper (item 6, above), which will in any case need monitoring. The priority needs are to develop enhanced monitoring capability for the butterfly, and to apply these more widely to determine its presence elsewhere in Victoria.

Resources required:

Action		$
1	Trap nesting for *Papyrius* and baiting trials over 2 years. Costs $10,000 / year.	20,000.00
2	Surveys for *A. myrmecophila* in Victoria. $5,000 / year, 3 years	15,000.00
Total		35,000.00

Other management needs are at present indeterminate, but some may be conjoint with *A. b. cyrilus*.

Lead organisations: Victorian Department of Natural Resources and Environment; Parks and Wildlife Commission of the Northern Territory.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Britton, D.R. 1997.Ant trap nests enable detection of a rare and localised butterfly, *Acrodipsas myrmecophila* (Waterhouse and Lyell) (Lepidoptera: Lycaenidae) in the field. Memoirs of the Museum of Victoria 56: 383–387.

Britton, D.R., New, T.R. and Jelinek, A. 1995. Rare Lepidoptera at Mount Piper, Victoria; the role of a threatened butterfly community in advancing understanding of insect conservation. Journal of the Lepidopterists' Society 49: 97–113.

CNR 1995. Threatened fauna in Victoria — 1995. Department of Conservation and Natural Resources, Victoria.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Jelinek, A. and White, M. 1996. Action Statement no 71. Small Ant-blue Butterfly, *A. myrmecophila.* Department of Natural Resources and Environment, Victoria.

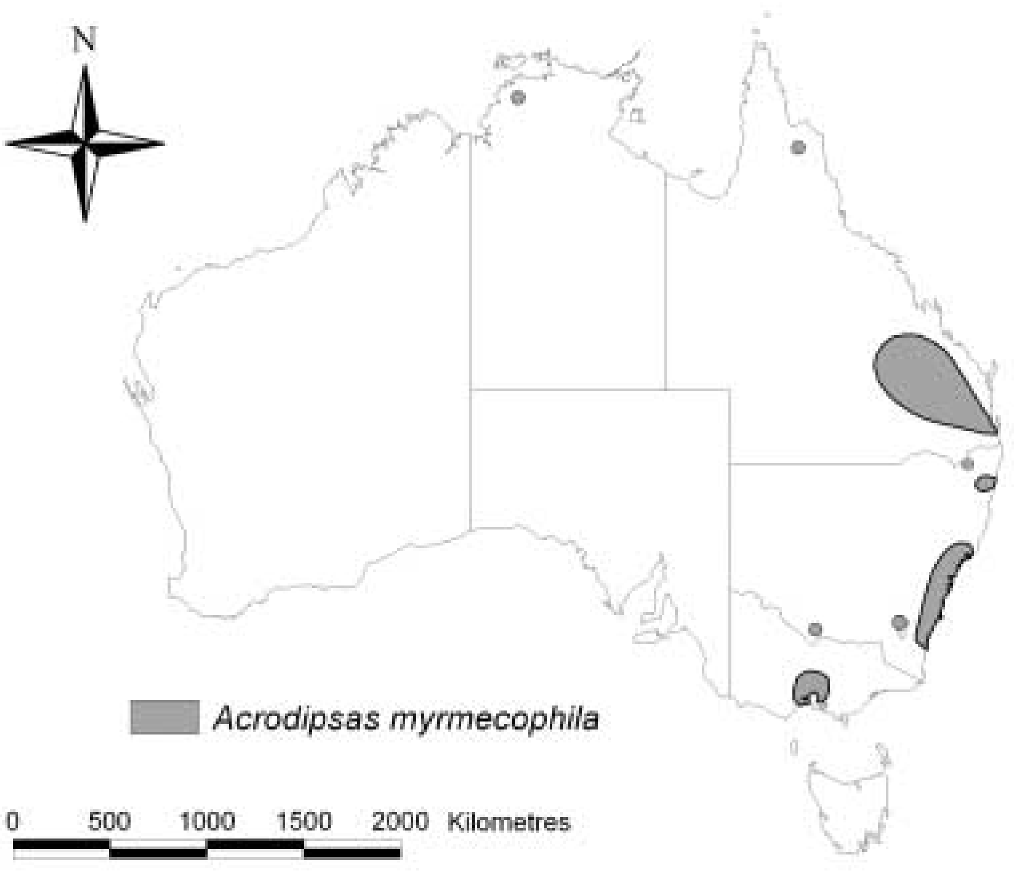
New, T.R. 1998. Recovery plan for 'Butterfly Community No. 1', a threatened butterfly community at Mount Piper in central Victoria. Department of Natural Resources and Environment, Victoria.

New, T.R. and Britton, D.R. 1997. Refining a conservation plan for an Endangered lycaenid butterfly, *Acrodipsas myrmecophila*, in Victoria, Australia. Journal of Insect Conservation 1: 65–72

New, T.R., Britton, D.R., Hinkley, S.D. and Miller, L.J. 1996. The ant fauna of Mount Piper, Broadford, and its relevance to environmental assessment and the conservation of a threatened butterfly community. Flora and Fauna Technical Report, no 143.

SAC 1991. Scientific Advisory Committee, Flora and Fauna Guarantee Act. Final recommendation on a nomination for listing. Nomination No. 90.

Distribution of *Acrodipsas myrmecophila*



LYCAENIDAE: POLYOMMATINAE

Scientific name: *Candalides consimilis toza* (Kerr)

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Claudie River

Taxonomy: The genus *Candalides* contains groups of related species requiring revision. Although Tite (1963) proposed an arrangement for genera, several names were not validated. *Candalides consimilis* is in the *absimilis* species group, represented by six species in Australia but with most occurring in Papua New Guinea.

Infra-specific relationships or variation: Three subspecies of *C. consimilis* occur in Australia, with the distinctive ssp. *toza* confined to the Claudie River area.

Habitat critical to survival: Not known. The type series were taken while flying around a flowering tree in open forest, several hundred metres from rainforest (Kerr 1967).

History of conservation concern: Dunn et al. (1994) considered that this subspecies was insufficiently known. Only four male specimens are known, the type series originally taken at the Claudie River by Dr J.F.R. Kerr in 1966. Specimens identified by Dunn et al. (1994) as ssp. *toza*, were subsequently stated to be *C. absimilis* (Braby 2000). Sands (1990) indicated that the survival of this subspecies might be dependent on maintaining the habitat and its surrounding vegetation intact. However, as with other taxa occurring only at Iron Range / Claudie River, most of the habitat is national park or resources reserve and is unlikely to be subjected to threats affecting survival of this taxon. The female remains unknown.

Major Threatening Processes: None known. The type locality is Iron Range National Park (J.F.R. Kerr pers. comm.).

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate and insufficient data are available. However, it is unlikely that this subspecies is threatened in Iron Range National Park.

Recovery needs: Surveys are required to locate *C. consimilis toza*, map its habitat, carry out biological and taxonomic studies (especially of the female) and review management in areas where the subspecies occurs.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
2	Taxonomic studies	5,000.00
Total		20,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Kerr, J.F.R. 1967. New records of Lycaenidae (Lepidoptera) in Australia and a description of a new subspecies. Journal of the Australian Entomological Society 6: 49–51.

Sands, D.P.A. 1990. Australia's Endangered butterflies. News Bulletin, Entomological Society of Queensland. 18: 63–68

Tite, G.E. 1963. A revision of the genus *Candalides* and allied genera (Lepidoptera: Lycaenidae). Bulletin of the British Museum Natural History (Entomology) 14: 197–259.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Candalides heathi aeratus* (Montague)

National Conservation Status: Data Deficient

Range: Western Australia.

Distribution: Monte Bello Islands.

Taxonomy: *Candalides* represents a group of about 30 species, occurring in Australia, mainland New Guinea and offshore islands, Timor and the Moluku islands. Species have not yet been appropriately grouped within the genera, and the attempt to revise them by Tite (1963) did not provide a valid basis for their classification.

Infra-specific relationships or variation: Four subspecies of *C. heathi* are usually recognised. Subspecies *aeratus* is said to be smaller and darker than the nominotypical subspecies (Common and Waterhouse 1981), but Smithers and Butler (1983) pointed out that this island subspecies was variable.

Habitat critical to survival: The habitats of ssp. *aeratus* have not been described in detail but probably resemble those of the mainland subspecies (Smithers and Butler 1983). Dunn et al. (1994) stated that the food plant was probably *Myoporum acuminatum*.

History of conservation concern: Dunn et al. (1994) considered this subspecies indeterminate. Their conservation assessments were largely hypothetical and no evidence was provided to suggest that the taxon is threatened in any way. Braby (2000) did not recognise the subspecies as distinct from the nominotypical subspecies.

Major Threatening Processes: None identified.

Is knowledge sufficient to formulate recovery actions? No. Information is inadequate to determine if recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Smithers, C.N. and Butler, W.H. 1983. The butterflies (Lepidoptera: Hesperioidea and Papilionoidea) of Barrow and nearby islands, Western Australia. Western Australian Naturalist 15: 141–145.

Tite, G.E. 1963. A revision of the genus *Candalides* and allied genera (Lepidoptera: Lycaenidae). Bulletin of the British Museum Natural History (Entomology) 14: 197–259.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Candalides heathi doddi* Burns

National Conservation Status: No Conservation Significance

Range: New South Wales

Distribution: Barrington Tops, Ebor, New England highlands.

Taxonomy: See comments for subspecies *aeratus.*

Infra-specific relationships or variation: Four subspecies of *C. heathi* are usually recognised. Specimens of *C. heathi doddi* are larger and much darker than the nominotypical subspecies.

Habitat critical to survival: Said to be steep rocky areas where the food plant, *Derwentia derwentiana* grows (Common and Waterhouse 1981).

History of conservation concern: Dunn et al. (1994) stated that the subspecies was indeterminate and expressed concern because of the few localities known at the northern end of Barrington Tops, and at Ebor where *C. heathi doddi* was present. Much of the area near both localities is now protected in national parks and the habitats are secure.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is not threatened.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Candalides heathi* ssp. 'Wimmera form'.

National Conservation Status: Endangered [ENb,c].

Range: Victoria.

Distribution: Lake Wyn Wyn Wildlife Reserve.

Taxonomy: *C. heathi* (Cox) is a variable species, with four named subspecies. The unnamed subspecies known simply as the 'Wimmera form' or 'Wyn Wyn' is distinct from all of these.

Infra-specific relationships or variation: Douglas (1995) listed and discussed seven features of wing colour and markings, which are peculiar to this form. It is thus very distinctive in appearance, and Douglas (1995) suggested that the population might have been isolated for a long period.

Habitat and key ecological features: The habitat of the subspecies is open grassland dominated by *Danthonia* and creeping myoporum (*Myoporum parvifolium*, the likely larval food plant, on which oviposition has been observed). It also includes swampy depressions with stands *of Melaleuc*a *halmaturorum* and ground cover of *Samolus repens* or samphire (*Sarcocornia quinqueflora*) (details from Douglas 1995). Pupae have been found on old pieces of *Melaleuc*a surrounded by *Myoporum* plants. By analogy with other subspecies of *C. heathi*, it is probable that larvae are attended by ants, probably *Iridomyrmex* sp. Adults have been observed in November and December.

History of conservation concern: Douglas (1995) ranked this subspecies as 'Endangered; DCNR (1999) suggested 'Critically Endangered' and it was noted by Braby (2000) as of regional or local concern. The entire known range of the subspecies is within a 65 ha block abutting the Lake Wyn Wyn Wildlife Reserve, and searches have not yet revealed any additional colonies. The actual area of breeding colonies may total only around 2-3 ha, and all are likely to be subject to intermittent flooding. A high density of *Myoporum* is needed for the butterfly to thrive. The site has been purchased (1994) by the Victorian Conservation Trust but threats still exist.

Major Threatening Processes: Douglas (1995) noted potential threats to the site occupied by *C. heathi* 'Wimmera form': invasion by a weed, horehound (*Marrubium vulgare*) and importation of its seeds; rabbits, grazing pressures on sensitive vegetation, and incidence of grazing stock with a likelihood of increased grazing. Rise of salt levels poses a serious threat to the food plants (T. New unpublished).

Is knowledge sufficient to formulate recovery action? Yes, only in part. Despite lack of knowledge of developmental biology and confirmation of the larval food plant (both of which are high priorities for research), searches in the area have confirmed that the subspecies has a very small breeding distribution around Lake Wyn Wyn. Despite the site being fully reserved, threats can be specified and monitored in some detail. The unknown ability of the butterfly population to resist flooding may be of critical importance in its survival. It is likely that sporadic flooding has occurred naturally many times over the butterfly's history in the area, but whether this has produced local extirpations which were formerly buffered by a more widespread metapopulation is unknown.

Recovery needs: Practical conservation of the subspecies has the main components:

1. Take action to sustain the butterfly in its sole known site at Lake Wyn Wyn which is not sufficiently secure.
2. Within the next decade, urgent action (such as by tree planting) must be taken to alleviate the threats of increasing salinity which are likely to destroy all the food plants and lead to extinction of the butterfly.
3. Undertake more extensive surveys to locate any additional colonies. Should any be found, more focussed conservation for each should be pursued.

At Lake Wyn Wyn, the following measures need implementation:

1. Consult with the appropriate authority (Commission), to initiate measurements for increases in salinity and the time likely to result in extinction of the food plants.
2. Weed control, in particular of invasive *Marrubium*. Control should be active and sensitive, so as not to adversely affect *Myoporum*.
3. Fencing of the site to exclude grazing stock, and facilitating control of rabbits by trapping and baiting on and near the site.

4. Augmentation of *Myoporum* by seeding and planting, to increase its density in native grasslands.

Can recovery be carried out with existing resources? No.

Resources required:

Action		$
1	Increased survey for the butterfly and food plant, both around Wyn Wyn and at other apparently suitable sites, to be undertaken over three years at $10 000 / year.	30,000.00
2	Management of the sole known site for the butterfly, incorporating the measures noted above	20,000.00
3	Risk assessment for increasing salinity	15,000.00
Total		65,000.00

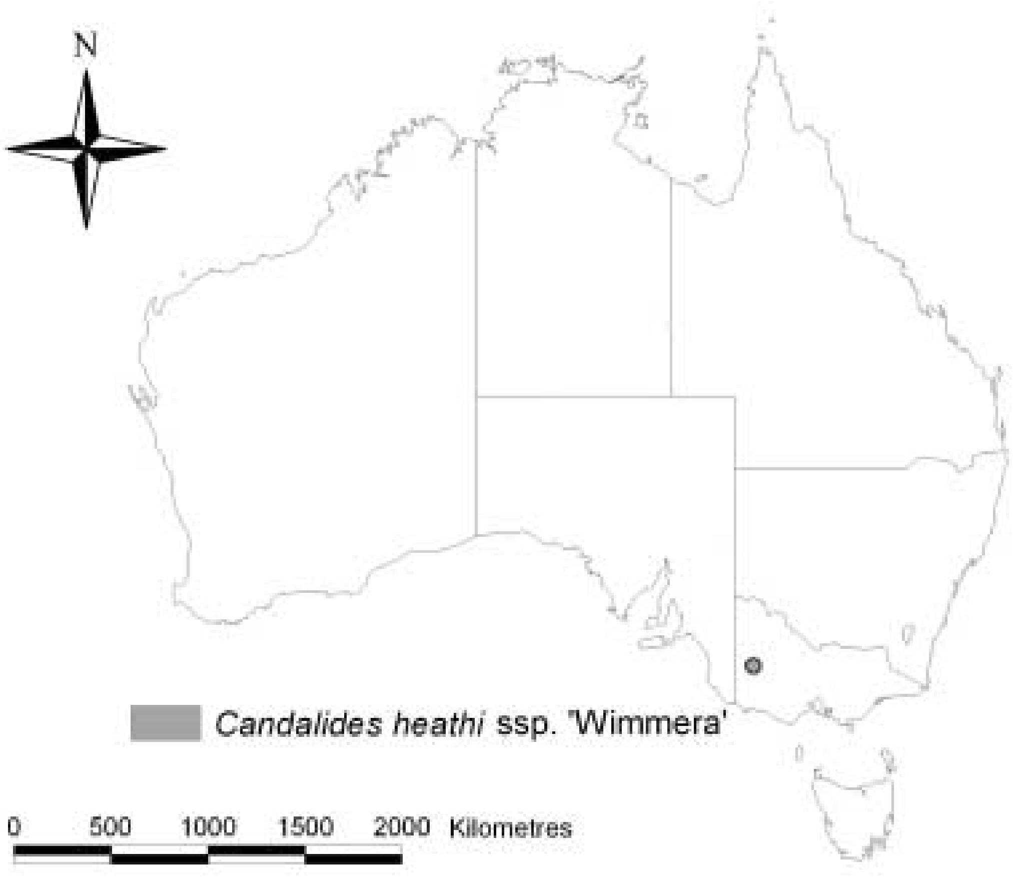
Lead organisations: Environment Australia; Victorian Dept of Natural Resources and Environment.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Distribution of *Candalides heathi ssp. 'Wimmera form'*



LYCAENIDAE: POLYOMMATINAE

Scientific name: *Candalides hyacinthinus 'josephina'* Harris

National Conservation Status: No Conservation Significance

Range: Victoria.

Distribution: Stawell area, western Victoria.

Taxonomy: *C. hyacinthinus josephina* was not recognised as a valid subspecies by Common and Waterhouse (1981) and it is generally accepted (e.g. Braby 2000) to be a hybrid between two subspecies of *C. hyacinthinus*, sspp. *hyacinthinus* and *simplex*.

Infra-specific relationships or variation: *C. hyacinthinus josephina* is very variable in the shade of blue or purple, grading in colour between the two subspecies in the hybrid zone.

Habitat critical to survival: *C. hyacinthinus josephina* occupies a similar habitat to the subspecies of *C. hyacinthinus*, mostly open eucalypt woodland or heathland when the food plants *Cassytha* spp., mainly *C. melantha*, are present.

History of conservation concern: Douglas (1995) considered this putative subspecies to be rare in Victoria and nationally Endangered. Braby (2000) also considered this population to be of national conservation concern. However, participants at the BAP Workshop held in Melbourne agreed that the hybrid populations were not threatened.

Major Threatening Processes: None identified other than risks associated with the limited distribution (Harris 1952, 1953). Since both founder subspecies, *hyacinthinus* and *simplex*, are at present wide spread and not threatened, it is unlikely the areas of interface will be at risk.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The hybrid population referred to, as *josephina*, is considered not to be threatened. However, every opportunity should be taken to (i) survey and record the areas occupied and (ii) preserve the habitats where this hybrid zone occurs, since the hybrid has significant scientific interest.

Lead Organisation: Victorian Department of Natural Resources and Environment.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Harris, E.J.W. 1952. *Candalides hyacinthina josephina* var. nov. A new race of the butterfly, *Candalides hyacinthina* Semper. Family Lycaenidae. North Queensland Naturalist. 20: 33–34.

Harris, E.J.W. 1953. Notes on *Candalides hyacinthina josephina* var. nov. North Queensland Naturalist. 21: 1–3.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Catochrysops amasea amasea* Waterhouse and Lyell

National Conservation Status: Data Deficient

Range: Queensland

Distribution: Northern Torres Strait Islands, Cape York to Iron Range.

Taxonomy: Two species of *Catochrysops* are recorded from Australia, including *C. amasea amasea*, which also occurs in Papua New Guinea.

Infra-specific relationships or variation: None recorded.

Habitat critical to survival: In Papua New Guinea this species is abundant in disturbed rainforest regrowth, where one of its larval foods is the flower buds of *Desmodium heterocarpon* (T. Lambkin *in* Braby 2000).

History of conservation concern: Very few specimens are known from Australia, but it is more abundant on the northern and eastern Torres Strait Islands. There is very little known about *C. amasea amasea* in Australia and its habitat requirements have not been identified.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. Surveys for this and other species in the areas are needed to identify its breeding habitats and assess their security, especially at Cape York. The species is not threatened at Iron Range and Claudie River where most of the area is national park or in the resources reserve (Wood 1987).

Resources required:

Action		$
1	Surveys	5,000.00
Total		5,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Lambkin, T. in Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Wood, G.A. 1987. New and interesting butterfly records from northern Queensland and Torres Strait. Australian Entomological Magazine 14: 71–72.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Catopyrops florinda estrella* (Waterhouse and Lyell)

National Conservation Status: No Conservation Significance; Western Australia: Data Deficient

Range: Western Australia, Northern Territory, Queensland.

Distribution: Southeast of Broome, Western Australia to Claudie River, Queensland.

Taxonomy: Two subspecies occur in Australia, sspp. *estrella* and *halys*, the latter occurring in southeastern Australia.

Infra-specific relationships or variation: The purple areas on the upperside in the male of *C. florinda estrella* are variable and the extent of blue in the female exhibits seasonal variation. Braby (2000) recognised *C. florinda estrella* as a distinct subspecies.

Habitat critical to survival: Probably riverine or creek-edging rainforest. The food plant of *C. florinda estrella* in Western Australia has not been identified.

History of conservation concern: *C. florinda estrella* is considered to be Data Deficient in Western Australia by the participants at several BAP Workshops, including one held in Perth. However, a review of known habitats has shown that several are secure in national parks in Western Australia.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. *C. florinda estrella* is not threatened and no recovery actions are necessary. In Western Australia surveys for additional habitats should be conducted.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	10,000.00
Total		10,000.00

Lead Organisation: Western Australian Department of Conservation and Land Management.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Danis danis syrius* Miskin

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Lockerbie Scrub, Cape York, Iron Range Claudie River.

Taxonomy: One of two subspecies in Australia, the other being ssp. *serapis*, occurring from Cooktown to Paluma. Other subspecies occur in Papua New Guinea and West Papua.

Infra-specific relationships or variation: Little variation has been observed in *D. danis syrius*. The green basal areas in females may be variably restricted or absent in some specimens.

Habitat critical to survival: This species is one of the few lycaenid butterflies that frequents shaded areas beneath the canopy in primary rainforest. It is seasonally very abundant and, in December 1970, adults were observed in substantial densities at Iron Range (D. Sands unpubl.). *D. danis syrius* is less frequently seen during the dry seasons, giving the impression that it is rare. It is almost certain that it has been overlooked due to the seasonal appearance of adults, appearing mainly during the wet season when few lepidopterists visit the area. At Iron Range larvae feed on small unidentified Rhamnaceae, possibly the same plant recorded from Papua New Guinea (Parsons 1998). Ants do not attend them.

History of conservation concern: Dunn et al. (1994) considered that this subspecies was Vulnerable, based on its perceived rarity. However, it appears to be mainly a wet season subspecies (D.P.A. Sands) on Cape York and has probably been overlooked by most visitors to this area during the dry season. *D. danis syrius* is currently listed as Vulnerable and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994). Dunn et al. (1994) stated that the species was threatened by destruction of rainforest habitat, particularly at Lockerbie. However, the subspecies is secure in Iron Range National Park and elsewhere on the Claudie River.

Major Threatening Processes: At Lockerbie, destruction of rainforest habitat may have affected the abundance of this subspecies and Dunn et al. (1994) also attributed logging and clearing for pastures as threats. Delisting by QPWS is recommended

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Recovery actions are not required because the subspecies is secure in substantial areas of habitat at Iron Range and the Claudie River.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Parsons, M. 1998. The butterflies of Papua New Guinea. Their systematics and biology. Academic Press, London.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation 1994

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops apelles apelles* (Fabricius)

National Conservation Status: No Conservation Significance; New South Wales: Lower Risk (Near Threatened)

Range: Northern Territory, Torres Strait Islands, Queensland, New South Wales.

Distribution: *H. apelles apelles* has been recorded from coastal southeastern Queensland as far south as Richmond River, New South Wales (Common and Waterhouse 1981). In New South Wales, this species currently is known to occur only at Terranora Inlet, on the Tweed River, near the border with Queensland.

Taxonomy: Only one subspecies, *Hypochrysops apelles apelles* is found in Australia. It also occurs in southern mainland New Guinea and Aru Islands, Indonesia (Sands 1986).

Infra-specific relationships or variation: none recognised in Australia. The subspecies *praeclarus* Fruhstorfer occurs in northern mainland New Guinea. Populations from the Claudie River differ slightly from others by the pointed forewings in males and somewhat darker colour.

Habitat critical to survival: Occurs in mangroves in Northern Territory, Queensland and northern New South Wales but also in open eucalypt forests north from Townsville, and sand dune vegetation and rainforest on Cape York Peninsula. North from Townsville this species is polyphagous, and its larvae feed on members of many plant families including Barringtoniaceae, Combretaceae, Euphorbiaceae, Fabaceae, Lecythidaceae, Mimosaceae, Myrtaceae, Rhamnaceae, Verbenaceae and Rhizophoraceae. In southeastern Queensland and northern New South Wales, larvae feed only on Rhizophoraceae. Adult females deposit their eggs on leaves of the food plant, usually at the edge of old feeding scars. Larvae and pupae of *H. apelles* live in curled leaves and are always attended by a species of ant, *Crematogaster* sp., with which the larvae have an obligatory, symbiotic relationship. Adults are usually locally abundant.

Populations from the Claudie River and Iron Range rainforests, northern Queensland, are somewhat different in appearance and require further taxonomic study. At Iron Range the food plant is *Commersonia bartramia* (Rhamnaceae; unpublished).

History of conservation concern: Braby (2000) considered that *H. apelles apelles* was regionally threatened in southeastern Queensland and northern New South Wales, with insufficient secure habitat to sustain survival of this taxon in New South Wales. It is not listed as threatened by State or Commonwealth authorities. The only known habitat in New South Wales is at West Drydock Road, near the end of the Council boardwalk (28°11’S, 153 °31E), Terranora Inlet, near the mouth of the Tweed River (G. Newland unpublished). Although the species has been recorded further south on the Richmond River (Common and Waterhouse 1981) and observed at Brunswick Heads (DPAS), the site at Terranora Inlet appears to be the only habitat in New South Wales remaining intact.

H. apelles is near the edge of its southern range in northern New South Wales and it is secure and not threatened in any other state where it occurs. Most if not all, of the habitats for *H. apelles apelles* in New South Wales on the Richmond River, have been destroyed by clearing and disturbance of mangrove communities. A specimen of *H. apelles apelles* is believed to have been collected many years ago near Newcastle but its presence south of the Richmond River has not been confirmed. Habitats in New South Wales near Ballina and Brunswick Heads were probably destroyed in the 1980s, but in Queensland the butterfly continues to be very abundant and not threatened, in suitable mangrove localities north from Coolangatta. Of the several populations of *H. apelles apelles* once known in New South Wales, only the Terranora population is known to be intact. In Northern Territory *H. apelles apelles* is very local and near Darwin, the mangrove habitats are not protected plant communities, and populations of the species may be at risk (T. L. Fenner pers. comm.).

Major Threatening Processes: In New South Wales at Terranora Inlet, major disturbance of mangroves utilised as breeding trees. Disturbance in the council reserve, including rubbish dumping, land filling and cultivation of lawn and exotic plants. Although not viewed to cause imminent in New South Wales, threats should be monitored and alleviated by appropriate management.

Is knowledge sufficient to formulate recovery actions? Information is adequate.

Recovery needs

1. Preservation, improved management and signage to alleviate garden waste dumping at the habitat for H. apelles, near Terranora in the council reserve.
2. Take all steps to protect the appropriate mangroves in this area including an upgrade of security for the site.
3. Manage weeds and exotic plant invasion in the habitat.
4. Surveys for additional habitats in northern New South Wales, especially between Harwood Island and the Tweed River.
5. Community participation in site rehabilitation.

Can recovery be carried out with existing resources? No.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance.

Action		$
1	Surveys and mapping, $5,000 / year over 2 years	10,000.00
2	Land re-zoning 4 Site rehabilitation, fencing and boardwalks, $15,000 pa 2 years	30,000.00
Total		40,000.00

Lead Organisation: New South Wales National Parks and Wildlife Service, Tweed Shire Council.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops apollo apollo* Miskin

National Conservation Status: No Conservation Significance; Ingham to Innisfail populations: Lower Risk (Near Threatened).

Range: Queensland.

Distribution: Cooktown to Ingham.

Taxonomy: *Hypochrysops apollo* is one of three closely related species in the genus, one of which, *H. coelisparsus*, is the only species found in southeast Asia (Sands 1986).

Infra-specific relationships or variation: Two subspecies occur in Australia, and the nominotypical ssp., *apollo*, shows little variation over its range. Towards the northern distribution of this subspecies, it appears to form a cline with ssp. *phoebus*.

Habitat critical to survival: Since discovery of its unusual life history (Borch 1926), *Hypochrysops apollo* has attracted interest from collectors of butterflies and other biologists. *H. apollo apollo* is dependent on plant communities supporting the bulbous epiphyte, *Myrmecodia beccarii* as a food plant for its larvae, and possibly presence of an ant, *Philidris cordatus*, which occupies cavities in the bulbs. However, there are doubts as to whether the ants have an obligatory relationship with the larvae of the butterfly, since they may be occupying the same microhabitat as the butterfly without any direct interactions other than with the plant. Habitats for *H. apollo apollo* include coastal monostands of *Melaleuca viridiflora* and other coastal trees including mahogany and mangroves, when these trees are substrates for *M. beccarii*. At Kuranda, *H. apollo apollo* and the food plant *M. beccarii* were previously known to occur but these populations were destroyed by burning and clearing (Braby 2000).

History of conservation concern: This subspecies it is currently listed as Vulnerable and is protected fauna under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994). McCubbin (1971) recommended that *H. apollo* and its food plant should be protected, and Dunn et al. (1994) considered *H. apollo apollo* to be Vulnerable. Braby (2000) considered this subspecies to be nationally threatened. Sands (1993) suggested that removal of the food plants and displacement of the native ant *Philidris cordatus* in the bulbs of the food plant by the exotic ant, *Pheidole megacephala*, had caused a decline in abundance of the butterfly. *H. apollo apollo* is not currently a threatened subspecies but its southern populations have suffered a rapid decline in number of colonies, a trend that can be halted by protection and management of its habitat, especially in that part of its range. Sands (1993) incorrectly thought that the taxon was threatened when he overlooked the secure mangrove habitats utilised by this subspecies. Delisting by QPWS is recommended.

Major Threatening Processes: Clearing of melaleucas, mangroves and other trees supporting *M. beccarii*, in particular for pine and sugarcane plantations, golf courses and canal resorts. Threats are most serious to melaleucas supporting ant plants are from forestry activities south of Cardwell and between Cairns and Port Douglas. Temporary threats may include damage by cyclones (e.g near Daintree) but secure habitats include mangroves near Cairns, from Port Douglas to Mossman and extensive patchy areas of the epiphyte from Daintree to Cooktown. Threats also include inadequate fire management, especially during dry-seasons and possibly invasion of the epiphytes by the exotic ant, *P. megacephala* which displace the native ant, *P. cordatus*. *P. megacephala* is known to be responsible for destroying the flowers and developing seeds of the epiphyte and may indirectly be responsible for declines in the abundance of the plant (G. Maynard pers. comm).

There is little doubt that at the southern edge of its range between Cardwell and Ingham, *H. apollo apollo* has suffered from a decline in areas of occupancy (Sands 1993). Evaluation has shown that this was due to clearing of melaleuca habitat for the planting of *Pinus allotei* and sugarcane, and not from a damage to host plants caused by collectors. It is probable that the only significant decline in food plants has been confined to accessible plants near roadsides, rather than over the whole otherwise intact areas. Ant plants, *Myrmecodia beccarii*, have sometimes been removed in numbers from the substrate supporting trees and opened by those seeking immature stages of the butterflies, leading to the proposal that a decline has occurred in the availability of food plants for the butterfly. Dunn et al. (1994) noted that collecting of adults would be unlikely to have any impact on the butterfly. In previous conservation assessments, the food plant of the butterfly, *Myrmecodia beccarii* was assumed to be dependent on species of melaleuca as a substrate for the epiphyte. However, this assumption has been shown to be incorrect, with much of the habitat for butterfly and host plant now known likely to be mangroves, all now protected as ecological communities in Queensland.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate.

Recovery needs: Required at the population or municipal level to prevent further contraction of the southern populations.

1. Restrict further incursion of forestry and canal development activities into coastal melaleucas supporting ant plant habitats near Cardwell.
2. Preserve and manage areas where moist forests, melaleucas and mangroves support *M. beccarii.*
3. Manage fire for melaleuca habitats in the southern range of *H. apollo apollo*, between Ingham and Cooktown.

Can recovery be carried out with existing resources? No.

Resources required: Land acquisition for extension of existing national parks and establishment of fauna and flora reserves to protect remaining sites. These cost are not included below.

Action		$
1	Site rehabilitation	25,000.00
Total		25,000.00

Lead Organisation: Queensland Parks and Wildlife Service, Ingham and Cardwell Shire Councils.

References:

Borch, C. 1926. Life histories of Miletus butterflies. Victorian Naturalist 43: 214–215.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

McCubbin, C. 1971. Australian butterflies. Nelson, Melbourne.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation 1994.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder. pp 160-162, *in* (T.R. New ed.) *Conservation biology of Lycaenidae (butterflies)*. IUCN, Gland.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops apollo phoebus* (Waterhouse)

National Conservation Status: No Conservation Significance

Range: Torres Strait Islands, Queensland.

Distribution: Southern Papua New Guinea, Torres Strait Islands, Bamaga to Rocky River, Cape York Peninsula.

Taxonomy: One of two subspecies of *Hypochrysops apollo* occurring in Australia. Other subspecies including ssp. *wendisi* occur in Papua New Guinea. Males of ssp. *phoebus* tend to be darker above than ssp. *apollo*, and the white markings beneath the hind wing are overlain with orange in the posterior half of the wings (Sands 1986).

Infra-specific relationships or variation: Little variation occurs in *phoebus* throughout its range in Torres Strait and northern Cape York Peninsula.

Habitat critical to survival: Similar to ssp. *apollo* but the food plant is mainly *Myrmecodia tuberosa* on Cape York Peninsula (C. Huxley pers. comm.). The species is secure in several areas, in particular Iron Range National Park and the nearby resources reserve.

History of conservation concern: McCubbin (1971) referred to habitat destruction as a threatening process, and Dunn et al. (1994) considered that the subspecies is insufficiently known. *Hypochrysops apollo phoebus* was listed as Vulnerable and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994).. However, information on the security of adequate habitats indicates the taxon is not currently at risk and delisting by QPWS is recommended.

Major Threatening Processes: McCubbin (1971) suggested that the subspecies was threatened by the activities of collectors including the destruction of the food plants, and Dunn et al. (1994) suggested that habitat destruction was contributing to a decline in this subspecies. Neither of these threats has been substantiated.

Is knowledge sufficient to formulate recovery actions? Yes, information is adequate. No recovery actions are required.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

McCubbin, C. 1971. Australian butterflies. Nelson, Melbourne.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation 1994

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops arronica arronica* (C. and R. Felder)

National Conservation Status: Data Deficient

Range: Queensland (? presence in State)

Distribution: The species is well known from mainland New Guinea and offshore islands. It may not be established in Australia since it is known from only one male specimen in the Natural History Museum, London, labelled: 'Cedar Bay, S. of Cooktown (Meek)'. Braby (2000) did not record the species from Australia.

Taxonomy: Two subspecies are recognised in Papua New Guinea, ssp. *arronica* from the mainland and ssp. *honora*, from the Bismarcks and possibly Manus Island (Sands 1986).

Infra-specific relationships or variation: Only one specimen is known from Australia, which is very similar to specimens from Papua New Guinea. In males, variation in width of the black apex of the fore wings and shape of both wings is very noticeable (Sands 1986).

Habitat critical to survival: In Papua New Guinea, the rainforest habitats for *Hypochrysops arronica* are very similar to many plant communities in northern Queensland. Near Port Moresby adults are usually found near trees of Ca*suarina* sp. supporting the epiphytic bulbs of a *Myrmecodia* sp. The life history of *Hypochrysops arronica* (Szent-Ivany and Carver 1967) is similar to that of *Hypochrysops apollo* and the larvae of both species feed within the bulbs of *Myrmecodia* spp..

History of conservation concern: A single specimen from Cedar Bay was referred to by Sands (1986) but no further information is available for the species in Australia. Not known from Australia except for one possible specimen, from near Cedar Bay.

Major Threatening Processes: None known.

Is knowledge sufficient to formulate recovery actions? No, only one specimen is known. Further specimens are needed to confirm the presence of *H. arroni*ca in Australia.

Resources required:

Action	$
1 Surveys over 2 years	16,000.00
Total	16,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Szent-Ivany, J.J.H. and Carver, R.A. 1967. Notes on the biology of some Lepidoptera of the Territory of Papua New Guinea with descriptions of the early stages of *Ornithoptera meridionalis* Rothschild. Papua and New Guinea Scientific Society Transactions 8: 3–35.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops byzos hecalius* Miskin

National Conservation Status: No Conservation Significance

Range: New South Wales, Victoria.

Distribution: Southeastern New South Wales to Victoria

Taxonomy: The species is most closely related to *H. meeki*, from Papua New Guinea.

Infra-specific relationships or variation: Females of *H. byzos hecalius* are very variable in the extent of orange areas on the upperside of both wings. In males from southern New South Wales, variation in the underside is substantial and the colour may be gray or yellow, or intermediate. The two subspecies, *byzos* and *hecalius* apparently share a zone of hybridisation.

Habitat critical to survival: Protected slopes and gullies in moist eucalypt forests on the coast, or more exposed areas further inland and in the mountains where the food plants, *Pomaderris* spp., are in moderate densities. Ants do not usually attend the immature stages. The subspecies is particularly abundant in the mountain ash areas north of Melbourne., at Ferntree Gully and other suburbs in the ranges. The species sometimes colonises gardens when the food plants are present (R. Field pers. comm.).

History of conservation concern: Yen and Butcher (1997) indicated that the species was recognised as of conservation significance by the Department of Conservation and Natural Resources, Victoria. No other concerns for this species have been recorded. Its wide distribution and security in many national parks indicates it to be of no serious concern. Subspecies *byzos* is well protected and is not threatened despite its few known localities in Queensland (c.f. Sands 1993).

Major Threatening Processes: Bushfires undoubtedly temporarily destroy colonies. However, neither subspecies, *byzos* nor *hecalius*, is threatened or of concern and both are secure in a number of national parks throughout their range.

Is knowledge sufficient to formulate recovery actions? No, not required; the subspecies is abundant, widely distributed and not threatened.

References:

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder. pp 160-162, *in* (T.R. New ed.) Conservation biology of Lycaenidae (butterflies). IUCN, Gland.

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops cleon* Grose-Smith

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range, Claudie River, Cape York Peninsula. The species also occurs in mainland New Guinea and the Aru Islands, Indonesia.

Taxonomy: *Hypochrysops cleon* is closely related to several other species occurring in Papua New Guinea and Australia, in particular *H. miskini*.

Infra-specific relationships or variation: No significant variation has been observed in this species in Australia. In Papua New Guinea, the width of the black apex of the fore wing in males is variable (Sands 1986).

Habitat critical to survival: *H. cleon* occurs in, or near, tropical rainforest. Its life history is unknown.

History of conservation concern: Since its discovery in Australia (Sands et al. 1979), this species has only been recorded from near Iron Range and the Claudie River. Hill and Michaelis (1988) listed this species as threatened and Sands (1993) referred to its only known habitat near Iron Range.

Major Threatening Processes: None identified. There have been no known changes in distribution or threats to the habitats of *H. cleon*. All known habitats are secure in the Iron Range National Park or in the nearby resources reserve.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required but more surveys to determine the distribution of this species should be encouraged by the conservation authorities in Queensland.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Sands, D.P.A., De Baar, M. and Johnson, S.J. 1979. First record of *Hypochrysops cleon* Grose-Smith (Lepidoptera: Lycaenidae) from Australia. Australian Entomological Magazine 6: 23–24.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops delicia delicia* (Hewitson)

National Conservation Status: No Conservation Significance

Range: Victoria.

Distribution: Grampians National Park (form of ssp. *delicia*).

Taxonomy: *Hypochrysops delicia* was formally reviewed by Sands (1986), who was not familiar with the Grampians population.

Infra-specific relationships or variation: This apparently distinct form from the Grampians was said by Douglas (1995) to be most similar to ssp. *delicia*. This population is unlike ssp. *delos*, which occurs elsewhere in Victoria, is of taxonomic and ecological interest, and it may represent an undescribed subspecies because it is isolated from other populations of *H. delicia delos* occurring in Victoria. Douglas (1995) mentioned the width of the red bands on the underside which are wider than typical ssp. *delicia* or other subspecies. One male specimen resembled the characteristics of ssp. *delos*. The other main taxon found in Victoria, *H. delicia delos*, was not recognised as a valid subspecies by Dunn and Dunn (1991) or Braby (2000).

Habitat critical to survival: Adult males of *Hypochrysops delicia* are most obvious as they congregate on hilltops, usually from mid afternoon to sunset. The food plants are usually mature or old trees of *Acacia* spp.. Larvae hide by day in the rotting sections of the trunk or in beetle holes, and emerge after sunset to feed on the foliage where they are attended by the ant, *Crematogaster fusca*.

History of conservation concern: Douglas (1995) considered that the Grampians population of *Hypochrysops delicia* was rare and nationally Vulnerable. F. Douglas provided more information when attending the BAP Workshop in Melbourne. However, the two habitats are extensive and secure in the Grampians National Park, and the population of this species was not considered to be threatened. No changes in its abundance have been observed.

Major Threatening Processes: No specific threats to the Grampians form have been proposed. Sands (1993) referred to effects of hilltop clearing on other populations of this species.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The Grampians population of *H. delicia* is secure and no recovery actions are necessary. However, since the population is of special scientific interest, care should be taken by conservation authorities not to disturb the hilltopping sites. An effort should be made to locate the *Acacia* breeding trees, which are likely to be old and susceptible to fire. Once located, the surrounding area should be assessed for any special management that will ensure that the breeding trees are maintained.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder. pp 160-162, in (T.R. New ed.) Conservation biology of Lycaenidae (butterflies). IUCN, Gland.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops digglesii* (Hewitson)

National Conservation Status: No Conservation Significance; New South Wales: Data Deficient.

Range: Torres Strait Islands, Queensland, New South Wales

Distribution: Eastern Queensland to Grafton, New South Wales.

Taxonomy: *Hypochrysops digglesii* constitutes a distinctive species group with one related species, *H. rufimargo*, occurring on Manam Island, Papua New Guinea. *H. digglesii* also occurs in Papua New Guinea (Sands 1986).

Infra-specific relationships or variation: Variation has been noted in specimens of *H. digglesii*. Specimens from New South Wales are distinctive and considerably darker on the underside than specimens from central and northern Queensland.

Habitat critical to survival: *H. digglesii* occurs on the coast in open eucalypt plant communities, mangroves or at the edge of rainforest where the larvae feed on a range of different species of mistletoes. Larvae are attended by ants, *Crematogaster* sp. (*laevieps* group), and pupate in curled dead leaves or beetle holes in nearby branches.

History of conservation concern: Sands (1993) considered a population of *H. digglesii* near Broken Head in New South Wales to be at risk. Several other populations have since become known in that State, but all are on private property. No doubt others will be located if surveys are undertaken, in the opinion of participants at the BAP Workshops in several states. Many habitats have been destroyed, and the range is contracting in southeastern Queensland (Sands 1999), but the species is not considered threatened in that State. The major concern is in New South Wales, where there are insufficient populations protected in appropriate reserves such as national parks.

Major Threatening Processes: Sands (1993) identified urban development as a threat to the population of *H. digglesii* at the edge of the national park at Broken Head. A similar threat to the species affects major populations on the Sunshine Coast, Queensland.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate, but surveys should be undertaken to determine if habitats are secure in New South Wales. If not, the National Conservation Status should be reviewed and an action plan developed towards preserving habitat to sustain the species.

Recovery needs:

1. Surveys and mapping the distribution of *H. digglesii* in New South Wales.
2. Acquisition and preservation of areas where the species occurs in New South Wales.
2. Management plans for weeds and fire.

Action		$
1	Surveys and land tenure assessments	7,000
Total		7,000

Lead Organisation: New South Wales National Parks and Wildlife Service

References:

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder Pp. 160–162, in (T.R. New ed.) Conservation biology of Lycaenidae (butterflies). IUCN Gland, Switzerland.

Sands, D.P.A. 1999. The jewels, *Hypochrysops* species (Lycaenidae). Chapter 17, pp 261-277 in (R.L. Kitching, E. Scheermeyer, R.E. Jones and N. E. Pierce eds) The biology of Australian butterflies. CSIRO, Melbourne.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops elgneri barnardi* Waterhouse

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Cape York to Silver Plains, McIlwraith Range.

Taxonomy: Two subspecies are recognised, ssp. *elgneri* occurring in Papua New Guinea and on the Torres Strait Islands.

Infra-specific relationships or variation: The extent of orange on the upperside of both wings of the female of *H. elgneri barnardi* is very variable in extent.

Habitat critical to survival: *H. elgneri barnardi* is associated mainly with open eucalypt and melaleuca forests or sometimes at the edge of rainforest. Adults are not uncommon but are cryptic in behaviour, flying very rapidly and settling frequently some distance from the ground where they are well camouflaged. Its life history was not known until recently and it is now considered to be much more abundant than thought previously (Samson et al. 1997). This species has a range of food plants including *Planchonia careya*, *Nauclea orientalis* and some mistletoes. In Papua New Guinea, larvae likely to be of this species were found feeding on a species of *Melaleu*ca (Sands 1986). Immature stages are attended by the ant *Philidris cordatus*.

History of conservation concern: Dunn et al. (1994) considered *H. elgneri barnardi* to be rare due to its poor representation in collections. *H. elgneri barnardi* is a protected species but listed as 'common' and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994).

Major Threatening Processes: None recognised. The species is especially secure in Iron Range National Park where there are no threats to this species.

Is knowledge sufficient to formulate recovery actions? Yes, *H. elgneri barnardi* is not threatened and recovery actions are not required.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Samson, P.R., Johnson, S.J. and Valentine, P. S. 1997. The life history of *Hypochrysops elgneri barnardi* Waterhouse (Lepidoptera: Lycaenidae). Australian Entomologist 24: 159–163.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation 1994.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops epicurus* Miskin

National Conservation Status: No Conservation Significance

Range: Queensland, New South Wales.

Distribution: Port Alma, Queensland to Newcastle, New South Wales.

Taxonomy: *H. epicurus* is closely related to *H. cyane*, *H. piceatus* and *H. ignitus*.

Infra-specific relationships or variation: There is some variation in the extent of blue on the upperside of females, especially in populations from the Mary River, Queensland. The extent of orange suffusion is also variable in both sexes.

Habitat critical to survival: Mature stands of *Avicennia marina*, usually at the edge of waterways and bays, or where there are natural cleared areas among the trees. Moderate to large trees of *A. marina* are utilised as food plants for the larvae which shelter in curled leaves or in hollow branches, the same sites in which they pupate.

History of conservation concern: Hill and Michaelis (1988) referred to *H. epicurus* as threatened, and Miller and Morhaus (1975) and Sands (1993) considered populations of this species in New South Wales to be declining and at risk from coastal development. Braby (2000) considered that it was regionally threatened in northern New South Wales. However, many other populations have since become known in that State, extending as far south as Newcastle (Atkins 1984, R. Mayo pers. comm.). Other populations have been destroyed in southeastern Queensland, but many habitats remain intact in that State and the species is locally abundant.

