Review of the distribution and conservation status of the western ringtail possum, *Pseudocheirus occidentalis*, and recommendations for management.

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September 2000

Note: This document is an extract from manuscripts currently in preparation by P. de Tores, S. Rosier and G. Paine and also sources early versions of the western ringtail possum Interim Wildlife Management Guidelines prepared by P. de Tores, S. Rosier and K. Himbeck.

Conservation status was assessed against the IUCN Red List Categories Version 3.1 and associated annexes. The Criteria and Annexes have been provided on a confidential basis. The Criteria have been approved by the Species Survival Commission Executive. Annex 3 is still under review and may not be the final version. Information on the Criteria and Annexes is not to be distributed.

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Summary

Although there has been no formal taxonomic review of the western ringtail possum, *Pseudocheirus occidentalis*, recent scientific literature has recognised *P. occidentalis* as a separate taxon. The uncertainty of the taxonomic status is discussed and the desirability of undertaking appropriate DNA studies to clarify the issue is identified and recommended.

The distribution of *P. occidentalis* is mapped identifying current and former known locations. Locations are based on data from published and unpublished sources and include sub-fossil records. Records of dubious reliability are not included. The known extant distribution shows a northern, southwestern and southeastern extension to the distribution identified by Jones *et al.* (1994a).

Clearly, there has been an increase in knowledge on the distribution of the *P. occidentalis*, however, there is very limited information on population and subpopulation size(s). Estimates of subpopulation size were available from 9 locations only. One of these is a translocation release site, another is currently being cleared for residential development. Appropriate maintenance of location and distribution information and quantifying and monitoring subpopulation sizes at selected locations is identified as a high priority.

Pseudocheirus occidentalis is currently listed as Vulnerable in accordance with Category C, sub-criterion 2a of the IUCN Red Lists Categories (IUCN, 1994). It is also listed as "fauna which is rare or likely to become extinct" in accordance with Section 14(2)(ba) of the Western Australian Wildlife Conservation Act 1950.

For this review, the conservation status of *P. occidentalis* was initially assessed against the criteria for the IUCN Red Lists Categories, Version 3.0 (as proposed by the IUCN/SCC Criteria Review Working Group 1999) (IUCN, 1999) and subsequently against Version 3.1 (IUCN, 2000).

Several aspects of the revisions of the 1994 Red List Categories are relevant to assessment of the conservation status of *P. occidentalis*. These are:

1. Sub-criterion C2a of the category Vulnerable (VU) has been amended.
2. Subsection 7 of Section II (Preamble) has been expanded and more clearly identifies how uncertainties within available information are to be addressed and advocates adopting a precautionary attitude when applying the criteria. This is particularly relevant to estimates of population and subpopulation size for *P. occidentalis*.
3. Definitions of population and subpopulations have been clarified.
4. Annex 3 has been included and provides a draft list of the minimum documentation required for new listings and changes to existing IUCN red listings. Existing listed taxa will also require this documentation.

On the basis of the review, there was sufficient reason for *P. occidentalis* to remain listed as a threatened taxon in the Vulnerable Category, in accordance with IUCN (2000) Criterion C2a(i). Justification for this is provided. Most supporting documentation, as per the requirement of Annex 3 of Version 3.1 of the IUCN Red List categories, is provided within this review. Comprehensive documentation is provided by (de Tores and Rosier, in prep).

Conservation status was also assessed against CALM's criteria for listing/de-listing a taxon as a threatened species.

Critical terms in the criteria for de-listing are not defined and assessment is extremely subjective. *Pseudocheirus occidentalis* was assessed as continuing to meet CALM's Criterion i) and Criterion ii) c) for recommendation for declaration as threatened fauna. This assessment was reached on the basis of the limited number of locations with estimates of subpopulation size, the continued fragmentation of peppermint/tuart woodland coastal habitat, the implication of increased predation risk in the presence of timber harvesting at jarrah/marri forest locations and the lack of success of the only translocation to forest habitat.

The results from monitored translocated populations are provided and research and management issues discussed. The role of translocations in improving conservation status is briefly discussed. Other recommendations are proposed to facilitate better management, disseminate information and improve access to records.

Review of the distribution and conservation status of the western ringtail possum, *Pseudocheirus occidentalis*, and recommendations for management.

1. Taxonomy

There is inconsistency in the literature concerning the taxonomic status of the western ringtail possum. The species was first described by Thomas (1888) (see Walton, 1988) from a specimen collected from King George Sound, Western Australia. The specimen described by Thomas (1888) was listed as a separate species, *Pseudochirus occidentalis*.

Until recently, ringtail possums were included within the Petauridae and most taxonomic classifications listed the western ringtail possum as *Pseudocheirus peregrinus occidentalis*, a sub-species of the common ringtail possum of eastern Australia (see for example McKay, 1983).

Although there has been no published taxonomic review, recent phylogenetic and other literature included ringtails, along with the greater glider (*Petauroides volans*), within the Pseudocheiridae (for example Baverstock *et al.* (1990), Springer *et al.* (1992), Springer (1993), Flannery (1994), Menkhorst (1995), Strahan (1995), IUCN (1996)). The justification for raising Pseudocheirinae to family is presented by Smith (1984).

Smith (1984) recognised 5 genera within the Pseudocheiridae and did not recognise *Pseudocheirus occidentalis* at species level. Strahan (1995) recognised 6 genera which included *Pseudocheirus occidentalis* at species level. *Pseudocheirus occidentalis* now seems to be widely accepted by the scientific community and wildlife managers as a separate species. However, there has been no justification presented for this and the raising to species level appears to have been based on morphological differences alone.

The geographical isolation of *P. occidentalis* can also be argued as justification for managers to treat it as a separate species.

Preliminary mitochondrial DNA analysis (Draper, 1999) revealed substantial genetic divergence when comparing the western ringtail possum, *Pseudocheirus occidentalis,* with sub species of the common ringtail possum, *Pseudocheirus peregrinus*, from eastern Australia. Samples from ten geographical locations (including WA and Tasmania) were analysed and there was shown to be significant genetic variation between populations. The Western Australian and Tasmanian populations showed the highest level of divergence.

Phylogenetic relationships were examined using three different analyses and three phenograms were produced. With some minor exceptions, all analyses consistently placed individuals into expected geographic clusters. However, only one technique produced a phylogenetic tree splitting the Western Australian *Pseudocheirus occidentalis* population from all eastern Australian *Pseudocheirus peregrinus*. A consensus tree was constructed consistent with the existence of only one Evolutionarily Significant Unit (ESU).

Given this finding, and the implication that raising to species level was based of morphological differences alone, there is a clear need to pursue the taxonomic status and determine whether *Pseudocheirus occidentalis* constitutes an ESU as defined by Moritz (1994).

2. Distribution

2.1 Historical distribution

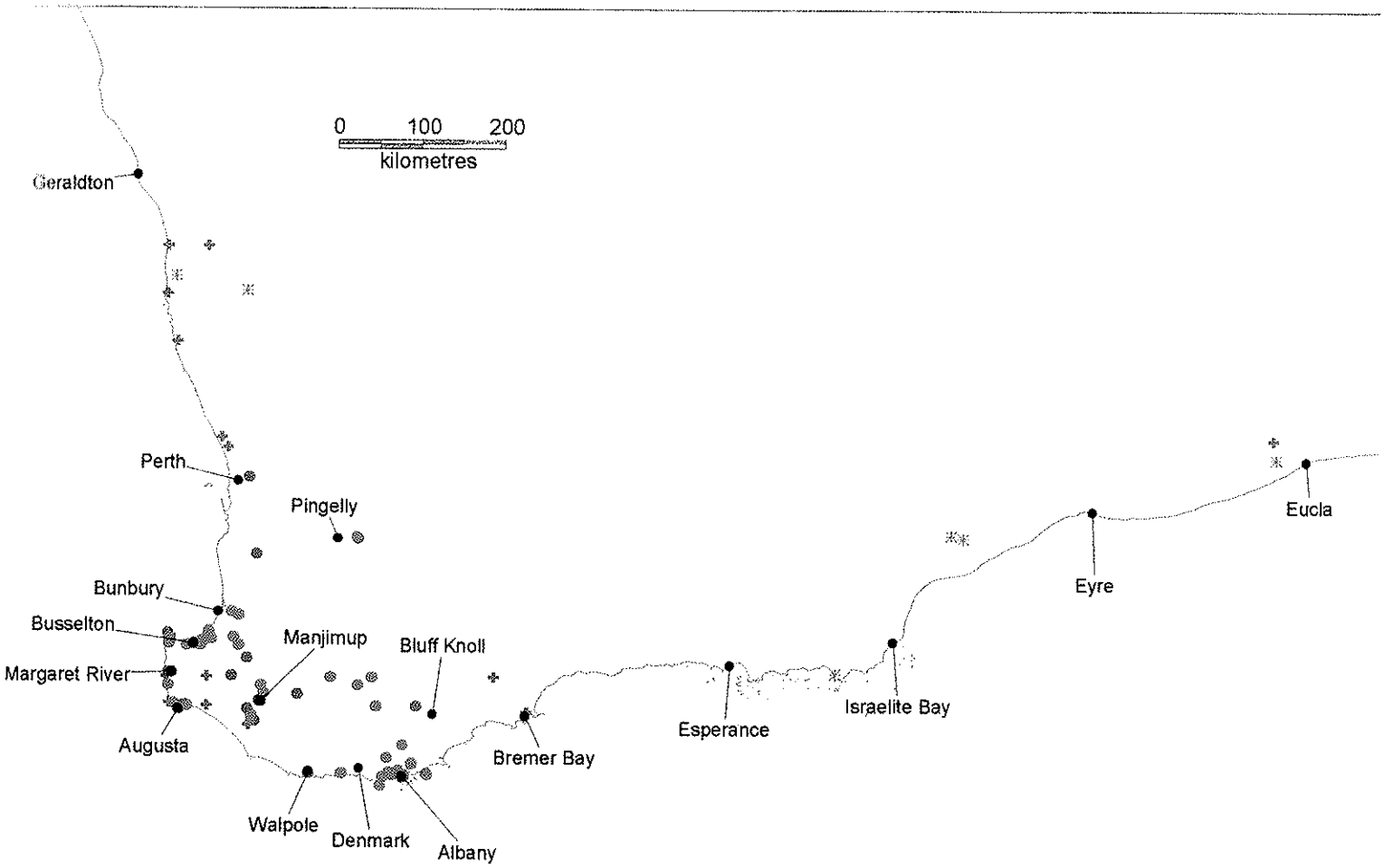
The historical distribution of *P. occidentalis* is shown in figure 1. Distribution is inferred from data derived from museum records, published and unpublished sub fossil records and published and unpublished historic accounts prior to 1990.