Major Threatening Processes: Damage to mature mangrove communities with *Avicennia marina* as a dominant species. Hill and Michaelis (1988) suggested that urbanisation and mosquito control were threats for *H. epicurus.* Destruction of habitats in coastal mangroves, for urban and commercial development, wharves, dredging and shipping was formerly widespread. Most of this has ceased and mangrove communities are now protected in New South Wales and Queensland, and adequate habitats are intact and secure to prevent threats to the species' survival.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not threatened in either Queensland or New South Wales.

References:

Atkins, A.F. 1984. Notes and records for some butterflies from eastern Australia, 1980–1984. Victorian Entomologist 14: 26–29.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Miller, C.G. and Morhaus, I.G. 1975. Butterfly records of interest from the northern rivers district of New South Wales Australian Entomological Magazine 2: 85–86.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder. Pp. 160–162, in (TR. New ed.). Conservation biology of Lycaenidae (butterflies). IUCN, Gland, Switzerland.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops halyaetus* Hewitson

National Conservation Status: No Conservation Significance; Perth to Moore River: Lower Risk (Near Threatened).

Range: Western Australia (endemic).

Distribution: On the coast from near Perth to North West Cape, and inland at Wongan Hills.

Taxonomy: The taxonomic relationships of *H. halyaetus* were summarised by Sands (1986). It is a distinctive species, not closely related to other species of *Hypochrysops* but taxonomically closest to the *ignitus* species group.

Infra-specific relationships or variation: Considerable variation has been noted (Common and Waterhouse 1981) and differences between northern populations and those from south of Geraldton, particularly south from the Moore River and Leeman, indicate that two subspecies may be recognisable. Further studies on geographical variation are necessary to determine if subspecies *uranites* Meyrick, with its type locality Geraldton, is valid. The taxonomic status of populations north of the Moore River and south of Geraldton, for example, at Leeman (Field 1987), require assessment to enable distinctions between the possible subspecies of *H. halyaetus*. There is distinct clinal variation within this range.

Habitat critical to survival: Heathland with *Banksia attenuata* and *B. menziesii*, or jarrah woodland when the food plants and the attendant ant, *Crematogaster perthensis*, are present. The food plants are various but mainly *Davesia* spp., *Jacksonia sternbergiana* or *Acacia* spp. (Braby 2000).

History of conservation concern: Braby (2000) considered that it was regionally threatened in southwestern Western Australia. Many of the southern habitats of *H. halyaetus* have been destroyed following urban development, especially near Perth (Williams et al. 1998). However, it is adequately protected in the Moore River National Park and Koondoola Bushland Reserve. Historical localities need evaluation for conservation of the southern populations of the species, including habitats ca 12 km north of Muchea (intact but on private property) where several populations continue to be viable, and between Gingin and Bindoon (A. Williams pers. comm.).

There is a history of extinctions, decline and reduction in the distribution and area of occupancy of *H. halyaetus* between Perth and Geraldton. Insufficient recent surveys have been conducted to determine the number of habitats that may be secure. The butterfly is of regional significance in the south of the Moore River because there are few surviving discrete populations, some are in decline and near Perth many have been destroyed. Since their morphology is distinguishable from individuals from further north, southern populations must be considered of municipal conservation concern pending review of their subspecific status.

Major Threatening Processes: Urban disturbance and destruction of the habitats for farming, especially the southern populations of *H. halyaetus* near Perth. Many localities have been affected by urban development, farming and road construction. This butterfly may be fairly resistant to fire since larvae and pupae shelter underground at the base of the food plants (A. and M. Williams, pers. comm.).

Is knowledge sufficient to formulate recovery actions? Information is adequate but further surveys are necessary to define the distribution, current status and security of southern habitats.

Recovery needs:

1. Surveys and mapping, acquisition, preservation and management of southern habitats of *H. halyaetus* that are not currently secure, especially those 12 km N. of Muchea and near Ioppolo Road. The former site is currently privately owned.
2. Manage weeds and fire control for habitats.
3. Community participation in a Recovery Plan: site management, plant propagation and planting to enrich food plant densities. Investigate enhancing mulch and fallen timber as micro-habitats for ant colonies.
4. Taxonomic studies on populations and morphometric studies to ascertain their subspecific status.

Can recovery be carried out with existing resources? No.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance.

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
2	Land acquisition	
4	Site rehabilitation, plant propagation and cultivation, $15,000 per year over 3 years	45,000.00
Total		60,000.00

Lead Organisation: Western Australian Department of Conservation and Land Management.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Field, R.P. 1987. Notes on butterflies collected in south-west Western Australia, September-October, 1987. Victorian Entomologist17: 111–114.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Williams, M.R., Williams, A.A.E. and Lundstrom, T.D. 1998. Jewels of the west. Landscape 13: 49–53.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops hippuris nebulosis* Sands

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: southwestern Papua New Guinea, Iron Range and Claudie River, Queensland.

Taxonomy: *Hypochrysops hippuris* is one of three closely-related species, *H. alyattes* occurring in the Bismarck Islands and Solomon Islands, and *H. bakeri* from West Papua.

Infra-specific relationships or variation: The nominotypical subspecies occurs on the Aru Islands (Sands 1986)

Habitat critical to survival: *H. hippuris nebulosis* occurs in, or at the edge of, tropical rainforest and males sometimes congregate on hilltops in open forest. Sands (1993) referred to the population of this species at Iron Range in northern Queensland but indicated that it was not at risk. At the Claudie River larvae thought to be this species were found feeding on an unidentified fern (Polypodiaceae), attended by the ant *Philidris cordatus* (D.P.A. Sands, Braby 2000). Johnson and Valentine (2001) subsequently described the life history. The larvae feed on the fern, *Pyrrosia lanceolata* (L.) (Polypodiaceae).

History of conservation concern: Hill and Michaelis (1988) referred to *H. hippuris nebulosis* as a threatened species. However, the species is secure in the Iron Range National Park and nearby resources reserve.

Major Threatening Processes: None identified.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate, no recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Johnson, S.J. and Valentine, P.S. 2001. Notes on the life history of *Hypochrysops hippuris nebulosis* Sands (Lepidoptera: Lycaenidae). Australian Entomologist 28: 13–16.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder. Pp. 160-162 in (New, T.R. ed.) Conservation biology of Lycaenidae (butterflies). IUCN Gland, Switzerland.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops ignitus chrysonotus* (Grose-Smith)

National Conservation Status: No Conservation Significance; Western Australia: Lower Risk (Least Concern)

Range: Queensland, Western Australia.

Distribution: *Hypochrysops ignitus chrysonotus* occurs in Queensland from Cape York Peninsula south to Rockhampton, and then west of the Main Divide south to Leyburn. However, one population in Western Australia, at Watheroo, has been referred to this subspecies. This subspecies also occurs in southwestern Papua New Guinea.

Taxonomy: *Hypochrysops ignitus* is widespread on the Australian mainland.

Infra-specific relationships or variation: *Hypochrysops ignitus chrysonotus* was discussed by Sands (1986) but it was not then known from Western Australia. This subspecies is sometimes difficult to separate clearly from other subspecies. All populations from southwestern Australia, including some from south of Perth, are said by Braby (2000) to belong to *H. ignitus olliffi*, endemic to the region. Braby (2000) noted the differences different appearance of specimens from Watheroo and Cape Arid, with the female upperside being brighter and with more black margins. The Watheroo population is considered by A. and M. Williams (pers. comm.) to be referrable to *H. ignitus chrysonotus*, despite the considerable distance from its main distribution in Queensland (Williams et al. 1997).

Habitat critical to survival: *H. ignitus chrysonotus* inhabits a wide range of eucalypt and heathland communities, and its food plants are often *Acacia* spp. The immature stages are always attended by strong smelling ‘coconut’ ants, *Papyrius* sp. (*nitidus* group). In Queensland males frequent hilltops during mid to late afternoons.

History of conservation concern: Referees suggested ranking this population as Vulnerable or Endangered, and this status may indeed be warranted when more knowledge of threats has been accumulated. The highly localised nature of this form in Western Australia, where it is known from only one single population (in the Watheroo National Park), and for which targeted surveys of nearby areas have failed to locate additional colonies (Williams et al. 1997), have aroused concern for its wellbeing in that State.

Major Threatening Processes: None currently recognised. However, careful fire management would appear to be appropriate.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary, but continued monitoring is recommended for the single known population. Recovery after fire would provide a valuable indication of possible threats in the National Park.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Williams, A.A.E., Williams, M.R. and Atkins, A.F. 1997. Notes on some Western Australian butterflies. Victorian Entomologist 27: 44–49.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops ignitus erythrinus* (Waterhouse and Lyell)

National Conservation Status: No Conservation Significance

Range: Western Australia, Northern Territory

Distribution: Broome and Kimberley region, Western Australia and from Daly River to Darwin, Northern Territory.

Taxonomy: This subspecies was discussed by Sands (1986). Subspecies *erythrinus* is most similar to ssp. *chrysonotus* from Queensland and ssp. *chrysotoxus* from Papua New Guinea.

Infra-specific relationships or variation: Both sexes of *H. ignitus erythrinus* are variable in the width of red bands beneath, males in the extent of purple on the fore wing and females in the shade of blue or purple on both wings above. Specimens from Watheroo National Park are closest to ssp. *chrysonotus*. Specimens from Broome, Western Australia, may prove to represent a separate subspecies.

Habitat critical to survival: *H. ignitus erythrinus* occurs in a wide range of eucalypt communities and food plants when the appropriate ants are present. Several food plants were listed by Braby (2000). The species is abundant south of Darwin, even in areas recently burnt. Favoured food plants near Darwin include *Planchonia careya* and *Maranthes corymbosa* (R. Weir pers. comm.).

History of conservation concern: Dunn et al. (1994) were correct in stating this species was then insufficiently known. Sands (1993) incorrectly thought that the subspecies was threatened in Northern Territory, due to the few specimens collected in recent times and loss of two of the then known habitats from fire. Since then many colonies have been discovered, some near Darwin at the edge of urban areas, and others in habitats that are regularly burnt. Fire has not been proved to be a threatening process for this subspecies, because the larvae often shelter underground and have been found to survive relatively hot fires (T. Fenner, R. Weir pers. comm.).

Major Threatening Processes: None currently recognised. Fire has destroyed some colonies but others have recovered rapidly from larvae sheltering underground.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary. *H. ignitus erythrinus* should not be considered a threatened subspecies.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder. Pp. 160-162, in (T.R. New ed.) Conservation biology of Lycaenidae (butterflies). IUCN Gland, Switzerland.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops ignitus ignitus* (Leach)

National Conservation Status: No Conservation Significance; Victoria, South Australia: Lower Risk (Least Concern).

Range: Queensland, New South Wales, Victoria, South Australia

Distribution: *Hypochrysops ignitus ignitus* occurs south from Eungella, Queensland, eastern New South Wales, central Victoria and southeastern South Australia.

Taxonomy: *H. ignitus* is one of about 17 species of the genus occurring in Australia, with subspecies also occurring in Papua New Guinea.

Infra-specific relationships or variation: *H. ignitus* is one of the most widespread and variable lycaenid species occurring in mainland Australia. Distribution and identity of the subspecies have not been fully resolved, particularly for the inland populations (Dunn and Dunn 1991).

Habitat critical to survival: *H. ignitus ignitus* occurs in a wide range of eucalypt and heathland plant communities. The gregarious larvae are polyphagous, feeding on a range of legumes and other plants, but particularly *Acacia* spp. in southeasten Australia. The immature stages are attended by strong smelling 'coconut' ants, *Papyrius* sp. (*nitidus* group).

History of conservation concern: Hill and Michaelis (1988) listed *H. ignitus ignitus* as threatened and Dunn et al. (1994) claimed that *H. ignitus* was severely threatened and Endangered. The latter authors attributed these designations to clearing and habitat destruction, and possibly fires. They appeared to be referring mainly to the Victorian and South Australian populations. The subspecies was also referred to by Douglas (1995). Fisher (1978) considered that the subspecies was extremely rare and of conservation concern in South Australia. Grund 1999 noted its persistence in widely separated conservation parks but (Grund 2001) listed it as Vulnerable. However, at the BAP Workshop held in Adelaide, several populations were mentioned in that State that are secure. *H. ignitus ignitus* has attracted attention due to the loss of many of its habitats (Sands 1999). In New South Wales and Queensland this subspecies has not been considered of conservation concern.

Major Threatening Processes: Fisher (1978) considered that fire and Hill and Michaelis (1988) fire and drought were threats to this species. Loss and disturbance of habitat resulting from urban development and farming are important threatening processes. In southern Australia, *H. ignitus* does not appear to persist where human disturbance has taken place. Concerns were expressed that the native attendant ants were being displaced by exotic species in bushland habitats. This requires further investigation and may prove to be a serious threatening process. Sands (1993) highlighted the importance of retaining hilltops as congregating sites throughout its range.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Not a threatened subspecies but actions are necessary in Victoria and South Australia to ensure that sufficient populations of ssp. *ignitus* are secured in national parks and other environmental reserves to prevent it from becoming threatened. Surveys are needed in those States to record whereabouts of all colonies of *H. ignitus ignitus*, and to encourage municipal participation in habitat conservation.

Recovery needs:

Action		$
1	Surveys and land tenure assessments, Victoria and South Australia	15,000
Total		15,000

Lead Organisations: South Australian Department of Environment, Heritage and Aboriginal Affairs, Victorian Department of Natural Resources and Environment.

References:

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 1999. Butterfly conservation in the southern Flinders region. Department of Environment Heritage and Aboriginal Affairs, South Australia.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder Pp. 160–162, in (T.R. New ed.) Conservation biology of Lycaenidae (butterflies). IUCN, Gland, Switzerland.

Sands, D.P.A. 1999. The jewels, *Hypochrysops* species (Lycaenidae). Chapter 17, pp 261–277 in (R.L. Kitching, E. Scheermeyer, R.E. Jones and N. E. Pierce eds) The biology of Australian butterflies. CSIRO, Melbourne.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops piceatus* Kerr, Macqueen and Sands

National Conservation Status: Endangered [ENb,c]

Range: Queensland (endemic).

Distribution: Historically, *Hypochrysops piceatus* has been recorded from three localities west of the Darling Downs alluvial basin, near Millmerran (1 specimen), Leyburn and very recently, near Goondiwindi. The species was sighted ca 25 km NE Goondiwindi (in November 1997, D.P.A. Sands unpublished) and ca 40 km NE Goondiwindi at Bendidee National Park and in an adjacent forestry area (in April 2001, J. Moss pers comm.). The latter locality was validated by collection of a specimen at the Bendidee National Park (on 19 October 2001, D.P.A. Sands unpublished). Near Millmerran at Mount Emlyn, the butterfly is known from only one specimen (Dunn and Kitching 1994). At Leyburn between 1998 and 2000, about 11 sub-populations of *H. piceatus* were found during surveys to extend northeast and southwest of the type locality, occupying a total area of ca 8 x 1.5 km (Sands and Payne unpublished). Between October and December 1999, surveys of several other potentially suitable habitats west of Millmerran, failed to locate any colonies of *H. piceatus* (Sands and Veary 2000). Reports of sightings of the species in Dunmore State Forest and near Cecil Plains (DeBaar unpublished) have not been confirmed and require specimens for validation.

Taxonomy: The taxonomic relationships of *H. piceatus* were summarised by Sands (1986). The butterfly belongs to a small group of related species, *H. ignitus*, *H. cyane* and *H. epicurus*, which are all very similar in appearance and difficult to identify unless specimens are examined closely.

The first specimen of *H. piceatus* was collected on 12 February 1967 by Dr J.F.R. Kerr at Mount Emlyn, about 20 km southeast of Millmerran, on a property owned by the late Mr Jack Macqueen. Kerr at first thought that the specimen was an unusually dark form of the closely-related *Hypochrysops cyane*, a species known to occur from Sydney, New South Wales, to north of Cooktown, Queensland (Common and Waterhouse 1981, Dunn and Dunn 1991). *H. cyane* also occurs at the same localities as *H. piceatus*. The day after this specimen was taken, J.F.R. Kerr and J. Macqueen collected further specimens at the side of Toowoomba — Karara Road, east of Leyburn (J.F.R. Kerr pers. comm.). Since its description by Kerr, Macqueen and Sands (1969), series of *H. piceatus* collected at Leyburn have been lodged in collections throughout Australia, including State museums and the Australian National Insect Collection, Canberra.

Infra-specific relationships or variation: Some variation in the extent and shade of purple on the upperside of males has been observed. The females vary in size and the extent of pale areas on the underside.

Habitat critical to survival: Kerr, Macqueen and Sands (1969) discovered the life history of *H. piceatus* and subsequently more biological information has become available (Dunn and Kitching 1994, Braby 2000). The food plant for larvae is the bulloak, *Allocasuarina luehmannii*. Adult females deposit their eggs, usually about 4 to 7 metres above the ground, on twigs of old growth bulloaks (>30 cm breast diameter) bearing colonies of only one species of ant, identified as *Anonychomyrma* sp. (*itinerans* group) (Eastwood and Fraser 1999), which has a symbiotic relationship with the immature stages of the butterfly. Bulloak trees selected for oviposition are often senescent, and usually have several hollowed horizontal branches. Larvae feed at night on terminal growth and hide by day in hollow branches or twigs of mature bulloaks, and the ants provide some protection from natural enemies. Larvae pupate in similar situations or in beetle holes at the base of mistletoe plants.

Two generations of *H. piceatus* occur each year, occasionally with some overlap depending on climatic factors. Most years the adults commence emerging from pupae in late September with intermittent adult activity until early December (they were unusually abundant throughout December 1999). The second generation emerges in early to mid January, reaching a peak in February, and adults cease activity in mid to late March. Adult males settle on, and patrol areas between, mature *A. luehmannii* between 11am and 4 pm, settling every 30 seconds or longer at levels about 8–10 m above the ground. Females fly less rapidly and settle at lower levels when searching for suitable oviposition sites when the appropriate ant is present. In the field both sexes are not easily distinguished from other Lycaenidae, especially *H. cyane* and *Theclinesthes* spp. They feed on the nectar of flowers of several plant species, mainly mistletoes, eucalypts (Sands unpublished) and in spring, *Jacksonia scoparia* (Dunn and Kitching 1994, Braby 2000). A metapopulation structure may be part of the life system of *H. piceatus* but it is certain that colonies also persist on mature trees.

The relationship of coccids and breeding sites for *H. piceatus* proposed by Dunn and Kitching (1994) may be facultative, by enhancing the presence of ants but it is not obligatory. The butterfly inhabits groups of mature bulloak trees with ants for breeding and as habitat. Only old, mature growth of *A. luehmannii*, with unburnt, undisturbed grasses and an abundance of dead and fallen logs supporting the particular ants, are selected by butterflies as breeding sites. Young trees and regrowth of *A. luehmannii* are not utilised and the butterflies do not inhabit them.

History of conservation concern: Hill and Michaelis (1988), Dunn and Dunn (1991) and Dunn et al. (1994) considered *H. piceatus* was Endangered and Braby (2000) stated this species was nationally threatened. This species is currently listed as Endangered and is protected fauna under the Queensland Nature Conservation (Wildlife) Regulation (1994) (QPWS 1994). *H. piceatus* has a very high conservation significance, when assessed using criteria appropriate for determining butterfly National Conservation Status (Sands 1997) with one recently-confirmed population (Bendidee National Park and adjacent forestry area) likely to be adequately secure.

At the best-known locality near Leyburn, *H. piceatus* occupies an area of mainly roadside vegetation of about 12 sq. km, in the Clifton and Warwick Shires. Despite the inclusion of about 1.5 sq.km of this habitat in Ellangowan Nature Refuge, several threatening processes continue and the butterfly will not survive if current practices of clearing, cutting and removal of the food plant bulloak trees continue. The environmental values of the area near Millmerran have been recognised previously. For example, Roff (1961) listed fauna sanctuaries in the region (Fauna District No. 1) and showed their boundaries extending from 19 km to about 62 km west of Millmerran. The current status of these sensitive areas is not known. They were undoubtedly intended to preserve rare vertebrates and unusual plants occupying undisturbed communities of old growth brigalow, *Acacia harpophylla*, bulloak, *A. luehmannii* and the associated understorey. None of those unique habitats were permanently protected, except recently, the road verges near Leyburn occupied by *H. piceatus*. A second population within the Bendidee National Park and adjacent forestry area has recently been discovered but its conservation assessment has not yet been evaluated.

Dunn and Kitching (1994) prepared a report for the Queensland Department of Environment and Heritage (now Environmental Protection Agency), on the 'Distribution, status and management of the piceatus jewel butterfly on the Darling Downs, Queensland'. In this, no new localities were reported despite extensive surveys of 44 potentially suitable habitats occupied by the ant, *Anonychomyrma* sp. (*itinerans* group), with which *H. piceatus* has a symbiotic relationship. They located *H. piceatus* only at the already known roadside habitat at Leyburn and did not follow up sightings made at other localities. Greenslade (1995) nominated the Leyburn roadside habitat for *H. piceatus* for the Register of the National Estate. The locality nominated extended 2 km on the Toowoomba – Karara Road and began 3.8 km from the Millmerran turnoff , 200 m before the junction of Tummerville Road (road 331). The northwestern boundary was the Toowoomba – Karara Road and southeastern boundary the fence adjoining the Collins-owned private property. The area was owned by the Queensland Department of Transport and administered by Clifton Shire Council (ca 90%) and Rosenthal Shire (ca 10%). The Ellangowan Nature Refuge was established for the area following this nomination.

On 25 September 1997, Dr Chris Hill, Environmental Protection Agency (EPA), Toowoomba, made an important discovery of a new core habitat for *H. piceatus* a few km from the Nature Refuge on the Toowoomba — Karara Road. Dr G. Lundie-Jenkins of that Department then contracted Dr D.P.A Sands, with assistance from Ms A. Payne (Department of Environment, now Environmental Protection Agency), to survey the general area in attempt to locate further habitats. These surveys commenced on 11 February 1999 and continued until December 1999. They resulted in discovery of a complex of 14 separate micro-populations occupying undisturbed roadside vegetation and on privately-owned land, extending ca 8 x 1.5 km on both sides of Toowoomba – Karara Road.

Major Threatening Processes: *H. piceatus* is associated with declining plant communities occupied by bulloak, *A. luehmannii* and the attendant ant, *Anonychomyrma* sp. (*itinerans* species group). Much of the habitat has been destroyed near the type locality at Leyburn by road widening and tree felling (Sands and Payne 1999). Vegetation and tree felling, especially *A. luehmannii* for fence posts and turnery, the removal of dead and fallen trees supporting ant colonies, fire and increased fire regimes are the most serious threats. Widening of Toowoomba — Karara Road has been discontinued but was previously a major threatening process as well as erosion. Grazing the understorey should be stopped to prevent damage to grassland, plant communities and soil erosion, although grazing has not in itself been shown to be a threatening process.

Management of the recently established Ellangowan Nature Refuge *has not been adequate* and means to reduce the impact of, or prevent threatening processes are urgently required. Tree felling of several breeding trees for *H. piceatus* on the Nature Refuge has continued into 2000 (G. Lundie-Jenkins pers. com.). *A. luehmannii*, on which the larvae feed, is found extensively from central inland New South Wales to the Atherton Tableland, but it varies greatly in phenology and stands of old trees (ca > 100 years) are now very uncommon. The plant communities associated with this tree are also uncommon and are subjected to more frequent fire regimes than occurred when started naturally by lightning strikes.

Dunn et al. (1994) suggested collecting activities were a threat to *H. piceatus*. However, the collection of specimens of *H. piceatus* was not considered to be a threatening process by any BAP Workshop participants. It is not likely to ever be so since flight and perching by most adults occurs at about 8–10 m, well above the reach of a net. Genetic effects, e.g inbreeding depression, are unlikely to be important, based on knowledge of other localised species of Lycaenidae (Sands unpublished).

Is knowledge sufficient to formulate recovery actions? Information is adequate and successful recovery and de-listing of this species would provide a model for butterfly conservation in Queensland. A draft recovery plan for *H. piceatus* was prepared by the Queensland Parks and Wildlife Service, Southern Region in January 1999 (Payne and Lundie-Jenkins 1999), and an information leaflet was prepared by the same authors in February 1999. Although several recovery actions are in place, the Queensland Parks and Wildlife Service have not enforced protection of the bulloaks at Ellangowan Nature Refuge, and felling of the breeding trees continues. A media statement was released on 5 September 2000 by this Department, referring to the illegal collection of timber from Ellangowan Nature Refuge, and to its impact on *H. piceatus*.

Of major importance is protection and expansion of the Ellangowan Nature Refuge established on roadside vegetation administered by the Queensland Parks and Wildlife Service, Department of Transport and Main Roads, and Clifton Shire Council. However, protection of the plant communities has been difficult to enforce. Newly discovered habitats at roadside sub-populations need to be added to the reserved areas. The habitat discovered by Dr C. Hill is rated as very high conservation priority for permanent preservation. Information from all surveys for the butterfly, the food plant and attendant ants are necessary for inclusion in the Recovery Plan. The ranking as Endangered presupposes successful protection of critical habitat from deliberations currently underway. The ranking will also require revision when more information becomes available about the security of the newly discovered habitat(s) of *H. piceatus* near Goondiwindi.

Recovery needs:

1. Survey localities (especially Cecil Plains, Goondiwindi, Bendidee National Park and nearby forestry areas) to validate other possible sightings of *H. piceatus*. If new sites are confirmed the National Conservation Status will require re-assessment.
2. Update and clarify Draft Recovery Plan by Payne and Lundie-Jenkins (1999), submitted to Environment Australia. Update the Draft Recovery Plan, appoint a Recovery Team, and ensure representation by experienced lepidopterists and ecologists. A Threatened Species Community Grant (TSN Project) from WWF recently initiated, proposes to extend the boundaries of the Ellangowan Nature Refuge (Sands 2001).
3. Develop a sustainable Recovery Plan to involve community (local councils, landcare, QPWS staff, schools, butterfly specialists, main road authorities and QPWS. Currently underway: Sands 2001), especially for site rehabilitation near Leyburn.
4. Permanently protect critical habitat identified by C. Hill (in 1997), an area to encircle it and habitats identified by Sands and Payne (1999) (records lodged with QPWS, Toowoomba; proposals for protection in a current TSN Project).

5. Educate local community (and enforce) to stop tree felling, especially *A. luehmannii*, in roadside Ellangowan Nature Refuge. Ensure no further road widening or gutter intrusions occur and improve signage (underway at 6 September 2000) at the Ellangowan Nature Refuge. Manage weeds and prevent fire and rubbish dumping.
6. Preserve and manage weeds and fire, fallen timber (for nesting ants), and all roadside vegetation within a 10 km radius of the current Ellangowan Nature Refuge on the Toowoomba — Karara Road.
7. Extend protected areas to include existing habitats and survey, map, provide adequate signage and acquire them as permanently protected sites.
8. Encourage lepidopterists, especially skilled amateurs, to continue surveys for new localities for *H. piceatus* especially near Goondiwindi), suitable food plants and its attendant ant, and ensure issue of permits to collect does not restrict their activities or retention of voucher specimens.
9. Expand boundaries of Bendidee National Park (near Goondiwindi) to encompass parts or all of adjoining forestry areas occupied by breeding sub-populations of *H. piceatus*.
10. Plan long-term rehabilitation of sites near Leyburn (include erosion control) and identify projected date for recovery and de-listing. Rehabilitation must include conserving and relocation of logs and fallen timber beneath the breeding trees to allow ants to build up in the necessary numbers.

Can recovery be carried out with existing resources? No.

Resources required:

Action		$
1	Surveys and mapping	25,000.00
2*	Land re-zoning, especially for converting forestry areas into National Parks	
4	Site rehabilitation	20,000.00
5	Community program (TSN Project established 2001)	10,000.00
Total		55,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Timeframe for Rehabilitation of Taxon:

- In train 1 year
- Completed 4–5 years
- De-listing as soon as possible thereafter

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L. and Kitching, R.L. 1994. Distribution, status and management of the piceatus jewel butterfly on the Darling Downs, Queensland. Unpublished report to Queensland Department of Environment and Heritage, Conservation Strategy Branch, Australian School of Environmental Studies, Griffith University, Brisbane.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Eastwood, R. G. and Fraser, A. 1999. Association between lycaenid butterflies and ants in Australia. Australian Journal of Ecology 24: 503-537.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Greenslade, P. 1995. Leyburn's bull oak roadside: the only known locality for Australia's rarest butterfly the Darling Down jewel. Nomination for the National Estate, Australian Heritage Commission.

Kerr, J.F.R., Macqueen, J. and Sands, D.P. 1969. A new species of *Hypochrysops* (Lepidoptera: Lycaenidae) from south Queensland. Journal of the Australian Entomological Society 8: 117–120.

Payne, A. and Lundie-Jenkins, G. 1999. Draft recovery plan for the bulloak jewel butterfly (*Hypochrysops piceata*) 1998-2002. Unpublished report, Queensland Parks and Wldlife Service, Brisbane.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation 1994

Roff, C.1961. Queensland fauna sanctuaries. Queensland Agricultural Journal 87: 119–120, 639.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

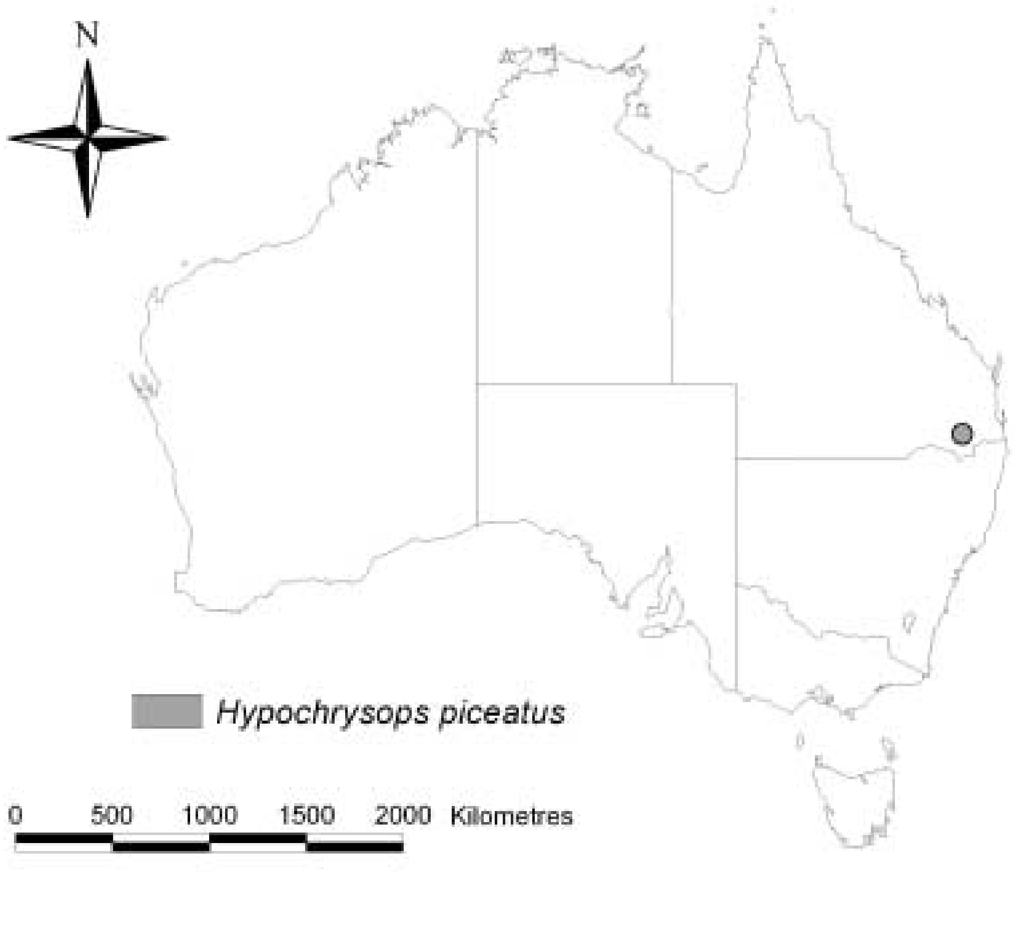
Sands, D.P.A. 1999. National Conservation Status of Lepidoptera: assessment, threatening processes and recovery actions. pp 382-387 in (W. Ponder and D. Lunney eds), The Other 99%. The Conservation and biodiversity of invertebrates. Transactions of the Royal Society of New South Wales 1999.

Sands, D.P.A. 2001. The bulloak jewel butterfly *Hypochrysops piceatus*: a community-based recovery plan. Unpublished synopsis prepared for the Threatened Species Network and World Wide Fund for Nature. The Hut Environmental and Community Association, Kenmore, Queensland, 19 December 2001.

Sands, D.P.A. and Payne, A. 1999. Surveys for the distribution of *Hypochrysops piceatus*. Unpublished report to Queensland Department of Environment and Heritage.

Sands, D.P.A. and Veary, A. 2000. Bulloak jewel butterfly, *Hypochrysops piceatus*. Surveys of the transmission corridor at Millmerran. Hyder Consulting (Australia) Pty Ltd, South Brisbane. Unpublished report.

Distribution of *Hypochrysops piceatus*



LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops theon cretatus* Sands

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Rocky River.

Taxonomy: *Hypochrysops theon* is one of several in the species group, most others occurring in New Guinea and the Maluku Islands, Indonesia. Seven subspecies of *Hypochrysops theon* are recognised (Sands 1986) and two of them, sspp. *medocus* and *cretatus*, occur in Australia.

Infra-specific relationships or variation: *H. theon cretatus* is readily distinguished from ssp. *medocus*, by the more extensive areas of white on both sexes above, and beneath which replaces most of the metallic green bands present on other subspecies.

Habitat critical to survival: *H. theon cretatus* has only been recorded from the Rocky River area on the eastern slopes of the McIlwraith Range (Sands 1986). The biology is very similar to the more widely distributed ssp. *medocus* (Daniels 1976). Larvae feed on the epiphytic fern, *Drynaria quercifolia*, growing on stumps and sometimes on branches of trees in rainforest. The ant, *Philidris cordatus*, attends the immature stages. Adults fly and settle in patches of sunlight at the edge of the rainforest. According to Johnson (pers. comm. *H. theon cretatus* is abundant further inland than at the type locality, and is not threatened (S.J. Johnson in Dunn et al. 1994).

History of conservation concern: *H. theon cretatus* is currently listed as Vulnerable under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994).

Major Threatening Processes: *H. theon cretatus* is more widely distributed along the Rocky River than at first thought (S. Johnson pers. comm.), and it is therefore unlikely to be threatened by gold mining or habitat damage as predicted by Sands (1990, 1993) and Dunn et al. (1994).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is not currently threatened. Surveys to establish the distribution of this distinctive subspecies are needed.

References:

Daniels, G. 1976. The life history of *Hypochrysops theon medocus* (Fruhstorfer) (Lepidoptera: Lycaenidae). Journal of the Australian Entomological Society 15: 197–199.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Sands, D.P.A. 1990. Australia's Endangered butterflies. News Bulletin, Entomological Society of Queensland. 18: 63–68

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder Pp. 160-162, in (T.R. New ed.) Conservation biology of Lycaenidae (butterflies). IUCN, Gland, Switzerland.

LYCAENIDAE: THECLINAE

Scientific name: *Hypochrysops theon medocus* (Fruhstorfer)

National Conservation Status: No Conservation Significance

Range: Torres Strait Islands, Queensland.

Distribution: Prince of Wales Island and eastern Cape York Peninsula, as far south as the Claudie River.

Taxonomy: Seven subspecies of *Hypochrysops theon* are recognised (Sands 1986), with most occurring on mainland New Guinea, the Aru and Maluku Islands, Indonesia. Two, sspp. *medocus* and *cretatus*, occur in Australia.

Infra-specific relationships or variation: *H. theon medocus* is readily distinguished from ssp. *cretatus*, by the less extensive areas of white on both sexes, and the broad metallic green bands on the underside.

Habitat critical to survival: Wet tropical rainforest north from Iron Range where the food plants, *Drynaria quercifolia*, *Platycerium hillii*, and the attendant ant, *Philidris cordatus*, are abundant.

History of conservation concern: Sands (1993) suggested that *H. theon medocus* was not at risk. However, *Hypochrysops theon* was subsequently listed as Vulnerable and protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994). Listing both subspecies *cretatus* and *medocus* presumably followed recommendations by Dunn et al. (1994) relating to ssp. *cretatus*, even though these authors did not regard ssp. *medocus* as threatened. It is possible that ssp. *medocus* was considered to be subject to the same threats as ssp. *cretatus* by the State Advisory Committee for Queensland National Parks and Wildlife Service

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. and R. Felder (Lepidoptera: Lycaenidae). Entomonograph 7, 116 pp. E.J. Brill / Scandinavian Science Press, Leiden.

Sands, D.P.A. 1993. *Hypochrysops* C. and R. Felder Pp. 160–162, in (T.R. New ed.) Conservation biology of Lycaenidae (butterflies). IUCN, Gland, Switzerland.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Ionolyce helicon hyllus* (Waterhouse and Lyell)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Torres Strait Islands, Cape York Peninsula to Rockhampton.

Taxonomy: Eight subspecies of *I. helicon* have been recognised to the north of Australia. One subspecies, ssp. *caracalla*, is one of the most abundant lycaenid butterflies in Papua New Guinea.

Infra-specific relationships or variation: No variation has been recorded in *I. helicon hyllus.* The much larger ssp. *caracalla* occurs on Darnley Island in Torres Strait as well as Papua New Guinea (Common and Waterhouse 1981).

Habitat critical to survival: Unlike many similar lycaenid butterflies, *I. helicon hyllus* frequents dense tropical rainforest and rarely occurs in the open. Males patrol areas in the shaded forest where they are very difficult to observe. They may be very seasonal; for example, many were seen at Iron Range in December 1970, at a time of the year when few lepidopterists visit the area.

History of conservation concern: Dunn et al. (1994) regarded this species as insufficiently known and it was regarded by Common and Waterhouse (1981) as very rare, probably due to the cryptic behaviour and seasonal appearance of adults. However, it is sometimes abundant (Valentine and Johnson 1992). Dunn et al. (1994) considered the species to be of conservation concern due to the little biological information available.

Major Threatening Processes: Dunn et al. (1994) suggested that clearing for agriculture and settlement may have destroyed the habitats for *I. helicon hyllus* near Cairns.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate, despite the lack of biological information. This species is apparently secure in Iron Range National Park and parts of the World Heritage area further south.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Valentine, P. and Johnson, S.J. 1992. Late dry season butterflies on Cape York Peninsula. Victorian Entomologist 22: 87–91.

LYCAENIDAE: THECLINAE

Scientific name: *Jalmenus aridus* Graham and Moulds

National Conservation Status: Vulnerable [VUb,c].

Range: Western Australia.

Distribution: Lake Douglas, near Kalgoorlie.

Taxonomy: A distinctive species, described only in 1988 and unlikely to be confused with any other taxon.

Habitat and key ecological features: Larvae are known to feed on foliage of *Acacia tetragonophylla*, and are tended by *Froggattella kirbyii* ants. Adults and larvae have been observed on *Cassia nemophila* (?= *Cassia artemisoides*) (Caesalpiniaceae), a food plant of the related *J. icilius*. This species may be unusually difficult to survey, in common with other *Jalmenus* spp., because of highly irregular appearance of adults mediated by complex egg diapause regimes.

History of conservation concern: *J. aridus* has been considered to be one of the rarest butterflies in the State, and of conservation significance. It was ranked as 'Endangered' by Dunn et al. (1994), following Dunn and Dunn (1991). At the time of the account by Dunn et al. (1994), *J. aridus* was known reputedly from only a single colony, on a single *Acacia* tree, with searches having failed to reveal additional colonies. It was understandably classified as 'Endangered' reflecting that perceived state. Four additional populations, all localised, were found and reported in an 'Addendum' by Dunn et al. (1994), but reviewers noted that this was erroneous.

A further colony has since been found, 1 km from the original colony but occupies an area of less than 2 ha (Braby 2000). Targeted surveys in and around the Lake Douglas area have failed to reveal additional colonies (A. and M. Williams, pers. comm.), and the two colonies probably represent part of the same population.

Major Threatening Processes: The still limited known distribution implies that a higher ranking than Vulnerable might be warranted. However, the converse also applies; some reviewers suggest Lower Risk might be more appropriate on the grounds of its almost certain occurrence over a wider range. Threats cannot be specified over large areas of apparently suitable habitat for this butterfly. For the limited area of occupancy known at present, habitat destruction and disturbance associated with vehicle tracks through the area are considered by Field (1999) to be threats.

Is knowledge sufficient to formulate recovery actions? Yes. The appraisal by Graham and Moulds (1988) provided a biological framework for the species, and some threats have since been identified.

Recovery needs:

1. Restriction of recreational activities, particularly vehicle access, where these are a threat to *J. aridus*.
2. Expand the knowledge of the butterfly's status and distribution by targeted surveys around Kalgoorlie. These should be combined with surveys for *Ogyris subterrestris petrina*, q.v.

Can recovery be carried out with existing resources? No. Survey for this species is relatively expensive because of large distances and remoteness of the likely sites. Surveys should be undertaken over two seasons to help determine the distribution and vulnerability of *J. aridus*, as a basis for assessing conservation need. Subsequent costs are at present indeterminate, but immediate steps for threat abatement are needed.

Resources required:

Action*		$
1	Surveys and mapping (over 2 years)	25,000.00
2	Threat abatement	15,000.00
Total		40,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead organisations: Environment Australia; Western Australian Department of Conservation and Land Management.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

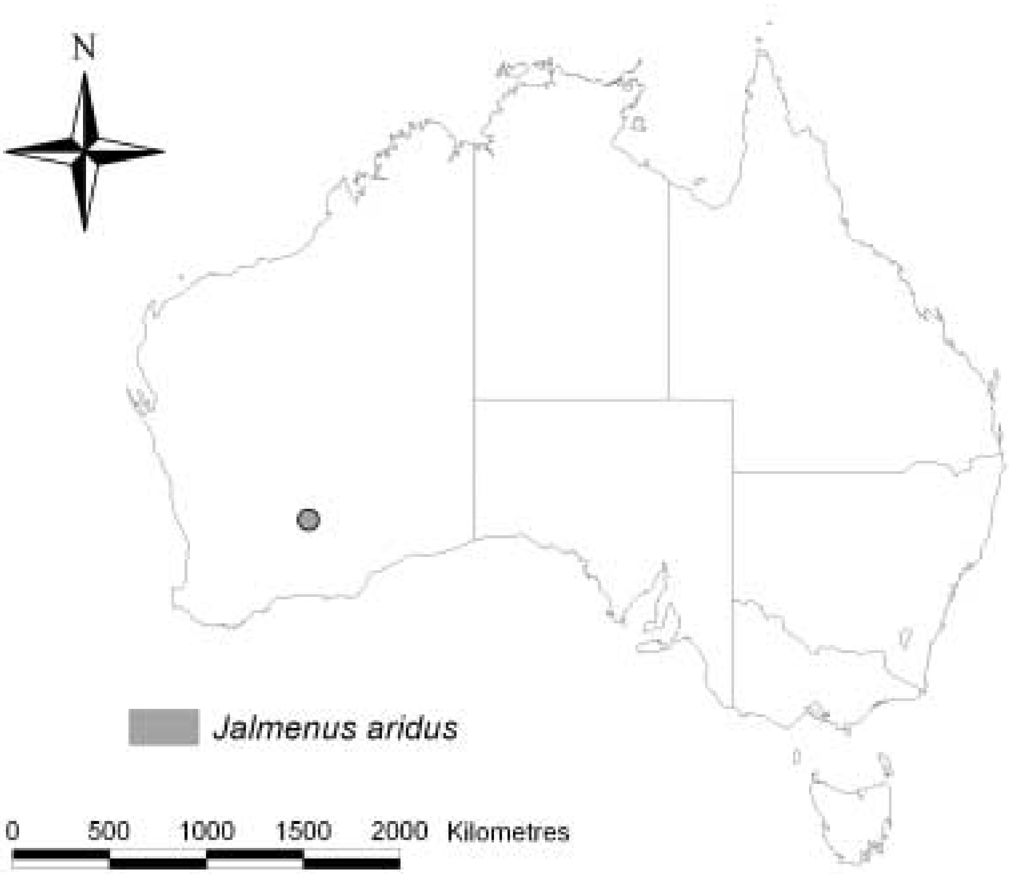
Dunn, K. L. and Dunn, L.E. 1991. Revision of the Australian butterflies: distribution, life history and taxonomy. Parts 1–4. Published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Field, R.P. 1999.A new species of *Ogyris* Angas (Lepidoptera: Lycaenidae) from southern arid Australia. Memoirs of the Museum of Victoria 57: 251–259.

Graham, A.J. and Moulds, M.S. 1988. A new species of *Jalmenus* Hübner (Lepidoptera: Lycaenidae) from Western Australia. General and Applied Entomology 20, 57–62.

Distribution of *Jalmenus aridus*



LYCAENIDAE: THECLINAE

Scientific name: *Jalmenus clementi* Druce

National Conservation Status: No Conservation Significance

Range: Western Australia

Distribution: Carnarvon, Onslow, Exmouth, Tom Price, Hammersley Range to Port Headland, Pilbara district, north Western Australia

Taxonomy: *Jalmenus clementi* is one of 11 species in the genus *Jalmenus.* Other species from Western Australia may not yet be recognised as distinct.

Infra-specific relationships or variation: Considerable variation was noted by Braby (2000), especially in size of adults. *J. clementi* is closely related to *J. icilius* (Dunn and Dunn 1991). The larvae of *J. clementi* differ from other species in the genus by the absence of dorsal tubercles.

Habitat critical to survival: *J. clementi* occurs locally in dry eucalypt or open plant communities sometimes bordering on desert. The food plants are *Acacia* spp. and immature stages are attended by an *Iridomyrmex* sp. (Braby 2000).

History of conservation concern: Dunn et al. (1994) considered this species Vulnerable and expressed concerns about the proximity of two of the habitats of *J. clementi* to the towns of Tom Price and Mount Tom Price. Most BAP Workshop participants considered this status appropriate because of the extensive area of occupation by *J. clementi* and the relatively little disturbance to its many habitats. However, some Western Australian participants considered that the species was Data Deficient.

Major Threatening Processes: Threats by clearing and urban development to one population were discussed by Dunn et al. (1994).

Is knowledge sufficient to formulate recovery actions? Information is adequate. No recovery actions are necessary. However, data on distribution are inadequate and surveys are required to determine the tenure of existing habitats and to locate additional localities.

Resources required:

Action		$
1	Surveys	15,000.00
Total		15,000.00

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: THECLINAE

Scientific name: *Jalmenus evagoras eubulus* Miskin

National Conservation Status: Lower Risk (Least Concern); New South Wales: Vulnerable[VUb].

Range: State: Queensland, New South Wales.

Distribution: *Jalmenus evagoras eubulus* occurs on the western slopes and plains from 35 km south of Boggabilla, New South Wales (M. DeBaar, in Common and Waterhouse 1981) to near Sarina, Queensland. Most populations occur between Marlborough and Sarina, Eidsvold, Leyburn and near Dalby, Queensland. The nominotypical subspecies, *evagoras*, occurs from about Noosa, Queensland, south on the eastern coast and tablelands of New South Wales, ACT to Victoria.