2.2 Current distribution

The current distribution of *P. occidentalis* is shown in figure 2. Distribution is inferred from published and unpublished location records and includes one location established as a result of a successful translocation. All translocated populations, including those yet to show translocation success, are shown in figure 3.

The inferred current distribution shows a northern, southwestern and southeastern extension from that inferred from the locations reported by Jones *et al.* (1994a).

Figure 1: **Former known locations and inferred historical distribution of the western ringtail possum, *Pseudocheirus occidentalis*.**



- **Historic Records**
  Bannister (1967)
  Christensen *et al.* (1985)
  Devlin, D. (pers. com.)
  Douglas (1980)
  How *et al.* (1987)
  Sampson (1971)
  Shortridge (1909)
  Thomas (1888) in Walton (1988)
  Whittell (1954)

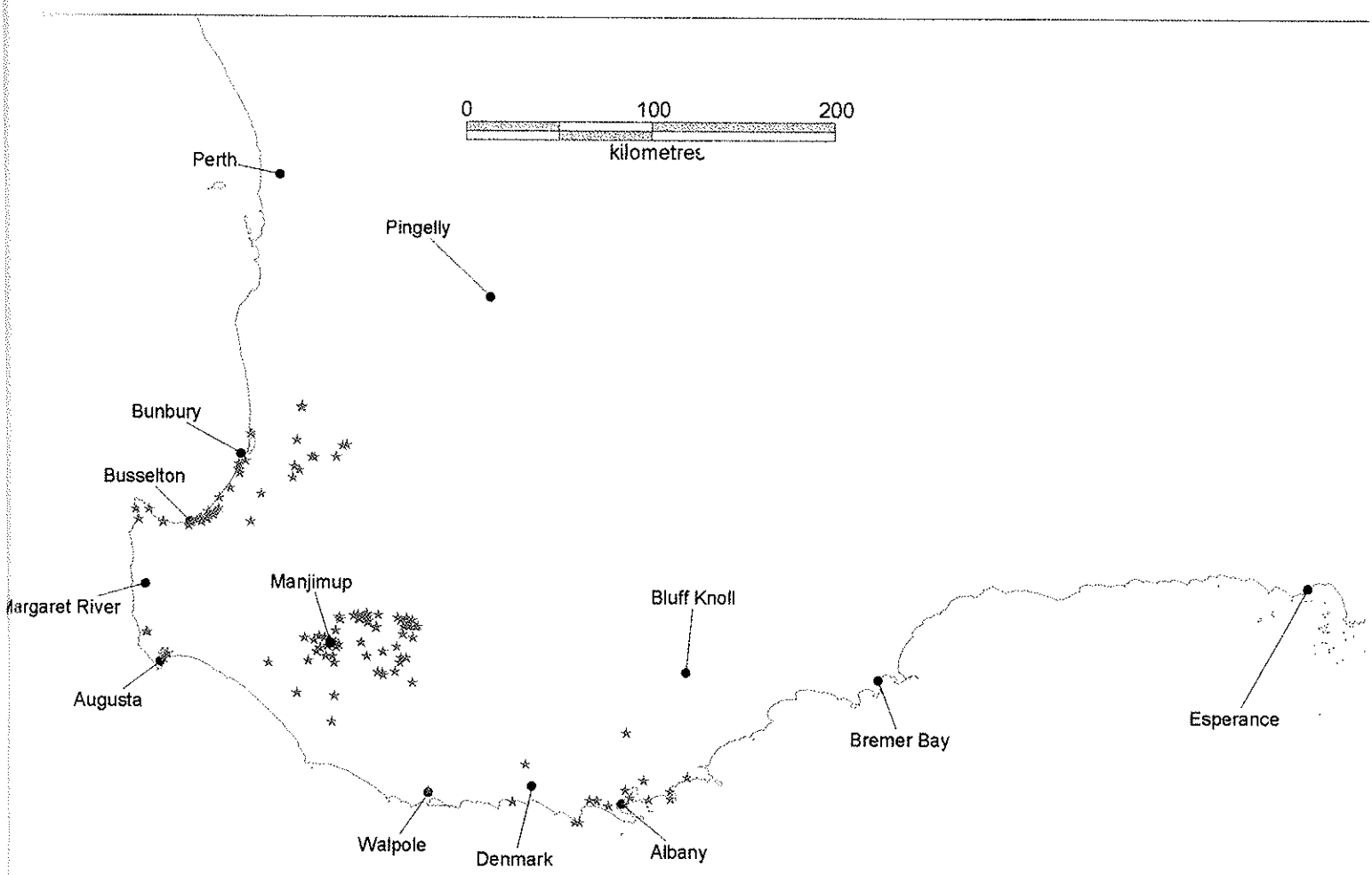
- **Western Australian Museum Records**
  Data base records supplied by the WA Museum
  Baynes (pers. com.)
  Kitchener and Vicker (1981)

- **Australian Museum Records**
  Database records supplied by the Australian Museum
  Abbott (1999)