Taxonomy: *Jalmenus evagoras* is one of 11 species in the endemic Australian genus *Jalmenus*. Only one distinct subspecies, *eubulus*, has been described.

Infra-specific relationships or variation: Subspecies *eubulus* has extensive areas of silky white on the upperside of both wings, whereas in the nominotypical ssp. *evagoras*, these areas are pale green. Throughout the inland part of its range, subspecies *eubulus* is quite uniform in appearance, but there are hybrids and clines, intermediate with subspecies *evagoras*, occurring west of Toowoomba, near Kilcoy, Bunya Mountains and near Maryborough, Queensland.

The nominotypical subspecies, *evagoras*, is geographically variable in the shade and extent of basal pale green areas on the wings, adults being darker in southern New South Wales and Victoria than from further north. Adults occurring north from Noosa, are paler than the typical ssp. *evagoras* but not nearly as pale as ssp. *eubulus*.

Habitat critical to survival: *J. evagoras eubulus* is mainly known from the inland brigalow areas of Queensland and northern New South Wales. Its larvae feed on brigalow, a preferred food plant and are always attended by one of several species of ants. However, it is not confined to brigalow and has been seen and collected from several areas, including Mount Moffatt (Monteith and Yeates 1988), Leyburn and west of Maryborough where its larvae feed on other species of *Acacia*. In Queensland larvae of ssp. *eubulus* also feed on *A. penninervis*, and near Leyburn an adult was observed ovipositing on another unidentified species of *Acacia* (D.P.A. Sands unpubl.). The subspecies has proven to be more widespread outside of the brigalow environment than was initially thought (McCubbin 1971). Brigalow, however, is its principal associated plant community and is a threatened plant community in both States. Unlike ssp. *evagoras*, ssp. *eubulus* only breeds in old growth forest, often on mature *Acacia* trees. The larvae appear to be less gregarious than the nominotypical subspecies, rarely occurring in groups of more than three larvae.

J. evagoras eubulus is only associated with mature brigalow, *Acacia harpophylla*, in New South Wales, a food plant frequently utilised in Queensland.

History of conservation concern: Dunn et al. (1994) regarded *J. evagoras eubulus* as Vulnerable and Braby (2000) considered that it was regionally threatened. *J. evagoras eubulus* was listed as Vulnerable and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994).

There are insufficient secure stands of brigalow habitat to sustain survival of this taxon in New South Wales where, unlike Queensland, it has not been found associated with other *Acacia* species. Only one locality, 35 south of Boggabri, is known for this subspecies in New South Wales (M. DeBaar). This subspecies has sometimes been thought to be entirely dependent on brigalow (Dunn et al. 1994), influencing assessment of its National Conservation Status. However, this subspecies is not threatened in Queensland since the food plants also include several *Acacia* spp. other than brigalow, which are not threatened plant communities in Queensland (Common and Waterhouse 1981, New South Wales BAP Workshop).

Major Threatening Processes: Disturbance of plant communities (Dunn et al. 1994), and clearing of old growth dry forests west of the Dividing Range, especially brigalow. Increase in burning frequency, grazing by cattle and invasion of grassland understorey by exotic grasses may also be important. Many of the brigalow habitats have been destroyed, resulting from tree clearing for farming activities. The site south of Boggabilla is roadside vegetation and privately-owned land.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate but further surveys for distribution of ssp. *eubulus* are a priority.

Recovery needs:

1. Surveys and mapping in both states, acquisition, preservation and management of areas where *J. evagoras eubulus* occurs in brigalow in New South Wales.
2. Assess existing habitats for permanent conservation, especially in brigalow plant communities.
3. Weed management and fire control for habitats.
4. Populations analysis by DNA and morphometric analysis recommended for the entire range of ssp. *eubulus*, as well as 'hybrid' populations.

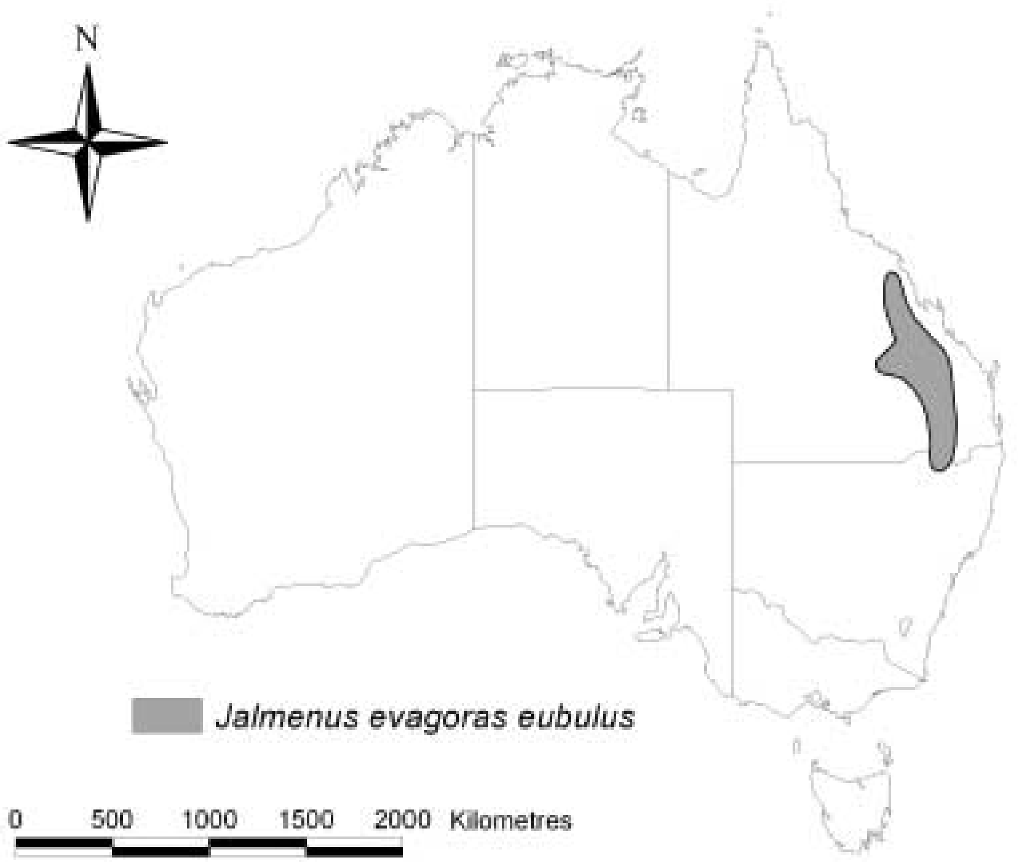
Can recovery be carried out with existing resources? No.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance.

Action		$
1	Surveys and mapping, $5,000 / year for 3 years	15,000.00
2	Land acquisition	
4	Site rehabilitation, plant propagation and cultivation, $15,000 per year over 3 years	45,000.00
Total		60,000.00

Lead Organisations: New South Wales National Parks and Wildlife Service; Queensland Parks and Wildlife Service.

Distribution of *Jalmenus evagoras eubulus*



References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

McCubbin, C. 1971. Australian butterflies. Nelson, Melbourne.

Monteith, G.B. and Yeates, D.K. 1988. The butterflies of Mount Moffatt and Carnarvon National Parks, Queensland. Queensland Naturalist 28: 14–25.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

LYCAENIDAE: THECLINAE

Scientific name: *Jalmenus icilius* Hewitson

National Conservation Status: No Conservation Significance; Victoria: Lower Risk (Near Threatened).

Range: Victoria, New South Wales, Australian Capital Territory, Queensland, South Australia, Western Australia.

Distribution: Widely distributed in all states except central and western Victoria.

Taxonomy: A distinctive species with no named subspecies.

Habitat and key ecological features: The butterfly occurs in many open woodland and mallee communities. Larvae feed on foliage of *Senna* (Caesalpiniaceae) and *Acacia* (with both bipinnate and phyllodinous host species reported), and are tended by several species of *Iridomyrmex* ants. Adults tend to remain close to the breeding sites.

History of conservation concern: No formal listings of this species have been made, but Douglas (1995) ranked it as 'Endangered' in Victoria. Braby (2000) noted it as of regional or local concern. The butterfly is very scarce in Victoria, tends to be very localised and now occurs only as remnant populations. Douglas (1995) knew of only five localities, but the butterfly may already be extinct at least one of these (Mount Piper). One colony is in a National Park (the Grampians). Some workshop participants suggested that *J. icilius* may be tolerant of habitat disturbance, but there seems little doubt that its decline in parts of the State reflects losses of native vegetation.

Major Threatening Processes: Vegetation clearing. Extensive areas of apparently suitable habitat have been lost due to clearing of vegetation for agriculture (Douglas 1995), and this has apparently rendered *J. icilius* extinct at a number of historical localities.

Is knowledge sufficient to formulate recovery needs? In part. Particularly for other States, a sound biological framework is available. The status of the butterfly in Victoria needs confirmation, and only after clarifying its distribution and vulnerability can more constructive management be pursued.

Recovery needs:

1. Surveys for *J. icilius* at all documented localities in Victoria, and assessment of vulnerability of all occupied sites.
2. More detailed investigation of the status of *J. icilius* in the Grampians National Park, and assessment of viability of the colony or colonies present.

Can recovery be carried out with existing resources? No. Funding is needed for surveys over two seasons and any subsequent recovery actions formulated as a consequence of these. Other recovery costs are at present indeterminate.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance.

Action		$
1	Surveys, $10,000 / year for 2 years in Victoria	20,000.00
Total		20,000.00

Lead organisation: Victorian Department of Natural Resources and Environment.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

LYCAENIDAE: THECLINAE

Scientific name: *Jalmenus inous* Hewitson

National Conservation Status: Data Deficient.

Range: Western Australia.

Distribution: Known from two areas in the southwest, from Esperance to Ravensthorp, and Cape Naturaliste Bay to north of Wanneroo (Braby 2000).

Taxonomy: Treated by Braby (2000) as conspecific with *J. notocrucifer*, but it is more lightly marked.

Infra-specific relationships and variation: Individuals vary considerably in the intensity and ground colour of underside markings (see also comments for *J. notocrucifer*).

Habitat and key ecological features: *J. inous* occurs on sand dunes, where the larval food plant is *Acacia saligna*. Larvae are attended by ants, *Iridomyrmex* sp.

History of conservation concern: No formal conservation concern. BAP workshops considered it either Data Deficient or No Conservation Significance. It is included here at the suggestion of reviewers, who perceived parallel concerns with *Theclinesthes hesperia hesperia* (q.v.) in its distribution and possible threats.

Major Threatening Processes: Insufficient is known of the number of secure habitats for this species. Coastal development may have the potential to encroach on existing habitats of the butterfly.

Is knowledge sufficient to formulate recovery needs? In Part. The biology of this species is adequately understood, but the tenure of many populations, and their vulnerability, needs further clarification. Taxonomic resolution of the relationship of this species with *J. notocrucifer* is recommended.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

LYCAENIDAE: THECLINAE

Scientific name: *Jalmenus lithochroa* Waterhouse

National Conservation Status: Lower Risk (Near Threatened); Adelaide populations: Municipal Critically Endangered.

Range: South Australia.

Distribution: Flinders Ranges, Port Augusta, Iron Knob, Mambray Creek, Melrose, formerly Blackwood, Happy Valley and other sites near Adelaide.

Taxonomy: A well-defined species with no named subspecies.

Infra-specific relationships or variation: The northern and more southern populations differ in the extent of underside markings, and appear to be distinctive.

Habitat and key ecological features: Larvae feed on foliage of *Acacia* (*A. victoriae* in the northern part of the species' range, *A. pycnantha* further south with the latter not acceptable to northern larvae; Common and Waterhouse 1981). Larvae are tended by large numbers of black *Iridomyrmex* ants; Grund (1996, 1997) noted *I. purpureus* and *I. viridiaeneus* associated with the species.

History of conservation concern: The species is of considerable conservation concern in South Australia, and was nominated recently through BCSA Inc for listing as 'Endangered' under National legislation, although considered to be Vulnerable by Grund (2001). The outcome of that nomination is not yet known. Dunn et al. (1994) ranked it as 'Endangered'. Noted as of regional or local concern by Braby (2000). *J. lithochroa* appears to have declined substantially in its areas of occupancy, and is now believed to be extinct around Adelaide, probably due to expansion of urban development (Fisher 1978) since the early 1960s. It is thus extinct at the type locality (Parkside) and other historical localities in the southern parts of its range (Blackwood, Happy Valley and near Adelaide); where we consider the status of Critically Endangered is appropriate. Indeed, the whole of the 'southern form' may be extinct.

In the northern part of the species' range, the host plant (*A. victoriae*) is common and widely distributed, but is under-represented in high quality reserves. In common with other species in the genus, the butterfly is apparently very 'patchy' over its range. It now extends from around Melrose to Port Augusta, and further north in the southern Flinders Ranges, and collectors have reported that it can be locally common in this extensive area. Grund (1999) noted that the colonies he surveyed were small.

Major Threatening Processes: Urban development (near Adelaide), clearing of vegetation, inadequately represented in high quality reserves. Initial threats to the southern populations were clearing of land for agriculture and pasture (Dunn et al. 1994). Despite its apparent security in the Flinders Ranges, several processes are potentially threatening. In particular, *A. victoriae* is regarded as an invasive species in pastures, and recent changes to the Native Vegetation Act permit clearing from such areas. Increasing amounts of seed collection for the burgeoning 'bush tucker' industry involves 'beating' of plants, albeit often not those heavily infested with ants.

Is knowledge sufficient to formulate recovery actions? In part. Whereas some aspects of the species' biology are well understood, it appears that the whole of the disjunct southern populations around Adelaide may be extinct. The extent of the butterfly in the northern parts of its range is not clear; it may well be represented in National Parks in that region, but data are not available.

Recovery needs:

1. Confirmation of status of southern populations, in particular to determine whether historical populations in the region are indeed extinct. Should any be located, habitat preservation should be implemented urgently.
2. Additional surveys of the northern range, to determine the extent of distribution from around Melrose to Port Augusta and beyond. The distribution may also extend further north, and surveys in areas of *A. victoriae* throughout the Flinders Ranges are necessary to determine this. Particular attention should be given to determining the incidence of *J. lithochroa* in National Parks (such as Mount Remarkable) in the region.

3. Protect, or regulate the destruction of, *A. victoriae* in the butterfly's documented range, pending clarification of the extent and vulnerability of *J. lithochroa*.

Can recovery be carried out with existing resources? No. The extensive surveys needed could be carried out effectively by experienced members of BCSA Inc., but the costs involved in travel and subsistence are likely to be substantial. The southern range for survey is relatively small, and a single season should be adequate to largely determine whether the butterfly is likely to persist there; opinion is already well informed, as knowledgeable lepidopterists have already searched extensively in the region. More extensive northern surveys should extend over three seasons, to help counter the apparent vagaries of the butterfly's appearance.

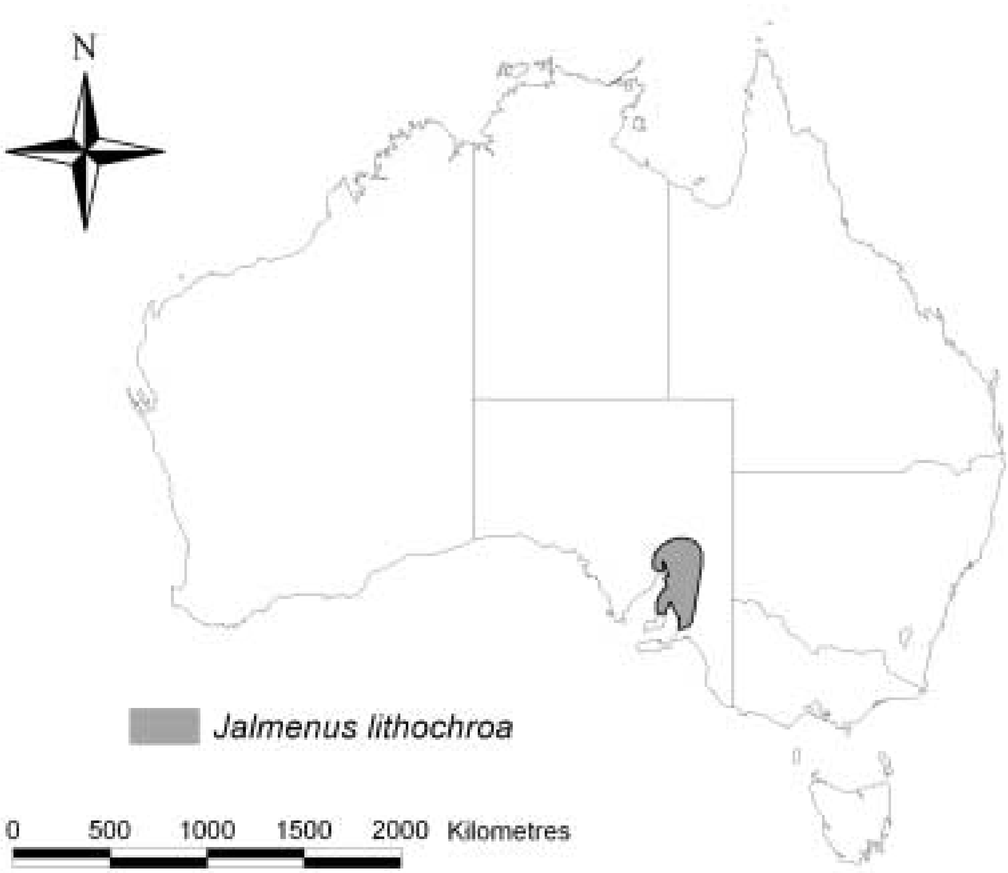
The parallel need for protection of *A. victoriae*, perhaps through a moratorium of seed collecting in selected areas, may be best pursued through consultation rather than more formal regulation.

Resources required:

Action*		$
1	Survey in the southern part of the species' range, including compilation of all existing historical information	5,000.00
2	Surveys over presumed northern range, to be undertaken over three seasons $12 000 / year.	36,000.00
3	*A. victoriae:* documentation of needs for practical conservation, as basis for future management of a critical resource for *J. lithochroa*	7,000.00
Total		48,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Distribution of *Jalmenus lithochroa*



Lead organisations: Environment Australia, South Australian Dept of Environment, Heritage and Aboriginal Affairs, BCSA Inc

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 1996. Range extensions, new food plant recordings and biology of some South Australian butterflies. Victorian Entomologist 26: 93–100.

Grund, R. 1997. Additional range extensions, new food plant recordings and biology for some rarer South Australian butterflies, including the life history for *Candalides cyprotus cyprotus* (Oliff). Victorian Entomologist 27: 7–14.

Grund, R. 1999. Butterfly conservation in the southern Flinders region. Department of Environment Heritage and Aboriginal Affairs, South Australia.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

LYCAENIDAE: THECLINAE

Scientific name: *Jalmenus notocrucifer* Johnson, Hay and Bollam

National Conservation Status: Data Deficient

Range: Western Australia.

Distribution: Known mainly from Yellowdine, Southern Cross (Johnson et al. 1992), Hyden and possibly Kellerberrin (Braby 2000).

Taxonomy: Braby (2000) considered *Jalmenus notocrucifer* to be a subspecies of *J. inous*. Braby (2000) referred to the DNA studies of Pierce and Nash (1999), but did not mention that these authors recognised four similar species including *J. notocrucifer*, as separate species, despite similarities in the DNA. *J. notocrucifer* is closely related to *J. inous* and it is possible that the two are conspecific, but research on the two taxa has to date not confirmed this.

J. notocrucifer differs from *J. inous* by the bands and spots on the underside, which is more heavily marked. However, more material is needed, if possible from between the coastal and inland sites currently known for both species, before a formal reappraisal of their status can be made.

Infra-specific relationships or variation: *J. notocrucifer* is very variable and there is a possibility that hybrid zones sometimes occur between this species and other related species.

Habitat critical to survival: *J. notocrucifer* is an inland species occurring in sand plains and woodlands where the food plant for its larvae, *Daviesia benthamii*, is abundant (Dunn et al. 1994). Immature stages are attended by an ant, *Iridomyrmex* spp., including *I. conifer* (Braby 2000).

History of conservation concern: Dunn et al. (1994) proposed the status of *J. notocrucifer* as indeterminate. Participants at the BAP Workshop held in Perth considered that *J. notocrucifer* was Data Deficient.

Major Threatening Processes: None currently recognised. Dunn et al. (1994) identified no threats but predicted that clearing for agricultural purposes would threaten this species. The land tenure of habitats needs to be reviewed to determine their security.

Recovery Actions: Not necessary, other than surveys, since the species is not threatened. However, detailed taxonomic studies on known populations are recommended to ascertain the specific identity of *J. notocrucifer*, so that its National Conservation Status and any threatening processes can be evaluated. Surveys are recommended to attempt to locate further habitats for this species and to investigate the possible interface localities with *J. inous*. As part of this study, the populations of *J. inous* said to occur as far north as Carnarvon (Common and Waterhouse 1981) need re-examination. Although DNA studies have not helped to resolve these taxonomic problems (Braby 2000), further work of this nature is also recommended.

Can recovery be carried out with existing resources? No. Support for surveys and taxonomic studies are required.

Resources required:

Action		$
1	Taxonomic studies	40,000.00
2	Surveys and mapping, 3 years at $5,000	15,000.00
3	Land acquisition	–
Total		55,000.00

Lead Organisation: Western Australian Department of Conservation and Land Management.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Johnson, S.J., Hay, R.W. and Bollam, H.H. 1992. *Jalmenus notocrucifera* sp. n. (Lepidoptera: Lycaenidae) from south Western Australia. Australian Entomological Magazine. 19: 69-74.

Pierce, N.E. and Nash, D.R. 1999. The Imperial blue, *Jalmenus evagoras* (Lycaenidae). Pp. 277-315 in (R.L. Kitching, E. Scheermeyer, R.E. Jones and N.E. Pierce eds), Biology of Australian butterflies. Monographs of Australian Lepidoptera. Volume 6, CSIRO, Melbourne.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Jamides cytus claudia* (Waterhouse and Lyell)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Claudie River, Iron Range

Taxonomy: Five species in the genus are known from Australia, with *J. cytus claudia* is in a large species group in countries to the north of Australia.

Infra-specific relationships or variation: Other subspecies are known from mainland New Guinea.

Habitat critical to survival: *J. cytus claudia* occurs in primary tropical rainforest and is only known from the Claudie River and Iron Range areas. It occurs mainly in Iron Range National Park and the nearby resources reserve. The food plant is the lilly pilly *Syzigium puberulum*, and possibly also *S. tierneyanum* (Wood 1987).

History of conservation concern: Hill and Michaelis (1988) considered this species threatened but no other information was provided.

Major Threatening Processes: A well-known and abundant endemic subspecies, not generally considered to be threatened. There has been no documented change in the distribution or abundance of *J. cytus claudia* and threatening processes have not been recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not threatened and is secure in protected habitats.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Wood, G. 1987. The life history of *Jamides cytus claudia* (Waterhouse and Lyell) (Lepidoptera: Lycaenidae: Lycaeniniae). Queensland Naturalist 28: 52–54.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Jamides nemophilus nemophilus* (Butler); *Jamides* sp. nr *phaseli* (Matthew)

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Darnley and Murray Islands, northern Torres Strait.

Taxonomy: Both *J. nemophilus nemophilus* and *Jamides* sp. nr *phaseli*, are of New Guinea origin, and their relationships to other taxa are quite complex (Parsons 1998).

Infra-specific relationships or variation: None recorded.

Habitat critical to survival: Not known. Probably rainforest, the habitat for *J. nemophilus* and related species in Papua New Guinea.

History of conservation concern: None recorded.

Major Threatening Processes: Very little has been recorded on both these taxa, making it impossible to evaluate threatening processes.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. Since both are 'Data Deficient', these two species require further evaluation. Surveys are required to gain information about their habitats and to determine possible risks to them.

Resources required:

Action		$
1	Surveys and taxonomic studies	8,000.00
Total		8,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

Reference:

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

LYCAENIDAE: LIPHYRINAE

Scientific name: *Liphyra brassolis major* Rothschild

National Conservation Status: No Conservation Significance

Range: Western Australia, Northern Territory, Torres Strait Islands, Queensland.

Distribution: *L. brassolis major* occurs from Papua New Guinea through the Torres Strait Islands, and from Bamaga, Cape York Peninsula to Yeppoon, central Queensland.

Taxonomy: Several subspecies of *Liphyra brassolis* occur widely from India, Southeast Asia, Indonesia, Papua New Guinea and the Solomon Islands. A related species, *L. grandis* Gaede, occurs in northern Papua New Guinea.

Infra-specific relationships or variation: The extent of black on the upperside of both sexes of *L. brassolis major* is variable. The darker colour may be seasonal (Braby 2000).

Habitat critical to survival: Since the account of Dodd (1902), *L. brassolis major* has been known for its extraordinary biology and relationship with the green ant *Oecophylla smaragdina*, the food of its predatory larvae. The habitat of *L. brassolis major* is not specialised or threatened, its associated plant communities are varied, the ant hosts are abundant and often regarded as pests. Although uncommon, the butterfly may occur in urban areas and appears to be well adapted to breed in ant nests on exotic trees such as citrus and mango.

History of conservation concern: *L. brassolis major* is listed as common, but is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994)., referred to in Yen and Butcher (1997). There are no other references to the conservation significance of this species. It has not been considered threatened and the history of its listing as a protected species is unknown.

Major Threatening Processes: None known. There is a potential for threat should the exotic ‘crazy’ ant, *Anoplolepis gracilipes* (Smith), recently established in Queensland, result in extensive displacement of the native host for the butterfly, the ant *O. smaragdina*. This exotic ant may displace *Oecophylla* along water courses and in other moist localities (S. Shattuck pers. comm.).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dodd, F.P. 1902. Contributions to the life history of *Liphyra brassolis*, West. Entomologist 35: 153–156.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Nacaduba biocellata biocellata* (C. and R. Felder)

National Conservation Status: No Conservation Significance; Tasmania: Data Deficient.

Range: Torres Strait Islands, all States

Distribution: Mainland Australia, newly discovered in Tasmania (I. Knight pers. comm.)

Taxonomy: Distinctive member of the genus with only one of the 17 known subspecies occurring in Australia.

Infra-specific relationships or variation: No variation recorded. The subspecific status of the Tasmanian population has yet to be determined.

Habitat critical to survival: Almost all known plant communities in Australia other than in montane systems and mangroves. Larvae of *N. biocellata biocellata* feed on the flower buds of *Acacia* spp., and pupate in sheltered places off the food plant on or under the ground (Common and Waterhouse 1981). Ants attend larvae and pupae and adults occasionally form swarms around the food plants. The ecology of the population from Tasmania has yet to be described.

History of conservation concern: *N. biocellata biocellata* has never been of conservation concern in mainland Australia but the newly discovered population in Tasmania (I. Knight pers. comm.) requires evaluation. The species' presence in Tasmania was discussed at the BAP Workshop in Hobart. Mr I. Knight expressed surprise that *N. biocellata biocellata* was so limited in its distribution in Tasmania and considered it worthy of further investigation.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate but surveys for the distribution of this species should be carried out as soon as possible to determine its status in Tasmania.

Resources required:

Action		$
1	Surveys	4,000.00
Total		4,000.00

Lead Organisation: Department of Primary Industries, Water and Environment, Tasmania.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Nacaduba calauria calauria* (C. Felder)

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Murray and Dauan Islands, Torres Strait.

Taxonomy: Four subspecies of *Nacaduba calauria* occur north of Australia but *calauria* is the only subspecies recorded from Australian localities.

Infra-specific relationships or variation: None recorded.

Habitat critical to survival: Lambkin and Knight (1990) and Johnson and Valentine (1997) have provided the only available information on this species in Torres Strait.

History of conservation concern: Only known from specimens discussed by Johnson and Valentine (1997). The species is Data Deficient and very limited in distribution on Australian islands.

Major Threatening Processes: None identified.

Is knowledge sufficient to formulate recovery actions? No, information is not adequate. Surveys to identify the distribution and habitats are required.

Resources required:

Action		$
1	Surveys and assessment of land tenure for habitats	10,000.00
Total		10,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Lambkin, T.A. and Knight, A.I. 1990. Butterflies recorded from Murray Island, Torres Strait, Queensland. Australian Entomological Magazine 17: 101–112.

Johnson, S.J. and Valentine, P.S. 1997. Further observations and records for butterflies (Lepidoptera) in northern Australia. Australian Entomologist 24: 155–158.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Nacaduba kurava felsina* Waterhouse and Lyell

National Conservation Status: No Conservation Significance

Range: Northern Territory.

Distribution: Katherine to Darwin.

Taxonomy: *N. kurava* is widely distributed in the northern Pacific region, with several subspecies occurring in Papua New Guinea.

Infra-specific relationships or variation: Two subspecies of *N. kurava* are known from Australia, including ssp. *parma* from the eastern coast.

Habitat critical to survival: Riverine rainforest where the understorey food plant vine *Embelia curvinervia* is present (Meyer 1996, R. Weir pers. comm.). The species is thought to be widely distributed in the Territory where the food plants grow in shaded areas close to water courses (R. Weir pers. comm.).

History of conservation concern: Dunn et al. (1994) stated that this species was rare and limited in distribution and suggested that the sites near Darwin were lost to urban development. However, the species has become well known since its life history was discovered (Meyer 1996). It is abundant at Ooloo Crossing, Adelaide River Bridge and Marrakai Road (R. Weir pers. comm.), all secure habitats.

Major Threatening Processes: None recognised. Dry season fires may destroy some plants bearing larvae but these are usually sufficient in the moister areas to avoid being damaged.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is not threatened.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Meyer, C.E. 1996. Notes on the life history of *Nacaduba kurava felsina* Waterhouse and Lyell (Lepidoptera: Lycaenidae). Australian Entomologist 23: 73–74.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Nacaduba pactolus cela* Waterhouse and Lyell

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Darnley and Murray Islands, Torres Strait.

Taxonomy: *N. pactolus cela* is one of about 15 subspecies occurring in Southeast Asia, mainland New Guinea and adjacent islands. It is probably the largest species in the genus.

Infra-specific relationships or variation: None known in ssp. *cela*. Other subspecies are variable in the extent of blue above and width of bands beneath.

Habitat critical to survival: In Papua New Guinea sp. *antalcidas* Fruhstorfer occurs in a range of habitats, including secondary regrowth and other disturbed vegetation. In Port Moresby, the larvae were found in an urban garden feeding on the flowers of *Terminalia catappa* (D. Sands unpublished). They were not attended by ants and occurred on the same flowers with other species of Lycaenidae.

History of conservation concern: Referred to as endangered and possibly extinct in Torres Strait by Dunn et al. (1994). *N. pactolus cela* is currently listed as Endangered and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994).

Major Threatening Processes: Dunn et al. (1994) considered that the subspecies was threatened by habitat loss, an unlikely factor considering the often-disturbed habitat that a subspecies occupies in Papua New Guinea.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are needed. However, further surveys are necessary to determine if the butterfly is a permanent resident in Australia, or an occasional visitor.

Resources required:

Action		$
1	Surveys	10,000.00
Total		10,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Neolucia agricola occidens* Waterhouse and Lyell

National Conservation Status: No Conservation Significance; Julimar biotype: Data Deficient.

Range: Western Australia.

Distribution: Geraldton to Twilight Cove, Stirling Range.

Taxonomy: *Neolucia agricola* is widely distributed through much of southern mainland Australia with ssp. *insulana* occurring in Tasmania.

Infra-specific relationships or variation: Markings on the underside of *N. agricola occidens* are much more obscure than on the nominotypical ssp. *agricola* from eastern States. Two geographically separated biotypes of *N. agricola occidens* occur in Western Australia, one having a spring generation and the other occurring in autumn.

Habitat critical to survival: Adults of the Julimar biotype of *N. agricola occidens* appear in the field in autumn, during late March and April when its local food plant, *Davesia angulata*, is in flower (Graham et al. 1996). This population differs from all other lowland populations of *N. agricola*, which are adults in spring, to coincide with the flowering periods of their food plants, other species of Fabaceae (Common and Waterhouse 1981).

History of conservation concern: One small population occurs at the Julimar Conservation Park, where the seasonal cycle differs considerably from other populations (Graham et al. 1996). It is of particular scientific interest. This population is by definition a biotype o f *N. agricola occidens*, since it does not fulfil the morphological requirements for recognition as a distinct taxon. The Julimar biotype was identified as Data Deficient at the BAP Workshop held in Perth. *N. agricola occidens* is abundant and widely distributed in south Western Australia where it has generally No Conservation Significance.

Major Threatening Processes: Potential disturbance of habitat in the Conservation Park, which may require specific management provisions (e.g. fire).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. This population is of particular scientific interest and although apparently not taxonomically distinct from ssp. *occidens*, the Julimar biotype may require specific management by the conservation authority in Western Australia. Surveys are required on its distribution and geographical relationship with the typical ssp. *occidens*.

Resources required:

Action		$
1	Surveys and mapping, $2,000 / year over 3 years	6,000.00
Total		6,000.00

Lead Organisation: Western Australian Department of Conservation and Land Management, Julimar Shire Council.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Graham, A.J., Bollam, H.H. and Williams, M. 1996. An unusual temporally isolated population of *Neolucia agricola* Waterhouse and Turner in Western Australia (Lepidoptera: Lycaenidae). Australian Entomologist 23: 111–114.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Neopithecops lucifer heria* (Fruhstorfer)

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Torres Strait Islands, Cape York to Iron Range. *N. lucifer heria* also occurs in Papua New Guinea.

Taxonomy: *Neopithecops*, with five species, occurs through China and Southeast Asia with *N. lucifer* also occurring in Papua New Guinea (Parsons 1998).

Infra-specific relationships or variation: Specimens from Papua New Guinea, ssp. *lucifer* (Rober), are slightly larger than ssp. *heria* from Cape York, and doubtfully represent a separate subspecies (Parsons 1998).

Habitat critical to survival: *N. lucifer heria* is known only from the edge of rainforest at Cape York. On Darnley Island the food plant is *Glycosmis trifoliata* growing in shaded rainforest (Johnson and Valentine 1997). *G. pentaphylla* grows in rainforest in northern Queensland, and is possibly the food plant at Cape York (Common and Waterhouse 1981).

History of conservation concern: No formal history of conservation concern. The recommendation of Data Deficient was based on recommendations from the BAP Workshops. Little ecological information available except that in Common and Waterhouse (1981), but much more recently from Johnson and Valentine (1997).

Major Threatening Processes: Conservation concerns relating to *N. lucifer heria* were also raised elsewhere about security and tenure of the fragile ecological community at Lockerbie Scrub.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The habitat for *N. lucifer heria* at Cape York, Lockerbie Scrub, requires evaluation to identify possible threats (e.g. logging, fire), and ways of securing and preserving what remains of this important ecological community.

Resources required:

Action		$
1	Land tenure assessments of habitats	5,000.00
Total		5,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Johnson, S.J. and Valentine, P.S. 1997. Further observations and records for butterflies (Lepidoptera) in northern Australia. Australian Entomologist 24: 155–158.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

LYCAENIDAE: POLYOMMATINAE

Scientific name *Nesolycaena albosericea* (Miskin)

National Conservation Status No Conservation Significance

Range: Queensland.

Distribution: Blackdown Tableland, Burrum Heads to near Gatton and Stradbroke Island.

Taxonomy: *Nesolycaena albosericea* is one of four species in the genus.

Infra-specific relationships or variation: Little variation has been observed except in size between individuals in populations of *Nesolycaena albosericea*.

Habitat critical to survival: Adapted to a range of habitats including heathlands on the coast and dry eucalypt plant communities inland, wherever the food plants (several *Boronia* spp., especially the *rosmarinifolia* group of species) are sufficiently abundant. Larvae commence feeding on flowers before moving to feed on the older leaves. Pupation takes place in curled leaves or among pieces of hollow twigs on the ground. The adults emerge following variable periods of pupal diapause, sometimes appearing at different times of the year, possibly due to variable rainfall. The larvae are not attended by ants (Sands 1971).

History of conservation concern: Dunn et al. (1994) suggested that *N. albosericea* was a Vulnerable species although they indicated that it was present in 12 or 13 national parks. It is currently listed as Vulnerable and is protected under the Queensland Nature Conservation (Wildlife) Regulation (1994). (QPWS 1994). However, many (ca 14) populations are secure in national parks in Queensland and no contractions in distribution are known to have occurred. Some local extinctions may have occurred on the Sunshine Coast, due to urban development. Other populations in that area may be Vulnerable. Newly discovered populations near Gatton indicate the species is much more widely distributed than previously thought in southeastern Queensland.

Major Threatening Processes: Dunn et al. (1994) noted that *N. albosericea* was very uncommon near Burrum Heads following bushfires, and cited P.J Fox as stating that over-collecting had reduced that population. Dunn et al. (1994) stated that collecting was a confirmed threat. However, there is no evidence that collecting specimens has had any sustained impact on the population at any of its habitats. Increased frequency of fires certainly affects the survival of populations and its food plants and unless there are corridors for recolonisation from unaffected areas, fires can lead to extinctions. At all localities, regardless of habitat disturbance, *N. albosericea* fluctuates considerably and sometimes disappears for several years before reappearing at sites which appear otherwise intact (D.P.A. Sands unpublished). Urban development is undoubtedly a key threatening process for coastal populations of *N. albocericea*, particularly when the food plants, *Boronia* spp., are susceptible to human disturbance, increased frequency of fire and weed invasion.

Is knowledge sufficient to formulate recovery actions? Information is adequate. No recovery actions are necessary. Fire management is important in national parks to reduce the threats of permanent extinctions of populations.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

QPWS 1994. Queensland Nature Conservation (Wildlife) Regulation (1994).

Sands, D.P.A. 1971. The life history and taxonomic relationships of *Nesolycaena albosericea* (Miskin) (Lepidoptera: Lycaenidae). Journal of the Australian Entomological Society 10: 290–292.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Nesolycaena urumelia* (Tindale)

National Conservation Status: No Conservation Significance

Range: Northern Territory, Queensland.

Distribution: Darwin, Alligator River and elsewhere in northern and eastern Northern Territory, near Lawn Hill, northwestern Queensland.

Taxonomy: *N. urumelia* is one of four species in the genus occurring in the northern Australian monsoon tropics. The species was originally assigned to the genus, *Adaluma*, but shown by Sands (1971) to be the same or very close to *Nesolycaena* and subsequently placed in that genus by d'Apice and Miller (1992).

Infra-specific relationships or variation: The black spots beneath both wings are variable in size.

Habitat critical to survival: Edwards (1980) described the life history of *N. urumelia*, which is very similar to that of *N. albosericea*. *N. urumelia* occurs abundantly in low heathlands or open eucalypt communities, growing on sandy soils, sandstone and sandstone escarpments, where the food plants, *Boronia* spp., are present at sufficient densities. Near Darwin an important species is *B. lanceolata*, a medium sized shrub that grows on outcrops near streams.

History of conservation concern: Sands (1990) considered this species to be at risk in the longer term from the routine annual burning of the few known habitats. However, the species is now known to occur at many protected sites, sufficient to ensure that fire does not eradicate all populations. This is an excellent indicator species in Northern Territory and provides evidence for unwise fire frequencies, which sometimes completely exterminate populations of this butterfly.

Major Threatening Processes: Annual burning of sandstone plant communities in Northern Territory where *Boronia lanceolata* occurs.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not threatened. No recovery actions are necessary.

References:

d'Apice, J.W.C. and Miller, C.G. 1992. The genus *Nesolycaena* Waterhouse and Turner (Lepidoptera: Lycaenidae) with description of a new species. Australian Entomological Magazine 19: 75–80.

Edwards, E.D. 1980. The early stages of *Adaluma urumelia* Tindale and *Candalides geminus* Edwards and Kerr (Lepidoptera: Lycaenidae). Australian Entomological Magazine 7: 17–20.

Sands, D.P.A. 1971. *Hypochrysops digglesii* (Hewitson) comb. n., and *H. rufimargo* (Rothschild) comb. n. (Lepidoptera: Lycaenidae). Journal of the Australian Entomological Society 10: 131–133.

Sands, D.P.A. 1990. Australia's Endangered butterflies. News Bulletin, Entomological Society of Queensland. 18: 63–68

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris aenone* (Waterhouse)

National Conservation Status: No Conservation Significance

Range: Torres Strait Islands, Queensland

Distribution: *Ogyris aenone* occurs on Thursday and Horne Islands, at Iron Range, Cooktown and Ayr, northern Queensland, and Leyburn, Millmerran and Goondiwindi (D. Sands unpublished) in southern Queensland.

Taxonomy: Twelve species of *Ogyris* occur in Australia. *O. aenone* is distinctive and not very similar to any other member of the genus.

Infra-specific relationships or variation: This species is variable: specimens from northern Queensland are paler than those from southern parts of the State, while adults from Leyburn, Millmerran and Goondiwindi that emerge in cooler months, are considerably darker beneath than summer specimens.

Habitat critical to survival: In addition to the southern Torres Strait Islands, *O. aenone* occurs in moist, coastal *Melaleu*ca *viridiflora* in northern Queensland or dry eucalypt woodlands and *Allocasuarina luehmannii* in the southeast of the State, west of the Main Divide. Larvae feed on several species of mistletoes, and ants attend the immature stages, either *Anonychomyrma* (*itinerans* group) in the southeast or *Philidris cordatus* in northern areas.

History of conservation concern: Braby (2000) suggested that the northern populations were of regional or local concern from destruction of habitats. Near Cardwell and Ayr, very little of the original habitats of *O. aenone*, particularly in melaleucas supporting mistletoes, remain intact. The same plant communities are important for other butterflies including *Hypochrysops apollo apollo* and *H. narcissus narcissus.*

Major Threatening Processes: The habitat for *O. aenone* between Cardwell and Ingham has been severely disturbed by clearing for planting *Pinus* spp., and near Ayr for planting sugar cane (Braby 2000). Regular burning has also affected the survival of mistletoes growing on melaleucas near Cardwell.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. This species is not threatened but a large area of known habitat south of Cardwell has been destroyed. The small national park south of Cardwell should be surveyed for presence of *O. aenone* and other species adapted to this unique ecological community, and assessed for security of its habitat.

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

LYCAENIDAE: THECLINAE

Scientific name *Ogyris amaryllis amata* (Waterhouse)

National Conservation Status No Conservation Significance

Range: Australian Capital Territory.

Distribution: Molonglo, Murrumbidgee and Cotter Rivers.

Taxonomy: *O. amaryllis* is the most widespread member of the genus on the mainland. The number of subspecies recognised and specific status of *O. hewitsoni* has been topic for debate. Dunn et al. (1994) did not consider ssp. *amata* as distinct from ssp. *amaryllis* but most other authors including Braby (2000), recognise it as a valid subspecies.

Infra-specific relationships or variation: Considerable variation in the width of the black margins of the upperside is present in males of *O. amaryllis amata*. This character in some populations from New South Wales is intermediate in appearance between ssp. *amaryllis* and *amata* (Dunn and Dunn 1991). The subspecific status of *O. amaryllis amata* has sometimes been doubted due to the variation in outlying populations that cannot be attributed to either sspp. *amaryllis* or *amata*.

Habitat critical to survival: Riverine trees of *Casuarina cunninghamiana*, carrying the food plant for its larvae, *Amyema cambagei*. Ants attend the immature stages, *Iridomyrmex* sp. (*rufoniger* group). Larvae hide by day near the base of the mistletoe or in beetle holes in the stems (Common and Waterhouse 1981).

History of conservation concern: Dunn et al. (1994) stated that *Ogyris amaryllis amata* was rare and listed this species with other less threatened taxa. However, this subspecies was said to be locally abundant and secure by participants attending the BAP Workshops held in Australian Capital Territory and New South Wales.

Major Threatening Processes: None recognised. Dunn et al. (1994) were concerned about effects of recreational activities on the recruitment of mistletoes on younger trees but this threat was not clearly explained.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is not threatened.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris amaryllis meridionalis* (Bethune-Baker)

National Conservation Status: No Conservation Significance

Range: Western Australia, Queensland, New South Wales, Victoria.

Distribution: Southern inland mainland States and Western Australia.

Taxonomy: *O. amaryllis meridionalis* is one of the most widespread lycaenid butterflies in mainland Australia. Dunn and Dunn (1991) and Braby (2000) both recognised *meridionalis* as a valid subspecies, even though intermediates with ssp. *amaryllis* are known from several places, for example near Toowoomba, Queensland.

Infra-specific relationships or variation: *O. amaryllis meridionalis* is one of about five subspecies and extensive variation is known in several subspecies. The taxonomic relationships between sspp. *meridionalis* and *hewitsoni* have not been formally resolved.

Habitat critical to survival: *O. amaryllis meridionalis* inhabits a wide range of plant communities in inland and northern Australia, where larvae feed on mistletoes parasitising many different plants.

History of conservation concern: Hill and Michaelis (1988) suggested that the subspecies was threatened, without providing further information. The species is abundant and widely distributed and protected in many national parks. Some populations that appear to be intermediate between ssp. *amaryllis* and *meridionalis* may be of conservation concern (e.g. at eastern base of the Main Range near Toowoomba, Queensland).

Major Threatening Processes: None known.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Recovery actions are not necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris barnardi delphis* (Tindale)

National Conservation Status: No Conservation Significance

Range: South Australia.

Distribution: Port Augusta to Iron Knob, Whyalla.

Taxonomy: One of two subspecies of *O. barnardi*, mainly an inland species.

Infra-specific relationships or variation: *O. barnardi delphis* is very distinct and geographically isolated from the nominotypical subspecies. It may eventually prove to be a distinct species. It is smaller than typical ssp. *barnardi*, with broader black margins. The female is bluish purple and both sexes have broader cell bars than ssp. *barnardi*.

Habitat critical to survival: *O. barnardi delphis* is adapted to mulga and saltbush plant communities over a restricted range in South Australia, where it breeds on mistletoe, *Amyema quandang*, parasitising shrubs or small trees of *Acacia sowdenii* (Fisher 1978). Larvae and pupae shelter under bark, in beetle holes or even in empty cocoons of moths during the day. They are usually, but not always, attended by ants, *Crematogaster* spp.

History of conservation concern: Dunn et al. (1994) considered that the subspecies was rare, but added that most or all the habitats were intact. The subspecies was said to be abundant at the breeding sites (McQuillan and Fisher 1985), views confirmed by a reviewer.

Major Threatening Processes: Dunn et al. (1994) identified loss of habitat from agricultural activities and burning as threatening processes. It is possible that *O. barnardi delphis* has suffered a decline in abundance and distribution from systematic removal of mistletoe parasitising *A. sowdenii* in South Australia (Shore 2001).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is not threatened. However, an assessment is needed to establish the tenure of its habitats, especially near Iron Knob.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R.H.1978. Butterflies of South Australia. Government Printer, Adelaide.

McQuillan, P.B. and Fisher, R.H. 1985. Moths and butterflies. Pp. 191-199 in Twidale, C.R., Tyler, and Davies, M. (eds) Natural History of Eyre Peninsula. Royal Society of South Australia, Adelaide.

Shore, E. 2001. Mistletoe and associated harmful effects in urban areas. Butterfly Conservation SA Inc. Newsletter No. 7: 4–5.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris genoveva araxes* (Waterhouse and Lyell); *Ogyris genoveva gela* (Waterhouse)

National Conservation Status: No Conservation Significance

Range: Victoria (*araxes*), Australian Capital Territory, central New South Wales (*gela*).

Distribution: Central and western Victoria (ssp. *araxes*), Canberra to Murrurundi, New South Wales (ssp. *gela*).

Taxonomy: Some of the subspecies of *O. genoveva* are not easily distinguished and the populations require formal reappraisal to determine those that are valid. Dunn and Dunn (1991) and Braby (2000) did not recognise ssp. *araxes* as distinct.

Infra-specific relationships or variation: Common and Waterhouse (1981) described the differences between sspp. *araxes* and *gela*; the former was smaller and basal metallic areas more restricted.

Habitat critical to survival: Both subspecies of *O. genoveva araxes* occur mostly in eucalypt woodlands and sometimes in sparsely forested areas when the suitable mistletoes and the attendant sugar ants, *Camponotus* spp., are present. Larvae shelter by day at the base of trees bearing mistletoes and ascend the trees at night to feed, attended by the sugar ants. The subspecies breed on a range of trees bearing mistletoes, including eucalypts, casuarinas and banksias. Subspecies *gela* is sometimes abundant in reserves near Canberra and on the Main Dividing Range, New South Wales. Adult males congregate on hilltops in the mid to late afternoon.

History of conservation concern: Douglas (1995) considered that *O. genoveva araxes* was rare in Victoria and a nationally Vulnerable subspecies. Braby (2000) considered that *O. genoveva* was regionally threatened in the ACT, central and western Victoria. Douglas (1995) and Braby (2000) were concerned at the number of local extinctions reported of *O. genoveva araxes* and the relatively few known localities, several of them in State or National Parks. However, many reports were received at the BAP Workshops indicating that the subspecies was widespread and, although local, was not threatened.

Major Threatening Processes: Douglas (1995) suggested that fires were threats to the trees bearing mistletoes and that dieback was occurring in one of the habitats in a reserve. He recommended a habitat in Black Range be added to the Grampians National Park.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. *O. genoveva araxes* is not currently threatened since a number of populations are secure in reserves but the number of populations has definitely declined. Surveys and careful monitoring is required to determine the number of populations in Victoria that are secure, and if management practices are required to prevent further declines and any threats developing.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris genoveva splendida* (Tindale)

National Conservation Status: Data Deficient

Range: South Australia, Western Australia (? ssp. *splendida*).

Distribution: Mount Painter, northern Flinders Ranges, South Australia; possibly also at Zanthus, Western Australia.

Taxonomy: *O. genoveva splendida* is one of six described subspecies of *O. genoveva*. It was not recognised as a distinct subspecies by Braby (2000). Females of this subspecies are much more colourful than those of all other subspecies.

Infra-specific relationships or variation: Specimens of ssp. *splendida* are known from few localities but the extent of blue on females and white streaks on the fore wing of males are much greater than present on other subspecies. Specimens from the Southern Flinders Ranges were said by Dunn and Dunn (1991) to be closer to ssp. *duaringae*.

Habitat critical to survival: Not recorded for the type locality, Mount Painter, but is mainly very sparse eucalypt woodland. The biology of *O. genoveva splendida* is likely to be the same as other subspecies of *O. genoveva*

History of conservation concern: Dunn et al. (1994) stated that *O. genoveva splendida* was insufficiently known. They referred to the type locality for *splendida*, Mount Painter, in the northern Flinders Ranges. They also mentioned Gammon National Park close to the type locality and that populations are likely to exist there. Populations from further south are not typical ssp. *splendida* (Dunn and Dunn 1991) and are more likely to be ssp. *duaringae*.

Major Threatening Processes: None recorded. Little is known about this subspecies but there is an opportunity for the South Australian conservation authorities to encourage and support surveys for *O. genoveva splendida* in Gammon National Park. If found there, appropriate management may be necessary to ensure that the populations are not threatened.

Is knowledge sufficient to formulate recovery actions? No. Information is inadequate. Further surveys are needed to locate populations of *O. genoveva splendida*, and to manage them in secured habitats. Initially, the locality at Mount Painter should be re-visited and the habitat assessed. This should be followed by more intensive studies to locate *O. genoveva splendida* elsewhere. Populations of *O. genoveva* from near Zanthus, Western Australia, require further studies, first to establish the subspecific identity of the populations, and follow with an assessment of the security of its habitat.

Can recovery be carried out with existing resources? No, surveys are required for this subspecies in Western Australia.

Resources required:

Action*		$
1	Surveys and mapping	10,000.00
2	Land tenure assessment	3,000.00
Total		13,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead Organisations: South Australian Department of Environment, Heritage and Aboriginal Affairs, Western Australian Department of Conservation and Land Management.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris ianthis* (Waterhouse)

National Conservation Status: No Conservation Significance

Range: Queensland, New South Wales.

Distribution: Mount Moffatt, Dalby, central inland Queensland and New South Wales, to coastal areas near Sydney.

Taxonomy: *O. ianthis* is a very distinct species related to *O. iphis*.

Infra-specific relationships or variation: Both sexes are variable. Males from Sydney have broader dark fore wing apices than those from Queensland, while in females, the extent of orange on both wings in Sydney specimens is more restricted.

Habitat critical to survival: Near Sydney, *O. ianthis* occurs in low, eucalypt dominated, Hawkesbury sandstone plant communities, where mistletoes are food plants growing on a range of different hosts, and always attended by the ant, *Froggattella kirbii*. Near Sydney, adult males occur on hilltops but females are very rarely observed. In central Queensland, both sexes occur in dry casuarina and eucalypt woodland, when the appropriate mistletoes and ants are present.

History of conservation concern: Dunn et al. (1994) considered *O. ianthis* rare, with the known southern sites close to Sydney and Newcastle. However although it is local, it is abundant at times near Sydney, New South Wales and near Leyburn, Queensland. The species is frequently seen but, as with other species of *Ogyris*, is very difficult to capture. Habitats near Leyburn have been destroyed but sufficient remain intact to consider the species secure in both states.

Major Threatening Processes: Near Sydney many of the earlier known habitats at Killara and near Como (Waterhouse 1932) were destroyed by urban development. However, known habitats are secure in several national parks with sandstone plant communities, including Kuringai Chase, Royal National Park and Berowra Waters. Bushfires are known to affect the abundance of this species (D.P.A. Sands).

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not threatened, and no recovery actions are necessary.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Waterhouse, G.A. 1932. What butterfly is that? Angus and Robertson, Sydney.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris idmo halmaturia* (Tepper)

National Conservation Status: Endangered [ENb]

Range: Victoria, South Australia.

Distribution: Kiata, Grampians, western Victoria; Kangaroo Island, Ceduna, Blackwood, Victor Harbour, Brimbago, Port Lincoln, South Australia.

Taxonomy: One of two named subspecies of *O. idmo* Hewitson. A third, undescribed, form was recognised and Field (1999) reviewed the complex taxonomic history of the species.

Infra-specific relationships or variation: *O. i. halmaturia* differs from *O. i. idmo* by having more extensive areas of purple on the upperside of the female wings, and much broader dark brown / black wing margins in the male. The two subspecies have non-overlapping ranges.

Habitat and key ecological features: Little is known of the detailed biology of *O. i. halmaturia*, and most information has come from a previously-known colony associated with the operation of a *Eucalyptus* distillery near Kiata (near what is now the Kiata Lowan Sanctuary) in the late 1930s. Low-flying adults were captured over areas of regenerating mallee eucalypts after they were cut to ground level, and numerous nests of *Camponotus* ants were present under the lignotubers of many of those eucalypts. Douglas (1995) gave further historical details. A specimen was reared by M.W.Mules in 1945, from a pupa found in a nest of *C. nigriceps* at the base of a small *E. viridis* (Fisher 1978). Fisher also noted that the tendency of adults to stay close to the ground and suggested that the larvae might not depend on high-growing mistletoes, as do those of several other species of *Ogyris*. The host ant is now known as *C. terebrans* (Lowne), and is the same species attending *O. otanes* and *O. subterrestris* (q.v.). It is believed that all early stages of the butterfly are passed within the ant nests. Braby (2000) suggested that *O. idmo* was predatory on the immature stages of the ants.

There are thus strong suggestions that the butterfly responds positively to disturbance, probably through removal of vegetation providing open conditions suitable for the attendant ant.

History of conservation concern: In Victoria, *O. i. halmaturia* is listed as a threatened taxon on schedule 2 of the Flora and Fauna Guarantee Act 1988. SAC (1996) determined that the taxon 'is very rare in terms of abundance or distribution'. Dunn et al. (1994) ranked it as 'Endangered' in Victoria and Braby (2000) noted it was of regional or local concern. Following recent rediscovery of the butterfly in South Australia (Grund 1997, Hunt et al. 1998), BCSA Inc. (1999) ranked it as 'Endangered' in the State, as did Grund (2001). *O. i. halmaturia* has always been considered rare. The butterfly has not been seen in Victoria since 1945 (the reared specimen noted above) other than for a single sighting by Douglas in the Grampians in 1970 (Douglas 1995), and is believed by some lepidopterists to be extinct in that State. Repeated searches have failed to rediscover the species in apparently suitable habitats in western Victoria. In South Australia, several colonies appear to have been lost, especially on Kangaroo Island, and the overall range has contracted substantially over the last century. Grund (1997) summarised the historical records from Ceduna (1942), Kangaroo Island (1934), Brimbago (1951), Mount Lofty and Victor Harbour (pre-1900), and suggested the need for secrecy over the newly-discovered locality for fears of commercial collectors. It was not found in the southeast of the State by Grund and Hunt (2000). Two other sites support the butterfly in South Australia.

Incidence of *O. i. halmaturia* in New South Wales was based on a single individual recorded from Broken Hill which is now known to be *O. subterrestris subterrestris* Field (Field 1999). However, the occurrence of the species in that State should not be discounted without further targeted surveys in the abundant suitable habitats.

Major Threatening Processes: Declines in both states have been attributed to land clearances for agriculture. The land supporting the former Kiata colony was cleared of all native vegetation in 1944 for cereal cropping (Douglas 1995). No colonies are currently known in national parks.

Is knowledge sufficient to formulate recovery actions? In part. There is major need for targeted surveys to determine whether the butterfly still exists in Victoria and more widely in South Australia as, without this information, any conservation measures must be generalised to the habitat and areas of historical incidence.

Recovery needs: Largely indeterminate, as noted above. They are essentially those for a poorly-known taxon.

1. Survey all recorded historical localities for *O. i. halmaturia* where *C. terebrans* and patches of natural vegetation remain. Particular attention should be paid to localities in the Grampians National Park, as possibly harbouring populations in a reserve area, and to parts of southeastern South Australia.

Can recovery be carried out with existing resources? No, other than by relying on ad hoc volunteer efforts.

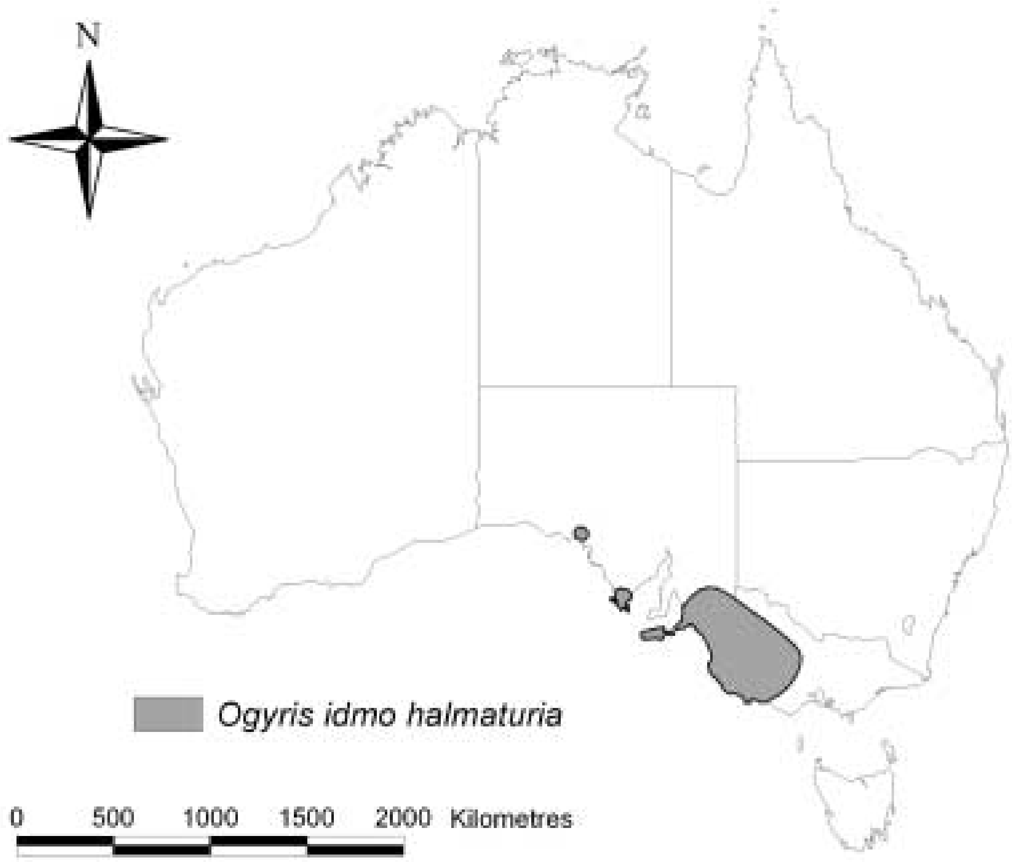
Other recovery needs and costs are at present indeterminate. Costs may be reduced by combining surveys with those for *O. otanes* and *O. s. subterrestris.*

Resources required:

Action		$
1	Funding for surveys, to be undertaken over two seasons, and concentrating on areas noted above is a prerequisite for estimating more focused management needs. Survey costs for Victoria $10 000 / year and South Australia $20,000 per year	30,000.00
2	Studies to understand the basic biology	10,000.00
Total		40,000.00

Lead organisations: Environment Australia; Victorian Department of Natural Resources and Environment; South Australian Department of Environment, Heritage and Aboriginal Affairs.

Distribution of *Ogyris idmo halmaturia*



References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

BCSA 1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss to proposed nominations of threatened South Australian butterflies.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Field, R.P. 1999. A new species of *Ogyris* Angas (Lepidoptera: Lycaenidae) from southern arid Australia. Memoirs of Museum Victoria 57, 251–259.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Grund, R. 1977. Recovery of *Ogyris idmo halmaturia* (Lepidoptera: Lycaenidae), the large brown azure. National Heritage Trust, Canberra.

Grund, R. 1999. Butterfly conservation in the southern Flinders region. Department of Environment Heritage and Aboriginal Affairs, South Australia.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

Hunt, L., Moore, M. and Moore, D. 1998. Rediscovery of *Ogyris idmo halmaturia* (Tepper, 1890). Victorian Entomologist 28, 113–116.

SAC 1996. Scientific Advisory Committee, Flora and Fauna Guarantee Act. Victoria. Final recommendation on a nomination for listing. Nomination No. 388.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris idmo idmo* (Hewitson)

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: Port Denison to Perth, Cape Arid National Park, Stirling Range, Windy Harbour and Denmark.

Taxonomy: The taxonomy of *O. idmo idmo* was recently discussed by Field (1997). It is most closely related to *O. subterrestris* and *O. otanes*.

Infra-specific relationships or variation: In Western Australia there is considerable variation in the extent and shade of purple or purplish-blue on females on the upperside of both wings, and shape of the fore wings, especially in males. Adults also vary in size.

Habitat critical to survival: The species was recently studied by Field (1997) who gained a great deal of information on the behaviour of adults and preliminary information on its biology. Males often congregate on sandy ridges and hilltops and fly at a different time of day to females. Near Perth, *O. idmo idmo* occurs in woodland above the escarpment, where it is relatively abundant (M. Williams pers. comm.). The life history has not been elucidated but the larvae live in the underground nests of *Camponotus* spp.. The nature of their food is not known but they may be predatory on the immature ant stages (Eastwood and Fraser 1999).

History of conservation concern: Hill and Michaelis (1988) listed *O. idmo idmo* as threatened but despite their recommendation, the species has not usually been considered as threatened in Western Australia (BAP Workshop, Perth).

Major Threatening Processes: None recorded. Many of the habitats are in national parks and the species seems to be resistant to bushfires, due to its subterranean immature stages. This western subspecies is much more widespread than the eastern ssp. *halmaturia* (q.v.), which is threatened by loss of habitat.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate; no recovery actions are necessary.

References:

Eastwood, R.G. and Fraser, A. 1999. Associations between lycaenid butterflies and ants in Australia. Australian Journal of Ecology 24: 503–537.

Field, R.P. 1997. The *Ogyris idmo* complex (Lepidoptera: Lycaenidae) as flagship species for conservation in southern Australia. Memoirs of the Museum of Victoria 56: 389–392.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris iphis doddi* (Waterhouse and Lyell)

National Conservation Status: Data Deficient

Range: Northern Territory, (?) Western Australia.

Distribution: Port Darwin, Melville Island and (?) Daly River, NT, and (?) Mitchell Plateau, northern WA.

Taxonomy: Two subspecies of *Ogyris iphis* are recognised, ssp. *iphis* from northern Queensland and ssp. *doddi* from the Northern Territory. Individuals almost certainly of this subspecies were observed but not collected at Burrells Trig, near the Daly River, Northern Territory and on the Mitchell Plateau, Western Australia (D. Sands).

Infra-specific relationships or variation: *O. iphis doddi* differs from the nominotypical subspecies in both sexes, by the narrower black margins on the upperside and in the female of ssp. *doddi*, by the larger orange patch in the cell on the underside of the fore wing.

Habitat critical to survival: In northern Queensland, *O. iphis iphis* occurs commonly in dry eucalypt forests on hilltops on the western slopes of the Main Divide, for example near Mareeba and Paluma. Two possible sightings of *O. iphis doddi* were made at Burrells Trig, Northern Territory and on the Mitchell Plateau, Western Australia. The habitat and life history will probably be similar to those of the eastern subspecies. Larvae of ssp. *iphis* feed on several different species of mistletoes and shelter, sometimes some distance from the food plant, where they are attended by the ant, *Froggattella kirbii*. Adults congregate around midday on hilltops where their behaviour closely resembles that of the related *Ogyris ianthis*.

History of conservation concern: Dunn et al. (1994) stated that *O. iphis doddi* was extinct and had not been taken since 1909. Braby (2000) considered this species to be nationally threatened. *O. iphis doddi* is Data Deficient and no accurate assessment can currently be made relating to its National Conservation Status or threatening processes. This subspecies is mainly known from specimens collected at Darwin, lodged in the Australian Museum, Sydney. Only one other specimen, a female from Melville Island, has been recorded in recent years (P. Homer in Braby 2000).

Major Threatening Processes: Dunn et al. (1994) suggested extinction of ssp. *doddi* resulted from World War II activities, cyclone destruction in 1974, land clearing and urban development or associated activities. Braby (2000) suggested it might be threatened by too frequent burning, a process noted for its impact on the related *O. ianthis* near Sydney. Burning, a practice carried out routinely in suitable habitats for *O. iphis doddi* every year, was noted (D. Sands unpubl.) to have caused extensive death of mistletoes in Northern Territory. However, participants at the BAP Workshop in Darwin confirmed that there is no evidence that burning has had an effect on the survival of *O. iphis doddi*.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate.

Recovery needs:

1. Surveys to determine the location in Northern Territory, of colonies of the attendant ant, *Froggattella kirbii* near Darwin and in northern Western Australia.
2. Identification and monitoring of sites where ants and potential food plants occur together.
3. Management of the use of fire so that suitable potential habitats are not destroyed and given a chance to attract and support the development of butterfly larvae.

Action		$
1	Surveys and mapping, $5,000 / year for 5 years	25,000.00
2	Site rehabilitation and management (fire impact etc)	45,000.00
Total		70,000.00

Lead Organisation: Parks and Wildlife Commission of the Northern Territory.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Homer, P. in Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris otanes* (C. and R. Felder)

National Conservation Status: Data Deficient; Victoria: Endangered [ENb,c].

Range: Victoria, South Australia, New South Wales, Western Australia.

Distribution: Big Desert, Red Bluff, Victoria; Kangaroo Island, Innis National Park, Yorke and Eyre Peninsulas; Ngarkat Conservation Park; South Australia; Broken Hill, New South Wales; Cape Arid National Park to Pink Lake, Stirling Range, Leeman, Port Denison, Western Australia.

Taxonomy: A distinctive species with no named subspecies. However, Dunn and Dunn (1991) recognised three separate local forms, represented respectively by the populations from Victoria and South Australia, south west Western Australia (Leeman, Pink Lake), and far south west Western Australia (Stirling Ranges). Two new subspecies, *sublustrus* and *arcana*, were recently described from Western Australia (Williams and Hay 2001).

Habitat and key ecological features: The butterfly occurs in open heath, mallee and transitional mallee-heathland communities. The larval food plant is *Choretrum, C. spicatum* in Victoria and *C. glomeratum* in South Australia (Douglas 1995, Fisher 1978, Fisher and Watts 1994), and *Leptomeria* is a possible food plant in Western Australia (Dunn and Dunn 1991). Larvae are tended by *Camponotus* ants (predominantly *C. terebrans* (Lowne), although *C. intrepidus* and *C. testaceipes* have also been noted). Food plants of *C. spi*ca*tum* affected by larval feeding have a 'scorched' appearance, due to dieback on the plants (Douglas 1995), and each such plant typically harbours a nest of *Camponotus* at or near its base. Adult butterflies hilltop, and commonly fly close to the ground. *O. otanes* is thought to be bivoltine.

History of conservation concern: Dunn et al. (1994) ranked the Victorian populations as 'Vulnerable'. Braby (2000) noted the 'eastern form' of *O. otanes* as of regional or local conservation concern. The species has always been regarded as rare by lepidopterists, and has been ranked as high as 'Endangered' in Victoria (DCNR 1991). *O. otanes* is listed as a threatened taxon on Schedule 2 of Victoria's Flora and Fauna Guarantee Act 1988. SAC (1991) determined that 'the taxon is in a demonstrable state of decline which is likely to result in extinction' [with the note that 'the known populations were later wiped out by unscrupulous collectors'], 'significantly prone to future threats which are likely to result in extinction', and 'very rare in terms of abundance and distribution'. The butterfly is among those subject to a voluntary Code of Conduct, initiated by the Entomological Society of Victoria to restrict collecting selected species of conservation interest.

Fisher and Watts (1994) commented that the butterfly was once widespread across southern Australia, but was known only from one population in Victoria, two in South Australia and three in Western Australia at the time of their report. It has recently been found more extensively in South Australia (Grund 1997, 1999). The main known Victorian population (on sand dunes some 43 km north of Yanac, in the Big Desert of Victoria's north west) may now be extinct, as the butterfly has not been seen there since 1977. Common and Waterhouse (1981) noted another locality (Red Bluff) in the Big Desert. Dunn et al. (1994) regarded that population as 'apparently still extant', based on observations by K. Hateley. Douglas (1995) reported a specimen seen in 1989. All Victorian records are from the Big Desert, so that the distribution is defined to this extent. The sole New South Wales record is of an individual from Broken Hill in 1912, and Douglas (1995) suggested a possible misidentification of this individual. Despite some concerns for decline in South Australia, with habitats lost on Kangaroo Island, it appears to be secure in reserves both there (namely in Innes National Park, Warrenben Conservation Park, and parts of Kangaroo Island) and in Western Australia. However, Grund (2001) considered it to be Vulnerable in South Australia, following earlier appraisals as Endangered (Fisher and Watts 1994). Williams and Hay (2001) referred to the conservation significance of sspp. *sublustris* and *arcana* but these subspecies were not separately evaluated in this Action Plan.

Major Threatening Processes: Losses from Kangaroo Island have been attributed to conversion of habitats to farmland (Fisher 1978). In Victoria, losses attributed to overcollecting may have been overstated — as suggested by several recent commentators — but SAC (1991) also noted fires (as did Fisher and Watts 1994) and intrusive vehicles were threats to the species in its sensitive desert environments. Natural succession is also implicated strongly as a threat, and has possibly been the cause of loss of some historical populations.

Is knowledge sufficient to formulate recovery actions? In part. Douglas (1995) note the scattered distribution of *C. spicatum* in the Big Desert, and that patches of this food plant could be the focus for systematic searches for *O. otanes*. Other searches have confirmed that the butterfly is likely to be very localised in Victoria, so that areas of critical habitat can be defined realistically.

Recovery needs:

In Victoria:

1. Increase targeted surveys of the Big Desert to explore for distribution of *Choretrum* and the presence of *O. otanes* in association with the plant.
2. Investigate the role of *Choretrum* in succession, its density and its susceptibility to natural changes in vegetation.
3. Determine the responses of *Choretrum* to fire.

Management:

1. Determine the presence of *O. otanes* at Red Bluff and, if it is found, investigate its distribution and the security of the site.
2. Increase protection of the former breeding site on the Murrayville Track, such as by designation as 'critical habitat' (Douglas 1995).

In addition to the focus in Victoria, Fisher and Watts (1994) called for expanded surveys and management-oriented research on Kangaroo Island, with the objective of stabilising the Kangaroo Island populations, and rendering the Yorke Peninsula populations secure.

Can recovery be carried out with existing resources? No. The major needs are for surveys, as a basis to evaluate more detailed recovery needs. Research on the abundance, distribution and ecology of *Choretrum* and the relationship of its density to the butterfly is also advocated, possibly as a graduate student project.

Resources required:

Action		$
1	Surveys for *O. otanes* over three seasons, for which costs could be shared by conjoint surveys for *O. i. halmaturia* and *O. s. subterrestris*. Costs of Victorian surveys $10,000 / year.	20,000.00
2	Surveys and management on Kangaroo Island and Yorke Peninsula	10,000.00
3	Initial research on *Choretrum* ecology, to include full literature review, distributional surveys, and evaluation of successional status over one season	20,000.00
Total		50,000.00

Lead organisations: Victorian Department of Natural Resources and Environment, New South Wales National Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

DCNR 1991. Department of Conservation and Natural Resources, Victoria.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Fisher, R.H. 1978. Butterflies of South Australia. Government Printer, Adelaide.

Fisher, R.H. and Watts, C.H.S. 1994. The small brown azure butterfly (*Ogyris otanes*) in South Australia. Recovery Plan. Australian Nature Conservation Agency, Canberra.

Grund, 1997. Butterfly conservation in southern Eyre Peninsula. Department for Environment Heritage and Aboriginal Affairs, South Australia.

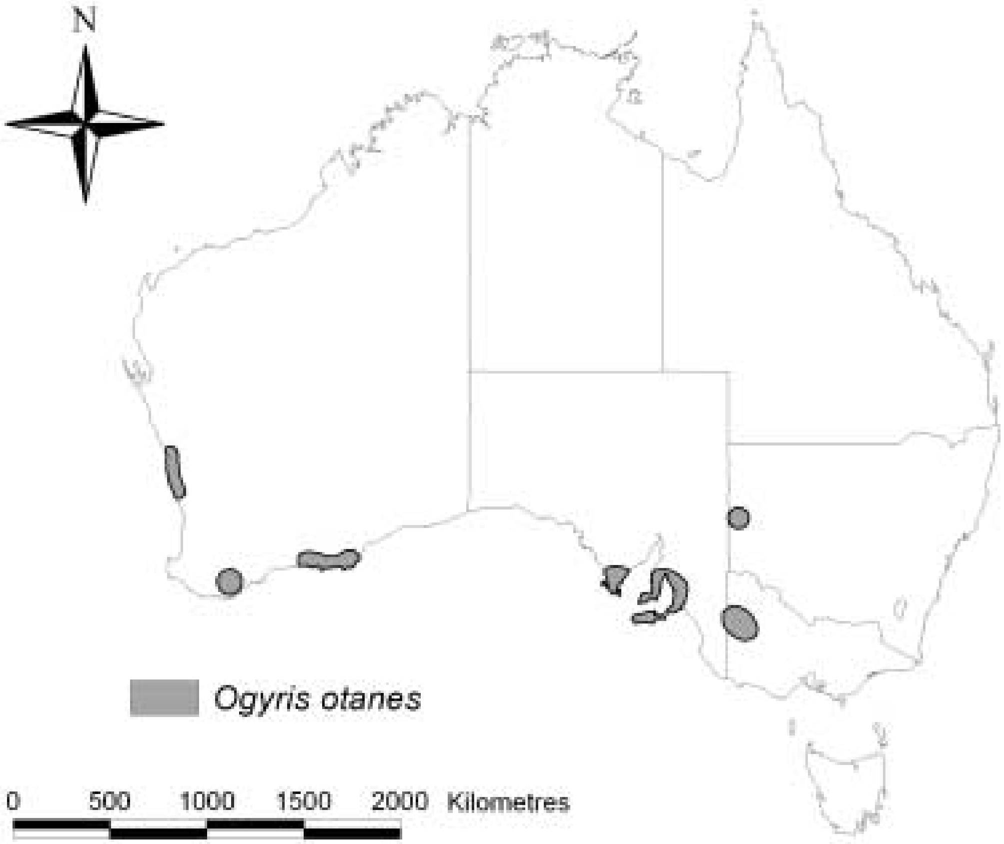
Grund, R. 1999. Butterfly conservation in the southern Flinders region. Department of Environment Heritage and Aboriginal Affairs, South Australia.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide.net.au/~reid/checklist.htm (Accessed 18 April 2001).

SAC 1991. Scientific Advisory Committee, Flora and Fauna Guarantee Act. Victoria. Final recommendation on a nomination for listing. Nomination No. 51,

Williams, M.R., Hay, R.W. Two new subspecies of *Ogyris otanes* C. & R. Felder (Lepidoptera: Lycaenidae) from Western Australia. Australian Entomologist 28: 55–63.

Distribution of *Ogyris otanes*



LYCAENIDAE: THECLINAE

Scientific name: *Ogyris subterrestris petrina* Field

National Conservation Status: Critically Endangered [CRb].

Range: Western Australia.

Distribution: Lake Douglas, Kalgoorlie.
O. s. petrina is known only from a small area north east of Lake Douglas (Field 1999).

Taxonomy: *O. s. subterrestris* is closely related to *O. idmo* and was previously confused with it. It is one of two subspecies recognised.

Infra-specific relationships or variation:
O. s. petrina Field occurs in Western Australia, and differs from the nominotypical subspecies in the less heavily patterned underside of the hind wings and less extensive blue areas on the uppersides of both wings.

Habitat critical to survival: Its biology is largely unknown, but it is associated with an ant, *Camponotus terebrans* (Lowne). It is likely that the larvae are myrmecophagous (Field 1999).

History of conservation concern:
O. subterrestris was considered to be of national concern by Braby (2000). Western Australian lepidopterists at the BAP Workshop have expressed concerns over apparent decline, with reported extinction of some populations and a range contraction of more than 80% in the State. Indeed, as individuals have not been seen since 1993, reviewers feared that the population might have been lost, and recommended a status of Critically Endangered. Our dilemma is whether this taxon is sufficiently well known for an accurate evaluation as Critically Endangered, or whether it is more properly Data Deficient.

Major Threatening Processes: Tourism and recreation, and mining activities have been implicated as major threats. The Lake Douglas area is subject to considerable human interference, with documented disturbance of the breeding areas (Field 1999). Habitat disturbance associated with vehicle tracks through the breeding area. The species seems to be particularly sensitive to disturbance (Braby 2000).

Recovery needs:

1. Prohibit recreational activities, which disturb the habitat around Lake Douglas, and at any other sites where the butterfly is eventually discovered.
2. Continue to expand knowledge of the butterfly's status and distribution by targeted surveys around Kalgoorlie. These should be combined with surveys for *Jalmenus aridus* (q.v.).

Is knowledge sufficient to formulate recovery actions? In part. Surveys are a priority as is more defined protection and management of the only known localities for this species. The fragmentary biological knowledge of this species precludes any constructive management beyond ensuring security of the only known site at Lake Douglas, but Field (1999) indicates avenues towards management by indicating threats, as above.

Resources required:

Action		$
1	Surveys and mapping, $8,000 / year over 3 years	24,000.00
2.	Ecological and life history studies, assessment of threats	16,000.00
Total		40,000.00

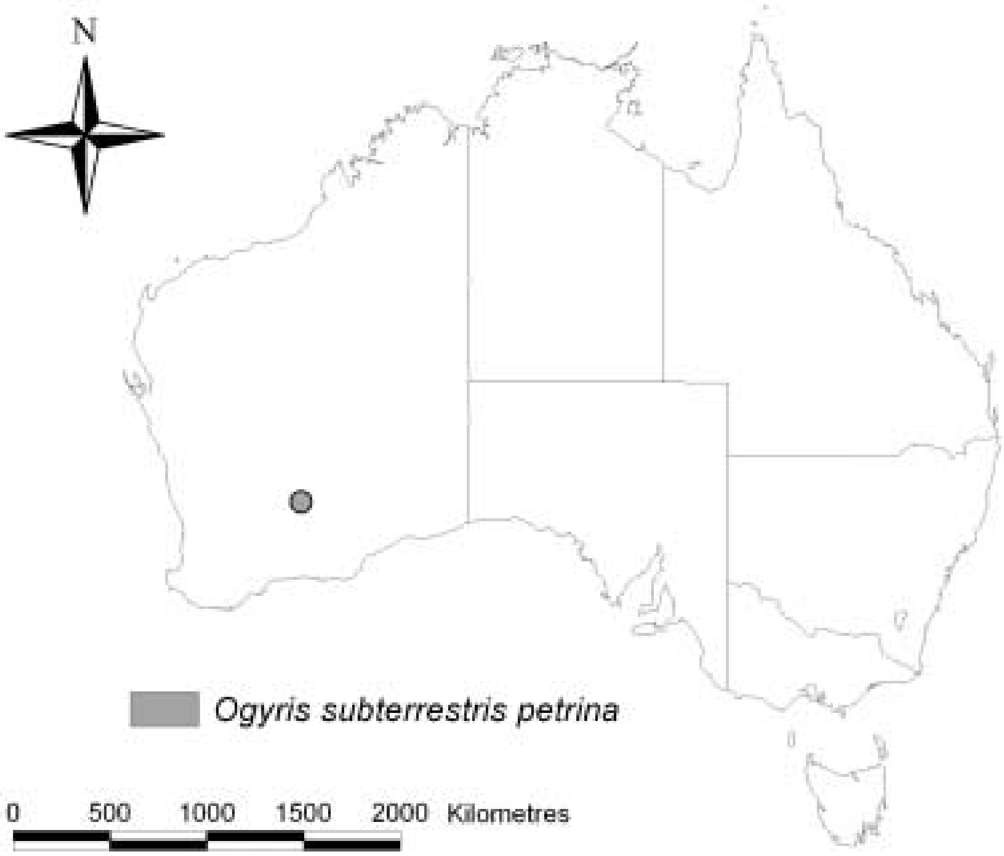
Lead Organisation: Western Australian Department of Conservation and Land Management.

Reference:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Field, R.P. 1999. A new species of *Ogyris* Angas (Lepidoptera: Lycaenidae) from southern arid Australia. Memoirs of Museum Victoria 57: 251–259.

Distribution of *Ogyris subterrestris petrina*



LYCAENIDAE: THECLINAE

Scientific name: *Ogyris subterrestris subterrestris* Field

National Conservation Status: Vulnerable [VUb,c]; New South Wales: Data Deficient.

Range: Victoria, South Australia, New South Wales.

Distribution: Mildura, Murray-Sunset National Park, Victoria; Waikerei, Loxton, near Renmark and Ceduna, South Australia; Broken Hill, New South Wales.

Taxonomy: One of two recently described subspecies of *O. subterrestris* Field. The species has been known informally to collectors as the 'Mildura Ogyris' or '*O.* sp. aff. *idmo*', with the recognition that it is indeed closely related to *O. idmo*.

Infra-specific relationships or variation: The nominotypical subspecies differs from *O. s. petrina* in the more heavily patterned underside of the hind wings and more extensive blue areas on the uppersides of both wings.

Habitat and key ecological features: The butterfly is associated with colonies of the ant *Camponotus terebrans* (Lowne). Larvae hatching from eggs laid near the nest entrances (often near the bases of various mallee eucalypts) are carried by the ants into their nests. Larval growth and pupation takes place within the nests. Details of biology, and of any form of herbivory by the larvae, are unknown and it is likely that the larvae are myrmecophagous (Field 1999). Butterflies fly close to the ground, and have been observed flying over agricultural lands near presumed breeding colonies.

History of conservation concern: The species *O. subterrestris* was considered of national concern by Braby (2000). As '*Ogyris* sp. aff. *idmo*', this taxon is listed as a threatened taxon on Schedule 2 of Victoria's Flora and Fauna Guarantee Act 1988. SAC (1996) determined that it 'is very rare in terms of abundance or distribution'. As the 'Mildura Ogyris', it has been ranked as high as 'Endangered' in Victoria (Douglas 1995), with strong conservation concerns also in South Australia leading to a ranking of 'Vulnerable' by BCSA Inc. (1999). The status in New South Wales has not been formally appraised.

Major Threatening Processes: Mainly vegetation clearing. Insufficient colonies are known in national parks to ensure its sustained survival. The subspecies may always have been scarce and localised, but it is clearly susceptible to habitat disturbance of various kinds including sheep stocking and roadside clearing. Potential threats include recreational activities (such as vehicles and trail bikes), and at Mildura, pesticide drift from nearby citrus and vineyard crops (Field 1999). Douglas (1995) noted that 'even moderate stocking of sheep may cause the species to vacate a breeding area', and vegetation clearing can lead to substantial reduction of host *Camponotus* nests. Some colonies have been subject to considerable human interference, and Field (1999) noted that most known colonies (of both subspecies of *O. subterrestris*) are in disturbed areas.

Is knowledge sufficient to formulate recovery actions? In part. Appraisals by Douglas (1995) and Field (1999), in particular, have provided a broad biological framework sufficient to characterise habitat, recognise the host ant, and indicate some of the threats affecting the butterfly.

Recovery needs:

1. Restriction of vegetation clearing around known colonies, with provision for substantial (? 1 km) buffer zones of conserved vegetation.
2. Restriction of recreational activities around sites where these could be a threat to *O. s. subterrestris.*
3. Restriction of stock grazing on / around known colonies, by provision of exclusion fencing if necessary.
4. Attempt to reduce or eliminate chances of pesticide drift from crops near butterfly colonies.
5. Continue to expand knowledge of the butterfly's status and distribution, by surveys in north western Victoria (especially in the Murray Sunset National Park, where a high level of site protection might be feasible) and elsewhere around Mildura, as well as around the three sites reported for South Australia (Moore 1999).

5. Investigation of the status of the subspecies in New South Wales, by surveys around Broken Hill, and between Broken Hill and the Victorian border.

Can recovery be carried out with existing resources? No. The needs are for additional survey, which could be combined effectively with those for other species (*O. otanes*, *O. i. halmaturia*) in both Victoria and New South Wales, and more defined protection of existing colonies.

Resources required:

Action*		$
1	Survey costs, as under *O. i. halmaturia*, conjoint costs Victoria $20,000, New South Wales $15,000.	35,000.00
2	Threat abatement to existing colonies. Costs are indeterminate, and the initial need is to detail threats and appraise costs of site protection measures, as above.	15,000.00
Total		50,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget

Lead organisations: Victorian Dept. of Natural Resources and Environment; South Australian Dept of Environment, Heritage and Aboriginal Affairs; BCSA Inc.; New South Wales National Parks and Wildlife Service.

References:

BCSA Inc. 1999. Butterfly Conservation South Australia Inc. Unpublished summary of meeting to discuss proposed nominations of threatened South Australian butterflies.

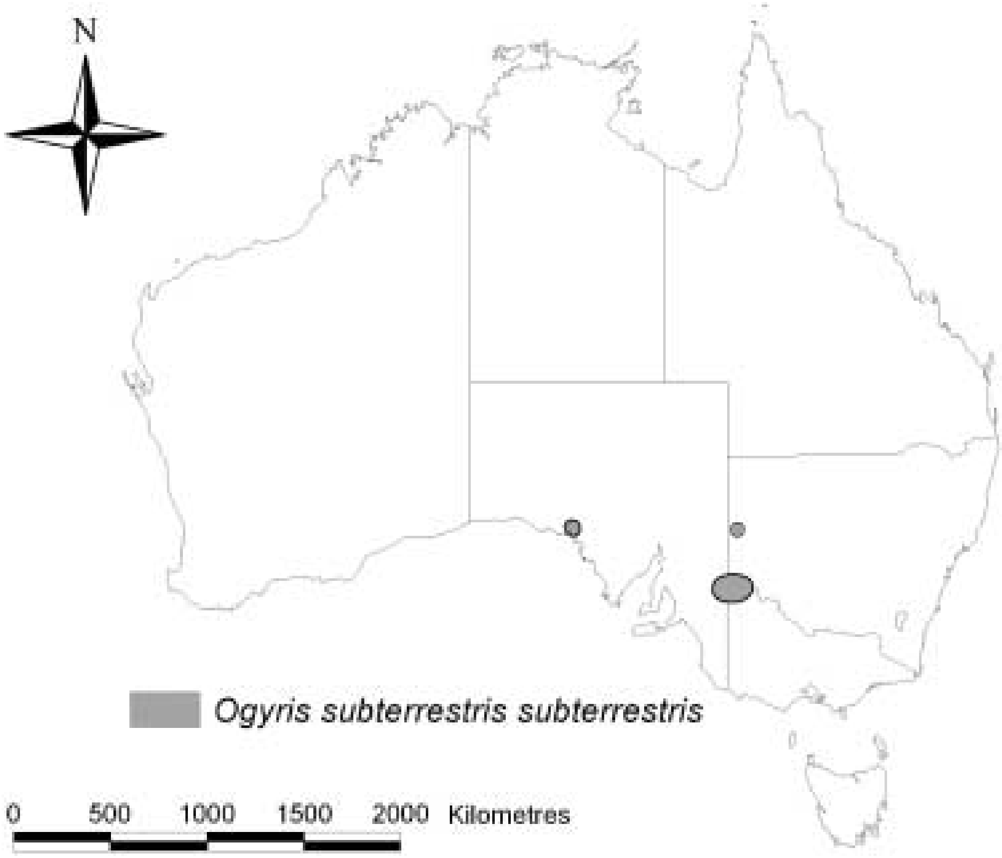
Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Field, R.P. 1999. A new species of *Ogyris* Angas (Lepidoptera: Lycaenidae) from southern arid Australia. Memoirs of Museum Victoria 57, 251–259.

SAC 1996. Scientific Advisory Committee, Flora and Fauna Guarantee Act. Victoria. Final recommendation on a nomination for listing. Nomination No. 389.

Distribution of *Ogyris subterrestris subterrestris*



LYCAENIDAE: THECLINAE

Scientific name: *Ogyris zosine zolivia* (Waterhouse)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Whitsunday Islands, central Queensland.

Taxonomy: Subspecies *zolivia* is one of three subspecies recognised by Common and Waterhouse (1981) but Braby (2000) did not regard it as distinct.

Infra-specific relationships or variation: Very few specimens are known. It is very distinct with much broader black margins, and is not as variable as ssp. *zosine* (Dr T. Guthrie pers. comm.).

Habitat critical to survival: In 1963, *O. zosine zolivia* was seen (D. Sands) in abundance on South Mole Island, flying around mistletoes growing on casuarinas behind the beaches. The life history is the same as for the nominotypical subspecies (T. Guthrie pers. comm..).

History of conservation concern: Dunn et al. (1994) suggested that the subspecies was indeterminate, based on the few earlier records. Other than some comments by T. Guthrie in 1964 (pers. comm.), very little information is available on ssp. *zolivia*.

Major Threatening Processes: None recognised or likely. The habitats are all in national parks apart from some seaside urban development on the islands.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The subspecies is most unlikely to be threatened but conservation authorities in Queensland should encourage surveys for its distribution and secure habitats in national parks on the Whitsunday Islands.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: THECLINAE

Scientific name: *Ogyris zosine zosine* Hewitson

National Conservation Status: No Conservation Significance

Range: Queensland, New South Wales.

Distribution: Maryborough, Queensland to Evans Head, New South Wales. Other subspecies of *O. zosine* occur in nothern Australia and southern Papua New Guinea.

Taxonomy: *O. zosine* is closely related to *O. genoveva*, and occurs in similar areas of the southeastern part of its range.

Infra-specific relationships or variation: Three subspecies were recognised by Common and Waterhouse (1981), but only one, ssp. *zosine*, was recognised from Australia by Braby (2000). The females of ssp. *zosine* are very variable in the shade of purple above and in both sexes, the markings beneath. Unlike ssp. *typhon*, which has blue or purple, forms of the female further north, females of ssp. *zosine* are always purple.

Habitat critical to survival: *O. zosine* occupies many different plant communities including mangroves and casuarinas, to closed and open eucalypt woodlands where mistletoes and certain species of attendant ants, *Camponotus* spp., are present. Larvae shelter by day at or near the base of the trees bearing the food plants, emerging at night to feed. Males aggregate on hilltops. In an extraordinary practical effort in Brisbane, DeBaar (1994) has succeeded in maintaining colonies of the butterfly and sugar ants on mistletoe growing on exotic plants in an urban garden.

History of conservation concern: Dunn et al. (1994) referred to this subspecies as insufficiently known, based on the few localities then known in New South Wales. BAP Workshop participants did not consider the subspecies of concern, because many habitats were known in both States. Some habitats were known to be stable in severely disturbed areas. An excellent example of colony enhancement in a garden was discussed by DeBaar (1994), when mistletoes on exotic plants were enhanced to provide a sustained breeding colony for more than 16 years.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate, no recovery actions are necessary.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

De Baar, M. 1994. New records, food plants and life history notes for lycaenids (Lepidoptera) and formicids (Hymenoptera). News Bulletin of the Entomological Society of Queensland 22: 50–52)

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: THECLINAE

Scientific name: *Paralucia pyrodiscus lucida* Crosby

National Conservation Status: Vulnerable [VUa,c]

Range: Victoria.

Distribution: Known from three disjunct areas of Victoria: around Kiata, Salisbury (eastern district); Castlemaine; Eltham, Greensborough.

Taxonomy: *P. pyrodiscus lucida* is one of three species of *Paralucia*. Two named subspecies of *P. pyrodiscus* (Doubleday) are known. *P. p. pyrodiscus* occurs at scattered localities from northern Queensland to eastern Victoria; *P. p. lucida*, differentiated by having a well defined patch of bright copper scales on the upper surface of the male hind wing, is confined to Victoria.

Infra-specific relationships and variation:
Some specimens from inland Queensland and New South Wales are very similar to the '*lucida* form' (Braby et al. 1999), so that the distinction between the two subspecies is not always clear. The subspecies are accepted here as distinct, pending more detailed appraisal of their relationships. They were not recognised by Braby (2000).

Habitat and key ecological features:
The butterfly frequents open grassy woodland or mixed woodland containing the sole larval food plant (*Bursaria spinosa*, sweet bursaria or blackthorn; Pittosporaceae) and nests of *Notoncus* ants. The predominant tree species in the overstorey differ across the subspecies' range, and good drainage is also a feature of most occupied sites.