- **Sub fossil and surface cave deposits (with WA Museum registrations)**
  Archer (1974)
  Archer and Baynes (1972).
  Baynes (pers. com.)
  Butler and Merrilees (1971)
  Merrilees (1967)

- **Sub fossil and surface cave deposits (without WA Museum registrations)**
  Baynes (pers. com.)
  Baynes (1987)

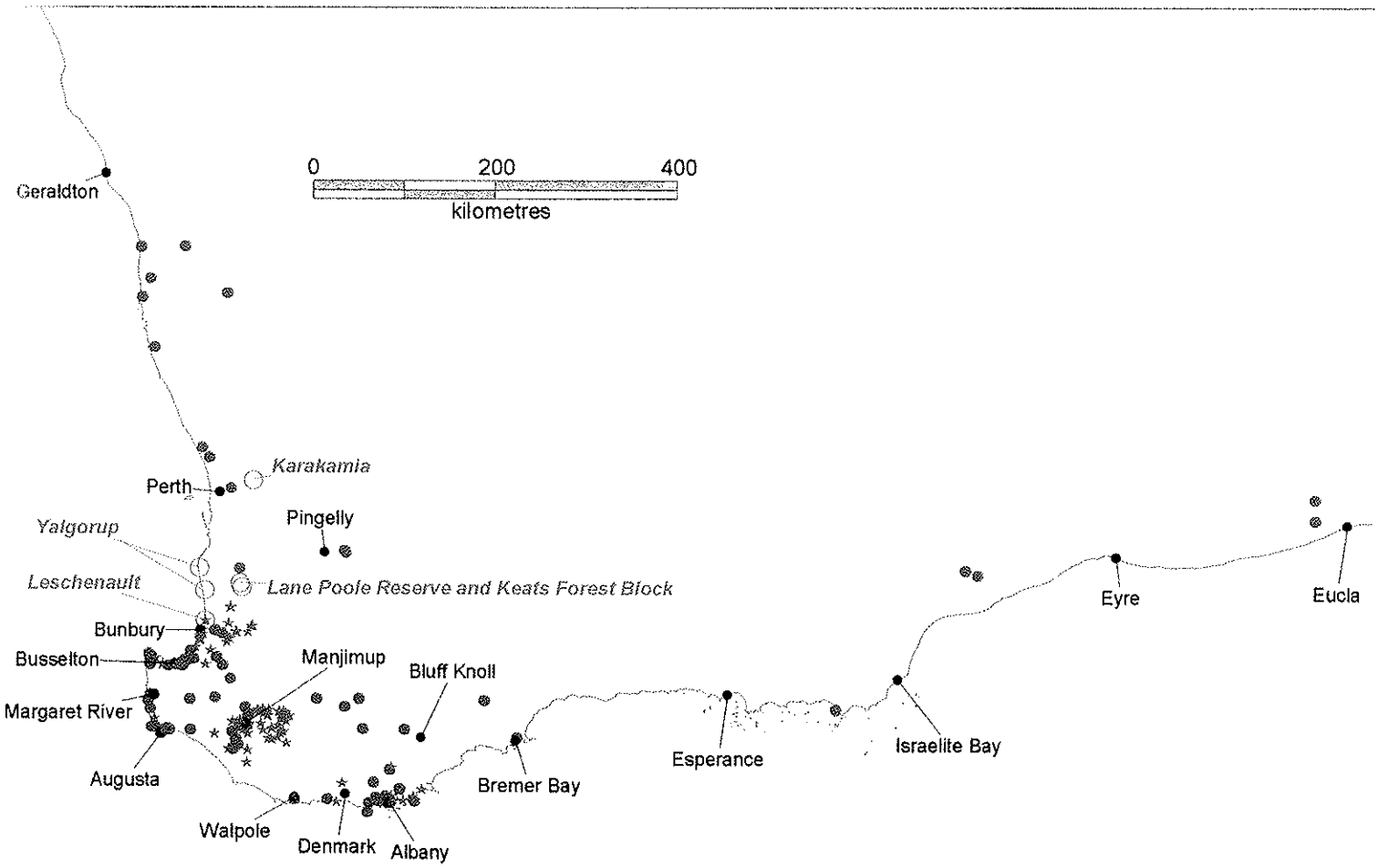
Figure 2: Known locations of extant populations and inferred current distribution of the western ringtail possum, *Pseudocheirus occidentalis*.



★ **Known locations of extant populations**

Barrett (1996)
Bradshaw, D. (pers. com.)
Brazell, R (pers. com.)
CALM Wildlife Branch Database records (exclusive of records unable to be substantiated)
Campbell, C. (pers. com.)
Collins, P. (pers. com.)
Davies, J. (pers. com.)
de Tores and Rosier (1997)
de Tores and Rosier (unpublished)
de Tores *et al.* (in prep)
Jones *et al.* (1994a)
Liddelow, G. (pers. com.)
Paxman, M. (pers. com.)
Rooney, J. (pers. com.)
Shugg, J. (pers. com.)
Smith, R. (pers. com.)
Tingay (1998)
Tucker, M. (pers. com.)
Waterhouse, K. (pers. com.)
Williams, K. (pers. com.)

Figure 3: **Former known locations, known extant locations and translocated populations, of the western ringtail possum, *Pseudocheirus occidentalis*. Locations include translocations yet to demonstrate translocation success**



● **Former known locations**
See figure 1 for source

★ **Known extant locations**
See figure 2 for source

○ **Translocated populations**
de Tores and Rosier (unpublished)
de Tores *et al.* (in prep)
Smitz, A. (pers. com.)

The known extent of occurrence, as defined by the shortest continuous boundary which can be drawn to encompass all the known, inferred or projected sites IUCN (2000) is estimated to be approximately 24,000 km^2. This extent of occurrence is approximately 11,000 km^2 larger than that inferred from distribution records reported by Jones *et al.* (1994a). In both cases the extent of occurrence encompasses large areas with no known record of occurrence.

The increase in the known extent of occurrence does not reflect an increase in the level of knowledge of the size or structure of subpopulations. However, it does reflect an increase in the number of known locations. This increase in the number of known locations in turn reflects an increase in the number of surveys to detect presence, an increase in the number of *ad hoc* surveys and an increase in the level of reporting of incidental sightings.

3. Current Conservation Status

Pseudocheirus occidentalis is recognised as Vulnerable (IUCN, 1996) in accordance with Category C, sub-criterion 2(a) of the IUCN Red List Categories (IUCN, 1994).

In 1983 it was listed as "fauna which is rare or likely to become extinct" in accordance with Section 14(2)(ba) of the Western Australian Wildlife Conservation Act 1950.

4. Review of conservation status

4.1 International Criteria

4.1.1 IUCN Red Lists Categories

The conservation status of *P. occidentalis* was assessed against the IUCN criteria. Initial assessment was against the criteria for the IUCN Red Lists Categories, Version 3.0 (as proposed by the IUCN/SCC Criteria Review Working Group 1999) (IUCN, 1999). Subsequent assessment was against Version 3.1 (IUCN, 2000).

Version 3.1 lists the criteria a taxon is required to meet for listing as Critically Endangered, Endangered or Vulnerable. The protocols for assessment require a taxon need meet only 1 criterion to qualify for listing at that level of threat.

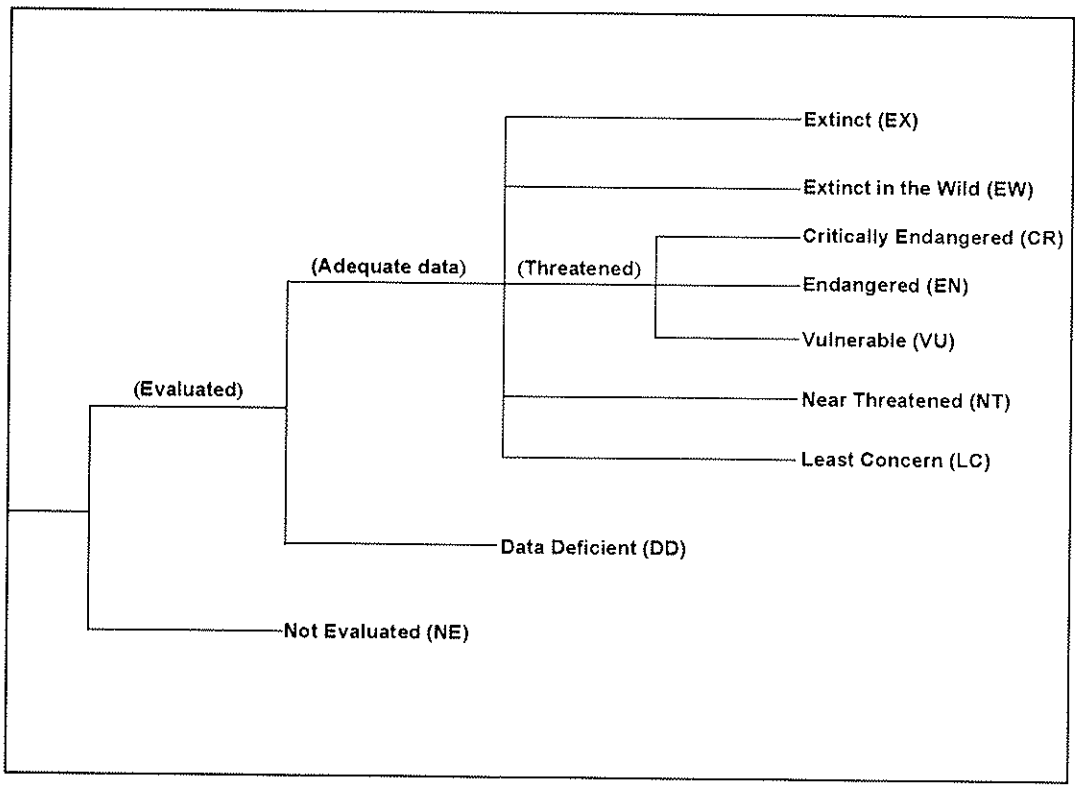
As a result of the revisions of the 1994 Red List Categories, the former category of Lower Risk and sub-category of Conservation Dependent have been removed. The structure of the IUCN Red List Categories is shown in figure 4.