Female butterflies oviposit on the base of *Bursaria* stems or on lower foliage, most commonly on short and stunted plants. Caterpillars are tended by *Notoncus* ants, which shepherd them from the nest chambers at the base of occupied plants to feed by night on foliage. The species of ant involved in this mutualism differs between the western Victorian sites (*N. ectatomoides* (Forel)) and others (*N. capitatus* Forel, formerly regarded as *N. enormis* Szabo). *Notoncus* spp. are ground nesting ants, regarded as generalist predators (Shattuck 1999) but also forage on *Bursaria* for honeydew and nectar. They form small nest chambers (regarded as 'satellite nests') around the base of *Bursaria* stems.

The critical needs of the butterfly are therefore the constituents of the tripartite association between *P. p. lucida*, the specific form of the larval food plant, and *Notoncus* colonies in close association with these, in a variety of woodland habitats. *B. spinosa* and *Notoncus* spp. occur together in many localities from which the butterfly is absent. Occupied habitats are regarded as remnants in a formerly wider distributional range, so that the present distribution comprises small, isolated, fragmented populations.

History of conservation concern:
P. p. lucida was noted as of regional or local concern by Braby (2000). It is listed as a threatened taxon on Schedule 2 of Victoria's Flora and Fauna Guarantee Act 1988, and has been a notable 'flagship taxon' for butterfly conservation in Australia. SAC (1991) determined that the subspecies, known commonly as the Eltham copper, is 'in a demonstrable state of decline which is likely to result in extinction', 'significantly prone to future threats which are likely to result in extinction', and 'very rare in terms of abundance and distribution'. DCE (1991) ranked it as 'Vulnerable', and Douglas (1995) considered it 'Endangered', as did Dunn et al. (1994). Other commentators (such as Vaughan 1988) noted it as 'of particular conservation concern'.

Impetus for conservation interest in *P. p. lucida* was initiated by discovery of a colony in Eltham in early 1987, because the butterfly was believed widely to have reached the point of extinction in this outer Melbourne region (but see Endersby 1996). Extensive studies of the butterfly since then have revealed its presence in three widely separated areas of Victoria: Kiata / Salisbury (six colonies), Castlemaine (one colony), and the Eltham / Greensborough area (10 colonies). Direct threats to the Eltham / Greensborough colonies by urbanisation led to purchase and / or reservation of the sites of several main colonies, and prompted searches for other colonies in the region. Early recovery plans (Vaughan 1988, Crosby 1987) formed the basis for continuing management and study on these sites (Braby et al. 1999), and management continues to the present, with the main aim of preventing further declines through external threats or successional changes on the sites. It has been an important flagship species for butterfly conservation in Australia.

Major Threatening Processes: Urban pressures and intrusions on small isolated sites in outer Melbourne.: weed invasion, succession, human activities; elsewhere: weed invasion, overgrazing of *Bursaria* by rabbits and hares. All colonies are susceptibility to stochastic effects. The Castlemaine colony (in the Botanic Gardens) and the Kiata / Salisbury colonies are all circumscribed, and have also been subject to threats by changes in land tenure or increase of weeds and feral animals, so that the butterfly has needed conservation throughout its Victorian range

Is knowledge sufficient to formulate recovery actions? Yes, although there are still important gaps in understanding larval biology and phenology. The biological needs and habitat features of *P. p. lucida* have been documented for all known sites. Management is guided by an advisory group including representatives of all interested parties, and the Friends of the Eltham Copper continue to provide valuable practical support. The reserve status of the most critical urban sites allows for a high level of management, but the small size of the sites also has disadvantages. Opportunity for manipulation is limited, and there are continuing pressures from local residents for access and development; as examples, within the last few years (a) a substantial wooden 'cubby house' was constructed by neighbours on one site, with destruction and removal of a number of *Bursaria* to make way for this, and (b) an open block adjacent to one reserve has recently changed hands with the increased likelihood of further development. The presence of differing management authorities for the urban colonies is also a mixed benefit: on the one hand it maintains formal interest by several independent authorities, whilst on the other it has some potential to hinder more holistic management for the butterfly. We recommend increased security, and integrated management and formal leadership through the Department of Conservation of Natural Resources and Environment, to encompass all occupied sites.

A key objective for this subspecies is downlisting the status to Conservation Dependent.

Recovery needs: These can be specified separately for the three main areas of Eltham copper occurrence in Victoria. Conservation measures are needed in each to enhance security and to reduce perceived threats, but details differ.

Castlemaine:

1. Conservation of the single small population, probably averaging less than 100 adults / season, depends on site condition and security. Continuing management at present levels, including weed removal from the site and prevention of peripheral threats, is necessary. The activities of local supporters and management authority should be encouraged strongly.

Kiata:

1. The colonies at Kiata and Salisbury receive little active management. Grazing of *Bursaria* by hares and invasion by weeds are seen as threats.
2. Very low numbers of butterflies in some years may be related to drought, and it is likely that the frequency of drought episodes may sustain populations at only low levels. More knowledge is needed of this possible interaction.
3. The remnant sites in the area need increased security to prevent any further loss of habitat.

Eltham:

The sites at Eltham are the most intensively managed, as small areas isolated by urban development, and it is clear that continuing vigilance and management will be needed to sustain the major colonies of the butterfly in Eltham and Greensborough.

1. General sanitation at all sites, to counter the continuing impacts of urban isolation; removal of rubbish and debris, buffering of run-off from roads, control of invasive and destructive human activities (such as accidental fires, construction of further pathways, trampling, etc.).
2. Weed control and successional control to maintain *Bursaria*. A general policy of non-interventionist management has seen considerable changes to the main sites, including buildup of ground litter, increase in weeds, progressive canopy closure, and others. Control burning has been shown to be a feasible rejuvenation strategy (New et al. 2000), and a protocol for effective control burn includes the elements of (a) late season burning, so that caterpillars are already well advanced, and sensitive eggs, young caterpillars and reproductive adults are absent; (b) the hottest possible burn to eliminate exotic weeds and foster regeneration of native vegetation; (c) mosaic burning, whereby areas with particularly high butterfly numbers are left unburnt; and (d) extending the fire into the canopy to 'open' the system. The logistics of this on small sites surrounded by housing need

very careful planning and considerable help. In the 1998 fire, caterpillars survived the following winter to feed in spring on fresh sprouted growth of *Bursaria* from existing rootstock; likewise, the ants were little harmed.

3. Hand pulling of weeds such as broom on some sites, as an ongoing exercise.
4. Public awareness of the butterfly is already high, and fostered through the Friends of the Eltham copper, whose interest merits the highest level of support.

Can recovery be carried out with existing resources? In part, not least because continuity of funding for routine documentation, monitoring, and site maintenance is uncertain, so that longer-term planning is difficult. More substantial management, such as control burns or site sanitation through weed control relies heavily on the goodwill of professional help and volunteers. Such measures outside the urban Melbourne. sites would need additional costing.

Because of the restricted size and isolation of the urban habitats in outer Melbourne., continuing site management is essential to sustain these populations; these colonies are essentially Conservation Dependent, although the level of support specifically for the butterfly in relation to other site values may relatively decline. Two broader management approaches merit investigation to extend the range and abundance of *P. p. lucida*.

1. to seek nearby sites (if necessary, enriching and preparing them by augmenting / introducing *Bursaria* and *Notoncus*) within / near the Eltham / Greensborough range in larger protected areas (possible sites could include Yellow Gum Park, Plenty Gorge Park, La Trobe University Wildlife Reserves) suitable for introduction of the butterfly through translocation.
2. Enriching the sites outside Melbourne. through augmenting *Bursaria* plants by planting, and protecting them further from external threats.

A regular funding allocation would stabilise and promote active conservation management which is at present sporadic and uncertain, and help considerably with further monitoring and analysis of threats, as well as clarifying population dynamics and investigating the feasibility and wisdom of translocation.

Resources required:

Action		$
1	Continuing site maintenance and management ($15,000 per year) over 5 years	75,000.00
Total		75,000.00

Lead organisations: Environment Australia; Victorian Dept of Natural Resources and Environment.

Timeframe for Rehabilitation of Taxon:

- In train — current
- Completed — beyond 5 years
- De-listing — 5 years

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Braby, M.F., Van Praagh, B.D. and New, T.R. 1999. The dull copper, *Paralucia pyrodiscus* (Lycaenidae). Pp. 247-260 in Kitching, R.L., Scheermeyer, E., Jones, R.E. and Pierce, N.E. (eds). Biology of Australian butterflies. CSIRO, Melbourne.

Crosby, D.F. 1987. The National Conservation Status of the Eltham copper butterfly (*Paralucia pyrodiscus lucida* Crosby) (Lepidoptera: Lycaenidae). Arthur Rylah Institute for Environmental Research, Department of Conservation, Forests and Lands, technical report series no. 81, Melbourne.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Endersby, I.D. 1996. Some aspects of the biology and behaviour of *Paralucia pyrodiscus lucida* Crosby (Lepidoptera, Lycaenidae) at Eltham, Victoria. Proceedings of the Royal Society of Victoria 107, 83–94.

FFG 1988. Flora and Fauna Guarantee Act 1988, Victoria.

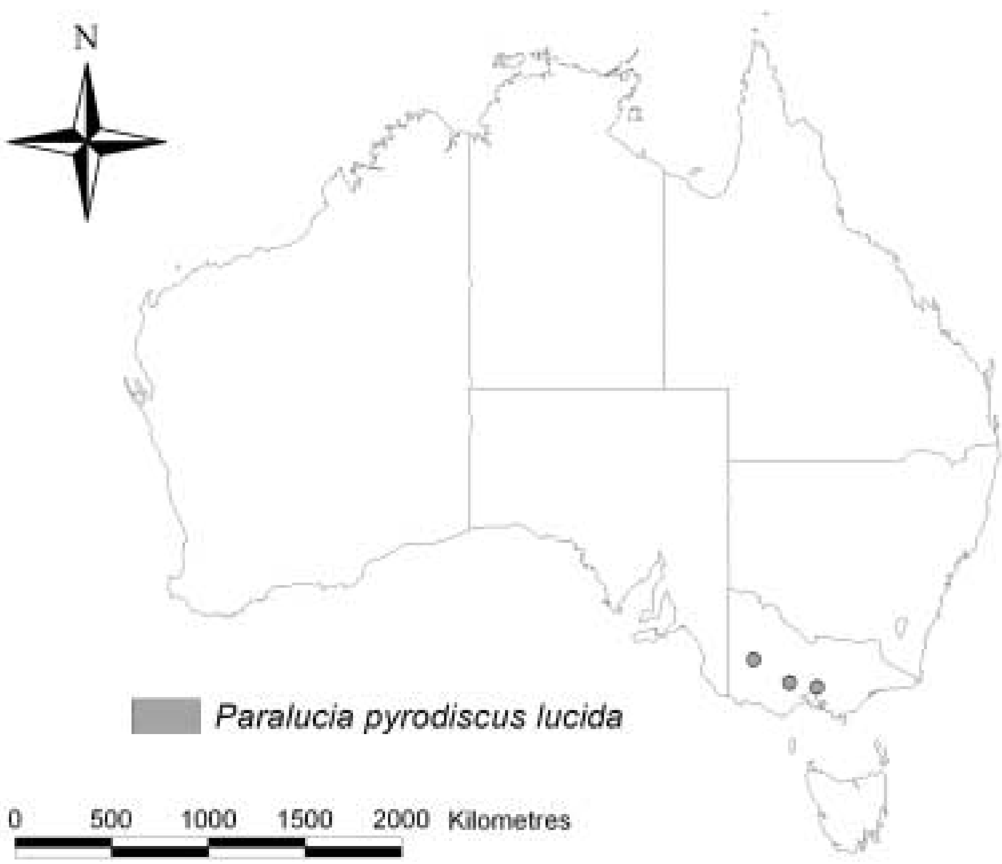
New, T.R., Van Praagh, B.D. and Yen, A.L. 2000. Fire and the management of habitat quality in an Australian lycaenid butterfly, *Paralucia pyrodiscus lucida* Crosby, the Eltham copper. Metamorphosis 11, 154–163.

SAC 1991. Scientific Advisory Committee, Flora and Fauna Guarantee Act. Victoria. Final recommendation on a nomination for listing. Nomination No. 112.

Shattuck, S.O. 1999. Australian ants, their biology and identification. Monographs on Invertebrate Taxonomy, Volume 3. CSIRO, Melbourne.

Vaughan, P.J. 1988. Management plan for the Eltham copper butterfly (*Paralucia pyrodiscus lucida Crosby*). Arthur Rylah Institute for Environmental Research, technical report series no 79, Melbourne.

Distribution of *Paralucia pyrodiscus lucida*



LYCAENIDAE: THECLINAE

Scientific name: *Paralucia spinifera* Edwards and Common

National Conservation Status: Lower Risk (Conservation Dependent)

Range: New South Wales.

Distribution: About 29 localities from near Bathurst, Hampton (ARP, NSWPWS, Approved Recovery Plan June 2001), Oberon and Lithgow (Dunn et al. 1994), Rockney, Black Springs and Hartley Vale (unpublished) on the western slopes of the Blue Mountains.

Taxonomy: *Paralucia spinifera* was for many years known only from one specimen collected beneath power lines west of Yetholme. It was described from a small series subsequently taken near Yetholme by E.D. Edwards (Edwards and Common 1978). *P. spinifera* is one of three species in the genus *Paralucia*. The other species are more widely distributed than *P. spinifera*, and include another of conservation interest, *P. pyrodiscus lucida* (q.v.).

Infra-specific relationships or variation: The female of *P. spinifera* is very variable; the upper side may be uniformly brown or with limited or extensive basal areas of deep blue. The significance of this variation, or differences between sub-populations, has not been quantified.

Habitat critical to survival: *P. spinifera* occurs in eucalypt woodland, mainly in open clearings where its stunted larval food plant, *Bursaria spinosa* (ssp. *lasiophylla*) and attendant ants, *Anonychomyrma itinerans* (group), occur. It occurs only on the western slopes of the Blue Mountains. Its distribution is influenced by the climate and altitude (ca 900 – 1250 m), plant communities including food plant, and species of attendant ant. Substantial surveys undertaken by NSWNPWS has located many new sites for *P. spinifera*.

History of conservation concern: Hill and Michaelis (1988), Dunn and Dunn (1991) and Dunn et al. (1994) all considered that *P. spinifera* was Endangered, based on the few colonies of the species then known. *P. spinifera* is currently listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, and in New South Wales as Endangered under the *Threatened Species Conservation Act 1995*. This species was listed as Endangered by IUCN (2000). The listing as endangered was based on the three populations then known. Initially only three sub-populations, all near Yetholme, were known. Since then highly successful surveys (most by NSWPWS) have revealed many more (29) localities, some of which now need management and / or securing as permanently protected habitats.

Major Threatening Processes. Hill and Michaelis (1988) identified roadworks and clearing of habitat for agriculture as threats. *P. spinifera* was believed to be threatened by loss and disturbance of the few known habitats (reviewed by Yen and Butcher 1997), and by over-collecting (Dexter and Kitching 1991). Threats from weeds and goats were discussed by Kitching and Baker (1990), and disturbance by weeds, pigs, goats and land use by (Kitching, in New 1990) and Dunn and Dunn (1991). The National Conservation Status of *P. spinifera* was reviewed by Dexter and Kitching (1991), Dunn et al. (1994) and published references by Yen and Butcher (1997). Its threatened status and some threatening processes were discussed by Braby (2000) who referred to 22 fragmented sub-populations. There has been no major contraction in distribution or decline of this species since discovery but there is no information available on original distribution of the species prior to European settlement.
A reviewer with 15 years experience with this species noted metapopulation colonisation, contraction, temporary extinctions and re-colonisation of microhabitats over this period, which he considered normal for this species.
The potential threats posed by destruction and disturbance of the butterfly habitats (especially by farming, clearing, forestry) supporting the food plant, *B. spinosa* (ssp. *lasiophylla*) and attendant ants, *Anonychomyrma itinerans* (group), weeds and fire, are considered in the ARP (New South Wales National Parks and Wildlife Service June 2001). In practice few of the known habitats have been destroyed by farming activities. However, *P. spinifera* is known to recover after fire (Braby 2000) and the ARP notes that the exclusion of fire in the absence of other disturbance regimes to encourage regeneration of blackthorn is a threat to the species. The ARP, nevertheless, highlights that timing of fires is critical to avoid damaging the habitat. Similar recovery after fire is known for *Paralucia pyrodiscus lucida* (New 2000).

The effects of pigs may require actions since 30% damage to plants is reported and they are likely to have a major impact on the butterfly and its food plants. Weeds, particularly blackberry and Scotch broom, are a major threat to the integrity of the butterfly habitats (Braby 2000). Honeysuckle, *Salix* sp. and *Pinus radiata* also invade the habitats (D.P.A. Sands).

Based on the criteria used in this report de-listing is recommended for *P. spinifera* at the conclusion of the current recovery actions, since the information currently available does not support its current status as Endangered. In 1998, New South Wales National Parks and Wildlife Service (NPWS) carried out successful surveys, locating a total of 29 sub-populations from between Hampton, Bathurst and Lithgow. In 1999, NPWS published two information leaflets under their 'Rare and Endangered' series, titled *The Bathurst Copper Butterfly* and *Native Blackthorn*. In 2000 NPWS published for public comment a Draft Recovery Plan for *P. spinifera* (New South Wales Parks and Wildlife Service / Environment Australia Recovery Plan - Exhibition Version, NPWS [2000] 'Bathurst Copper Butterfly (*Paralucia spinifera*) Recovery Plan', NPWS, Sydney 2000). The focus of recovery action for the species is a major community education and involvement program supported through the National Heritage Trust (Nally 2000). The draft plan was revised taking account of public comments received and published as an Approved Recovery Plan in June 2001.

An accurate assessment and appraisal of recovery actions that may vary the National Conservation Status of *P. spinifera* in no way detracts from the efforts of New South Wales NPWS team, or their surveys. During their studies and following studies by Dexter and Kitching (1991) new colonies have been found and important recovery actions been identified. This project is a model for achieving the major components of a recovery plan for a butterfly by (i) *new information*: e.g locating many new localities as habitats for *P. spinifera* and (ii) *recovery actions*: managing threatening processes at sufficient numbers of habitats to minimise risks of extinction. The ARP provides for encouraging the involvement of lepidopterists in the recovery effort particularly in habitat survey, population monitoring and research. This is likely to be most effective if conducted by the non-professional entomologists who have the most experience with the species. Provision for the supervised, legal collection of representative specimens of *P. spinifera* (see Code of Conduct, this document), encouraging collectors (with support by NPWS) to search for new localities and validate these by the collection of voucher specimens are activities to which non-professional lepidopterists could contribute. The ARP highlights that the NPWS will liaise with entomological societies to gain their assistance in the identification of unrecorded habitat and sites.

Illegal collecting. In the current assessment, collecting of specimens was not considered to have been a threatening process for *P. spinifera*. Dexter and Kitching (1991) referred to the adverse impacts of collecting but these claims have not been substantiated. Comments from one very experienced reviewer indicate that collecting has not affected the species and one of us (D.P.A. Sands) also interviewed the people referred to in the document by Dexter and Kitching (1991). We conclude that there were not nearly sufficient specimens collected on that particular occasion to affect the survival of that colony of *P. spinifera*.

We conclude there is no evidence that collecting has affected six of the 29 populations referred to where changes have occurred, since small sub-populations are known to 'come and go' as part of a metapopulation system. From first hand experience (D.P.A. Sands) and many others, *P. spinifera* varies greatly in its 'apparent' presence and or absence, and actual numbers from year to year at each site. On one occasion at one site near Yetholme, individuals were present in hundreds, where as only two or three were seen the previous year (Sands unpublished). These fluctuations were due mainly to the 'suitability' – changes in the phenology – of the food plant. The ARP includes provision for ongoing surveillance to deter any illegal collecting.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate and a recovery plan has been approved for this taxon (ARP).

Recovery needs

1. **Recovery Objectives**. The recovery program for the Bathurst Copper Butterfly aims '… to stabilise the population through the prevention of threatening processes, then to increase the *in situ* population through habitat management with the aim of downlisting the species to vulnerable…' (Page 31 ARP). During the five year period of operation of the ARP the overall objective is to stabilise the species status and prevent the decline in the number of sub-populations of the species in the wild by protecting known sub-populations

from threats. It is clearly desirable that recovery plans aim for recovery of the species to a secure status as soon as feasible.

2. **Protected Habitats**. One of the actions identified in the ARP is to seek increased legislative protection of freehold and publicly owned Bathurst Copper Butterfly sites.
The recovery plan for this species must focus on protecting and managing as many of the known habitats as possible, i.e. existing threatened ecological communities supporting *Bursaria spinosa* (ssp. *lasiophylla*) where the butterflies are breeding. Only two of the 29 known sites (referred to in the ARP), one the Winburndale Nature Reserve, the other on Commonwealth owned land at Lithgow, appear to be adequately protected. At least five localities for *P. spinifera* should be targeted for sustainable protection and management, preferably in national parks or environmental reserves. There are other opportunities for municipal habitat protection designations under *Conservation Zones* or the *Land for Wildlife* Schemes, and practical recognition and compensation by municipal councils for habitat preservation by land owners (e.g compensation for variation in land use, with NHT support).

   Weed invasion is a significant issue at ten of the 29 known Bathurst Copper Butterfly habitats. Weed management must be undertaken at all occupied habitats. There is no better example for neglect of a fragile habitat for a reputed threatened species, than at the now unoccupied original sites for *P. spinifera* at Yetholme. Despite several years of weed overgrowth there was no evidence for weed management when the site was visited (by DPAS) in April 2001. This locality has been threatened for many years as weeds (blackberries, honeysuckle, ? *Salix* sp., *Pinus radiata*) have invaded and displaced the blackthorn breeding sites. Mis-management of environmental issues generally at Yetholme, have been widely publicised, for example, the Council rubbish dump was sited on 'scarce bushland' edging a Nature reserve allowing fire and weeds to constantly threaten the protected area (Goldney 1991). This highlights the needs for management of habitats near the type locality for *P. spinifera*. There was no evidence in 2001 that any major weed removal activities had been undertaken at the earlier known sites at Yetholme (D. Sands).

   The NPWS (Nally pers. comm.) advises that initial management priority has been afforded to active sites in preference to sites that require intensive management to encourage recolonisation. Subject to the cooperation of land owners and appropriate experimental design, degraded sites that are known to have been occupied by Bathurst Copper Butterflies in the past will be assessed for their regeneration potential and used to trial habitat restoration activities including the use of fire.

   Informal reports of other, undocumented habitats for *P. spinifera* have been reported and the search for more should continue to be encouraged, keeping in mind the potential to protect their tenure by whatever means are possible.

3. **Habitat Enhancement**. The food plant, blackthorn, is vigorous and sometimes even a weed, yet enrichment planting at protected sites where the ants are present, has not been promoted in the ARP. This action is a high priority for the Bathurst Copper and can easily be done as has been implemented for the Eltham Copper, *P. pyrodiscus lucida* (T.R. New unpubl.). In addition to enrichment of existing habitats, there is an opportunity to translocate the butterfly into national parks in the area, after ensuring sufficient food plant and appropriate ants are either present or introduced to the locality.

4. **Ability to Recover**. *P. spinifera* can clearly be 'recovered' as soon as an adequate number of habitats are protected and its survival is no longer threatened by habitat disturbance or destruction. All that is required to recover the species is *to preserve and manage (mainly weeds), a selected number of plant communities supporting habitats, so that the survival of this species is no longer threatened.* While it may not be possible to protect all known sites, these actions will be sufficient to prevent the species from becoming extinct. There has been no known contraction in distribution since discovery and very few of the number of habitats known have been destroyed. Despite apparent 'loss' of some habitats the number now known for this species is far greater than known 10 years ago, due to the extended surveys. The creation of new habitats, although desirable within protected areas, is not an essential prerequisite for conservation of the species or its downlisting, since management, including possibly food plant enrichment, of existing habitats is all that is required. One reviewer noted that even small colonies recovered and thrived after small, localised fires.

5. **Recovery needs**: Key objectives should aim to downlist *P. spinifera* from threatened to 'rehabilitated' or 'conservation dependent', in

response to (i) new information and (ii) successful recovery actions. Already new information is available on additional sites not previously known, and the recovery actions need definition.

Key Recovery Actions:

1. At least five basic sub-populations of the known 29 habitats, or others not yet documented, should be selected for protection and the management monitored. If possible, as many others should also be secured for protection and management, using whatever means are available (e.g council vegetation protection ordinance, levy relief, Land for Wildlife etc). We consider food plant enrichment to be a priority for enhancing the carrying capacity of protected areas (e.g. national parks and nature reserves). However, not all known populations can be considered suitable for permanent protection when their safe tenure cannot be ensured. The difficulties in protecting all presently known habitats should not be seen as limiting recovery of the species.
2. Further surveys are needed for the area and should include the Hartley Vale, Black Springs, Oberon and Rockney areas where habitats for *P. spinifera* are thought to occur but have not yet been recorded.
3. Manage weeds (ARP Appendix 3) and fire for all habitats (ARP Appendix 4, including those on private land). Weed management must be undertaken at the most important occupied sites as a matter of priority. The ARP identifies encouraging research on the response of the attendant ant, butterfly and host plant to fire as part of the research activities of the recovery plan.
4. Rehabilitate protected sites for management by NPWS, forestry authorities and local community groups, including ‘enrichment planting’ with *Bursaria spinosa* (ssp. *lasiophylla*). Enhance nesting sites for ants near food plants (eg by accumulating suitable logs etc). Provide special signage for habitats. There is an opportunity for local involvement, e.g. a suitable plant nursery could take on seedling collection, germination, cutting propagation and replanting these areas.
5. Translocation of the butterfly after finding suitable sites, or to sites after preparing them as suitable habitats (food plants + logs + ants). This action is only necessary if insufficient populations cannot be preserved in protected habitats. The ARP indicates that captive breeding of the species is possible and therefore translocation is feasible but is not considered an appropriate conservation measure at this stage of the recovery effort.
6. Recognition of the species by councils as a local environmental community icon. Educate local council (especially at Yetholme and Oberon) to avoid damage to habitats. Appropriate integration of this species as a symbol for environmental protection by NPWS, by the municipal councils, regional forestry authority, and schools and in other community activities and literature (Nally 2000). Input by experienced lepidopterists is essential.
7. De-listing – a major objective and indicator of the long term success of the project – should be considered at the completion of the period of the current approved recovery plan. Based on the application of the criteria used in this plan we believe that the species warrants re-categorisation to Lower Risk – Conservation Dependent. As a first step, the discrepancy in the listed status of the species under Commonwealth and New South Wales legislation should be reviewed.
8. Prior to de-listing, initiate studies of subpopulations using morphometric and DNA analysis.

Can recovery be carried out with existing resources? No. Further resources are required to strengthen the recovery actions carried out to date. The ARP identifies an estimated budget for the recovery plan as $226,900.00 over five years of implementation. This includes an estimated unfunded requirement for $142,500. We consider the following actions are priorities for inclusion within the recovery plan budget:

Resources required:

Action*		$
1	Surveys and mapping	20,000.00
2	Land re-zoning	
4	Site rehabilitation, enrichment planting	30,000.00
5	Management by NPWS including signage and co-ordination	30,000.00
Total		80,000.00

*Note: costs of land acquisition or re-zoning have not been estimated in the budget

Timeframe for Rehabilitation of Taxon

- In train — 1 years
- Completed — 4 years
- De-listing — Review and align Commonwealth and NSW listed status. At end of Recovery Plan period review success of recovery actions and re-categorise as conservation dependent.

Lead Organisation: New South Wales National Parks and Wildlife Service.

References

ARP 2001. Approved Recovery Plan ‘Bathurst Copper Butterfly (*Paralucia spinifera*) Recovery Plan’, New South Wales Parks and Wildlife Service, Sydney;

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dexter, E.M. and Kitching, R.L. 1991. Nomination for the register of the National Estate. Report to Australian Heritage Commission.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1-4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Edwards, E.D. and Common, I.F.B. 1978. A new species of *Paralucia* Waterhouse and Turner from New South Wales (Lepidoptera: Lycaenidae). Australian Entomological Magazine 5: 65-70.

Goldney, D. 1991. If we had only listened to the birds. Wildlife Australia 28: 13-15.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

IUCN 2000. Red list of threatened species, IUCN, Gland, Switzerland and Cambridge.

Kitching, R.L. and Baker, E.J. 1990. Hello, Goodbye? Australian Geographic 12: 92-95.

Nally, S. 2000. *Paralucia spinifera*. Lithgow’s endangered copper butterfly. Community education and involvement program annual report 2000.

New, T.R. 1990. Directory of Lepidoptera conservation projects. La Trobe University, Melbourne.

New, T.R. 2000. Conservation biology. An introduction for southern Australia. Oxford University Press.

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

LYCAENIDAE: THECLINAE

Scientific name: *Philiris azula* Wind and Clench

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Iron Range.

Taxonomy: The identity of *P. azula* in Australia was discussed by Johnson and Johnson (1984).

Infra-specific relationships or variation: Only two specimens are known from Australia but *P. azula* is well known from Papua New Guinea, where little variation has been observed. The black apex of the fore wing on the two known males from Iron Range is broader than that of specimens from Papua New Guinea (Johnson and Johnson 1984).

Habitat critical to survival: Lowland tropical rainforest. Two male specimens collected at the edge of rainforest in Iron Range National Park. The life history of *P. azula* has not been recorded from Australia. In Papua New Guinea the species is very seasonal in appearance and more so than most other *Philiris* spp. This may account for the extreme scarcity of specimens known from Australia.

History of conservation concern: *P. azula* was listed as threatened by Hill and Michaelis (1988). No further information was provided.

Major Threatening Processes: None known or likely to occur. The species is almost certainly secure in Iron Range National Park and the nearby resources reserve.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Although Data Deficient in terms of number of specimens known, the species is not likely to be threatened in Australia because the only known population is secure in a major national park. Further surveys should accompany studies on other species.

References:

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Johnson, S.J. and Johnson, I.R. 1984. First record of *Philiris azula* Wind and Clench (Lepidoptera: Lycaenidae) from Australia. Australian Entomological Magazine 10: 89–90.

LYCAENIDAE: THECLINAE

Scientific name: *Philiris diana diana* Waterhouse and Lyell

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Bluewater Range to Kuranda, including Atherton Tablelands.

Taxonomy: The genus *Philiris* contains more than 65 species, most occurring in Papua New Guinea and surrounding islands. About six are known from Australia.

Infra-specific relationships or variation: Two subspecies of *Philiris diana* occur in northern Queensland, ssp. *papuana* occurring from Rocky River to Cape York and in Papua New Guinea. On the upperside of males of *Philiris diana diana* the extent of white on the fore wing is variable and on females, the areas of white can sometimes extend over most of the fore and hind wings above.

Habitat critical to survival: *P. diana diana* occurs in, and at the edge of, rainforest on the Main Divide. The subspecies is very rarely seen, and because of its high flight, seasonal appearance and its similarity to *P. fulgens kurandae*, it is not easily identified unless captured.

History of conservation concern: *P. diana diana* was inappropriately referred to by Sands (1990) as likely to be in danger of extinction. The scarcity of this subspecies contributed to his opinions that the species was becoming threatened, but this is now regarded as unrelated to conservation issues. Dunn et al. (1994) stated that the species was Endangered, and had not been collected since 1907. This was not correct; in recent years a female was collected near Paluma in the 1970s, a male bred from near Kuranda, a male collected on the Copperload Dam Road, Cairns and a female was collected at Lake Eacham, Atherton Tablelands. This subspecies is currently listed as Endangered and is protected fauna under the Queensland Nature Conservation (Wildlife) Regulation (1994).

Major Threatening Processes: Dunn et al. (1994) stated habitat loss to be a threat for *P. diana diana*. However, all known habitats are in or adjacent to the extensive World Heritage rainforest protected areas between Bluewater Range and Kuranda. Prior to the inclusion of tropical rainforests in the World Heritage conservation area, much of the accessible habitat for *P. diana diana* was disturbed by logging operations.

Is knowledge sufficient to formulate recovery actions? Information is adequate. No recovery actions are recommended.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Queensland Nature Conservation (Wildlife) Regulation (1994).

Sands, D.P.A. 1990. Australia's Endangered butterflies. News Bulletin, Entomological Society of Queensland. 18: 63–68.

LYCAENIDAE: THECLINAE

Scientific name: *Philiris ziska titeus* D'Abrera

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Iron Range, Claudie River, Rocky River.

Taxonomy: *Philiris ziska ziska* is abundant and widely distributed in mainland New Guinea but in Australia the subspecies *titeus* is much more restricted in distribution.

Infra-specific relationships or variation: Both sexes of ssp. *titeus* are much smaller than ssp. *ziska* and males usually have a white suffusion on the veins in the cell of the fore wings, not usually distinct on ssp. *ziska*. The areas of white on both wings of the females of ssp. *titeus* are much larger than those of ssp. *ziska*.

Habitat critical to survival: The habitat of *P. ziska titeus* is lowland tropical rainforest. In Papua New Guinea *P. ziska* is very abundant and larvae feed on the vine, *Trophis scandens* (Parsons 1998).

History of conservation concern: Hill and Michaelis (1988) listed *P. ziska titeus* as threatened but Dunn et al. (1994) stated that the subspecies was insufficiently known.

Major Threatening Processes: None known. The species is secure in Iron Range National Park and the nearby resources reserve, and is probably secure at the Rocky River.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not threatened in Australia and the populations are secure in Iron Range National Park. The security and tenure of rainforest edging the Rocky River needs assessment for this and other species found only in far northern Queensland.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

.

LYCAENIDAE: RIODININAE

Scientific name: *Praetaxila segecia punctaria* (Fruhstorfer)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Cape York to Rocky River.

Taxonomy: *P. segecia* also occurs in Papua New Guinea.

Infra-specific relationships or variation: Little variation noted in specimens from Australia. Subspecies *yaniya* from Papua New Guinea is larger than ssp. *punctaria* from Australia, and the latter subspecies has the wings paler on the underside.

Habitat critical to survival: *P. segecia punctaria* occurs in primary tropical rainforest. Adults rarely leave the shaded understorey where they settle on shrubs at about 1m from the ground. The food plant for larvae was *Rapanea porosa* (Samson et al. 1999). Dunn et al. (1994) were incorrect in stating that the species had not been taken at the Claudie River since 1913 and adults are usually not crepuscular, as they suggested. The species was often seen and occasionally taken at Iron Range during 1970-90s. Samson et al. (1999) recently discovered the life history at the Rocky River.

History of conservation concern: Dunn et al. (1994) stated that *P. segecia punctaria* was insufficiently known.

Major Threatening Processes: Dunn et al. (1994) were concerned about logging of the habitat at Cape York. Undoubtedly this activity at Lockerbie Scrub has been very destructive for many unique insect species, but *P. segecia punctaria* is secure elsewhere in National Parks and reserves. The species is secure at present at Iron Range, in the McIlwraith Range and at Rocky River.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not threatened in Australia and the populations are secure in national parks and other habitats.

References

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Samson, P.R., Johnson, S.J. and Wilson, P.R. 1999. The life history of *Praetaxila segecia punctaria* (Fruhstorfer) (Lepidoptera: Lycaenidae: Riodininae). Australian Entomologist 26: 57–63.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Prosotas gracilis saturiator* (Rothschild)

National Conservation Status: Data Deficient

Range: Queensland.

Distribution: Dauan Island, Torres Strait.

Taxonomy: *Prosotas gracilis saturiator* is known from Papua New Guinea and is one of several similar species in the genus.

Infra-specific relationships or variation: The subspecific status of Australian material has not been determined with certainty. Four subspecies are recognised, occurring in India, Southeast Asia and Papua New Guinea.

Habitat critical to survival: Not recorded. The species occurs in rainforest in Papua New Guinea (Parsons 1998).

History of conservation concern: Only two specimens known, collected by Johnson and Valentine (1997). Insufficient information on the habitat and food plants is available to assess the conservation status of this species in Torres Strait.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. Further information on its habitat is required before an assessment can be made. This information will be gained most effectively by encouraging the investigations by non-professional lepidopterists.

Resources required:

Action		$
1	Surveys in Torres Strait	10,000.00
Total		10,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Johnson, S.J. and Valentine, P.S. 1997. Further observations and records for butterflies (Lepidoptera) in northern Australia. Australian Entomologist 24: 155–158.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

LYCAENIDAE: THECLINAE

Scientific name: *Pseudalmenus chlorinda barringtonensis* Waterhouse

National Conservation Status: No Conservation Significance

Range: New South Wales.

Distribution: Tenterfield to Barrington Tops.

Taxonomy: *P. chlorinda barringtonensis* is easily separated from the several other subspecies.

Infra-specific relationships or variation: Both sexes are variable, but variation does not overlap with other subspecies, since the median band of the hind wing is continuous almost to the tornus. The areas of yellow on both wings also vary in extent.

Habitat critical to survival: Montane open and sometimes closed woodland where the food plants for larvae, *Acacia* spp. mainly *A. dealbata*, and attendant ants, *Anonychomyrma biconvexa*, are abundant. Larvae have been found on very small (ca 1m) or tall trees (> 10m) and leave when mature to find shelter to pupate, often under the bark of nearby eucalypts or in stumps. *P. chlorinda barringtonensis* is one of the first butterflies to emerge in spring at high altitudes on the northern Main Divide.

History of conservation concern: Hill and Michaelis (1988) listed this species as threatened. The subspecies was earlier thought to be restricted to the Barrington Tops area but *P. chlorinda barringtonensis* is now known to be relatively abundant over a much greater area on the Main Divide almost to Tenterfield (G. Miller, R. Field pers. comm.). Many populations, for example at Barrington Tops and near Point Lookout, Ebor, are secure in national parks.

Major Threatening Processes: None recorded. Bushfires temporarily affect populations but recolonisation has occurred at some habitats in severely burnt areas at Barrington Tops.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary.

References

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

LYCAENIDAE: THECLINAE

Scientific name: *Pseudalmenus chlorinda chlorinda* (Blanchard)

National Conservation Status: No Conservation Significance

Range: Tasmania.

Distribution: East coast from Hobart to Swansea, inland to South Esk and Tamar Valleys.

Taxonomy: This is one of seven subspecies of *P. chlorinda* recognised by Common and Waterhouse (1981).

Infra-specific relationships or variation: *P. chlorinda chlorinda* is sometimes variable in the extent of yellow on the upperside. Subspecies *chlorinda* can be distinguished from most others by the distinctly grey tint beneath.

Habitat critical to survival: *P. chlorinda chlorinda* occurs in open or closed, moist eucalypt forests, where the food plants, species of *Acacia*, often *A. dealbata*, are abundant. Immature stages are attended by ants, *Anonychomyrma biconvexa*, and often feed gregariously before leaving the food plant to pupate under the bark of eucalypts or in rotting logs.

History of conservation concern: Hill and Michaelis (1988) listed ssp. *chlorinda* as threatened and Braby (2000) considered that it was Vulnerable and of regional conservation concern in Tasmania.

This subspecies has suffered from loss of a number of populations, but participants attending the BAP Workshop in Hobart pointed out that the subspecies in Tasmania was well protected in reserves, and remained widely distributed. Sufficient localities were known to be secure to ensure the subspecies was not threatened at present.

Major Threatening Processes: Possible activities include logging, tree removal, clearing of habitats and fire.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary but populations should be monitored to ensure adequate protection of habitats prevents the subspecies from becoming threatened.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

LYCAENIDAE: THECLINAE

Scientific name: *Pseudalmenus chlorinda conara* Couchman)

National Conservation Status: No Conservation Significance

Range: Tasmania.

Distribution: north central midlands at Conara, Strickland, Bothwell and Kempton.

Taxonomy: Subspecies *conara* is one of seven recognised by Common and Waterhouse (1981).

Infra-specific relationships or variation: Subspecies *conara* is a distinctive subspecies, in which the orange area beyond the cell is overlaid with black scales.

Habitat critical to survival: The habitats, biology and behaviour of ssp. *conara* are apparently very similar to those of ssp. *zephyrus* (I. Knight pers. comm.). The food plants are usually *Acacia dealbata* or rarely *A. mearnsii*, growing in dry woodland (Dunn et al. 1994).

History of conservation concern: Couchman and Couchman (1977) mentioned that about 80% of the known habitats had been destroyed. Hill and Michaelis (1988) listed *P. chlorinda conara* as threatened, Prince (1988) considered it Vulnerable, Dunn et al. (1994) as rare, and Braby (2000) considered that it was of national concern.

Major Threatening Processes: Dunn et al. (1994) mentioned two populations that were lost from clearing and many others that are on privately owned land. Dunn et al. (1994), quoting Couchman (1965), stated that much of the type locality has been cleared for pasture, woodchips and by burning. However, Dunn et al. (1994) noted the 'boom and bust' cycles that this species undertakes, leading to the mistaken belief that extinctions may occur in lean years. At the BAP Workshop in Hobart, participants stated that adequate secure habitat was available for this subspecies and it was not currently threatened.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. *P. chlorinda conara* is not considered to be threatened, and recovery actions are not required. However, as part of a mapping and monitoring program for *P. chlorinda* and its subspecies in Tasmania, the identification of suitable habitats of *P. chlorinda conara* for permanent protection is recommended.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Couchman, L.E. 1965. Notes on some Tasmanian and Australian Lepidoptera-Rhopalocera. II. Papers and Proceedings of the Royal Society of Tasmania 99, 81–85.

Couchman, L.E. and Couchman, R. 1977. The butterflies of Tasmania. Tasmanian year book 1977, 11–96.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

Prince, G.B. 1988. The National Conservation Status of the hairstreak butterfly *Pseudalmenus chlorinda* Blanchard in Tasmania. Report to Tasmanian Department of Lands, Parks and Wildlife, Hobart.

LYCAENIDAE: THECLINAE

Scientific name: *Pseudalmenus chlorinda fisheri* Tindale

National Conservation Status: No Conservation Significance

Range: Victoria.

Distribution: Grampians National Park.

Taxonomy: Braby (2000) did not recognise *P. chlorinda fisheri* as a distinct subspecies and referred to it as a synonym of *P. chlorinda zephyrus*.

Infra-specific relationships or variation: Said by Braby (2000) to be variable and the differences indistinguishable from ssp. *zephyrus*. However, Common and Waterhouse (1981) stated that *P. chlorinda fisheri* can be distinguished from ssp *zephyrus* by the more pronounced orange and red markings, and black on the hind wing.

Habitat critical to survival: Douglas (1995) described The habitats in some detail. Breeding trees for larvae were described as stands of *Acacia melanoxylon*, occurring at high altitudes in comparatively wet eucalypt forests, with an ant, *Anonychomyrma* sp., attending the larvae.

History of conservation concern: Douglas (1995) considered that *P. chlorinda fisheri* was a nationally Vulnerable subspecies, very rare, and that only five sites were known in Victoria. At the BAP Workshops, participants considered that the habitats were secure, no contraction in distribution had occurred, and no direct threats could be identified in the Grampians National Park.

Major Threatening Processes: Douglas (1995) suggested no defined threats other than potential weed invasion. All known habitats are in the Grampians National Park.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are necessary. National parks authorities may need to monitor weed invasions and consider fire management for the local colonies.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

LYCAENIDAE: THECLINAE

Scientific name: *Pseudalmenus chlorinda myrsilus* (Waterhouse)

National Conservation Status: Vulnerable [VUb,c].

Range: Tasmania.

Distribution: Tasman and Forestier Peninsulas, southeastern Tasmania

Taxonomy: The Australian hairstreak, *P. chlorinda* (Blanchard), exhibits striking geographical variation which has led to designation of seven named subspecies, several of which have narrow distributions. The species occurs in southeastern Australia, including Victoria, the Australian Capital Territory, New South Wales and Tasmania.

Infra- specific relationships or variation: The integrity of several subspecies needs quantitative confirmation, and separation here follows the arrangement in Prince (1988, following Couchman and Couchman 1977). *P. c. myrsilus* is thus regarded as a distinctive form with a small distribution in southeastern Tasmania, although Dunn and Dunn (1991) considered its status doubtful. Common and Waterhouse (1981) stated that the male of ssp. *myrsilus* resembles ssp. *zephyrus* but the fore wing orange bar is more prominent and crossed by black veins. Both sexes resemble ssp. *chloris* (from New South Wales) in having a whitish ground colour beneath.

Habitat and key ecological features: Larvae feed on foliage of *Acacia*, and the species as a whole utilises a number of different species. The food plant for *P.c. myrsilus* at one colony is *A. dealbata* (Couchman 1965). *P. chlorinda* has also been reported from *A. mearnsii* and *A. melanoxylon* in Tasmania, and *A. sophorae* is an almost certain additional host (Prince 1988). Larvae are attended by the ant *Anonychomyrma biconvexa* (Santschi) (= *foetans* Clarke), and they pupate under the bark of nearby eucalypts such as *E. viminalis*, on which the ants live. Key habitat features are the close proximity of suitable *Acacia*s and large eucalypts supporting the attending ant.

History of conservation concern: Considerable losses of the species *P. chlorinda* in Tasmania have been implied by Couchman (1965), followed by Couchman and Couchman (1977) and a detailed survey by Prince (1988). Couchman and Couchman (1977) emphasised the serious decline of all forms of *P. chlorinda* in Tasmania, and the small (remnant) distribution of *P. c. myrsilus* was noted by Prince (1988). Using the former IUCN categories, Prince suggested a ranking of 'Endangered' for the subspecies, as did Dunn et al. (1994). This subspecies was not listed by IAC (1994) but was noted as of regional or local concern by Braby (2000). Participants at the BAP Workshop in Hobart indicated that only two populations are now known, and they may be susceptible to uncontrolled burning.

Major Threatening Processes: Couchman and Couchman (1977) believed that *P. c. myrsilus* might have been present formerly over the entire Tasman Peninsula, but had been reduced to very low levels by extensive clearing and burning. Prince (1988) emphasised the harmful effects of clearing the understorey but Knight (pers. comm. 2000) considers that there is need to reduce the amount of ti-tree undergrowth, as it poses a substantial fire hazard in the area. The Lime Bay Nature Reserve may provide some security for one population.

Is knowledge sufficient to formulate recovery actions? Yes. The biology of *P. chlorinda* is well understood, and the key resources needed are clearly defined, as are the threats to these. Uncertainty over the taxonomic integrity of *P. c. myrsilus* needs to be addressed, and further survey on the Tasman Peninsula might lead to some revision of the subspecies' conservation needs.

Recovery needs:

1. Additional surveys on parts of the Tasman Peninsula, to detect any additional sites and colonies of the butterfly, and to clarify the taxonomic status of populations in the area.
2. Restriction on further clearing of native vegetation on lands supporting colonies of *P. c. myrsilus*.
3. Possible augmentation of habitat around known colonies, by planting of *Acacia* (particularly *A. mearnsii*), around large eucalypts supporting *Anonychomyrma* ants.
4. Reduction of fire hazard by selective removal of understorey at some sites.
5. Signage for selected habitats supporting the butterfly.

Can recovery be carried out with existing resources? No. The needs noted above are difficult to cost. The most pressing are for surveys by experienced lepidopterists, and assessment of needs for restoration and regulatory controls on clearing of vegetation. The latter clearly follow from survey results, but protection of existing colonies should not be postponed until after the surveys are completed.