Several other aspects of the revisions are relevant to assessment of the conservation status of *P. occidentalis*. These are:

1. Sub-criterion C2a of the category Vulnerable (VU) was amended in version 3.0 and further amended in version 3.1. The term "severely fragmented" is no longer included as part of criterion VU C2a(i), where severely fragmented is defined as referring to " ... *the situation where increased extinction risks ... result from the fact that most individuals ... are found in small and relatively isolated subpopulations ...*" (IUCN, 2000). As there is no supporting documentation for the 1996 listing of *P. occidentalis*, it is unclear whether the listing resulted from meeting the sub-criterion of severely fragmented or the more specific sub-criterion of "*no subpopulation estimated to contain more than 1000 mature individuals*". The 1994 Red List categories appeared to treat these sub-criteria as synonymous. Given the information available at the time on the extent of occurrence of *P. occidentalis*, the limited information on subpopulation size and the extent of population fragmentation, it would have been justifiable to list it as meeting two vulnerable criteria, VU B12 and VU C2a.
2. Subsection 7 of Section II (Preamble) has been expanded and more clearly identifies how uncertainties within available information are to be addressed. In Version 3.1, "uncertainty" is addressed in subsection 8 of Section II and in Annex 1. Adopting a precautionary attitude is advocated when applying the criteria. This is particularly relevant when applying the criteria to *P. occidentalis* estimates of population and subpopulation size, and consequently to observed, projected or inferred declines in the size of the population/subpopulations: "... *A precautionary attitude will classify a taxon as threatened unless we are certain that it is not threatened, whereas an evidentiary attitude will classify a taxon as threatened only when there is strong evidence to support a threatened classification. Assessors should ... adopt a precautionary but realistic attitude to uncertainty when applying the criteria ...* " (IUCN, 2000).
3. Definitions of population and subpopulations have been clarified. This review uses the terms as defined in the revisions.
4. Annex 3 has been included and provides a draft list of the minimum documentation required for IUCN red listing of a taxon. Additions to the IUCN Red List, and changing of existing listings, will require this documentation. Where no changes to listings are proposed all existing listed taxa will, in due course, also require this documentation. No documentation was available for the original listing of *P. occidentalis*. Full documentation is given by de Tores and Rosier (in prep).

Pseudocheirus occidentalis was assessed against the criteria for Vulnerable (IUCN, 2000) and found to meet Criterion C2a(i). Detail is presented below. *Pseudocheirus occidentalis* did not meet any criteria from the categories Endangered or Critically Endangered.

Figure 4: Structure of the IUCN Red List Categories (IUCN, 2000).



4.1.2 Assessment against specific IUCN Red List criteria – Category of Vulnerable (VU)

To qualify for listing as Vulnerable, a taxon must meet one of the criteria summarised in A to E below. The criteria are detailed in IUCN (2000). *Pseudocheirus occidentalis* was assessed against each as follows:

Criterion A: Reductions in population size

For *Pseudocheirus occidentalis* to meet this criterion there must be:

1. an observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible and understood and ceased; or
2. a population size reduction of ≥30% over the last 10 years or three generations where the reduction or its causes may not have ceased, or be understood, or be reversible; or
3. a population size reduction of ≥30%, projected or suspected to be met within the next ten years or three generations; or
4. a population size reduction of ≥30% over any 10 year or three generation period, (up to a maximum of 100 years), where the time period includes both the past and the future, and where the reduction or its causes may not have ceased.

Assessment

Pseudocheirus occidentalis population size is not known. The contraction of the former geographic range infers a reduction in population size. However, the major contraction in range occurred prior to 1990 and, although estimates of subpopulation size are available for 9 locations, subpopulation size at every other locations is not known.

Subpopulation estimates range from 0.03 to 4.5 ha^{-1} for eight of the nine locations where estimates are available (de Tores and Rosier, in prep; de Tores *et al.*, in prep; Jones *et al.*, 1994b). Despite intensive survey, there has been confirmation of the presence of only two animals at the ninth and northern most known location (de Tores and Rosier, 1997). Many of the remaining locations are known from incidental sightings of one or very few animals.

Subpopulation size has been shown to be increasing at Leschenault Peninsula, one of the four translocation release sites. This site is now considered to have established a self sustaining

population (de Tores and Rosier, in prep; de Tores *et al.*, in prep). Anecdotal evidence suggests subpopulation size may also be increasing at Perup Forest, the only forest location (exclusive of translocation release sites) managed for conservation purposes and where introduced predator control (fox baiting) has been implemented.

Despite a lack of information on subpopulation sizes, there is insufficient evidence for *P. occidentalis* to qualify as Vulnerable in accordance with this criterion.

Criterion B: Geographic range

For *Pseudocheirus occidentalis* to meet this criterion, the extent of occurrence must be less than 20,000 km^2 or area of occupancy less than 2,000km^2 . For each, population estimates must also indicate two of the following (a) to (c):

(a) Severely fragmented or known to exist at no more than ten locations.

(b) Continuing decline, observed, inferred or projected, in any of:
- (i) extent of occurrence
- (ii) area of occupancy
- (iii) area, extent and/or quality of habitat
- (iv) number of locations or subpopulations
- (v) number of mature individuals.

(c). Extreme fluctuations in any of the following:
- (i) extent of occurrence
- (ii) area of occupancy
- (iii) number of locations or subpopulations
- (iv) number of mature individuals.

Assessment

Pseudocheirus occidentalis does not qualify as Vulnerable in accordance with this criterion. The estimated extent of occurrence is approximately 24,000km^2 . This extent of occurrence includes substantial areas of unsuitable habitat and areas of suitable habitat with no known occurrence. However, the alternative measure (using area of occupancy) is less appropriate to apply at any meaningful scale as it requires a level of knowledge of occurrence not currently available.