Resources required:

Action*		$
1	Surveys for *P. c. myrsilus* on the Tasman Peninsula over two seasons. $8 000 / year	16,000.00
2	Taxonomic investigation of *P.c. myrsilus*, in context of distinctiveness of all Tasmanian forms of *P. chlorinda*. The costs of this could be combined with those of survey, if the same personnel are involved. This is envisaged as a project suitable for a Ph.D. or M.Sc. degree, and the estimated funding does not include provision of a scholarship (ca $20 000 / year). Costs for laboratory studies, travel, fieldwork and visit to ANIC (Canberra) to study relevant material there are estimated.	35,000.00
3	Management of known habitats	10,000.00
Total		61,000.00

* Note: costs of land acquisition or re-zoning have not been estimated in the budget. Costs needed for habitat protection and restoration are at present indeterminate.

Lead organisation: Department of Primary Industries, Water and Environment, Tasmania.

References:

Braby, M.F. 2000. Butterflies of Australia. Their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Couchman, L.E. 1965. Notes on some Tasmanian and Australian Lepidoptera-Rhopalocera. II. Papers and Proceedings of the Royal Society of Tasmania 99, 81–85.

Couchman, L.E. and Couchman, R. 1977. The butterflies of Tasmania. Tasmanian year book. 1977, 11: 11–96.

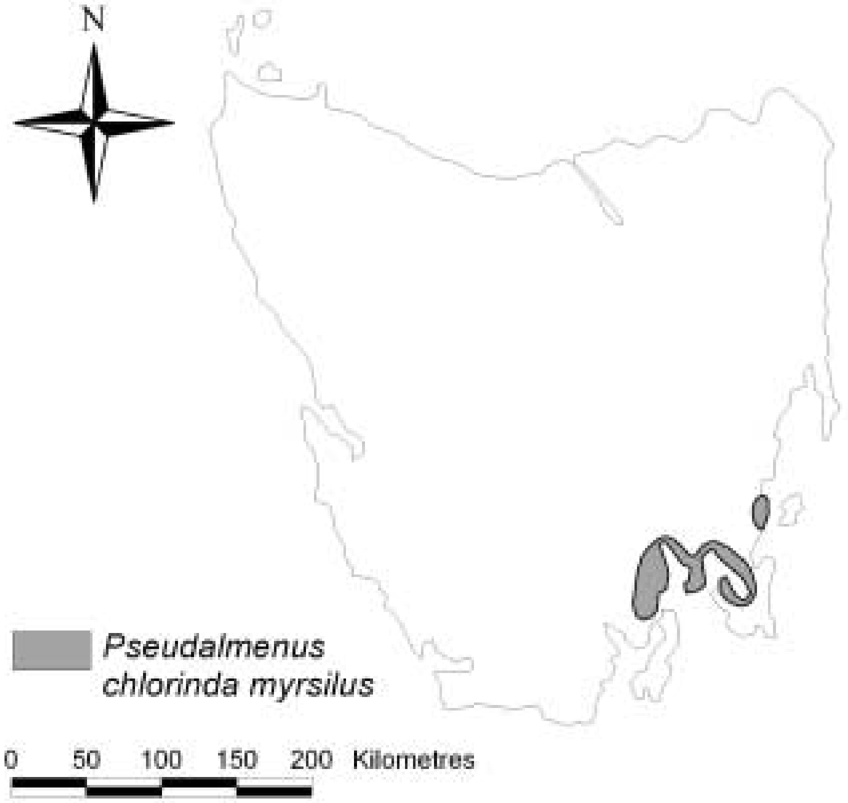
Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

IAC 1994. Invertebrate Advisory Committee (Tasmania) 1994. Interim list of native invertebrates which are rare or threatened in Tasmania. Parks and Wildlife Service, Hobart.

Prince, G.B. 1988. The National Conservation Status of the hairstreak butterfly *Pseudalmenus chlorinda* Blanchard in Tasmania. Report to Tasmanian Department of Lands, Parks and Wildlife, Hobart.

Distribution of *Pseudalmenus chlorinda myrsilus*



LYCAENIDAE: THECLINAE

Scientific name: *Pseudalmenus chlorinda zephyrus* Waterhouse and Lyell

National Conservation Status: No Conservation Significance; Tasmania: Lower Risk (Near Threatened)

Range: New South Wales, Australian Capital Territory, Victoria, Tasmania

Distribution: Tinderry Mountains, Monga, Brindabella Range to eastern Victoria, Upper Scamander to Port Sorell, northeastern Tasmania.

Taxonomy: *P. chlorinda zephyrus* is the most distributed of the seven subspecies.

Infra-specific relationships or variation: A variable subspecies, some individuals showing overlap in appearance with ssp. *chloris* and *fisheri*. There has been some confusion over identity of *P. chlorinda zephyrus* in Tasmania.

Habitat critical to survival: Prince (1988) referred to *P. chlorinda* near *zephyrus* in the northeast of Tasmania as of conservation interest, possibly Endangered. Braby (2000) accepted this as *P. chlorinda zephyrus*, hence the historical interest in conservation of this subspecies. In common with other subspecies, *P. chlorinda zephyrus* occurs in moist eucalypt plant communities when *Acacia* spp., mainly *A. dealbata* in Tasmania, and *A. melanoxylon*, are abundant. Immature stages are always attended by ants, *Anonychomyrma* sp. and larvae leave the food plant to find shelter, usually under bark of eucalypts, to pupate. Adults are some of the first butterflies to appear in spring.

History of conservation concern: Decline in the number of known habitats in Tasmania is serious cause for concern. Many populations of *P. chlorinda zephyrus* have been destroyed by urban development, land clearing and increased frequency of fire (Braby 2000). In Victoria the subspecies is secure and sometimes abundant in various parts of the Dandenong Ranges, even able to sustain some environmental disturbance (R. Field pers. comm.). However, in Tasmania, housing has recently affected some localities near Port Sorell and the numbers of habitats overall may be in decline. The subspecies has recently been discovered at Turners Beach, and it probably occurs more widely than previously thought (I. Knight).

At present this species is not threatened but surveys are required to ensure that further decline in the number of secure habitats does not occur in Tasmania. At the BAP Workshop in Hobart, participants considered that the status of this subspecies was Lower Risk, and it may become threatened if the loss or degradation of habitats continues.

There is clearly a need to examine data on all the subspecies and populations of *P. chlorinda* in Tasmania, to determine the conservation needs for the species as a whole. Inadequate information on distribution of *P. chlorinda* is compounded by unclear taxonomy and boundaries of the subspecies, which affects conservation assessment. Populations from the west coast of Tasmania, not assigned to subspecies, should be included in this review.

Major Threatening Processes: Principally urban development, tree clearing, understorey regrowth and bush fires.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate in Tasmania. There is a need to carry out systematic surveys to ensure that the subspecies does not decline further and to identify adequate habitat for permanent protection.

Recovery needs (Tasmania only):

1. Surveys and mapping to determine areas where the subspecies occurs.
2. Assess all intact habitats for permanent conservation.
3. Manage regrowth, weeds and fire for habitats.
4. Ensure long-term rehabilitation and management of sites.

Can recovery be carried out with existing resources? No.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance.

Action		$
1	Surveys and mapping, $5,000 / year over 4 years	20,000.00
2	Land re-zoning 4 Site rehabilitation, plant propagation and cultivation; $5,000 per year over 3 years	15,000.00
Total		35,000.00

Lead Organisation: Department of Primary Industries, Water and Environment, Tasmania.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L. and Dunn, L.E. 1991. Review of Australian Butterflies: distribution, life history and taxonomy. Parts 1–4. Privately published by the authors, Melbourne.

Prince, G.B. 1988. The National Conservation Status of the hairstreak butterfly *Pseudalmenus chlorinda* Blanchard in Tasmania. Report to Tasmanian Department of Lands, Parks and Wildlife, Hobart.

LYCAENIDAE: THECLINAE

Scientific name: *Pseudodipsas cephenes* Hewitson

National Conservation Status: No Conservation Significance; New South Wales: Data Deficient

Range: Queensland, New South Wales.

Distribution: Coast and nearby ranges from near Cooktown to Burleigh, Queensland and Tweed Heads to Iluka, New South Wales.

Taxonomy: *Pseudodipsas cephenes* is endemic to Australia and is one of two species in the genus occurring in Australia. *P. aurea* occurs in mainland Papua New Guinea and *P. una* occurs in New Ireland. Parsons (1998) considered the subspecies of *P. eone* from New Britain was also a separate species.

Infra-specific relationships or variation: Both sexes are variable in the extent of blue on the upperside of both wings, especially males, in which these areas are sometimes absent.

Habitat critical to survival: *Pseudodipsas cephenes* occurs in, or at the edge of rainforest where the immature stages are closely associated with the ant, *Anonychomyrma gilberti*. The larvae feed on several plants (Braby 2000) but in the southeast of its range, mainly small plants of *Diospyros fasciculosa* and *Smilax australis* (Smales and Ledward 1943). Breeding usually occurs in cleared or open areas at the edge of rainforest, especially on regrowth. Larvae shelter with the ants in curled or dead leaves, under bark or in hollow branches near the food plants. Adults are cryptic in behaviour. The males settle in sunlit patches high (ca 6–8 m) on the edge of the forest and females appear sporadically near the food plants. Both sexes are sometimes seen feeding on small flowers at the edge of rainforest and in northern Queensland adults are sometimes very numerous, having been seen on flowers of lychee in orchards (D. Sands). The ant and its habitat must also be considered at risk in the context of assessment. In Queensland the same ant attends the immature stages of the lycaenid, *Hypochrysops miskini miskini*, a species also in decline in the southeastern part of its range. Larvae of both species sometimes share the same shelters (Braby 2000).

History of conservation concern: Insufficient known habitat is secure for this taxon in New South Wales. Similarly, few populations are secure in southeastern Queensland (south of Noosa) where the species should be considered in decline. The rate of decline in the number of populations in New South Wales is the main reason for concern expressed at the BAP Workshops held in Queensland and New South Wales, with very few known populations in protected areas. In two National Parks in Queensland, Broken Head and Iluka, populations of this species are relatively secure but more populations should be sought and rendered secure. *P. cephenes* is not listed as threatened by State or Commonwealth authorities and has not previously been considered of conservation significance. BAP Workshop participants expressed concerns over its status in New South Wales..

Major Threatening Processes: Habitat destruction by roadworks, housing development and clearing for gardens and farms. Weed invasions, especially of lantana, are also important threats. Many of the habitats in New South Wales have been destroyed from urban development, especially between the Richmond and Tweed Rivers. The species is close to the edge of its range in northern New South Wales and the habitats have always been limited. The density of adult numbers fluctuates greatly, so that the species is often regarded as rare but is occasionally locally very abundant.

Is knowledge sufficient to formulate recovery actions? No. The species is Data Deficient in New South Wales and surveys for habitats are a high priority. It is desirable that experienced lepidopterists be engaged to locate additional habitats and be encouraged to carry out surveys in appropriate national parks.

Recovery needs:

5. Surveys, mapping and management of areas where the species occurs.
6. Assess newly located habitats for permanent conservation.
7. Manage weeds and fire control for habitats.
8. Long-term rehabilitation of sites.

Can recovery be carried out with existing resources? No.

Resources required: Land acquisition has not been estimated in the budget (below) but is recognised as of primary importance.

Action		$
1	Surveys and mapping, $5,000 / year over 2 years	10,000.00
Total		10,000.00

Lead Organisation: New South Wales National Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Parsons, M. 1998. The butterflies of Papua New Guinea. Their systematics and biology. Academic Press, London.

Smales, M. and Ledward, C.P. 1943. Notes on the life histories of some lycaenid butterflies — Part II. (With notes on some skippers) The Queensland Naturalist 12: 47–52.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Theclinesthes albocincta* (Waterhouse)

National Conservation Status: No Conservation Significance; Queensland: Data Deficient

Range: Mainland States, Northern Territory.

Distribution: Inland eastern States to coastal South Australia, Western Australia except the southwest and north to Broome; and western Queensland.

Taxonomy: *Theclinesthes albocincta* is closely related to *T. hesperia* but they do not overlap in distribution.

Infra-specific relationships or variation: *T. albocincta* is very variable, with seasonal and geographical forms (Sibatani and Grund 1978). Four forms have been described (Grund 2000). Adult males may vary from grey-blue to brown and the markings are very variable beneath. Specimens from Peak Downs, Queensland, are extensively pale blue on the upperside (Sibatani and Grund 1978).

Habitat critical to survival: *T. albocincta* occurs in dry, open mallee communities and sand dunes, when the larval food plants, *Adriana tormentosum* (Western Australia) and *A. hookeri* (Alice Springs), are present. Larvae feed on leaves or flowers, depending on the form of the butterfly (Grund 2000). The larvae may be attended by several different species of ants (Common and Waterhouse 1981).

History of conservation concern: Douglas (1995) considered that *T. albocincta* was rare in Victoria and Vulnerable nationally. Braby (2000) referred to the two known specimens collected in 1903 from Queensland as the 'eastern form', as of regional or local concern, and recommended exploration to locate further populations.
He also referred to the Victorian and New South Wales populations ('inland form'), as of local or regional concern.

Major Threatening Processes: In Victoria, clearing for agriculture, grazing by sheep and ring barking by rabbits of the food plant, *Adriana hookeri*, were suggested by Douglas (1995) to be threatening processes. Braby's (2000) concerns related mainly to the Queensland population but he reiterated the concerns of Douglas relating to the species in Victoria and mentioned housing development as a threat near Adelaide.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. The species is not considered threatened on a large scale but municipal populations may be threatened, for example in Victoria and South Australia. In Queensland further surveys for the 'lost' populations of the species are recommended. They can be founded on records for species of potential food plants, *Adriana* spp., occurring in inland areas.

Resources required:

Action		$
1	Surveys and mapping, $5,000 / year over 3 years	15,000.00
Total		15,000.00

Lead Organisation: Queensland Parks and Wildlife Service.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2: Family Lycaenidae. Report to Department of Conservation and Natural Resources, Victoria.

Grund, R. 2000. The life histories for *Theclinesthes hesperia hesperia* Sibatani and Grund and *Theclinesthes albicincta* Waterhouse (Form 4 adults Sibatani and Grund)(Lepidoptera: Lycaenidae). Victorian Entomologist 30: 80–84.

Sibatani, A. and Grund, R. 1978. A revision of the *Theclinesthes onycha* complex (Lepidoptera: Lycaenidae). Transactions of the Lepidopterists Society of Japan 29: 1–34. .

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Theclinesthes hesperia hesperia* Sibatani and Grund

National Conservation Status: Lower Risk (Least Concern).

Range: Western Australia.

Distribution: Restricted to coastal sand dunes between Bunbury and Perth, with an outlying population near to Jurien, southwestern Western Australia.

Taxonomy: *Theclinesthes hesperia* is closely related to *T. albocincta* but the two apparently have no interface in distribution.

Infra-specific relationships or variation: Two subspecies have been recognised, ssp. *hesperia* and ssp. *littoralis*. No variation in them has been recorded.

Habitat critical to survival: The food plant of *Theclinesthes hesperia* is *Adriana quadripartita*, a shrub that grows in sand dunes and other sparsely vegetated areas (Grund 2000).

History of conservation concern: Dunn et al. (1994) regarded both subspecies as rare. Braby (2000) considered that ssp. *hesperia* was of regional conservation concern in southwestern Western Australia, and noted that much of the habitat had been destroyed for urban development. However, Dunn et al. (1994) noted that ssp. *hesperia* was probably adequately protected in Yalgorup National Park. At the BAP Workshop held in Perth, this subspecies was considered of definite conservation significance.

Major Threatening Processes: Atkins (1978) and Braby (2000) noted that urban development had destroyed much of the habitat of ssp. *hesperia*. Small distribution accompanied by urban development is probably the major concern for ssp. *hesperia*.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. Subspecies *hesperia* is not considered to be threatened. Since urban development is encroaching on several populations, e.g. at Singleton and Port Kennedy south of Perth (M. Williams pers. comm.). A review of the disturbance of habitats of ssp. *hesperia* is essential to identify adequate and permanently protected habitats.

Lead Organisation: Western Australian Department of Conservation and Land Management.

Recovery needs:

1. Develop a Recovery Plan and Recovery Actions
2. Survey and map known habitats between Perth and Bunbery
3. Survey areas north of Perth to identify any additional habitat.

Can recovery be carried out with existing resources? No. Surveys are a high priority. Other recovery needs are at present indeterminate.

Resources required:

Action		$
1	Surveys and mapping, $3,000 / year over 5 years	15,000.00
Total		15,000.00

References:

Atkins, A. 1978. A collecting trip to Western Australia. A list of butterflies captured and some biological notes. Victorian Entomologist 8: 25–29.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Grund, R. 2000. The life histories for *Theclinesthes hesperia hesperia* Sibatani and Grund and *Theclinesthes albicincta* Waterhouse (Form 4 adults Sibatani and Grund)(Lepidoptera: Lycaenidae). Victorian Entomologist 30: 80–84.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Theclinesthes hesperia littoralis* Sibatani and Grund

National Conservation Status: No Conservation Significance

Range: Western Australia.

Distribution: Esperance and Bremer Bay districts.

Taxonomy: *T. hesperia littoralis* is one of two subspecies occurring only in Western Australia. It is closely related to *T. albocincta*.

Infra-specific relationships or variation: No variation is recorded and Braby (2000) noted that seasonal variation was not known. Sibatani and Grund (1978) described the subspecies and it's distinguishing features.

Habitat critical to survival: *T. hesperia littoralis* is locally abundant in sand dunes and near beaches where the food plants, *Adriana* spp. (including *A. quadripartita*) are present. The larvae are sometimes attended by the ant, *Iridomyrmex conifer* (Eastwood and Fraser 1999).

History of conservation concern: Dunn et al. (1994) considered that ssp. *littoralis* was rare but identified no threats, and it was recognised as secure in the Cape Le Grand National Park. These authors recommended creation of a reserve for the habitat near Esperance, pointing out that this would ensure the long-term security of this subspecies.

Major Threatening Processes: None known for this subspecies. However, urban development at beach side suburbs is likely to be a threatening process at unprotected localities.

Is knowledge sufficient to formulate recovery actions? Information is adequate. The subspecies is not threatened.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Eastwood, R. G. and Fraser, A. 1999. Associations between lycaenid butterflies and ants in Australia. Australian Journal of Ecology 24: 503–537.

Sibatani, A. and Grund, R. 1978. A revision of the *Theclinesthes onycha* complex (Lepidoptera: Lycaenidae). Transactions of the Lepidopterists Society of Japan 29: 1–34.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Theclinesthes serpentata lavara* (Couchman)

National Conservation Status: No Conservation Significance

Range: Tasmania.

Distribution: Known from Cambridge, northeast of Hobart.

Taxonomy: The genus *Theclinesthes* contains six species, with all except one, *T. miskini*, occurring only in Australia.

Infra-specific relationships or variation: The central blue areas of male *T. serpentata lavara* are more extensive than the nominotypical ssp. *serpentata*, and in both sexes the markings beneath are more distinct. *T. serpentata serpentata* occurs in northeastern Tasmania as well as on the mainland.

Habitat critical to survival: A seasonal subspecies occurring in mudflats and open areas near salt water where species of salt bush (*Atriplex*) are food plants for the larvae of *T. serpentata lavara*.

History of conservation concern: Dunn et al. (1994) considered this subspecies was Vulnerable. However, at the BAP Workshops including one held in Hobart, the subspecies was considered to be of no conservation concern. A reviewer later suggested it was Data Deficient.

Major Threatening Processes: None identified by Dunn et al. (1994) or other authors. The only habitat, near Cambridge, is adjacent to the airport. It is extensive but its tenure should be checked to confirm that there are no likely threats from future development. The subspecies has only been known from one intact locality (I. Knight pers. comm.). Despite its apparent safety, we recommend steps be taken to further secure the site, and pursue appropriate management through the Department of Primary Industries, Water and Environment.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are considered necessary. A check on the future land use of its one extensive habitat can certainly be justified.

References:

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Udara tenella* (Miskin)

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Tinaroo Range to Cooktown, Main Divide at Kuranda but also near the coast at Mossman, Cairns and Cape Tribulation.

Taxonomy: The genus *Udara* with about 37 species, occurs from India, Japan and Southeast Asia, to Papua New Guinea and Solomon Islands. *Udara* is closely related to the genus *Celastrina*, found in the northern hemisphere including Europe.

Infra-specific relationships or variation: In *U. tenella* the areas of white on the upperside of both sexes above are sometimes variable, possibly seasonally.

Habitat critical to survival: *U. tenella* occurs only in or near rainforest, usually when frequenting hilltops or feeding on flowers. Although often abundant, it flies mostly well out of reach and is therefore not easily collected or well represented in collections. Its life history and food plants are not known.

History of conservation concern: Dunn et al. (1994) considered this species Vulnerable. It is currently listed as Vulnerable and is protected fauna under the Queensland Nature Conservation (Wildlife) Regulation (1994), possibly a result of their recommendations. *U. tenella* has always been regarded as abundant near Kuranda during the winter months (Common and Waterhouse 1981).

Major Threatening Processes: Dunn et al. (1994) suggested habitat loss. *U. tenella* was thought by Dunn et al. (1994) to be limited to 10 habitats, mainly at Kuranda, and threatened by the clearing of rainforest. Some habitats near Kuranda have been subjected to clearing under power lines and road widening but the species eventually returns to the disturbed sites. Most habitats are protected in the World Heritage rainforest area of northern Queensland.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Zizeeria karsandra* (Moore)

National Conservation Status: No Conservation Significance

Range: Western Australia, Northern Territory, Queensland, New South Wales, Victoria, South Australia.

Zizeeria karsandra has an extensive distribution from the southern Mediterranean region, India, Southeast Asia, Indonesia, Papua New Guinea, and northern and eastern Australia.

Distribution: Fitzroy Crossing, northern Australia to the Murray Valley.

Taxonomy: The genus *Zizeeria* with four species, occurs almost worldwide, but only one subspecies of *Z. karsandra* has been recognised through out its range.

Infra-specific relationships or variation: Little variation in *Z. karsandra* is known (Braby 2000). The Australian populations may belong to ssp. *conformis* (Butler), but this subspecies has not been validated.

Habitat critical to survival: *Z. karsandra* is very widely distributed throughout its range and abundant at times in most localities. The food plants for larvae are the flowers of *Tribulus* (Fabaceae) and some other plant families.
A population recorded from Victoria is probably not permanent in that State but is secure in national parks if it does persist.

History of conservation concern: *Z. karsandra* was said to be threatened by Yen and Butcher (1997), who referred to the Department of Conservation and Natural Resources, Victoria, as the nominating authority. No other reference to its conservation status has been made, but it may have been because it is little known at the edge of its range in Victoria. *Z. karsandra* has no known conservation significance throughout its range.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Information is adequate. No recovery actions are required.

References:

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Zizina labradus labdalon* Waterhouse and Lyell

National Conservation Status: No Conservation Significance

Range: Queensland.

Distribution: Torres Strait Islands, Cape York to Claudie River.

Taxonomy: *Z. labradus* has a wide distribution from India, throughout Southeast Asia, Indonesia, Papua New Guinea, New Zealand and the western Pacific. *Zizina labradus labdalon* is abundant in Papua New Guinea as well as Australia (Parsons 1998).

Infra-specific relationships or variation: *Z. labradus labdalon* is variable in the extent of markings beneath.

Habitat critical to survival: Although reported to be uncommon in northern Queensland and Torres Strait (Common and Waterhouse 1981), *Z. labradus labdalon* is likely to occupy similar habitats to ssp. *labradus* elsewhere in Australia. The species occurs anywhere in grasslands where suitable food plants for its larvae, a wide range of Fabaceae, are present. In Papua New Guinea this subspecies is at times very abundant.

History of conservation concern: Dunn et al. (1994) stated that this subspecies was insufficiently known. *Z. labradus labdalon* has no known conservation significance throughout its range.

Major Threatening Processes: None recognised.

Is knowledge sufficient to formulate recovery actions? Yes. Information is adequate. No recovery actions are required.

References:

Common, I.F.B. and Waterhouse, D.F. 1981. Butterflies of Australia. Revised edition. Angus and Robertson, Sydney.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The National Conservation Status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

LYCAENIDAE: POLYOMMATINAE

Scientific name: *Zizina otis* (Fabricius)

National Conservation Status: Data Deficient

Range: Christmas Island.

Distribution: Central Plateau, Flying Fish Cove. The species may be a recent arrival on Christmas Island.

Taxonomy: This species is well known from India, Asia and parts of Southeast Asia.

Infra-specific relationships or variation: Several subspecies have been described, including ssp. *lampa* (Corbet) from Malaysia and ssp. *sangra* (Moore) from Asia. The population from Christmas Island has not been identified to subspecies.

Habitat critical to survival: No information on the habitat for *Zizina otis* was recorded by Moulds and Lachlan (1987). In Malaysia the larvae of this species feed on the weed *Mimosa pudica* and on *Alysicarpus vaginalis* (Corbet and Pendlebury 1978).

History of conservation concern: First recorded on Christmas Island by Moulds and Lachlan (1987). Insufficient data are available to make an ecological assessment.

Major Threatening Processes: None known.

Is knowledge sufficient to formulate recovery actions? No. Information is not adequate. All habitats on Christmas Island must be separately evaluated for threats to the plant communities and any other environmental disturbance.

Resources required:

Action		$
1	Surveys	12,000.00
Total		12,000.00

Lead Organisation: Environment Australia.

References:

Moulds, M.S. and Lachlan, R.B. 1987. The butterflies (Lepidoptera) of Christmas Island, Indian Ocean. Australian Entomological Magazine 14: 57–66.

Corbet, A.S. and Pendlebury, H.M. 1978. Butterflies of the Malay Peninsula, 3rd (ed. J.N. Eliot), Malayan Nature Society, Malaysia.

Appendices

Appendix 1:
Threatened butterfly taxa: National and State recommendations

Categories: CR, Critically endangered; EN, Endangered; VU, Vulnerable.

Range States: Q, Queensland; NSW, New South Wales; V, Victoria; T, Tasmania; SA, South Australia; WA, Western Australia.

* Specific populations threatened (see appendix 2)

Taxon	National	State	Range States
HESPERIIDAE			
Anisynta cynone cynone (Hewitson)	VU	VU (SA)	SA
Herimosa albovenata albovenata (L.E. Couchman)	VU	VU (SA)	SA
Hesperilla flavescens flavescens Waterhouse	LR (LC)	LR (LC) VU (V)*	V
Hesperilla flavescens flavia Waterhouse	VU	VU (SA)	SA
Hesperilla idothea clara Waterhouse	NCS	VU (SA)	V, SA
Ocybadistes knightorum Lambkin & Donaldson	VU	VU (NSW)	NSW
Telicota eurychlora Lower	LR (LC)	VU (Q)	Q, NSW, V
Trapezites phigalia phigalia (Hewitson)	NCS	VU (SA)	NSW, V, ACT
NYMPHALIDAE			
Argyreus hyperbius inconstans (Butler)	DD	VU (Q)	Q, NSW
Heteronympha cordace wilsoni Burns	CR	CR (V, SA)	V, SA
Oreixenica kershawi kanunda Tindale	LR (LC)	VU (SA)	V, SA
Oreixenica ptunarra roonina L.E. Couchman	VU	VU (T)	T
Tisiphone abeona morrisi (Waterhouse)	NCS	CR (Q)	Q, NSW
LYCAENIDAE			
Acrodipsas brisbanensis cyrilus (Anderson and Spry)	VU	VU (V, SA)	V, SA
Acrodipsas myrmecophila (Waterhouse and Lyell)	NCS	EN (V)	NT, Q, NSW, V
Candalides heathi ssp. "Wimmera"	EN	EN (V)	V
Hypochrysops piceatus Kerr, Macqueen & Sands	EN	EN (Q)	Q
Jalmenus aridus Graham & Moulds	VU	VU (WA)	WA
Jalmenus evagoras eubulus Miskin	LR (LC)	VU (NSW)	Q, NSW
Jalmenus lithochroa Waterhouse	LR (NT)	LR (NT) CR (SA)*	SA
Ogyris idmo halmaturia (Tepper)	EN	EN (V, SA)	V, SA
Ogyris otanes (C. & R. Felder)	DD	EN (V)	NSW, V, SA, WA
Ogyris subterrestris petrina Field	CR	CR (WA)	WA
Ogyris subterrestris subterrestris Field	VU	VU (V, SA), DD (NSW)	NSW, V, SA
Paralucia pyrodiscus lucida Crosby	VU	VU (V)	V
Pseudalmenus chlorinda myrsilus (Westwood)	VU	VU (T)	T

Appendix 2:
Data deficient & lower risk butterfly taxa: State & Municipal recommendations

[1] *Categories*: VU, vulnerable; DD, data deficient, indeterminate or insufficiently known; NrTh, Near Threatened; LR, lower risk; LsCn, least concern; CnDp, Conservation Dependent; NCS, No conservation significance.

[2] *Australian mainland, island & Territories* — NT, Northern Territory; Q, Queensland; NSW, New South Wales; V, Victoria; T, Tasmania; SA, South Australia; WA, Western Australia; TSI, Torres Strait islands; LHI, Lord Howe Island; NFI, Norfolk Island; COI, Cocos-Keeling Islands; CHI, Christmas Island.

Taxon	Conservation status [1]		Range States [2]	Locality of municipal concern
	National/State	Municipal		
HESPERIIDAE				
Anisynta cynone gracilis (Tepper)	LR (LsCn)	SA		
Anisynta cynone gunneda Couchman	NCS	LR	NSW	Bolivia Hill
Anisynta dominula, ssp. "Moree"	DD		NSW	
Antipodia chaostola leucophaea (L.E. Couchman)	DD		T	
Antipodia dactyliota dactyliota (Meyrick)	DD		WA	
Antipodia dactyliota nila (Waterhouse)	DD		WA	
Croitana aestiva Edwards	DD		NT	
Croitana arenaria Edwards	DD		NT, SA	
Euschemon rafflesia rafflesia	NCS	LR (LC)	Q, NSW	South from Port Macquarie
Herimosa albovenata fuscata (Parsons)	DD		WA	
Hesperilla chysotricha leucosia Waterhouse	NCS, LR (LsCn) (SA)		V, SA	
Hesperilla chysotricha lunawanna L.E. Couchman	DD		T	
Hesperilla donnysa galena Waterhouse	DD		WA	
Hesperilla flavescens flavescens Waterhouse	LR (LsCn)	VU	V	Altona
Hesperilla mastersi marakupa L.E. Couchman	DD		T	
Oreisplanus munionga larana L.E. Couchman	LR (LsCn)		T	
Suniana lascivia lasus Waterhouse	DD		NT (Bathurst Is.)	
Taractrocera ina Waterhouse	NCS, DD (NSW)		NT, TSI, Q, NSW	
Telicota ancilla baudina Evans	DD		WA, NT	
Telicota eurychlora Lower	LR (LsCn), VU (Q)		Q, NSW, V	
Telicota mesoptis mesoptis Lower	NCS, DD (NT)		TSI, NT, Q	
Trapezites eliena (Hewitson)	NCS, LR (LsCn) (SA)		Q, NSW, ACT, V, SA	
Trapezites luteus luteus (Tepper)	NCS, LR (LsCn) (SA)		V, SA	
Trapezites symmomus soma Waterhouse	NCS, LR (LsCn) (SA)		V, SA	

Taxon	Conservation status [1] National/State	Municipal	Range States [2]	Locality of municipal concern
PAPILIONIDAE				
Cressida cressida cressida (Fabricius)	NCS, DD (NSW)		Q, TSI, NSW	
Graphium macleayanum insulanum Waterhouse	DD		LHI, NI	
Ornithoptera richmondia (Gray)	NCS, LR (LsCn) (Q)		Q, NSW	
PIERIDAE				
Appias albina albina (Boisduval)	DD		NT, TSI	
Eurema alitha amplexa (Butler)	DD		CHI	
NYMPHALIDAE				
Euploea climena macleari (Stoll)	DD		COI, CHI, WA	
Euploea modesta Butler, ssp.	DD		TSI	
Euploea netscheri erana (Fruhstorfer)	DD		TSI	
Junonia erigone walkeri (Butler)	DD		NT (Wessel Islands)	
Lexias aeropa eutychius (Fruhstorfer)	DD		Q	
Melanitis amabilis valentina Fruhstorfer	DD		TSI	
Oreixenica kershawi kanunda Tindale	LR (LsCn), VU (SA)		V, SA	
Oreixenica lathoniella herceus Waterhouse & Lyell	NCS, DD (SA)		NSW, ACT, V, SA	
Oreixenica latialis theddora L.E. Couchman	LR (NrTh)		V	
Oreixenica ptunarra ptunarra L.E. Couchman	LR (LsCn)		T	
Oreixenica ptunarra angeli L.E. Couchman	LR (LsCn)		T	
Oreixenica ptunarra ssp.	LR (Ls.Cn)		T	
Polyura andrewsi (Butler)	DD		CHI	
Polyura sp. ? *jupiter* (Butler)	DD		TSI	
Polyura sempronius tiberius (Waterhouse)	DD		LHI	
Taenaris artemis jamesi Butler	DD		TSI, Q	
Tisiphone abeona 'joanna' (Butler)	LR (LsCn)		NSW	
Tisiphone abeona ssp.	DD	DD	NSW	Combyne Plateau
LYCAENIDAE				
Acrodipsas arcana (Miller & Edwards)	DD		Q, NSW	
Acrodipsas brisbanensis brisbanensis (Miskin)	NCS, DD (WA)		WA, Q, NSW, V, ACT	
Acrodipsas illidgei (Waterhouse & Lyell)	NCS, DD (NSW)		Q, NSW	
Acrodipsas mortoni Sands, Miller and Kerr	NCS, DD (Q)		Q, NSW	

Taxon	Conservation status [1]		Range States [2]	Locality of municipal concern
	National/State	Municipal		
Acrodipsas myrmecophila (Waterhouse & Lyell)	NCS, DD (NT), EN (V)		NT, Q, NSW, V	
Candalides consimilis toza (Kerr)	DD		Q	
Candalides heathi aeratus (Montague)	DD		WA (Monte Bello Islands)	
Catochrysops amasea amasea Waterhouse & Lyell	DD		TSI, Q	
Catopyrops florinda estrella (Waterhouse and Lyell)	NCS, DD (WA)		WA, NT, Q	
Hypochrysops apelles apelles (Fabricius)	NCS, LR (LsCn) (NSW)		NT, TSI, Q, NSW	
Hypochrysops apollo apollo Miskin	NCS	LR	Q	Ingham to Innisfail
Hypochrysops arronica arronica (C. & R. Felder)	DD		?Q	
Hypochrysops digglesii (Hewitson)	NCS, DD (NSW)		TSI, Q, NSW	
Hypochrysops halyaetus Hewitson	NCS	LR	WA	Perth to Moore River
Hypochrysops ignitus chrysonotus Grose-Smith	NCS,			
LR (LsCn) (WA)				
Q, WA				
Hypochrysops ignitus ignitus (Leach)	NCS, LR (LsCn) (V, SA)		Q, NSW, V, SA	
Jalmenus evagoras eubulus Miskin	LR (LsCn), VU (NSW)		Q, NSW	
Jalmenus icilius Hewitson	NCS, LR (NrTh) (V)		WA, Q, NSW, ACT, V, SA	
Jalmenus inous Hewitson	DD		WA	
Jalmenus lithochroa Waterhouse	LR (NrTh)	CR	SA	Adelaide region
Jalmenus notocrucifer Johnson, Hay & Bollam	DD		WA	
Jamides nemophilus nemophilus (Butler)	DD		TSI	
Jamides sp. nr. *phaseli* (Mathew)	DD		TSI	
Nacaduba biocellata biocellata (C. & R. Felder)	NCS, DD (T)		WA, NT, TSI, Q, T, NSW, V, SA	
Nacaduba calauria calauria (C. Felder)	DD		TSI	
Nacaduba pactolus cela Waterhouse and Lyell	DD		TSI	
Neolucia agricola occidens Waterhouse & Lyell	NCS	DD	WA	Julimar
Neopithecops lucifer heria (Fruhstorfer)	DD		TSI, Q	
Ogyris genoveva splendida (Tindale)	DD		SA, WA	

Taxon	Conservation status [1]		Range States [2]	Locality of municipal concern
	National/State	Municipal		
Ogyris iphis doddi (Waterhouse & Lyell)	DD		NT	
Ogyris otanes C. & R. Felder	DD, EN (V)		NSW, V, SA, WA	
Paralucia spinifera Edwards & Common	LR (CnDp)		NSW	
Philiris azula Wind & Clench	DD		Q	
Prosotas gracilis saturiator (Rothschild)	DD		TSI	
Pseudalmenus chlorinda zephyrus Waterhouse & Lyell	NCS, LR (NrTh) (T)		NSW, ACT, V, T	
Pseudodipsas cephenes Hewitson	NCS, DD (NSW)		Q, NSW	
Theclinesthes albocincta (Waterhouse)	NCS, DD (Q)		WA, NT, Q, NSW, V, SA	
Theclinesthes hesperia hesperia Sibatani & Grund	LR (LsCn)		WA	
Zizinz otis (Fabricius)	DD		CHI, LHI	

APPENDIX 3:
Australian butterflies: Distribution & previous threat assessments

1 *Threat categories*: EX, Extinct; CR, Critically Endangered; EN, Endangered; TH, Threatened; VU, Vulnerable; CS, Conservation Significance; LR, Lower Risk; DD, Data Deficient; NCS, No Conservation Significance.

2 *Butterfly Action Plan Workshop Assessments*: [a] Queensland; [b] Western Australia; [c] Victoria; [d] New South Wales; [e] South Australia; [f] Tasmania; [g] Australian Capital Territory; [h] NorthernTerritory.

3 *Published threat categories* (brackets if only that State; categories not all standardised).

4 *Australian mainland, islands & Territories* - NT, Northern Territory; Q, Queensland; NSW, New South Wales; V, Victoria; T, Tasmania; SA, South Australia; WA, Western Australia.; TSI, Torres Strait islands; LHI, Lord Howe Island; NFI, Norfolk Island; COI, Cocos-Keeling Islands; CHI, Christmas Island.

5 *Conservation & distribution sources, other than Common and Waterhouse (1981)*

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
HESPERIIDAE				
COELIADINAE				
Allora doleschallii doleschallii Felder)	NCS[adfg]	LR CS	TSI, Q	Dunn et al. 1994, (C. QNCA 1994
Allora major major (Rothschild)	NCS[adfg]	CS	Q	Hill & Michaelis 1988
Badamia exclamationis (Fabricius)	NCS[abcdfg]	CS	WA, NT, TSI, Q, NSW, V	Hill & Michaelis 1988
Hasora chromus chromus (Cramer)	NCS[adfg]		NT, TSI, Q, NSW	
Hasora discolor mastusia Fruhstorfer	NCS[abcdfg]		TSI, Q, NSW	
Hasora hurama hurama (Butler)	NCS[adfg]		NT, TSI, Q	
Hasora khoda haslia Swinhoe	NCS[acdfg]		Q, NSW	
PYRGINAE				
Chaetocneme beata (Hewitson)	NCS[adfg]		Q, NSW	
Chaetocneme sphinterifera sphinterifera (Fruhstorfer)	NCS[adg]	LR CS	TSI, Q	Dunn et al. 1994, QNCA 1994, Parsons 1998
Chaetocneme denitza (Hewitson)	NCS[adg h]		WA, NT, Q	
Chaetocneme porphyropis (Meyrick & Lower)	NCS[adfg]	VU CS	Q	Dunn et al. 1994, QNCA 1994
Euschemon rafflesia rafflesia (W.S. Macleay)	CS[a] NCS[dfg]	TH, LR CS	Q, NSW	Mahood 1980, Fry & Robinson 1986, Sands 1990, Dunn et al. 1994, IUCN 1988, 1994
Euschemon rafflesia alba Mabille	NCS[adfg]	LR CS	Q	Dunn et al. 1994, QNCA 1994
Exometoeca nycteris Meyrick	NCS[adg] DD[b]	VU CS	WA	Dunn et al. 1994

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Netrocoryne repanda repanda C. & R. Felder	NCS[acdfg]		Q, NSW, ACT, V	
Netrocoryne repanda expansa Waterhouse	NCS[adfg]		Q	
Tagiades japetus janetta Butler	NCS[adfg]		TSI, Q	
Tagiades nestus korela Mabille	DD[adg]		TSI	Waterhouse & Lyell 1914
TRAPEZITINAE				
Anisynta cynone cynone (Hewitson)	NCS[d] VU[efg]	CS VU	SA	Hill & Michaelis 1988, Braby 2000, Grund 2001,
Anisynta cynone gracilis (Tepper)	NCS[dfg] CS[e(coastal)]	CS TH	SA	Hill & Michaelis 1988
Anisynta cynone grisea Waterhouse	NCS[acdfg]	VU (V) TH	NSW, V	Dunn et al. 1994,
Anisynta cynone gunneda L.E. Couchman	NCS[acdfg]	VU CS	NSW	Dunn et al. 1994
Anisynta dominula dominula (Plötz)	NCS[acdfg]	DD CS	T	Dunn et al. 1994
Anisynta dominula drachmophora (Meyrick)	NCS[acdfg]		NSW, V	
Anisynta dominula draco Waterhouse	NCS[acdfg]		NSW	
Anisynta dominula dyris Waterhouse	NCS[acdfg]		ACT	
Anisynta dominula pria (Waterhouse)	NCS[adf]		T	
Anisynta dominula, ssp. "Moree"	DD[ag]		NSW	
Anisynta monticolae (Olliff)	NCS[acdfg]		NSW, ACT, V	
Anisynta sphenosema (Meyrick & Lower)	NCS[abcdfg]		WA	
Anisynta tillyardi Waterhouse & Lyell	NCS[acdfg]		Q, NSW	
Antipodia atralba (Tepper)	DD[cd] NCS[efg]	CS TH (V)	V, SA	Douglas 1993, Venn 1993, Braby 2000
Antipodia chaostola chaostola (Meyrick)	NCS[acdfg]	EN CS	NSW	Dunn et al. 1994, Hill & Michaelis 1988, Nadolny 1987
Antipodia chaostola chares (Waterhouse)	DD[cg]	VU,TH, CS	V	Bell 1978, Sands 1990, Douglas 1993, Dunn et al. 1994, D. Crosby pers. comm.

Taxon	Categories[1] Workshops[2]	Publ.[3]	Distribution[4]	Key references[5]
Antipodia chaostola leucophaea (L.E. Couchman)	NCS[e] DD[f]	EN,VU, CS, TH	T	IUCN 1988, Hill & Michaelis 1988, Dunn et al. 1994, Neyland 1994, Braby 2000
Antipodia dactyliota dactyliota (Meyrick)	DD[b] (Geralton)	DD CS	WA	Hill & Michaelis 1988, Dunn et al. 1994
Antipodia dactyliota anaces (Waterhouse)	NCS[abcdg]	LR CS	WA	Dunn et al. 1994
Antipodia dactyliota anapus (Waterhouse)	NCS[abcdg]		WA	
Antipodia dactyliota nila (Waterhouse)	DD[bg] CS	DD	WA	Dunn et al. 1994
Croitana aestiva Edwards	DD[adg h]	DD CS	NT	Hill & Michaelis 1988, Dunn et al. 1994
Croitana arenaria Edwards	DD[adefg h]	DD CS	NT, SA	Dunn et al. 1994
Croitana croites (Hewitson)	NCS[abcdg]		WA	
Dispar compacta (Butler)	NCS[abcdfg]		Q, NSW, ACT, V	
Herimosa albovenata albovenata (Waterhouse)	VU[eg] CS[f]	LR, TH CS	SA	Nodolny 1987, Hill & Michaelis 1988, Sands 1990, Watts 1992, Dunn et al. 1994, Braby 2000, Grund 2001.
Herimosa albovenata fuscata (Parsons)	NCS[abcd]	LR, CS TH	WA	Nodolny 1987, Dunn et al. 1994, Hill & Michaelis 1988, Braby 2000
Herimosa albovenata weemala (L.E. Couchman)	NCS[bdg] DD[af]	EN TH	NSW	Nodolny 1987, Hill & Michaelis 1988, Dunn et al. 1994
Hesperilla chysotricha chysotricha (Meyrick & Lower)	NCS[abcd]		WA	
Hesperilla chysotricha cyclospila (Meyrick & Lower)	NCS[acdfg]		V	
Hesperilla chysotricha leucosia Waterhouse	NCS[acdg] VU[e] DD[f]	CS, VU (SA)	V, SA	Hill & Michaelis 1988, Grund 2001 (as ssp. *cyclospila*).
Hesperilla chysotricha lunawanna L.E. Couchman	NCS[ad f]	VU CS	T	Dunn et al. 1994
Hesperilla chysotricha naua L.E. Couchman	NCS[d g] VU[e] DD[f]	LR CS	SA, Eyre Pen. Kangaroo Is.	Dunn et al. 1994
Hesperilla chysotricha plebeia Waterhouse	NCS[ad f]		T	
Hesperilla crypsargyra crypsargyra (Meyrick)	NCS[acdfg]	LR CS	NSW	Dunn et al. 1994
Hesperilla crypsargyra hopsoni Waterhouse	NCS[acdfg]		Q, NSW	

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Hesperilla crypsargyra lesouefi Tindale	NCS[acdfg]	CS	V	Douglas 1993
Hesperilla crypsigramma (Meyrick & Lower)	NCS[abcdfg h]		NT, Q, NSW	
Hesperilla donnysa donnysa Hewitson	NCS[acdfg]		NSW, ACT	
Hesperilla donnysa aurantia Waterhouse	NCS[d fg]	T		
Hesperilla donnysa albina Waterhouse	NCS[abcdg]		WA	
Hesperilla donnysa diluta Waterhouse	NCS[acdfg]	CS	SA	Hill & Michaelis 1988
Hesperilla donnysa delos Waterhouse	NCS[acd g]	CS	SA, V	Hill & Michaelis 1988
Hesperilla donnysa galena Waterhouse	DD[abg] VU[e]	DD CS	WA	Dunn et al. 1994 Hill & Michaelis 1988
Hesperilla donnysa icaria Waterhouse	NCS[acdfg]		Q, NSW	
Hesperilla donnysa patmos Waterhouse	NCS[acdfg]		V	
Hesperilla donnysa samos Waterhouse	NCS[acdfg]		NSW	
Hesperilla donnysa ssp.	NCS[g]		Flinders Is.	C. Meyer pers. comm.
Hesperilla flavescens flavescens Waterhouse	LR[cg]	VU, CS TH, EN	V	Hill & Michaelis 1988, Sands 1990, Vaughan 1998, New 1991, Braby 2000, Dunn et al. 1994, Douglas 1993, Grund 2001.
Hesperilla flavescens flavia Waterhouse	VU[eg] CE, St Kilda[e f]	VU, CS TH	SA	Hill & Michaelis 1988, Sands 1990, Dunn et al. 1994
Hesperilla furva Sands & Kerr	NCS[acdfg]		Q	
Hesperilla idothea idothea (Miskin)	NCS[acdfg]		Q, NSW, V,T	
Hesperilla idothea clara Waterhouse	NCS[acdg] CS[e] VU[f]	TH, CS, VU (SA)	V, SA	Braby 2000, Grund 2001.
Hesperilla malindeva malindeva Lower	NCS[acdfg]		TSI, Q, NSW	Moss 1995
Hesperilla mastersi mastersi Waterhouse	NCS[acdfg]		Q, NSW, V	
Hesperilla mastersi marakupa L.E. Couchman	DD[d fg]	EX TH	T	Hill & Michaelis 1988, IUCN 1988, Sands 1990, Dunn et al. 1994.

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Hesperilla ornata ornata (Leach)	NCS[acdfg]		Q, NSW, V	
Hesperilla ornata monotherma Lower	NCS[acdfg]		Q	
Hesperilla picta (Leach)	NCS[bcdfg] CS[a]		Q, NSW, V	
Hesperilla sarnia Atkins	NCS[acdfg]	Q		
Hesperilla sexguttata Herrich-Schäffer	NCS[abcdfg h]		WA, NT, TSI, Q	
Mesodina aeluropis Meyrick	NCS[acdfg]	LR CS	NSW	Dunn et al. 1994
Mesodina cyanophracta Lower	NCS[abcdfg]		WA	
Mesodina gracillima Edwards	DD[adf] NCS[g h]	DD CS	NT	Dunn et al. 1994
Mesodina halyzia (Hewitson)	NCS[acdfg]		Q, NSW, V	
Mesodina hayi Edwards & Graham	DD[bg]	TH, CS	WA	Williams and Atkins 1997 (Quarirading pop.), Braby 2000
Motasingha dirphia (Hewitson)	NCS[abcdfg]		WA	
Motasingha trimaculata trimaculata (Tepper)	NCS[acdefg]	CS	V, SA	Hill & Michaelis 1988, Watts 1992
Motasingha trimaculata dea Waterhouse	NCS[acdfg]	LR CS	NSW	Watts 1992, Dunn et al. 1994
Motasingha trimaculata dilata Waterhouse	NCS[acdfg]		Q, NSW	
Motasingha trimaculata occidentalis Moulds & Atkins	NCS[abcdfg]		WA	
Neohesperilla croceus (Miskin)	NCS[acdfg h]		NT, TSI, Q	
Neohesperilla senta (Miskin)	NCS[abcdfg h]		WA, NT, Q	
Neohesperilla xanthomera (Meyrick & Lower)	NCS[acdfg h]		NT,Q, NSW	
Neohesperilla xiphiphora (Lower)	NCS[acdfg]		NT, TSI, Q	
Oreisplanus munionga munionga (Olliff)	NCS[acdfg]		NSW, ACT, V	
Oreisplanus munionga larana L.E. Couchman	NCS[deg] CS[f]	EN, CS TH	T	Hill & Michaelis 1988, IUCN 1988, Dunn et al. 1994, Braby 2000
Oreisplanus perornatus (Kirby)	NCS[acdfg]	CS	NSW, V	Nadolny 1987, Hill & Michaelis 1988
Pasma tasmanica (Miskin)	NCS[acdefg]	CS	Q, NSW, ACT, V, T	Douglas 1993
Proedoisa polysema (Lower)	NCS[abcdf h] DD[g]		WA, NT, Q	

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Rachelia extrusa (C. & R. Felder)	NCS[adg]	CS	Q	Hill & Michaelis 1988
Signeta flammeata (Butler)	NCS[acdefg]		Q, NSW, ACT, V, SA	
Signeta tymbophora (Meyrick & Lower)	NCS[acdfg]	CS	Q, NSW	Dunn et al. 1994
Toxidia andersoni (Kirby)	NCS[acdfg]		Q, NSW, V	
Toxidia doubledayi (C. Felder)	NCS[acdfg]		Q, NSW, V	
Toxidia inornata inornata (Butler)	NCS[adg]		Q	
Toxidia melania (Waterhouse)	NCS[acdfg]		Q	
Toxidia parvula (Plötz)	NCS[acdfg]		Q, NSW, ACT, V	
Toxidia peron (Latreille)	NCS[abcdfg]		Q, NSW, ACT, V	
Toxidia rietmanni rietmanni (Semper)	NCS[adfg]		Q, NSW	
Toxidia rietmanni parasema Lower	NCS[adfg]		Q	
Toxidia thyrrhus Mabille	NCS[adfg]		Q	
Trapezites argenteoornatus argenteoornatus (Hewitson)	NCS[abcdg]		WA (isl.)	
Trapezites argenteoornatus insula (Waterhouse)	NCS[abcdg]		WA	
Trapezites atkinsi Williams, Williams and Hay	DD[ad] VU[bg]	VU, CS	WA	Williams, Williams and Hay 1998, Braby 2000
Trapezites eliena (Hewitson)	NCS[acdfg] VU[e]	CS, VU (SA)	Q, NSW, ACT, V, SA	Hill & Michaelis 1988, Watts 1992, Grund 2001.
Trapezites genevievae Atkins	NCS[abcdfg]	VU	Q, NSW	Atkins 1997
Trapezites heteromacula Meyrick and Lower	NCS[acdfg]	CS	TSI, Q	Hill & Michaelis 1988
Trapezites iacchus (Fabricius)	NCS[acdfg]		TSI, Q, NSW	
Trapezites iacchoides Waterhouse	NCS[acdf]		Q, NSW, V	
Trapezites luteus luteus (Tepper)	NCS[acdg] VU[b] DD[f]	CS TH (V) VU (SA)	V, SA	Vaughan 1988, Hill & Michaelis 1988, Watts 1992, Douglas 1993, Braby 2000, Grund 2001.
Trapezites luteus glaucus Waterhouse & Lyell	NCS[dfg]		T	
Trapezites luteus leucon Waterhouse	NCS[cdfg] CS[a]		Q, NSW, ACT	Q: eastern population
Trapezites macqueeni Kerr & Sands	NCS[acdfg]		Q	
Trapezites maheta (Hewitson)	NCS[acdfg]		Q, NSW	

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Trapezites petalia (Hewitson)	NCS[acdfg]		Q, NSW	
Trapezites phigalia phigalia (Hewitson)	NCS[acdfg] VU[e]	CS TH (SA) VU (SA)	NSW, ACT, V, SA	Hill & Michaelis 1988, Vaughan 1988, Braby 2000, Grund 2001.
Trapezites phigalia philus Waterhouse	NCS[adfg]		Q	
Trapezites phigalioides Waterhouse	NCS[acdfg]		Q, NSW, ACT, V	
Trapezites praxedes (Plötz)	NCS[acdfg]		Q, NSW, V	
Trapezites sciron sciron Waterhouse & Lyell	NCS[abcdg]		WA	
Trapezites sciron eremicola Burns	NCS[acdefg]	CS	V, SA	Hill & Michaelis 1988, Watts 1992, Douglas 1993
Trapezites symmomus symmomus Hübner	NCS[acdfg]		Q, NSW, V	
Trapezites symmomus soma Waterhouse	NCS[acdfg] VU[e]	VU (SA)	V, SA	Grund 2001.
Trapezites symmomus sombra Waterhouse	NCS[abcdfg]	LR CS	Q	Dunn et al. 1994 QNCA 1994
Trapezites taori Atkins	NCS[adg]		Q	Atkins 1997
Trapezites waterhousei Mayo & Atkins	NCS[abcdfg]	DD CS	WA	Dunn et al. 1994
HESPERIINAE				
Arrhenes marnas affinis (Waterhouse & Lyell)	NCS[acdfg]		Q	
Arrhenes dschilus iris (Waterhouse)	NCS[acdfg]		Q	
Borbo cinnara (Wallace)	NCS[acdfg h]	DD(NT) CS	NT, TSI, Q	Dunn et al. 1994
Borbo impar lavinia (Waterhouse)	NCS[acdg h]		NT, Q	
Borbo impar tetragraphus (Mabille)	NCS[acdfg]		TSI	Lambkin and Knight 1990
Cephrenes augiades sperthias (C. Felder)	NCS[abcdfg]		TSI, Q, NSW, V, WA	
Cephrenes augiades ssp.	NCS[g h]		NT	D. Wilson\C. Meyer pers. comm.
Cephrenes trichopepla (Lower)	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
Mimene atropatene (Fruhstorfer)	NCS[adg]	CS	Q	Hill & Michaelis 1988
Notocrypta waigensis proserpina (Butler)	NCS[adfg]		TSI, Q	
Ocybadistes ardea ardea Bethune-Baker	NCS[adfg]		TSI	

Taxon	Categories[1] Workshops[2]	Publ.[3]	Distribution[4]	Key references[5]
Ocybadistes ardea heterobathra (Lower)	NCS[adfg]		TSI, Q	
Ocybadistes flavovittatus flavovittatus (Latreille)	NCS[acdfg]		Q, NSW	
Ocybadistes flavovittatus ceres Waterhouse	NCS[adfg]		TSI, Q	
Ocybadistes flavovittatus vesta (Waterhouse)	NCS[adfg]		NT	
Ocybadistes hypomeloma hypomeloma Lower	NCS[acdfg]		Q, NSW	
Ocybadistes hypomeloma vaga (Waterhouse)	NCS[abcdfg h]		WA, NT, TSI,	
Ocybadistes knightorum Lambkin & Donaldson	CE[a], EN[g] VU[df]	TH, CS	NSW	Sands 1997, Braby 2000
Ocybadistes walkeri hypochlorus Lower	NCS[acdefg]		SA	
Ocybadistes walkeri olivia Waterhouse	NCS[abcdf h]		WA, NT	
Ocybadistes walkeri sonia Waterhouse	NCS[acdfg]		TSI, Q	Lambkin and Knight 1990
Ocybadistes walkeri sothis Waterhouse	NCS[acdfg]		Q, NSW, ACT, V, T	
Parnara amalia (Semper)	NCS[acdfg]		NT, Q, NSW	
Parnara bada sida (Waterhouse)	NCS[acdfg]		Q, NSW	
Pelopidas agna dingo Evans	NCS[abcdf]		WA, NT, TSI, Q, NSW	Lambkin and Knight 1990
Pelopidas lyelli lyelli (Rothschild)	NCS[acdfg]		NT, TSI, Q	
Pseudoborbo bevani (Moore)	DD[dfg h]		NT	
Sabera caesina albifascia (Miskin)	NCS[acdfg]		TSI, Q	
Sabera dobboe autoleon (Miskin)	NCS[acdfg]		TSI, Q	
Sabera fuliginosa fuliginosa (Miskin)	NCS[acdfg]		Q	
Suniana lascivia lascivia (Rosenstock)	NCS[acdfg]		Q, NSW, V	
Suniana lascivia neocles (Mabille)	NCS[acdfg]		TSI, Q	
Suniana lascivia larrakia L.E. Couchman	NCS[abcdfg]		WA, NT	
Suniana lascivia lasus Waterhouse	DD[abcdf hg]	DD CS	Bathurst Is.	Dunn et al. 1994
Suniana sunias nola (Waterhouse)	NCS[acdfg]		Q, NSW	

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Suniana sunias rectivitta (Mabille)	NCS[acdfg]		TSI, Q	
Suniana sunias sauda Waterhouse	NCS[acdfg h]		NT	
Taractrocera anisomorpha (Lower)	NCS[abcdf h]		WA, NT, TSI, Q	
Taractrocera dolon dolon (Plötz)	NCS[abcfg] DD[d]		Q, NSW	
Taractrocera dolon diomedes Waterhouse	NCS[acdfg]		NT	
Taractrocera ina Waterhouse	NCS[acfg h] DD[d]	CS (NSW)	NT, TSI, Q, NSW	Braby 2000
Taractrocera ilia ilia Waterhouse	NCS[acdfg h]	LR CS	NT	Dunn et al. 1994
Taractrocera papyria papyria (Boisduval)	NCS[acdefg]		Q, NSW, V, T, SA, LHI	Smithers 1971
Taractrocera papyria agraulia (Hewitson)	NCS[abcdg]		WA	
Telicota ancilla ancilla (Herrich-Schäffer)	NCS[acdfg]		Q, NSW, V	
Telicota ancilla baudina Evans	NCS[acdf] DD[bg]	DD CS	WA, NT	Dunn et al. 1994
Telicota augias argilus Waterhouse	NCS[abcdfg]		WA, NT	
Telicota augias krefftii (W.J. Macleay)	NCS[acdfg]		TSI, Q	
Telicota anisodesma Lower	CS [a] NCS[cdfg]	LR (NSW) CS	Q, NSW	Dunn et al. 1994 Q: coastal populations
Telicota brachydesma Lower	NCS[acdfg]	DD CS	Q	Dunn et al. 1994
Telicota colon argeus (Plötz)	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
Telicota eurychlora Lower	CS [a] DD[cdf] NCS[g]	VU (NSW) CS	Q, NSW, V	Dunn et al. 1994, Braby 2000
Telicota eurotas laconia Waterhouse	NCS[acdfg]	DD CS	Q	Dunn et al. 1994
Telicota mesoptis mesoptis Lower	NCS[acdf] DD[g]	CS (NT)	TSI, NT, Q	Braby 2000
Telicota ohara ohara (Plötz)	NCS[acdfg]		TSI, Q	
PAPILIONIDAE				
PAPILIONINAE				
Atrophaneura polydorus queenslandicus (Rothschild)	NCS[acdfg]		TSI, Q	

Taxon	Categories[1] Workshops[2]	Publ.[3]	Distribution[4]	Key references[5]
Cressida cressida cressida (Fabricius)	NCS[abcfg] DD[d]		TSI, Q, NSW	
Cressida cressida cassandra (Waterhouse & Lyell)	NCS[abcdfg h]		WA, NT	
Graphium agamemnon ligatum (Rothschild)	NCS[acdfg]		TSI, Q	
Graphium aristeus parmatum (Gray)	NCS[acdfg]		Q	
Graphium eurypylus lycaon (C. & R. Felder)	NCS[abcdfg]		Q, NSW	
Graphium eurypylus lycaonides (Rothschild)	NCS[acdfg]		TSI	
Graphium eurypylus nyctimus (Waterhouse & Lyell)	NCS[abcdfg]		WA, NT	
Graphium macfarlanei macfarlanei (Butler)	NCS[acdfg]		TSI, Q	
Graphium macleayanum macleayanum (Leach)	NCS[acdfg]		Q, NSW, ACT, V, T	
Graphium macleayanum insulanum (Waterhouse)	DD[acdfg]		LHI, NFI	Smithers 1970, LHI, not established: Smithers pers. comm
Graphium macleayanum moggana Couchman	NCS[acdfg]		T	
Graphium macleayanum wilsoni Couchman	NCS[acdfg]		Q	
Graphium sarpedon choredon (C. & R. Felder)	NCS[acdfg]		TSI, Q, NSW, ACT	
Ornithoptera euphorion (Gray)	NCS[abcdfg]	CS	Q	QNCA 1994
Ornithoptera priamus macalpinei Moulds	NCS[acdfg]	CS	Q	QNCA 1994
Ornithoptera priamus poseidon (Doubleday)	NCS[acdfg]	CS	TSI	QNCA 1994
Ornithoptera priamus pronomus (Gray)	NCS[acdfg]	CS	TSI, Q	QNCA 1994
Ornithoptera richmondia (Gray)	VU (Qld)[a] NCS[cdg]	LR (NSW), VU (Q), CS,TH	Q, NSW	Bell 1978, Mahood 1980, Fry & Robinson 1986, Vaughan 1988, Dunn et al. 1994, QNCA 1994, Braby 2000
Papilio anactus W.S. Macleay	NCS[acdfg]		NT, Q, NSW, ACT, V, SA	
Papilio aegeus aegeus Donovan	NCS[acdfg]		TSI, Q, NSW, SA, V, ACT, NFI, LHI	Smithers 1971, NFI: not established, Smithers pers. comm.
Papilio aegeus ormenus Guérin-Méneville	NCS[acdfg]		TSI	

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Papilio ambrax ambrax Boisduval	NCS[acdfg]		TSI	
Papilio ambrax egipius Miskin	NCS[acdfg]		Q	
Papilio amynthor amphiaraus C. & R. Felder	NCS[d]		NI	Smithers 1970
Papilio canopus canopus Westwood	NCS[abcdfg]		WA, NT	
Papilio demoleus malayanus Wallace	DD[ad]		CHI	Moulds and Lachlan 1987
Papilio demoleus sthenelus (W.S. Macleay)	NCS[abcdefg]		WA, NT, Q,NSW, ACT, V, SA, LHI	Smithers 1971
Papilio fuscus capaneus Westwood	NCS[acdfg]		Q, NSW	
Papilio fuscus indicatus Butler	NCS[acdfg]		TSI	
Papilio memnon memnon Linneaus	DD[d]		CHI	Waterhouse & Lyell 1914, Moulds and Humphrey 2000
Papilio ulysses joesa Butler	NCS[abcdfg]	CS	Q	QNCA 1994
Protographium leosthenes leosthenes (Doubleday)	NCS[acdfg]		TSI, Q, NSW	
Protographium leosthenes geimbia (Tindale)	NCS[acdfg h]	LR CS	NT	T. L. Fenner in Yen & Butcher 1997 Dunn et al. 1994

PIERIDAE

COLIADINAE

Taxon	Work-shops	Publ.	Distribution	Key references
Catopsilia gorgophone gorgophone (Boisduval)	NCS[acdfg]		Q, NSW	
Catopsilia pomona pomona (Fabricius)	NCS[abcdfg]		WA, NT, TSI, Q, NSW, SA, CHI	
Catopsilia pyranthe crokera (W.S. Macleay)	NCS[abcdfg]		WA, NT, Q, NSW, V, SA, LHI	Smithers 1971
Catopsilia scylla etesia (Hewitson)	NCS[abcdfg h]		WA, NT, Q	
Eurema alitha alitha (C. & R. Felder)	NCS[afg h]		NT, Q	
Eurema alitha amplexa (Butler)	DD[d]		CHI	Moulds and Lachlan 1987
Eurema blanda blanda (Boisduval)	NCS[acdf]		CHI	Moulds and Lachlan 1987
Eurema blanda saraha (Fruhstorfer)	NCS[acdfg]		TSI	Waterhouse & Lyell 1914
Eurema brigitta australis (Wallace)	NCS[acdfg]		NT, TSI, Q, NSW	
Eurema brigitta drona	NCS[acd]		LHI	Smithers 1971

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Eurema puella virgo (Wallace)	NCS[acdfg]		Q	
Eurema hecabe phoebus (Butler)	NCS[acdfg]		WA, NT, TSI, Q, NSW, SA	Lambkin and Knight 1990
Eurema herla (W.S. Macleay)	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
Eurema laeta lineata (Miskin)	NCS[abcdfg]		WA, NT, TSI, Q	
Eurema smilax (Donovan)	NCS[abcdg]		WA, NT, TSI, Q, V, NSW, ACT, SA, LHI	Smithers 1971
PIERINAE				
Appias ada caria Waterhouse & Lyell	NCS[acdfg]		Q	
Appias albina albina (Boisduval)	DD[ag h]		NT, TSI	
Appias celestina (Boisduval)	NCS[acdfg]		Q	
Appias melania (Fabricius)	NCS[acdfg]		Q	
Appias paulina ega (Boisduval)	NCS[abcdfg]		WA, NT, TSI, Q, NSW, ACT,V, LHI	Smithers 1971
Appias paulina micromalayana (Fruhstorfer)	NCS[acd]		CHI	Moulds and Lachlan 1987
Belenois java teutonia (Fabricius)	NCS[abcdeg]		WA, NT, TSI, Q, NSW, ACT, V, SA, LHI	Smithers 1971
Belenois java peristhene (Boisduval)	NCS[acd]		NI	Smithers 1970
Cepora perimale perimale (Donovan)	NCS[acd]		NI	Smithers 1970
Cepora perimale latilimbata (Butler)	NCS[acdfg]		TSI	
Cepora perimale scyllara (W.S. Macleay)	NCS[acdfg] DD[b]		WA, NT, TSI, Q, NSW	
Delias aganippe (Donovan)	NCS[abcdeg]		WA, NT, Q, SA, NSW, ACT, V	
Delias argenthona argenthona (Fabricius)	NCS[acdfg]		TSI, Q, NSW	
Delias argenthona fragalactea (Butler)	NCS[abcdg]		WA, NT	
Delias aruna inferna Butler	NCS[acdfg]		TSI, Q	
Delias ennia nigidius Miskin	NCS[acdfg]		Q	
Delias ennia tindalii Joicey & Talbot	NCS[acdg]		Q	
Delias harpalyce (Donovan)	NCS[acdfg]		Q, NSW, ACT, V	
Delias mysis mysis (Fabricius)	NCS[acdfg]		Q	
Delias mysis aestiva Butler	NCS[acd gh] DD[b]	CS	WA, NT	Dunn et al. 1994
Delias mysis onca Fruhstorfer	NCS[acdfg]		TSI	

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Delias mysis waterhousei Talbot	NCS[acdfg]		Q	
Delias nigrina (Fabricius)	NCS[acdfg]		Q, NSW, ACT, V	
Delias nysa nysa (Fabricius)	NCS[acdfg]		Q, NSW, V	
Delias nysa nivira Waterhouse & Lyell	NCS[acdg]		Q	
Elodina angulipennis (P. H. Lucas)	NCS[acdfg]		TSI, Q, NSW	Lambkin and Knight 1990
Elodina claudia DeBaar and Hancock	NCS[acdfg]	CS	Q	Dunn et al. 1994
Elodina padusa (Hewitson)	NCS[abcdefg]		WA, NT, Q, NSW, ACT,V, SA	
Elodina parthia (Hewitson)	NCS[acdfg]		Q, NSW	
Elodina perdita Miskin	NCS[adfg]	CS	Q	M. Braby 2000
Elodina queenslandica queenslandica DeBaar and Hancock	NCS[acdfg]		TSI, Q	
Elodina queenslandica kuranda DeBaar and Hancock	NCS[acdfg]		Q	
Elodina tongura Tindale	NCS[acdf h] DD[g]	CS	NT	Dunn et al. 1994
Elodina walkeri Butler	NCS[abcdfg h]		WA, NT, Q	
Leptosia nina comma Fruhstorfer	NCS[abcdg]	CS	WA	Hill & Michaelis 1988
Pieris rapae rapae (Linnaeus)	NCS[abcdfg]		WA, NT, SA, Q, NSW, ACT, V, T	

NYMPHALIDAE

ACRAEINAE

Acraea andromacha andromacha (Fabricius)	NCS[abcdefg]		WA, NT, TSI, Q, NSW, ACT, V, SA	

AMATHUSIINAE

Taenaris artemis jamesi Butler	NCS[adfg]	CS	TSI, Q Sands 1990	
Taenaris catops turdula Fruhstorfer	NCS[adfg]		TSI	

APATURINAE

Apaturina erminea papuana Ribbe	NCS[adg]	CS	Q	Hill & Michaelis 1988, Sands 1990

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
ARGYNNINAE				
Argyreus hyperbius inconstans (Butler)	EN[a] DD[dfg]	EN (Q) TH, CS	Q, NSW	Mahood 1980, Nodolny 1987, Hill & Michaelis 1988, Sands 1990, Dunn et al. 1994, QNCA 1994, Braby 2000
Cupha prosope prosope (Fabricius)	NCS[acdfg]		Q, NSW	
Cupha prosope turneri (Butler)	NCS[acdfg]		TSI	
Phalanta phalantha araca (Waterhouse & Lyell)	NCS[acdg h]		NT	
Vagrans egista propinqua (Miskin)	NCS[acdfg]		TSI, Q	
Vindula arsinoe ada (M.R. Butler)	NCS[acdfg]		TSI, Q	
CHARAXINAE				
Polyura andrewsi (Butler)	DD[d]		CHI	Moulds and Lachlan 1987
Polyura sempronius sempronius (Fabricius)	NCS[abcdefg]		WA, NT, TSI, Q, NSW, ACT, V,SA	
Polyura sempronius tiberius (Waterhouse)	NCS[acdg]	CS	LHI	Dunn et al. 1994, Smithers 1971
Polyura sp. ? *jupiter* (Butler)	DD[adf]		TSI	Lambkin and Knight 1990
Charaxes latona papuensis Butler	NCS[acdg]	CS	TSI, Q	Hill & Michaelis 1988
DANAINAE				
Danaus affinis affinis (Fabricius)	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
D. affinis philene Stoll	NCS[acdfg]		TSI *affinis*	Parsons 1998: = *Danaus gelanor* (Waterhouse & Lyell)
Danaus chrysippus petilia (Stoll)	NCS[abcdefg]		WA, NT, TSI, Q, NSW, ACT, V, T, SA, LHI, NFI,CHI	Smithers 1971 NFI: migrant, Smithers pers. comm.
Danaus genutia alexis (Waterhouse & Lyell)	NCS[acdg h] DD[b]		WA, NT	
Danaus plexippus plexippus (Linnaeus)	NCS[abcdfg]		WA, NT, TSI, Q, NSW, ACT, V, T, SA, LHI, NFI, Flinders Is.	Smithers 1970, Smithers 1971. NFI: migrant, Smithers pers. comm.
Euploea alcathoe eichhorni Staudinger	NCS[acdfg]		Q	
Euploea alcathoe monilifera (Moore)	NCS[acdfg]	CS	TSI, Q	Dunn et al. 1994
Euploea alcathoe enastri Fenner	NCS[acdg h]	CS	NT	Dunn et al. 1994

Taxon	Categories[1]		Distribution[4]	Key references[5]
	Work-shops[2]	Publ.[3]		
Euploea algea amycus Miskin	NCS[acdfg]		TSI, Q	
Euploea batesii belia Waterhouse and Lyell	NCS[acdfg]		TSI, Q	
Euploea batesi resarta Butler	NCS[acdfg]		TSI	Lambkin and Knight 1990
Euploea climena macleari Butler	NCS[acd] DD[bgh]		WA, COI, CHI	
Euploea core corinna (W.S. Macleay)	NCS[abcdfg]		WA, NT, TSI, Q, NSW, ACT, SA, LHI, NFI	Smithers 1971
Euploea darchia darchia (W.S. Macleay)	NCS[abcdg h]		WA, NT	
Euploea darchia niveata (Butler)	NCS[acdfg]		TSI, Q	
Euploea modesta Butler ssp.	NCS[adf] DD[g]		TSI	
Euploea netscheri erana (Fruhstorfer)	NCS[adf] DD[g]		TSI	Parsons 1998
Euploea sylvester sylvester (Fabricius)	NCS[abdfg]		Q	
Euploea sylvester doleschallii C. & R. Felder	NCS[g]		TSI	Miller & Miller 1978
Euploea sylvester pelor Doubleday	NCS[abcdg]		WA, NT, Q	Daniels and Edwards 1998
Euploea tulliolus tulliolus (Fabricius)	NCS[acdfg]		TSI, Q, NSW	
Euploea leucostictos usipetes Hewitson	NCS[acdfg]		TSI, Q	Parsons 1999
Tirumala hamata hamata (W.S. Macleay)	NCS[abcdfg]		WA, NT, TSI, Q, NSW, ACT, V, LHI	Smithers 1971
Tirumala hamata subnubilia (Talbot)	NCS[acdfg]		TSI	
HELICONIINAE				
Cethosia cydippe chrysippe (Fabricius)	NCS[acdfg]		Q	
Cethosia penthesilea paksha Fruhstorfer	NCS[acdg h]		NT	
LIBYTHEINAE				
Libythea geoffroy genia Waterhouse	NCS[acdg h] DD[b]		WA, NT	
Libythea geoffroy nicevillei Olliff	NCS[acdfg]	VU	TSI, Q	Dunn et al. 1994, QNCA 1994
LIMENITIINAE				
Lexias aeropa eutychius (Fruhstorfer)	DD[acdg]	CS	Q	Sands 1990. Parsons 1998

Taxon	Categories[1] Work-shops[2]	Publ.[3]	Distribution[4]	Key references[5]
Neptis praslini staudingereana de Nicéville	NCS[acdfg]		TSI, Q	
Pantoporia consimilis pedia (Fruhstorfer)	NCS[acdfg]		TSI, Q	
Pantoporia venilia moorei (W.J. Macleay)	NCS[acdfg]		Q	
Phaedyma shepherdi shepherdi (Moore)	NCS[acdfg]		Q, NSW	
Phaedyma shepherdi latifasciata (Butler)	NCS[acdfg]		TSI, Q	
NYMPHALINAE				
Doleschallia bisaltide australis C. & R. Felder	NCS[acdfg]		TSI, Q, NSW	
Hypolimnas alimena darwinensis Waterhouse & Lyell	NCS[acdg]		NT	
Hypolimnas alimena lamina Fruhstorfer	NCS[acdfg]		TSI, Q, NSW	
Hypolimnas anomala anomala (Wallace)	NCS[acd]		CHI	Moulds and Lachlan 1987
Hypolimnas anomala albula (Wallace)	DD[acdfgh]		NT, TSI, Q	
Hypolimnas antilope (Cramer)	NCS[acdfg]		TSI	Wood 1987 Lambkin & Knight 1990
Hypolimnas bolina nerina (Fabricius)	NCS[abcdefg]		WA, NT, TSI, Q, NSW, ACT, V, SA, LHI, NI, CHI	Smithers 1970, Smithers 1971
Hypolimnas misippus (Linnaeus)	NCS[abcdf]		WA, NT, TSI, Q, NSW, NI, CHI	
Junonia erigone walkeri (Butler)	DD[acdg]	CS	NT (isl.)	Sands 1990
Junonia hedonia zelima (Fabricius)	NCS[acdfg]		NT, TSI, Q	
Junonia villida villida (Fabricius)	NCS[acd]		CHI	Moulds and Lachlan 1987
Junonia villida calybe (Godart)	NCS[abcdefg]		WA, NT, TSI, Q, NSW, ACT, V, T, SA, LHI, NI	Smithers 1970 Smithers 1971
Junonia orithya albicincta Butler	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
Mynes geoffroyi guerini Wallace	NCS[acdfg]		Q, NSW	
Vanessa cardui (Linnaeus)	NCS[abcdg]		WA	
Vanessa ? *gonerilla* (Fabricius)	DD[abcdg]		Macquarie Is.	
Vanessa itea (Fabricius)	NCS[abcdefg]		WA, NT, TSI, Q, NSW, ACT, V, T, SA, LHI, NI	Smithers 1970, Smithers 1971

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Vanessa kershawi (McCoy)	NCS[abcdefg]		WA, NT, TSI, Q, NSW, ACT, V, T, SA, LHI, NI, MI	Smithers 1970, Smithers 1971
Yoma sabina parva (Butler)	NCS[acdfg]		NT, TSI, Q	
SATYRINAE				
Argynnina cyrila Waterhouse & Lyell	NCS[acdfg]		Q, NSW, ACT, V	
Argynnina hobartia hobartia (Westwood)	NCS[acdfg]		T	
Argynnina hobartia tasmanica (Lyell)	NCS[acdfg]		T	
Argynnina hobartia lasus (Hewitson)	NCS[acdfg]		T	
Argynnina hobartia montana L.E. & R. Couchman	NCS[acdfg]		T	
Elymnias agondas australiana Fruhstorfer	NCS[acdfg]		Q	
Geitoneura acantha acantha (Donovan)	NCS[acdfg]	CS (SA)	Q, NSW, ACT	Braby 2000
Geitoneura acantha ocrea (Guest)	NCS[acdefg]		V, SA	
Geitoneura klugii klugii (Guérin-Méneville)	NCS[abcdfg]		WA, Q, NSW, ACT, V, T, SA	
Geitoneura klugii insula Burns	NCS[abcdfg]		WA (isl.)	
Geitoneura klugii mulesi (Burns)	NCS[adefg]	VU	SA (isl.)	Dunn et al. 1994
Geitoneura minyas minyas (Waterhouse & Lyell)	NCS[abcdg]		WA	
Geitoneura minyas mjobergi (Aurivillius)	NCS[abcdg]		WA	
Heteronympha banksii banksii (Leach)	NCS[acdfg]		NSW, ACT, V	
Heteronympha banksii mariposa Tindale	NCS[acdfg]		Q	
Heteronympha banksii nevina Tindale	NCS[acdfg]		V	
Heteronympha cordace cordace (Geyer)	NCS[acdfg]		NSW, ACT, V	
Heteronympha cordace comptena L.E. Couchman	NCS[acdfg]	CS	T	IUCN 1988, Hill & Michaelis 1988
Heteronympha cordace kurena L.E. Couchman	NCS[acdfg]	CS	T	Dunn et al. 1994
Heteronympha cordace legana L.E. Couchman	NCS[acdfg]	CS	T	Dunn et al. 1994

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Heteronympha cordace wilsoni Burns	NCS[deg] VU [c]	VU, TH CS, EN (SA)	V, SA	Dunn et al. 1994, Braby 2000, Grund 2001.
Heteronympha merope merope (Fabricius)	NCS[acdefg]		Q, NSW, ACT, V, SA	
Heteronympha merope duboulayi (Butler)	NCS[abcdg]		WA	
Heteronympha merope salazar Fruhstorfer	NCS[acdfg]		T, Flinders Is.	
Heteronympha mirifica (Butler)	NCS[acdfg]		Q, NSW	
Heteronympha paradelpha paradelpha Lower	NCS[acdfg]		NSW, ACT, V	
Heteronympha paradelpha deervalensis Burns	NCS[acdfg]		Q, NSW	
Heteronympha penelope penelope Waterhouse	NCS[acdefg]		NSW, ACT	
Heteronympha penelope alope Waterhouse	NCS[acdfg]		V	
Heteronympha penelope diemeni Waterhouse	NCS[acdfg]		T	
Heteronympha penelope maraia Tindale	NCS[acdefg]	CS	V, SA	Watts 1992
Heteronympha penelope panope Waterhouse	NCS[acdfg]		T	
Heteronympha penelope sterope Waterhouse	NCS[acdfg]		V	
Heteronympha solandri solandri Waterhouse	NCS[acdfg]		NSW, ACT, V	
Heteronympha solandri angela Tindale	NCS[acdfg]		V	
Hypocysta adiante adiante (Hübner)	NCS[acdfg]	CS	TSI, Q, NSW, V	Braby 2000
Hypocysta adiante antirius Butler	NCS[abcdfg h]		WA, NT	
Hypocysta angustata angustata Waterhouse & Lyell	NCS[acdfg]		Q	
Hypocysta euphemia Westwood	NCS[acdfg]		Q, NSW, ACT, V	
Hypocysta irius (Fabricius)	NCS[acdfg]		Q, NSW	
Hypocysta metirius Butler	NCS[acdfg]		Q, NSW	
Hypocysta pseudirius Butler	NCS[acdfg]		Q, NSW	
Melanitis amabilis valentina Fruhstorfer	DD[adfg]		TSI	

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Melanitis constantia constantia (Cramer)	DD[fg] NCS[ad]		TSI	
Melanitis leda bankia (Fabricius)	NCS[abcdfg]		WA, NT, TSI, Q, NSW, NI, LHI	Smithers 1971
Mycalesis perseus perseus (Fabricius)	NCS[acdfg]		NT, TSI, Q	
Mycalesis sirius sirius (Fabricius)	NCS[acdfg]	CS	NT, TSI, Q	Braby 2000
Mycalesis terminus terminus (Fabricius)	NCS[acdfg]		TSI, Q	
Nesoxenica leprea leprea (Hewitson)	NCS[acdfg]		T	
Nesoxenica leprea elia Waterhouse & Lyell	NCS[acdf]		T	
Oreixenica correae (Olliff)	NCS[acdfg]		NSW, ACT, V	
Oreixenica kershawi kershawi (Miskin)	NCS[acdfg]		NSW, V	
Oreixenica kershawi ella (Olliff)	NCS[acdfg]	CS	NSW	Bell 1978, Vaughan 1988
Oreixenica kershawi kanunda Tindale	NCS[acdfg]	CS VU (SA)	V, SA	Hill & Michaelis 1988, Watts 1992, Dunn et al. 1994, Grund 2001.
Oreixenica kershawi phryne Tindale	NCS[acdfg]		NSW, ACT	
Oreixenica lathoniella lathoniella (Westwood)	NCS[acdfg]		T	
Oreixenica lathoniella barnardi Turner	NCS[acdfg]	CS	T	Dunn et al. 1994
Oreixenica lathoniella herceus Waterhouse & Lyell	NCS[acdfg]	EN (SA)	Q, NSW, ACT, V, SA	Grund 2001, P. Grimshaw pers. comm.
Oreixenica lathoniella laranda Waterhouse & Lyell	NCS[acdfg]		T	
Oreixenica latialis latialis Waterhouse & Lyell	NCS[acdfg]		NSW, ACT, V	
Oreixenica latialis nama L.E. Couchman	NCS[adfg]		NSW	
Oreixenica latialis theddora L.E. Couchman	NCS[ad] LR[c]	CS	V	Vict. Conserv. Nat. Resources 1995
Oreixenica orichora orichora (Meyrick)	NCS[acdfg]		NSW, ACT, V	
Oreixenica orichora paludosa (T.P.Lucas)	NCS[acdf]		T	
Oreixenica ptunarra ptunarra L.E. Couchman	NCS[fg]	EX,VU TH, CS	T	Prince 1988, Neyland 1993, Dunn et al. 1994, Driessen 1999, Braby 2000

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Oreixenica ptunarra angeli L.E. Couchman	CS[f] (Valentine's Peak)	CS EX	T	Prince 1988, Neyland 1993, IAC 1994, Dunn et al. 1994
Oreixenica ptunarra roonina L.E. Couchman	VU[fg]	EX VU	T	Prince 1988, Neyland 1993, IAC 1994, Dunn et al. 1994
Oreixenica ptunarra ssp.	VU[f]		T	McQuillan & Ek (1996)
Orsotriaena medus moira Waterhouse & Lyell	NCS[adfg]	EN	TSI, Q	Dunn et al. 1994, QNCA 1994
Tisiphone abeona abeona (Donovan)	NCS[acdfg]		NSW	Fry & Robinson 1986
Tisiphone abeona albifascia Waterhouse	NCS[acdfg]	TH	NSW, V	Dunn 199? Vic Ent 26:79–
Tisiphone abeona antoni Tindale	NCS[defg]	VU (SA)	V, SA	Hill & Michaelis 1988, Watts 1992, Grund 2001 (as *albifasciata*).
Tisiphone abeona aurelia Waterhouse	NCS[acdfg]		NSW	
Tisiphone abeona joanna (Butler)	NCS[acdf] CS[g]	VU, TH CS	NSW	Hill & Michaelis 1988, Nonolny 1987, Mahood 1980, Sands 1990, Braby 2000
Tisiphone abeona morrisi Waterhouse	NCS[cdf], CE (Q)[ag]	VU, CS	Q, NSW	Dunn et al. 1994, Braby 2000 (Q)
Tisiphone abeona rawnsleyi (Miskin)	NCS[acdfg]		Q	
Tisiphone abeona regalis Waterhouse	NCS[acdfg]		Q, NSW	
Tisiphone abeona ssp. "Comboyne"	DD[dg]		NSW	R. Mayo pers. comm.
Tisiphone helena (Olliff)	NCS[acdfg]		Q	
Ypthima arctous arctous (Fabricius)	NCS[abcdfg]		WA, NT, TSI, Q, NSW, ACT, V	
TELLERVINAE				
Tellervo zoilus zoilus (Fabricius)	NCS[acdfg]		Q	
Tellervo zoilus digulica (Hustaert)	NCS[adfg]		TSI	Johnson et al. 1994
Tellervo zoilus gelo Waterhouse & Lyell	NCS[acdfg]		TSI, Q	
LYCAENIDAE				
LIPHYRINAE				
Liphyra brassolis major Rothschild	NCS[acdfg] DD[b]	CS	TSI,	Q QNCA 1994 Lambkin and Knight 1990

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Liphyra brassolis melania Waterhouse & Lyell	NCS[acdg h]		WA, NT	
POLYOMMATINAE				
Anthene lycaenoides godeffroyi (Semper)	NCS[abcdfg]		WA, NT, TSI, Q	
Anthene seltuttus affinis (Waterhouse & R.E. Turner)	NCS[acdfg]		NT, TSI, Q, (?NSW)	
Candalides absimilis (C. Felder)	NCS[acdfg]		Q, NSW	
Candalides absimilis ssp. (southern form)	DD[acd]		V	Braby 2000
Candalides acastus (Cox)	NCS[abcdefg]		Q, NSW, ACT, V, T, SA, WA	
Candalides consimilis consimilis Waterhouse	NCS[acdfg]		Q, NSW	
Candalides consimilis goodingi Tindale	NCS[acdfg]		NSW, ACT, V	
Candalides consimilis toza (Kerr)	DD[acdg]	CS	Q	Sands 1990, Dunn et al. 1994
Candalides cyprotus cyprotus (Olliff)	NCS[abcdefg]		NSW, V, SA, WA	
Candalides cyprotus pallescens (Tite)	NCS[acdfg]		Q, NSW	
Candalides erinus erinus (Fabricius)	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
Candalides geminus E.D. Edwards & Kerr	NCS[acdfg]		NT, Q, NSW	
Candalides gilberti Waterhouse	NCS[abcdfg h]		WA, NT, Q	Daniels and Edwards 1998
Candalides heathi heathi (Cox)	NCS[abcdefg]		Q, NSW, ACT, V, SA, WA	
Candalides heathi alpinus Waterhouse	NCS[acdfg]		NSW, ACT	
Candalides heathi aeratus (Montague)	NCS[abcdfg]	CS	WA (isl.)	Dunn et al. 1994
Candalides heathi doddi Burns	NCS[acdg]	CS	NSW	Dunn et al. 1994
Candalides heathi ssp. 'Wimmera'	CE[cd]	CS	V	Douglas 1995, Braby 2000
Candalides helenita helenita (Semper)	NCS[acdfg]		TSI, Q	
Candalides hyacinthinus hyacinthinus (Semper)	NCS[abcdefg]		Q, NSW, ACT, V, SA,WA	
Candalides hyacinthinus josephina Harris	NCS[cdg]	CS	V	Douglas 1995, Braby 2000

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Candalides hyacinthinus simplex (Tepper)	NCS[abcdefg]		NSW, V, SA, WA	
Candalides margarita margarita (Semper)	NCS[acdfg]		TSI, Q, NSW	
Candalides xanthospilos (Hübner)	NCS[acdfg]		Q, NSW, V, LHI	Smithers 1971
Candalides delospilus (Waterhouse)	NCS[abcdfg]		WA, NT, Q	
Catochrysops amasea amasea Waterhouse & Lyell	NCS[f] DD[acdg]		TSI, Q	
Catochrysops panormus platissa (Herrich-Schäffer)	NCS[acdfg] DD[b]		WA, NT, TSI, Q, NSW	
Catochrysops panormus papuana Tite	NCS[acdfg]		TSI	
Catochrysops panormus exigeuus (Distant)	NCS[acd]		CHI	Moulds and Lachlan 1987
Catopyrops ancyra mysia (Waterhouse & Lyell)	NCS[acdfg]		TSI	
Catopyrops ancyra exponens	DD[cd]		COI	
Catopyrops florinda estrella (Waterhouse and Lyell)	NCS[g h] DD[abcdf]		WA, NT, Q	
Catopyrops florinda halys (Waterhouse)	NCS[acdfg]		Q, NSW	
Danis danis serapis Miskin	NCS[acdfg]	Q		
Danis danis syrius Miskin	NCS[acdg]	VU	TSI, Q	Dunn et al. 1994, QNCA 1994
Erysichton lineata lineata (Murray)	NCS[acdfg]		Q, NSW	
Erysichton palmyra tasmanicus (Miskin)	NCS[acdfg]		Q, NSW	
Euchrysops cnejus cnidus Waterhouse & Lyell	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
Everes lacturnus australis Couchman	NCS[abcdfg]		WA, NT, Q, NSW, LHI	Smithers 1971
Famegana alsulus alsulus (Herrich-Schäffer)	NCS[abcdfg] DD[a]		WA, NT, TSI, Q, NSW	Q: DD for SE populations
Freyeria putli (Kollar)	DD[abd] NCS[g]		WA, NT, Q	
Ionolyce helicon caracalla (Waterhouse & Lyell)	NCS[acdfg]		TSI	
Ionolyce helicon hyllus (Waterhouse & Lyell)	NCS[acdfg]	CS	Q	Dunn et al. 1994
Jamides aleuas coelestis (Miskin)	NCS[adfg]		Q	

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Jamides bochus (Stoll)	NCS[ad]		CHI	Moulds and Lachlan 1987
Jamides amarauge Druce	NCS[adfg]		TSI	
Jamides cytus claudia (Waterhouse & Lyell)	NCS[acdfg]	CS	Q	Hill & Michaelis 1988
Jamides nemophilus nemophilus (Butler)	DD[adfg]		TSI	Waterhouse & Lyell 1914
Jamides phaseli (Mathew)	NCS[acdf] DD[b]		WA, NT, TSI, Q, NSW	
Jamides sp. nr *phaseli* (Mathew)	DD[adfg]		TSI	Nielsen et al. 1996
Lampides boeticus (Linnaeus)	NCS[abcdeg] DD[f]		WA, NT, TSI, Q, NSW, ACT, V, T, SA, LHI, NI, CHI	Smithers 1970, Smithers 1971
Leptotes plinius pseudocassius (Murray)	NCS[acdfg]		NT, TSI, Q, NSW	
Megisba strongyle nigra (Miskin)	NCS[acdfg]		Q	
Nacaduba berenice berenice (Herrich-Schäffer)	NCS[acdfgg]		TSI, Q, NSW	
Nacaduba biocellata biocellata (C. & R. Felder)	NCS[abcdeg] DD[f]		WA, NT, TSI, Q, NSW, V, T, SA, WA	Knight pers. comm.
Nacaduba calauria calauria (C. Felder)	DD[adg]		TSI	Johnson & Valentine 1997
Nacaduba cyanea arinia (Oberthür)	NCS[acdfg]		Q	
Nacaduba cyanea manto (Grosse-Smith & Kirby)	NCS[acdfg]			
TSI				
Nacaduba kurava felsina Waterhouse & Lyell	NCS[acdg h]	CS	NT	Dunn et al. 1994
Nacaduba kurava parma Waterhouse & Lyell	NCS[acdfg]		TSI, Q, NSW, CHI	
Nacaduba pactolus cela Waterhouse and Lyell	NCS[acdf] DD[g]	EN	TSI	Dunn et al. 1994, QNCA 1994
Neolucia agricola agricola (Westwood)	NCS[acdefg]		Q, NSW, ACT, V, SA	
Neolucia agricola insulana Waterhouse & Lyell	NCS[acdf]		T	
Neolucia agricola occidens Waterhouse & Lyell	NCS[abcd] * DD [b]		WA	* autumn biotype
Neolucia hobartensis hobartensis (Miskin)	NCS[acdfg]		NSW, ACT, V, T	
Neolucia hobartensis monticola Waterhouse & Lyell	NCS[acdfg]		NSW	