The role of translocations in increasing the extent of occurrence is addressed in Section 5, Management and Research Issues.

There is insufficient evidence for *P. occidentalis* to qualify as Vulnerable in accordance with this criterion.

Criterion C: Population size estimated to number less than 10,000 mature individuals

For *Pseudocheirus occidentalis* to meet this criterion, the estimated population size must be less than 10,000 mature individuals and either 1 or 2 below apply:

1. An estimated continuing decline of at least 10% within 10 years or three generations; or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and at least one of the following (a-b):

(a) Population structure in the form of one of the following:
- (i) no subpopulation estimated to contain more than 1000 mature individuals, or
- (ii) all mature individuals are in one subpopulation.

(b) Extreme fluctuations in number of mature individuals.

Assessment

The known increase in the extent of occurrence is a function of an increase in the number of *ad hoc* surveys, an increase in surveys to determine presence only and an increase in reporting of incidental sightings. However, it can be inferred from the subpopulation size estimate at the northern extent of the known range, that range contraction and population decline is still occurring.

Destruction and/or modification of peppermint woodland for residential development is continuing in coastal areas known to support subpopulations and population fragmentation appears to have increased. Timber harvesting of jarrah/marri forest has been implicated as increasing predation risk (A. Wayne, pers com). The one introduction/re-introduction to forest habitat cannot yet be deemed a success (de Tores and Rosier, in prep).

Subpopulation estimates are known from nine locations only and recently confirmed subpopulation sizes are not known or appear to be at critically low densities (see Criterion A, above). Anecdotal evidence suggests the largest subpopulations occur at jarrah/marri forest locations near Manjimup and peppermint/tuart woodland near Busselton. Anecdotal evidence and data are sufficient to assume no subpopulation has more than 1000 mature individuals.

Pseudocheirus occidentalis is currently listed as Vulnerable in accordance with criterion VU C2a (IUCN, 1994) and, if a precautionary attitude is adopted, it continues to meet the revised criterion and qualifies for listing as Vulnerable in accordance with criterion VU C2a(i) (IUCN, 2000).

Criterion D: Very small or restricted population

For *Pseudocheirus occidentalis* to meet this criterion, the estimated population must be less than 1000 mature individuals or have a restricted area of occupancy (typically less than 20km^2) or restricted number of locations (typically 5 or less).

Assessment

Pseudocheirus occidentalis does not meet this criterion as the relatively large number of subpopulations infer a population size in excess of 1000 mature individuals, the area of occupancy is subjectively considered to be in excess of 2,000km^2 and there are considerably more than 5 locations/subpopulations.

Criterion E: Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

Assessment

The lack of reliable demographic data, in particular data on age specific mortality, prohibit the use of meaningful quantitative analyses to estimate the probability of extinction. However, *Pseudocheirus occidentalis* does not meet this criterion as management strategies are in place to address perceived threats. Specifically, introduced predator control (fox baiting) programs have been implemented and translocation programs have commenced. The first of these translocations has demonstrated success and established a self sustaining subpopulation within conservation estate (de Tores *et al.*, in prep). Subject to the outcome of current translocations, further translocations, in conjunction with introduced predator control programs, will be implemented to re-establish subpopulations within the former geographic range.

4.2 Western Australian criteria

The conservation status of *P. occidentalis* was assessed against the Department of Conservation and Land Management criteria for listing/de-listing native fauna in accordance with the Wildlife Conservation Act of WA as "fauna which is rare or likely to become extinct".

CALM Policy Statement no. 33 "Conservation of Threatened and Specially Protected Fauna in the Wild" enables a taxon to be recommended for removal from the schedule of threatened fauna if recent zoological survey has shown it no longer meets the criteria for declaration as threatened fauna or where the taxon "is no longer threatened because it has been adequately protected by habitat protection and its population numbers have increased beyond the danger point".

Assessment against these criteria is extremely subjective and the terms "*adequately protected*" and "*increased beyond the danger point*" are undefined and ambiguous.

There have been minimal surveys to assess subpopulation densities. The increase in the number of known extant subpopulations, and subsequent extension of the known geographic range, has resulted from incidental sightings, *ad hoc* surveys and surveys undertaken for the purpose of determining presence only. The latter have usually been initiated as a result of clearing applications associated with proposed or approved residential or other developments.

The recently confirmed subpopulations appear to be at critically low densities. Destruction and/or modification of peppermint woodland for residential development is continuing in coastal areas known to support western ringtail possum subpopulations and population fragmentation appears to have increased. Timber harvesting of jarrah/marri forest has been implicated as increasing predation risk. The only introduction/re-introduction to forest habitat cannot yet be deemed a success.

Given the above, the western ringtail possum continues to meet CALM's Criterion i) and Criterion ii) c) for recommendation for declaration as threatened fauna.

5. Management and Research Issues

Assessment of population and subpopulation size

The lack of information on subpopulation size at most locations reflects the difficulty of undertaking population studies on *P. occidentalis*. The species is not amenable to conventional trapping techniques and "capture-mark-recapture" methods for estimating population size are not appropriate. Alternative techniques are labour intensive, costly and require training of survey personnel to ensure data are reliable and comparable between locations.