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Neolucia mathewi (Miskin)	NCS[acdg] DD[f]		NSW, V, T	
Neopithecops lucifer heria (Fruhstorfer)	DD[ag]		TSI, Q	
Nesolycaena albocericea (Miskin)	NCS[acdfg]	VU CS	Q	Dunn et al. 1994 QNCA 1994
Nesolycaena caesia d'Apice & Miller	NCS[abcdg]		WA	
Nesolycaena medicea Braby	NCS[acdg]		Q	
Nesolycaena urumelia (Tindale)	NCS[acdg h]	CS (Q)	NT, Q	Daniels and Edwards 1998
Nothodanis schaeffera caesius (Grose-Smith)	DD[afg]		TSI	Lambkin and Knight 1990, Parsons 1998
Petrelaea tombugensis (Rober)	NCS[acdfg]		NT, TSI, Q	Parsons 1991
Pithecops dionisius dionisius (Boisduval)	DD[af] NCS[g]		TSI, Q	
Prosotas aluta (Druce)	NCS[acd]		CHI	Moulds and Lachlan 1987
Prosotas dubiosa dubiosa (Semper)	NCS[abcdfg]		WA, NT, TSI, Q, NSW	
Prosotas dubiosa lumpura (Corbet)	NCS[acd]		CHI	Moulds and Lachlan 1987
Prosotas felderi (Murray)	NCS[acdefg] DD[e]		Q, NSW, SA	
Prosotas gracilis saturiator (Rothschild)	DD[ag]		TSI	Johnson & Valentine 1997
Prosotas nora auletes (Waterhouse & Lyell)	NCS[acdfg]		TSI, Q	
Psychonotis caelius salamandri (W.J. Macleay)	NCS[acdfg]		TSI, Q	
Psychonotis caelius taygetus (C. & R. Felder)	NCS[acdfg]		Q, NSW	
Psychonotis caelius taletum (Waterhouse & Lyell)	NCS[acdfg]		Q	
Sahulana scintillata (T.P. Lucas)	NCS[acdf] DD[g]		NT, TSI, Q, NSW	
Theclinesthes albocincta (Waterhouse)	NCS [cdef] DD[abg]	CS TH (Q)	WA, NT, Q, V, SA	Hill & Michaelis 1988, Douglas 1995, Braby 2000
Theclinesthes hesperia hesperia Sibatani & Grund	NCS[dg] CS[b]	TH, CS (S. WA)	WA	Dunn et al. 1994, Braby 2000
Theclinesthes hesperia littoralis Sibatani & Grund	NCS[bdg]	CS	WA	Dunn et al. 1994
Theclinesthes miskini miskini (T.P. Lucas)	NCS[abcdefg]		WA, NT, SA, Q, NSW, ACT, V	
Theclinesthes miskini arnoldi (Fruhstorfer)	NCS[adfg]		TSI	

Taxon	Categories[1] Work-shops [2]	Publ.[3]	Distribution [4]	Key references [5]
Theclinesthes miskini eucalypti Sibatani & Grund	NCS[adfg]		Q	
Theclinesthes onycha onycha (Hewitson)	NCS[acdfg]		Q, NSW, ACT	
Theclinesthes onycha capricornia Sibatani & Grund	NCS[acdf h] DD[g]		NT, Q	
Theclinesthes serpentata serpentata (Herrich-Schäffer)	NCS[abcdefg]		WA, Q, NSW, ACT, V, T, SA, Flinders Is.	
Theclinesthes serpentata lavara (L.E. Couchman)	NCS[adfg]	VU	T	Dunn et al. 1994
Theclinesthes sulpitius sulpitius (Miskin)	NCS[acdfg]		Q, NSW, V	
Theclinesthes sulpitius obscura Waterhouse & Lyell	NCS[acdfg h]		NT, Q	
Udara tenella (Miskin)	NCS[acdfg]	VU	Q	Dunn et al. 1994, QNCA 1994
Zizeeria karsandra (Moore)	NCS[acdfg] DD[be]	CS	WA, NT, TSI, Q, NSW, ACT, V, SA	Vict. Cons. Nat. Res. 1995
Zizina labradus labradus (Godart)	NCS[abcdef]		WA, NT, Q, NSW, V, ACT, SA, T, LHI, NI	Smithers 1970
Zizina labradus labdalon Waterhouse & Lyell	NCS[acdfg]	CS	TSI, Q	Dunn et al. 1994 Q, NSW, V
Zizina otis (Fabricius)	DD[dg]		CHI	Moulds and Lachlan 1987
Zizula hylax hylax (Fabricius)	NCS[acdg]		CHI	Moulds and Lachlan 1987
Zizula hylax attenuata (T.P. Lucas)	NCS[acdfg]		NT, TSI, Q, NSW	
THECLINAE				
Acrodipsas arcana (Miller and Edwards)	NCS[acdfg]	VU CS	Q, NSW	Nadolny 1987, Hill & Michaelis 1988, Sands 1990, Dunn et al. 1994
Acrodipsas aurata Sands	NCS[adfg] DD[c]		NSW, ACT, V	
Acrodipsas brisbanensis brisbanensis (Miskin)	NCS[adfg] DD[be]	TH (V) CS	WA, Q, NSW, V, ACT, SA	Hill & Michaelis 1988, FFG 1996
Acrodipsas brisbanensis cyrilus (Anderson and Spry)	LR[cfg]	TH, CS, EN (SA)	V, SA	Hill & Michaelis 1988, Douglas 1995, FFG 1996, Dunn et al. 1994, Grund 2001.
Acrodipsas cuprea (Sands)	NCS[acdfg]		Q, NSW	
Acrodipsas hirtipes Sands	NCS[acdfgh] DD[g]	VU (Q) CS	NT, Q	Sands 1990, Dunn et al. 1994, QNCA 1994

Taxon	Categories[1] Workshops [2]	Publ.[3]	Distribution [4]	Key references [5]
Acrodipsas illidgei (Waterhouse and Lyell)	DD[adfg]	EN (Q) CS, TH	Q, NSW	Hill & Michaelis 1988, Sands 1990, Greenslade & New 1991, IUCN 1994, 1996, Dunn et al. 1994, QNCA 1994, Braby 2000
Acrodipsas melania Sands	NCS[acdfg]	VU	Q	Dunn et al. 1994, QNCA 1994.
Acrodipsas mortoni Sands, Miller and Kerr	DD[acdfg]		Q, NSW	Sands, Miller and Kerr 1997
Acrodipsas myrmecophila (Waterhouse and Lyell)	NCS[abdf] CE[c], DD[g]	EN, CS VU, TH (V)	NT, Q, NSW, V	D.F. Crosby pers. comm., Hill & Michaelis 1988, Dunn et al.1994, Braby 2000
Arhopala centaurus centaurus (Fabricius)	NCS[acdfg]		TSI, Q	
Arhopala centaurus asopus Waterhouse & Lyell	NCS[abcdfg]		WA, NT	
Arhopala madytus Fruhstorfer	NCS[acdfg]		TSI, Q	
Arhopala micale amphis Waterhouse	NCS[acdfg]		Q	
Arhopala micale amydon Waterhouse	NCS[acdfg h]		NT, TSI	
Arhopala micale amytis (Hewitson)	NCS[acdfg]		TSI, Q	
Arhopala wildei wildei Miskin	NCS[acdfg]		TSI, Q	
Arhopala sp.	DD[ad]		TSI	Lambkin pers. comm.
Bindahara phocides yurgama Couchman	NCS[acdfg]		TSI, Q	
Deudorix democles Miskin	NCS[acdfg]		Q	
Deudorix diovis Hewitson	NCS[acdfg]		TSI, Q, NSW	
Deudorix epijarbas dido Waterhouse	NCS[acdfg]		Q	
Deudorix epirus agimar Fruhstorfer	NCS[acdfg]		Q	
Deudorix smilis dalyensis (Le Souef & Tindale)	NCS[acdfg h]		NT	
Hypochrysops apelles apelles (Fabricius)	NCS [acdfg] DD (NT, NSW)[ad]	CS (NSW)	NT, TSI, Q, NSW	Braby 2000
Hypochrysops apollo apollo Miskin	NCS[dfg] CS[a]	EN, VU CS	Q	Hill & Michaelis 1988, Dunn et al. 1994, QNCA 1994, Braby 2000

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Hypochrysops apollo phoebus (Waterhouse)	NCS[acdfg]	VU	CS	TSI, Q QNCA 1994
Hypochrysops arronica arronica (C. & R. Felder)	DD[adg]		?Q	Sands 1986
Hypochrysops byzos byzos (Boisduval)	NCS[acdfg]		Q, NSW	
Hypochrysops byzos hecalius Miskin	NCS[acdfg]	CS	NSW, ACT,V	CNR 1995
Hypochrysops cleon Grose-Smith	NCS[acdfg]	CS	Q	Hill & Michaelis 1988, Sands 1990.
Hypochrysops cyane (Waterhouse & Lyell)	NCS[acdf]		Q, NSW	
Hypochrysops delicia delicia Hewitson	NCS[acdfg]	CS	Q, NSW	Douglas 1995
Hypochrysops delicia delos (Waterhouse & Lyell)	NCS[acdfg]		ACT, V	
Hypochrysops delicia duaringae (Waterhouse)	NCS[acdfg]		Q	
Hypochrysops digglesii (Hewitson)	NCS[acdfg]		Q, NSW	
Hypochrysops elgneri elgneri (Waterhouse & Lyell)	NCS[g] DD[ad]		TSI	
Hypochrysops elgneri barnardi Waterhouse	NCS[acdf]	CS	Q	Dunn et al. 1994, QNCA 1994
Hypochrysops epicurus Miskin	NCS[acdfg]	CS, TH	Q, NSW	Bell 1978, Vaughan 1988, Braby 2000 Nadolny 1987, Hill & Michaelis 1988
Hypochrysops halyaetus Hewitson	NCS[adg] VU[b(south.)]	CS (S.WA)	WA	Braby 2000
Hypochrysops hippuris nebulosis Sands	NCS[acdfg]	CS	Q	Hill & Michaelis 1988
Hypochrysops ignitus ignitus (Leach)	NCS[acdefg]	EN (V, SA), VU (SA)	Q, NSW, ACT, V, SA	Hill & Michaelis 1988, Watts 1992, Dunn et al. 1994, Douglas 1995, Grund 2001.
Hypochrysops ignitus chrysonotus Grose-Smith	NCS[acdfg] DD[b]		Q, WA	WA: single population
Hypochrysops ignitus erythrinus (Waterhouse & Lyell)	NCS[abcdg]	TH	NT, WA	Sands 1990
Hypochrysops ignitus olliffi Miskin	NCS[abcdg]		WA	
Hypochrysops miskini miskini (Waterhouse)	NCS[acdfg] DD(SEQ)[a]		Q	

Taxon	Categories[1]		Distribution[4]	Key references[5]
	Work-shops[2]	Publ.[3]		
Hypochrysops narcissus narcissus (Fabricius)	NCS[acdfg]		Q	
Hypochrysops narcissus sabirius (Fruhstorfer)	NCS[acdfg]		TSI, Q	
Hypochrysops piceatus Kerr, Macqueen & Sands	EN[adfg]	EN, CS	Q	Hill & Michaelis 1988, Sands 1990, Dunn et al. 1994. QNCA 1994, Braby 2000
Hypochrysops polycletus rovena H.H. Druce	NCS[acdfg]		Q	
Hypochrysops polycletus rex (Boisduval)	DD[adg]		TSI	
Hypochrysops pythias drucei Oberthür	DD[acdg]		TSI	
Hypochrysops pythias euclides Miskin	NCS[acdfg]		Q	
Hypochrysops theon cretatus Sands	DD[adg]	VU, TH	Q	Sands 1990, Dunn et al. 1994, QNCA 1994
Hypochrysops theon medocus (Fruhstorfer)	NCS[acdfg]	VU	TSI, Q	QNCA 1994
Hypolycaena danis turneri (Waterhouse)	NCS[acdfg]		TSI, Q	
Hypolycaena phorbas phorbas (Fabricius)	NCS[acdfg]		TSI, Q	
Hypolycaena phorbas ingura Tindale	NCS[acdfg h]		NT	
Jalmenus aridus Graham & Moulds	NCS[acd] CS[bg]	EN CS	WA	Dunn et al. 1994
Jalmenus clementi H.H. Druce	NCS[ad] DD[b]	VU	WA	Dunn et al. 1994
Jalmenus daemeli Semper	NCS[abcfg] DD[d]		Q, NSW	
Jalmenus eichhorni Staudinger	NCS[acdfg]		QNCS[acdfg]	Q
Jalmenus evagoras evagoras (Donovan)	NCS[acdfg]		Q, NSW, ACT, V	
Jalmenus evagoras eubulus Miskin	NCS[cdfg] DD[a]	VU, CS		Q, NSW Dunn et al. 1994, QNCA 1994, Braby 2000
Jalmenus ictinus Hewitson	NCS[acdfg]		Q, NSW, ACT	
Jalmenus icilius Hewitson	NCS[abdefg] CS[c]	TH, CS (V)	Q, NSW, ACT, V, SA, WA	Douglas 1995, Braby 2000
Jalmenus inous Hewitson	NCS[adfg] DD[b]		WA	

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Jalmenus lithochroa Waterhouse	NCS[ad] VU[e] DD[fg]	EN,TH CS (SA) VU (SA)	SA	Hill & Michaelis 1988, Sands 1990, Dunn et al. 1994, Braby 2000, Grund 2001.
Jalmenus notocrucifer Johnson, Hay & Bollam	NCS[ad] DD[b]	CS	WA	Dunn et al. 1994
Jalmenus pseudictinus Kerr & Macqueen	NCS[acdfg]		Q	
Lucia limbaria (Swainson)	NCS[acdfg] DD[e]		Q, NSW, ACT, V, SA, LHI	Smithers 1971
Ogyris abrota (Westwood)	NCS[acdefg]		Q, NSW, ACT, V, SA	
Ogyris amaryllis amaryllis (Hewitson)	NCS[acdfg]		Q, NSW	
Ogyris amaryllis amata (Waterhouse)	NCS[acdfg]	CS	ACT	Dunn et al. 1994
Ogyris amaryllis hewitsoni (Waterhouse)	NCS[acdfg h]		NT, Q	
Ogyris amaryllis meridionalis (Bethune-Baker)	NCS[abcdefg]	CS	WA, NT, Q, NSW, V, SA	Hill & Michaelis 1988
Ogyris amaryllis parsonsi (Angel)	NCS[abcdefg]		WA, NT, Q, SA	Daniels and Edwards 1998
Ogyris aenone (Waterhouse)	NCS[acdfg]	CS (N.Q)	TSI, Q	Braby 2000
Ogyris barnardi barnardi (Miskin)	NCS[acdfg]		Q, NSW	
Ogyris barnardi delphis (Tindale)	NCS[acdefg]	CS	SA	Dunn et al. 1994
Ogyris genoveva genoveva (Hewitson)	NCS[acdfg]		Q, NSW	
Ogyris genoveva araxes (Waterhouse & Lyell)	NCS[acdfg]	CS	V	Douglas 1995, Braby 2000
Ogyris genoveva duaringa (Bethune-Baker)	NCS[acdfg]		Q, NSW, V	
Ogyris genoveva gela (Waterhouse)	NCS[acdfg]	CS	NSW, ACT	Braby 2000
Ogyris genoveva genua (Waterhouse)	NCS[acdef]		SA	
Ogyris genoveva splendida (Tindale)	NCS[acdefg] DD[b]	CS	SA, WA	Dunn et al. 1994. WA: R. Mayo pers. comm.
Ogyris ianthis (Waterhouse)	NCS[acdfg]	CS	Q, NSW	Dunn et al. 1994
Ogyris idmo idmo (Hewitson)	NCS[bd]	CS	WA	Hill & Michaelis 1988, Vaughan 1988
Ogyris idmo halmaturia (Tepper)	CE[c] EN[e] DD[adfg]	EN, CS (V, SA)	NSW, V, SA	Hill & Michaelis 1988, Vaughan 1988, Sands 1990, Dunn et al. 1994, Braby 2000, Grund 2001.

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Ogyris iphis iphis (Waterhouse & Lyell)	NCS[acdfg]		Q	
Ogyris iphis doddi (Waterhouse & Lyell)	DD[adg h]	EX, CS	NT (+ Melville Is.)	Dunn et al. 1994, Braby 2000
Ogyris olane olane (Hewitson)	NCS[acdfg]		Q, NSW	
Ogyris olane ocela (Waterhouse)	NCS[acdefg]		Q, NSW, ACT, V, SA	
Ogyris oroetes oroetes (Hewitson)	NCS[abcdfg]		Q, NSW, WA	
Ogyris oroetes apiculata (Quick)	NCS[abcdefg]		WA, NT, NSW, V, SA	
Ogyris otanes (C. & R. Felder)	NCS[adf], CE[c], VU[e], DD[bdeg] (N Kangaroo Is)	EN VU (V, SA) TH, CS	NSW, V, SA, WA	Crosby pers. comm., Vaughan 1988, Hill & Michaelis 1988, Watts 1992, Dunn et al. 1994, Braby 2000, Grund 2001.
Ogyris subterrestris subterrestris Field	DD[adfg] EN[c]	TH, CS, VU (SA)	V, SA, NSW	Douglas 1995, Braby 2000, Grund 2001.
Ogyris subterrestris petrina Field	CS[c] DD[bd] (Kalgoolie)		WA	
Ogyris zosine zosine (Hewitson)	NCS[acdfg]	CS	Q	Dunn et al. 1994
Ogyris zosine typhon (Waterhouse & Lyell)	NCS[abcdfgh]		WA, NT ,TSI, Q	
Ogyris zosine zolivia (Waterhouse)	NCS[acdg]	CS	Q (islands)	Dunn et al. 1994
Paralucia aurifera (Blanchard)	NCS[acdfg]		Q, NSW, ACT, V, T	
Paralucia pyrodiscus pyrodiscus (Rosenstock)	NCS[acdfg]		Q, NSW, ACT	
Paralucia pyrodiscus lucida Crosby	VU[cg]	EN TH	V	Sands 1990, Greenslade & New 1991, Dunn et al. 1994, Douglas 1995
Paralucia spinifera E.D. Edwards & Common	NCS [f h] VU [a] EN[d]	EN (NSW) VU, CS	NSW	Nadolny 1987, Hill & Michaelis 1988, Sands 1990, Greenslade & New 1991, Dunn et al. 1994, TSP 1995, IUCN 1996, Braby 2000
Philiris azula Wind & Clench	DD [adg]	CS	Q	Hill & Michaelis 1988
Philiris diana diana Waterhouse & Lyell	NCS[acdfg]	EN, TH	Q	Sands 1990, Dunn et al. 1994, QNCA 1994
Philiris diana papuanus Wind & Clench	NCS[acdg]		Q	

Taxon	Categories[1]		Distribution [4]	Key references [5]
	Work-shops [2]	Publ.[3]		
Philiris fulgens kurandae Waterhouse	NCS[acdfg]		Q	
Philiris innotatus innotatus (Miskin)	NCS[acdfg]		Q, NSW	
Philiris innotatus evinculis Wind & Clench	NCS[acdfg]		Q	
Philiris nitens nitens (Grose-Smith)	NCS[acdfg]		Q	
Philiris nitens lucina Waterhouse & Lyell	NCS[acdfg]		Q	
Philiris sappheira manskiei Ring & Olive	DD[a] NCS[cdg]		Q	
Philiris ziska titeus D'Abrera	NCS[adg]	CS	Q	Hill & Michaelis 1988, Dunn et al. 1994
Pseudalmenus chlorinda chlorinda (Blanchard)	NCS[abcdf]	VU, CS	T	Prince 1988, Hill & Michaelis 1988, Sands 1990, Braby 2000
Pseudalmenus chlorinda barringtonensis Waterhouse	NCS[abcdfg]	CS	NSW	Nadolny 1987, Hill & Michaelis 1988
Pseudalmenus chlorinda chloris Waterhouse & Lyell	NCS[abcdfg]		NSW	
Pseudalmenus chlorinda conara L.E. Couchman	NCS[cdfg]	VU, CS TH	T	Prince 1988, IUCN 1988, Hill & Michaelis 1988, Braby 2000
Pseudalmenus chlorinda fisheri Tindale	NCS[acdfg]	CS	V	CNR 1995, Douglas 1995
Pseudalmenus chlorinda myrsilus (Westwood)	NCS[dg] VU [f]	EN, CS	T	Prince 1988, Dunn et al. 1994 , Braby 2000
Pseudalmenus chlorinda zephyrus Waterhouse & Lyell	NCS[acdg] LR [f]		NSW, ACT, V, T	
Pseudodipsas cephenes Hewitson	NCS [afg] VU[ad] (NSW)		Q, NSW	
Pseudodipsas eone iole Waterhouse & Lyell	NCS[acdfg]		TSI, Q	
Rapala varuna simsoni (Miskin)	NCS[acdfg]		TSI, Q	
RIODININAE				
Praetaxila segecia punctaria (Fruhstorfer)	NCS[acdf]	CS	Q	Dunn et al. 1994

References and other sources for Appendix 3.

Atkins, A. 1997. Two new species of *Trapezites* Hübner (Lepidoptera: Hesperiidae) from eastern Australia. *Australian Entomologist* 24: 7–26.

Bell, F.C. (Ed.). 1978. Forest Ecosytems: their future in NSW. Total Environment Centre Publications, Sydney.

Braby, M.F. 2000. Butterflies of Australia, their identification, biology and distribution. CSIRO, Melbourne.

Collins, N.M. and Morris, M.G. 1985. Threatened swallowtail butterflies of the world. The IUCN Red Data Book. IUCN Gland, Switzerland.

Collins, N.M. and Thomas, J.A.. *The Conservation of Insects and Their Habitats*. Proceedings of the 15th Symposium of the Royal Entomological Society of London, 14–15th September 1989. Academic Press, London.

The IUCN red data book. IUCN Gland, Switzerland.

Common, I.F.B. and Waterhouse, D.F. 1981. *Butterflies of Australia*. Angus and Robertson.

Crosby, D.F. 1990. A management plan for the Altona skipper butterfly, *Hesperilla flavescens flavescens* Waterhouse (Lepidoptera: Hesperiidae). Arthur Rylah Institute for Environmental Research. Technical Report Series No. 98. Department of Conservation and Environment, Victoria.

Driessen, M.M. 1999. Management of threatened invertebrates of the Tasmanian Wilderness World Heritage area. Pp. 333–340 *in* (eds Ponder, W. & Lunney, D.), The Other 99%. *Transactions of the RoyalZoological Society of New South Wales* Mosman 2088.

CSP. 1992. Commonwealth Endangered Species Protection Act 1992. Environment Australia.

Daniels, G. and Edwards, E.D. 1998. Butterflies from Lawn Hill National Park and Musselbrook Reserve, Queensland. Pp. 89–91, *in* Mussellbrook Reserve scientific study report, Geography Monograph Series No.4. The Royal Geographic Society of Queensland Inc.

Douglas, F. 1993. The conservation status, distribution and habitat requirements of diurnal Lepidoptera in central and western Victoria. Department of Conservation and natural Resources, Melbourne.

Douglas, F. 1995. Recovery plan for threatened diurnal Lepidoptera in western Victoria. Part 2.

Family Lycaenidae. Department of Conservation and Natural Resources.

Dunn, K.L., Kitching, R.L. and Dexter, E.M. 1994. The conservation status of Australian butterflies. A report to Australian National Parks and Wildlife Service, Canberra ACT.

FFG 1996. *Victorian Flora and Fauna Guarantee Act 1988*. Schedule 2. Government of Victoria.

IAC. 1994. Invertebrate Advisory Committee Interim list of native invertebrates which are rare or threatened in Tasmania. Edition 1. Tasmanian Parks & Wildlife Service, Tasmania.

Fry, R. and Robinson, . 1986. *In* Kennedy. M and Burton, R. *A Threatened Species Conservation Strategy for Australia*. Ecofund Australia, Manly, New South Wales.

Greenslade, P. and New, T.R. 1991. Australia: Conservation of a continental insect fauna. Pp. 33–70 *in* eds.

Grund, R. 2001. South Australian butterflies checklist. http://www.adelaide:net.au/~reid/checklist.htm (accessed April 2001).

Hill, L. and Michaelis, F.B. 1988. Conservation of insects and related wildlife. Australian National Parks and Wildlife Service Occasional Paper No. 13.

IUCN 1988. Conservation Monitoring Centre. 1988 IUCN Red List of Threatened Animals. International Union for Conservation of Natural Resources. Gland, Switzerland / Cambridge, UK

IUCN 1994. World Conservation Union. International Union for Conservation of Natural Resources. Gland, Switzerland / Cambridge, UK

IUCN 1996. World Conservation Union. IUCN Red List of Threatened Animals.International Union for Conservation of Natural Resources. Gland, Switzerland.

Johnson, S.J. and Valentine, P.S. 1997. Further observations and records for butterflies (Lepidoptera) in northern Australia. Australian Entomologist 24: 155–158.

Johnson, S.J., Johnson, I.R. and Valentine, P.S. 1994. New and interesting butterfly records (Lepidoptera) from Torres Strait Islands. Australian Entomologist 21: 121–124.

Lambkin, T.A. and Knight, A.I. 1990. Butterflies recorded from Murray Island, Torres Strait, Queensland. *Australian Entomological Magazine* 17: 101–112.

McQuillan, P.B. and Ek, C.J. 1997. A biogeographical analysis of the Tasmanian endemic Ptunarra brown butterfly, *Oreixenica ptunarra* Couchman, 1953 (Lepidoptera: Nymphalidae: Satyrinae). Australian Journal of Zoology 44: 21–37.

Mahood, I.T. 1980. The role of national parks in insect conservation. Entomological Society of New South Wales, Circular No. 306, 15–16.

Miller, J.Y. and Miller, L.D. 1978. "East Indian" butterflies: notes and descriptions. Satyridae and Danaidae. Bulletin Allyn Museum No 49.

Moss St L., J.L. 1995. Butterfly records from Scawfell Island, Queensland, with a note on the local form of *Hesperilla malindeva* Lower (Lepidoptera: Hesperiidae): *Queensland Naturalist* 33: 124–130.

Moulds, M.S. and Humphrey, M. First record of *Papilio memnon* L. (Lepidoptera: Papilionidae) from Christmas Island, Indian Ocean. *Australian Entomologist* 27: 37.

Moulds, M.S. and Lachlan, R.B. 1987. The butterflies (Lepidoptera) of Christmas Island, Indian Ocean. *Australian Entomological Magazine* 14: 57–66.

Nadolny, C. 1987. Rainforest butterflies in New South Wales: their ecology, distribution and conservation. Australian National Parks and Wildlife Service / New South Wales National Parks and Wildlife Service

Nielsen, E.S., Edwards, E.D. and Rangsi, T.V. 1996. Checklist of the Lepidoptera of Australia.

Monographs on Australian Lepidoptera, Vol. 4. CSIRO, Melbourne.

New, T.R. 1991. Butterfly conservation. Oxford Universty Press, Melbourne.

Neyland, M. 1993. The ecology and conservation management of the ptunarra brown butterfly *Oreixenica ptunarra* (Lepidoptera: Nymphalidae: Satyrinae) in Tasmania, Australia. Papers and Proceedings of the Royal Society of Tasmania 27: 4348.

Neyland, M. 1994. The ecology and conservation status of three rare hesperiid butterflies in Tasmania. Wildlife Report 94 / 3, Parks and Wildlife Service, Tasmania.

Parsons, M. 1991. Butterflies of the Wau-Bulolo Valley. Wau Ecology Institute Handbook No. 12. Bishop Museum Press, Honolulu.

Parsons, M. 1998. The butterflies of Papua New Guinea Their systematics and biology. Academic Press, London.

Prince, B.P. 1988. The conservation status of the hairstreak butterfly, *Pseudamenus chlorinda* Blanchard in Tasmania. Report to the Department of Lands, Parks and Wildlife, Tasmania.
QNCA 1994. *Nature Conservation Act 1992* (Queensland, revised 1994). Queensland Parks & Wildlife Service, Queensland. SAC 1990.
Flora and Fauna Guarantee Scientific Advisory Committee, Victoria.

Sands, D.P.A. 1990. Australia's endangered butterflies. News Bulletin, Entomological Society of Queensland.18: 63–68.

Sands, D.P.A. 1986. A revision of the genus *Hypochrysops* C. & R. Felder (Lepidoptera: Lycaenidae)Entomonograph Vol. 7, E.J. Brill, Scandinavian Science Press.

Sands, D.P.A. 1997. *Alexfloydia repens* Simon: a food plant for *Ocybadistes knightorum* Lambkin

and Donaldson (Lepidoptera: Hesperiidae) and their conservation significance. *The Australian Entomologist* 24: 117–118.

Sands, D.P.A., Scott, S.E. and Moffatt, R. 1997. The threatened Richmond birdwing butterfly (*Ornithoptera richmondia*) [Gray]: a community conservation project. *Memoirs of the Museum of Victoria* 56: 449–453.

Sands, D.P.A 1999. Conservation status of Lepidoptera: assessment, threatening processes and recovery actions. Pp. 382-387 *in* (eds Ponder, W. & Lunney, D.), The Other 99%. *Transactions of the Royal Zoological Society of New South Wales* Mosman.

Smithers, C.N. 1970. Norfolk Island butterflies. Australian Entomological Press, Greenwich. Pp. 1–24.

Smithers, C.N. 1971. A note on Lord Howe Island butterflies. *Journal of the Australian Entomological Society* 10: 299–300.

TSC 1995. Threatened Species Conservation Act. Schedule 1. New South Wales National Parks and Wildlife Service.

Vaughan, P.J. 1998. A draft conservation strategy for the non-marine invertebrates and non-vascular plants of Victoria. Report to the Department of Conservation, Forests and Lands.

Venn, D. 1993. Recovery plan threatened diurnal Lepidoptera in north-western Victoria. Part 1. Castniidae & Hesperiidae. Report to Department of Conservation and Natural Resources, pp 42.

Waterhouse, G.A. and Lyell, G. 1914. The Butterflies of Australia. Angus and Robertson, Sydney.

Watts, C.H.S. 1992. Conservation of non-commercial invertebrates. In South Australia. In Soon Poh Tay (comp.) Threatened species and habitats in South Australia: a catalyst for community action. Conservation Council of South Australia, Adelaide. Chapter 8.

Western Australia 1996. *Wildlife Conservation (Specially Protected Fauna) Notice 1996.*

Williams, A.A.E. and Atkins, A. 1997. Notes on the life history of the Western Australian skipper *Mesodina hayi* Edwards & Graham (Lepidoptera: Hesperiidae). *Australian Entomologist* 24: 81–85.

Williams, A.A.E., Williams, M.R. and Hay, R.W. 1988. A new species of *Trapezites* Hübner (Lepidoptera: Hesperiidae) from Western Australia. *Australian Entomologist* 25: 7–12.

Williams, M.R., Williams, A.A.E., Lundstrom, T.D. and Hay, R.W. 1996. The distribution of Waterhouse's skipper *Trapezites waterhousei* Mayo & Atkins (Lepidoptera: Hesperiidae) in Western Australia. *Australian Entomologist* 23: 83–85.

Wood, G.A. 1987. The butterflies of Murray Island, Torres Strait, Queensland. *Australian Entomological Magazine* 14: 39-42.

Yen, A.L. and Butcher, R.J. 1997. An overview of the conservation of non-marine invertebrates in Australia. Endangered species program, Environment Australia, Canberra.

Appendix 4:
The IUCN categories (adopted November 1994)

Extinct (EX) A taxon is Extinct when there is no reasonable doubt that the last individual has died.

Extinct in the Wild (EW) A taxon is extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys on known and / or expected habitat, at appropriate time (diurnal, seasonal, annual), throughout its historical range have failed to record an individual. Surveys should be done over a time frame appropriate to the taxon's life cycle and life form.

Critically Endangered (CR) A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future as defined by any of the criteria A-E:

A. Population reduction in the form of either of the following:
   1. An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
      a. Direct observation
      b. An index of abundance appropriate to the taxon
      c. A decline in area of occupancy, extent of occurrence and / or quality of habitat
      d. Actual or potential levels of exploitation
      e. The effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
   2. A reduction of at least 80%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.

B. Extent of occurrence estimated to be less than 100 km^2 or area of occupancy estimated to be less than 10 km^2, and estimates indicating any two of the following:
   1. Severely fragmented or known to exist at only a single location
   2. Continued decline, observed, inferred or projected, in any of the following:
      a. Extent of occurrence
      b. Area of occupancy
      c. Area, extent and / or quality of habitat
      d. Number of locations or sub-populations
      e. Number of mature individuals.
   3. Extreme fluctuations in any of the following:
      a. Extent of occurrence
      b. Area of occupancy
      c. Number of locations or sub-populations
      d. Number of mature individuals.

C. Population estimated to number less than 250 mature individuals and either:
   1. An estimated continuing decline of at least 25% within 3 years or one generation, whichever is the longer, or
   2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
      a. Severely fragmented (i.e. no sub-population estimated to contain more than 50 mature individuals), or
      b. All individuals are in a single sub-population.

D. Population estimated to contain less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or 3 generations, whichever is the longer.

Endangered (EN) A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria A–E:

A. Population reduction in the form of either of the following:
   1. As for CR, but reduction of at least 50%
   2. As for CR, but reduction of at least 50%.

B. Extent of occurrence estimated to be less than 5000 km^2 or area of occupancy estimated to be less than 500 km^2, and estimates indicating any two of the following:
   1. Severely fragmented or known to exist at no more than five locations.

   2,3. As for CR.

C. Population estimated to number less than 2500 mature individuals and either:
   1. As for CR, but decline of at least 20% within 5 years or 2 generations
   2. As for CR but (a) no population estimated to contain more than 250 mature individuals.

D. Population estimated to number less than 250 mature individuals.

E. As for CR, but probability of at least 20% within 20 years or 5 generations.

Vulnerable (VU). A taxon is vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria A–E:

A. Population reduction in the form of either of the following:
   1. As for CR, but reduction of at least 20%
   2. As for CR, but reduction of at least 20%.

B. Extent of occurrence estimated to be less than 20 000 km^2 or area of occupancy estimated to be less than 2000 km^2, and estimates indicating any two of the following:
   1. Severely fragmented or known to exist at no more than 10 locations

   2,3. As for CR.

C. Population estimated to number less than 10 000 mature individuals and either:
   1. As for CR, but decline of at least 10% within 10 years or 3 generations
   2. As for CR but (a) no sub-population estimated to contain more than 1000 mature individuals.

D. Population very small or restricted in the form of either of the following;
   1. Population estimated to number less than 1000 mature individuals.
   2. Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km^2) or in number of locations (typically less than 5).

E. As for CR, but probability of at least 10% within 100 years.

Lower Risk (LR) A taxon is Lower Risk when it has been evaluated, and does not satisfy the criteria for any of the above categories. Taxa included can be separated into three sub-categories;

1. Conservation Dependent (CD) Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. Near threatened (NT) Taxa which do not qualify for CD, but which are close to qualifying for VU.
3. Least Concern (LC) Taxa which do not qualify for CD or NT.

Data Deficient (DD) A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and / or population status. DD is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

Not Evaluated (NE) A taxon is Not Evaluated when it has not yet been assessed against the criteria.

Appendix 5:
Points for a species restoration strategy for butterflies in the UK (Butterfly Conservation 1995).

1. The species should have declined seriously (or be threatened with extinction) at a national or regional level.

2. Remaining natural populations should be conserved effectively, and the restoration plan should be an integral part of a Species Action Plan.

3. The habitat requirements of the species and the reasons for its decline should be broadly known and the cause of extinction on the receptor site (where re-introduction is contemplated) should have been removed. There should be a long-term management plan which will maintain suitable habitat, and the site should be large enough to support a viable population in the medium to long term.

4. Extinction should have been confirmed at the receptor site (at least 5 years recorded absence), the mobility of the target species should be assessed and natural re-establishment should be shown to be unlikely over the next 10-20 years.

4. Opportunities to restore networks of populations or metapopulations are preferable to single site re-introductions (unless the latter is a necessary prelude to the former).

6. Sufficient numbers of individuals should be used in the re-introduction to ensure a reasonable chance of establishing a genetically diverse population.

7. As far as possible the donor stock should be the closest relatives of the original population, and genetic studies should be carried out where doubt exists.

8. The receptor site should be within the recorded historical range of the species.

9. Removal of livestock should not harm the donor population (donor populations may have to be monitored during the re-introduction programme).

10. The re-introduction should not adversely affect other species on the site.

11. If captive bred livestock is used, it should be healthy and genetically diverse (e.g. not normally captive bred for more than two generations).

12. Re-introduced populations should be monitored for at least five years, and contingency plans should be made in case the re-introduction fails, the donor population is adversely affected, or other species are adversely affected.

13. Approval should be obtained from the Conservation Committee of Butterfly Conservation and all other relevant conservation bodies and organisations (including statutory bodies in the case of scheduled species, SSSIs, etc.).

14. Approval must be obtained from the owners of both receptor and donor sites.

15. The entire process should be fully documented and standard record forms completed for Butterfly Conservation and JCCBI.

Appendix 6:
Published codes for insect collecting.

These are presented here as published for reference and for comparison with the scheme presented in this Action Plan. The two given are both pioneering and were designed predominantly for the northern temperate regions.

Joint Committee for the Conservation of British Insects (1971)

A CODE FOR INSECT COLLECTING

This Committee believes that with the ever-increasing loss of habitats resulting from forestry, agriculture, and industrial, urban and recreational development, the point has been reached where a code for collecting should be considered in the interests of conservation of the British insect fauna, particularly macrolepidoptera. The Committee considers that in many areas this loss has gone so far that collecting, which at one time would have had a trivial effect, could now affect the survival in them of one or more species if continued without restraint.

The Committee also believes that by subscribing to a code of collecting, entomologists will show themselves to be a concerned and responsible body of naturalists who have a positive contribution to make to the cause of conservation. It asks all entomologists to accept the following Code in principle and to try to observe it in practice.

1. COLLECTING – GENERAL

1.1 No more specimens than are strictly required for any purpose should be killed.

1.2 Readily identified insects should not be killed if the object is to ‘look them over’ for aberrations or other purposes: insects should be examined while alive and then released where they were captured.

1.3 The same species should not be taken in numbers year after year from the same locality.

1.4 Supposed or actual predators and parasites of insect should not be destroyed.

1.5 When collecting leaf-mines, galls and seed heads never collect all that can be found; leave as many as possible to allow the population to recover.

1.6 Consideration should be given to photography as an alternative to collecting, particularly in the case of butterflies.

1.7 Specimens for exchange, or disposal to other collectors, should be taken sparingly or not at all.

1.8 For commercial purposes insects should be either bred or obtained from old collections. Insect specimens should not be used for a manufacture of ‘jewellery’.

2. COLLECTING — RARE AND ENDANGERED SPECES

2.1 Specimens of macrolepidoptera listed by this Committee (and published in the entomological journals) should be collected with the greatest restraint. As a guide, the Committee suggests that a pair of specimens is sufficient, but that those species in the greatest danger should not be collected at all. The list may amended from time to time if this proves to be necessary.

2.2 Specimens of distinct local forms of macrolepidoptera, particularly butterflies, should likewise be collected with restraint.

2.3 Collectors should attempt to break new ground rather than collect a local or rare species from a well-known and perhaps over-worked locality.

2.4 Previously unknown localities for rare species should be brought to the attention of this Committee, which undertakes to inform other organisations as appropriate and only in the interests of conservation.

3. COLLECTING — LIGHTS AND LIGHT-TRAPS

3.1 The catch at light, particularly in a trap, should not be killed casually for subsequent examination.

3.2 Live trapping, for instance in traps filled with egg-tray material, is the preferred method of collecting. Anaesthetics are harmful and should not be used.

3.3 After examination of the catch the insects should be kept in cool, shady conditions and released away from the trap at dusk. If this is not possible the insects should be released in long grass or other cover and not on lawns or bare surfaces.

3.4 Unwanted insects should not be fed to fish or insectivorous birds and mammals.

3.5 If a trap used for scientific purposes is found to be catching rare or local species unnecessarily it should be re-sited.

3.6 Traps and lights should be sited with care so as not to annoy neighbours or cause confusion.

4. COLLECTING — PERMISSION AND CONDITIONS

4.1 Always seek permission from landowner or occupier when collecting on private land.

4.2 Always comply with any conditions laid down by the granting of permission to collect.

4.3 When collecting on nature reserves, or sites of known interest to conservationists, supply a list of species collected to the appropriate authority. When collecting on nature reserves it is particularly important to observe the code suggested in section 5.

5. COLLECTING — DAMAGE TO THE ENVIRONMENT

5.1 Do as little damage to the environment as possible. Remember the interests of other naturalists; be careful of nesting birds and vegetation, particularly rare plants.

5.2 When 'beating' for lepidopterous larvae or other insects never thrash trees and bushes so that foliage and twigs are removed. A sharp jarring of branches is both less damaging and more effective.

5.3 Coleopterists and others working dead timber should replace removed bark and worked material to the best of their ability. Not all the dead wood in a locality should be worked.

5.4 Overturned stones and logs should be replaced in their original positions.

5.5 Water weed and moss which has been worked for insects should be replaced in its appropriate habitat. Plant material in litter heaps should be replaced and not scattered about.

5.6 Twigs, small branches and foliage required as food plants or because they are galled, e.g. by clearwings, should be removed neatly with secateurs or scissors and not broken off.

5.7 'Sugar' should not be applied so that it renders tree-trunks and other vegetation unnecessarily unsightly.

5.8 Exercise particular care when working for rare species, e.g. by searching for larvae rather than beating for them.

5.9 Remember the Country Code!

6. BREEDING

6.1 Breeding from a fertilised female or pairing in captivity is preferable to taking a series of specimens in the field.

6.2 Never collect more larvae or other livestock than can be supported by the available supply of food plant.

6.3 Unwanted insects that have been reared should be released in the original locality, not just anywhere.

6.4 Before attempting to establish new populations or 'reinforce' existing ones please consult this Committee.

The Lepidopterists Society Statement of Committee on Collecting Policy (1982)

PREAMBLE

Our responsibility to assess and preserve natural resources, for the increase of knowledge, and for the maintenance of biological diversity in perpetuity, requires that lepidopterists examine the practices of collecting Lepidoptera, for the purpose of governing their own activities.

To this end, the following guidelines are outlined, based on these premises:

0.1 Lepidoptera are a renewable natural resource.

0.2 Any interaction with a natural resource should be in a manner not harmful to the perpetuation of that resource.

0.3 The collection of Lepidoptera

- 0.31 is a means of introducing children and adults to awareness and study of their natural environment;
- 0.32 has an essential role in the elucidation of scientific information, both for its own sake and as a basis from which to develop rational means for protecting the environment, its resources, human health and the world food supply;
- 0.33 is a recreational activity which can generally be pursued in a manner not detrimental to the resource involved.

GUIDELINES

Purposes of collecting (consistent with the above):

1.1 To create a reference collection for study and appreciation.

1.2 To document regional diversity, frequency and variability of species, and as voucher material for published records.

1.3 To document faunal representation in environments undergoing or threatened with alteration by man or natural forces.

1.4 To participate in development of regional checklists and institutional reference collections.

1.5 To complement a planned research endeavour.

1.6 To aid in dissemination of educational information.

1.7 To augment understanding of taxonomic and ecological relationships for medical and economic purposes.

RESTRAINTS AS TO NUMBERS

2.1 Collection (of adults or of immature stages) should be limited to sampling, not depleting, the population concerned; numbers collected should be consistent with, and not excessive for, the purpose of the collecting.

2.2 When collecting where the extent and / or the fragility of the population are unknown, caution and restraint should be exercised.

COLLECTING METHODS

3.1 Field collecting should be selective. When consistent with the reasons for the particular collecting, males should be taken in preference to females.

3.2 Bait or light traps should be live-traps and should be visited regularly; released material should be dispersed to reduce predation by birds.

3.3 The use of Malaise or other killing traps should be limited to planned studies.

LIVE MATERIAL

4.1 Rearing to elucidate life histories and to obtain series of immature stages and adults is to be encouraged, provided that collection of the rearing stock is in keeping with the guidelines.

4.2 Reared material in excess of need should be released, but only in the region where it originated, and in suitable habitat.

ENVIRONMENTAL AND LEGAL CONSIDERATIONS

5.1 Protecting the supporting habitat must be recognised as the sine qua non of protection of a species.

5.2 Collecting should be performed in a manner such as to minimise trampling or other damage to the habitat or to specific food plants.

5.3 Property rights and sensibilities of others must be respected (including those of photographers and butterfly-watchers).

5.4 Regulations relating to publicly controlled areas and to individual species and habitats must be complied with.

5.5 Compliance with customs, agricultural, medical and other regulations should be attained prior importing live material.

RESPONSIBILITY FOR COLLECTED MATERIAL

6.1 All material should be preserved with full data attached, including parentage of immature stages where known.

6.2 All material should be protected from physical damage and deterioration, as by light, moulds and museum pests.

6.3 Collections should be made available for examination by qualified researchers.

6.4 Collections or specimens, and their associated written and photographic records, should be willed or offered to the care of an appropriate scientific institution, if the collector lacks space or loses interest, or anticipates death.

6.5 Type specimens, especially holotype or allotype, should be deposited in appropriate scientific institutions.

RELATED ACTIVITIES OF COLLECTORS

7.1 Collecting should include permanently recorded field notes regarding habitat, conditions, and other pertinent information.

7.2 Recording of observations of behaviour and of biological interactions should receive as high priority as collecting.

7.3 Photographic records, with full data, are encouraged.

7.4 Education of the public about collecting and conservation, as reciprocally beneficial activities, should be undertaken whenever possible.

TRAFFIC IN LEPIDOPTERAN SPECIMENS

8.1 Collections of specimens of exchange or sale should be performed in accordance with these guidelines.

8.2 Rearing of specimens of exchange or sale should be from stock obtained in a manner consistent with these guidelines, and so documented.

8.3 Mass collection of Lepidoptera for commercial purposes, and collection or use of specimens for creation of saleable artefacts, are not included among the purposes of the Society.

Appendix 7: Translocation guidelines for Australian butterflies.

1. Translocation may be made within or between states: consider any permits necessary for relocating living material across state boundaries. Translocation should only be acceptable following carefully considered, scientific plans aimed towards conservation.

2. Taxon identities:
   - (i) Consider the taxonomic status of populations for relocation.
   - (ii) Consider the migratory / dispersal potential for each taxon relocated.
   - (iii) Taxon for relocation should be as similar as possible (morphology / biology / DNA) to that previously present in recipient region.
   - (iv) Avoid relocation sites close to populations with known morphological differences.
   - (v) Consider possible hybridisation affects with neighbouring populations.

3. Ecological matching:
   - (i) Latitude, longitude, altitude, climate, vegetation, food plants, natural enemies (if possible), symbionts (if appropriate) of recipient and donor sites must be comparable before populations are relocated. However, ecological matching may sometimes require varying combinations of latitude and altitude.
   - (ii) Translocation should normally be made only within the documented or

     presumed historical range of the taxon, and should not be used as a means to extend the range of a species into areas where it would be exotic.
   - (iii) Fire management plans must be compatible with sustained breeding by taxon.
   - (iv) Ensure translocation sites are ecologically secure.

4. Translocation strategies:
   - (i) If applicable to taxon, translocate at the beginning of the wet season during warmer months.
   - (ii) Ensure releases are not near colonies of generalist predators at recipient sites.
   - (iii) Ensure sufficient suitable food plants are present to support breeding at release sites.
   - (iv) A minimum of 5 mature / mated females should be a target for releases in a 14 day period.
   - (v) The introduction of immature stages (e.g eggs) from multiple donor sites may be an appropriate way of preventing inbreeding depression in some taxa.

5. Monitoring:
   - (i) Survival and reproduction should be monitored for at least a 3-month period and when initial establishment is apparent, further relocations should be avoided.
   - (i) Sustained breeding for 3 or more years may signify successful establishment.

6. Documentation:
   - (i) Details of all translocation (times, places, numbers) should be recorded formally, and state agencies informed.
   - (ii) A cumulative record of all butterfly translocation exercises should be made,and be available for reference.