Recommendations

- Priority should be carefully assessed when committing resources to surveying for the purpose of estimating population/subpopulation size.
- Priority should be allocated to assessing subpopulation size and monitoring at locations at the extent of the known range and at locations representative of forest (e.g. Perup) and coastal peppermint/tuart (e.g. Ludlow and Leschenault) subpopulations.

Threatening processes

Habitat alteration, fragmentation and destruction and predation from introduced predators are the major known threats to conservation of the western ringtail possum. Strategies are in place to reduce the risk from fox predation. Preliminary analysis indicates increased levels of predation by foxes occurs at forest locations where timber harvesting occurs (A. Wayne, pers com). Similarly, the extent of predation by feral cats is unknown and numerous studies from eastern Australia have shown *Pseudocheirus peregrinus* to be one of the most frequently recorded native mammal species in dietary analysis of the feral cat (see Dickman, 1996).

Recommendations

- Quantify the predation risk at forest sites where timber harvesting occurs and determine whether this risk can be reduced by manipulating existing 1080 baiting regimes.

Management of rehabilitated and displaced possums and the role of translocations

There are currently 4 translocation release locations. The location and current status of each translocation program is shown in Table 1.

Table 1: Translocation release locations for the western ringtail possum and status of released populations at September 2000

Release location	Source of released possums	Status
Leschenault Peninsula Conservation Park.	Rehabilitated possums sourced primarily from Busselton/Bunbury and surrounding areas. All have been rehabilitated or cared for by wildlife carers.	Translocation deemed to be a success and population thought to be self sustaining (de Tores *et al.*, 1998; de Tores *et al.*, in prep).
Yalgorup National Park – two release sites.	Possums displaced as a result of clearing for residential or other developments in Busselton and Bunbury. All animals were taken directly from development sites. There was no involvement from wildlife carers.	Monitoring is now restricted to one release site only. Translocation success yet to be confirmed, however data to indicate success include: • survivorship of individual released possums for nearly 4 years post release; • confirmed recruitment; and • survival of recruits to independence and sexual maturity.
Lane Poole Reserve/Keats Forest Block – two release sites.	Rehabilitated possums sourced primarily from Busselton/Bunbury and surrounding areas. All have been rehabilitated or cared for by wildlife carers.	Monitoring ceased in April 2000 with the death of the last remaining radio collared possum. A high level of mortality has been attributed to predation by *Dasyurus geoffroii*. Indicators of success include confirmation of breeding. However, there are no data to indicate young survive to independence and no evidence to suggest released possums survive beyond the first few months post release. Translocation cannot yet be deemed successful.
Karakamia Sanctuary, Chidlow.	Rehabilitated possums sourced primarily from Busselton/Bunbury and surrounding areas. All have been rehabilitated or cared for by wildlife carers.	Monitoring is on-going. Translocation success is yet to be confirmed. Data to indicate success include: • survivorship for over 4 years post release; and • confirmed recruitment. However, there is no evidence to show recruits have survived to independence or sexual maturity and dispersal patterns are unknown (Smitz, 2000).

Table 1 indicates only one of the four translocations can be deemed successful.

A breakaway radio collar suitable for use on sub adult and juvenile possums has recently been developed. The collar is in use at Yalgorup National Park where continued monitoring will enable assessment of survivorship, dispersal patterns and reproductive success of sub adult and juvenile possums (recruits to the population). This will enable assessment of translocation success. Data collection is scheduled for completion by 30 June 2001. This project has become partially self funding as a result of the co-operative arrangements now in place between the Dalyellup developer and CALMScience staff. Research Scientist salary is the only cost met by CALM.

Continued monitoring at the Karakamia Sanctuary has been unable to determine the fate of recruits. Further translocations of rehabilitated possums is scheduled for late Spring 2000.

The Lane Poole Reserve/Keats Forest Block translocations cannot yet be deemed successful and results to date indicate the translocation may have failed. However, the ability to determine translocation success for *P. occidentalis* appears to be highly dependent on the intensity of monitoring. An increased level of monitoring is required to adequately determine the fate of this translocation.

There is a current requirement for CALM to manage the release of rehabilitated possums. These possums provide a suitable source for further translocations to Karakamia Sanctuary, conservation estate and other areas within the former geographic range of *P. occidentalis* where predator control measures are in place. Issues associated with longer term use of rehabilitated possums for translocation need to be addressed.

Recommendations

- Continue monitoring at Yalgorup National Park to determine survivorship, dispersal patterns and reproductive success of recruits to the population.
- Provide advice to Karakamia Sanctuary on the use of breakaway collars and amendments to existing monitoring protocols. Monitoring emphasis should be on assessing survivorship, dispersal patterns and reproductive success of recruits to the population.
- Increase CALMScience involvement in the approval process for development applications where there is the potential to modify, fragment or destroy western ringtail possum habitat. Development approval should be subject to appropriate measures being undertaken to minimise fragmentation of western ringtail possum habitat. If relocation is recommended, costs for survey, relocation and monitoring should be met by the development proponent.
- Re-commence the monitoring program at Lane Poole Reserve to enable appropriate assessment of the translocation. Funding for this may be available through inter-agency agreements incorporating additional translocations of rehabilitated possums to 1080 baited areas of eastern jarrah/wandoo forest in the northern jarrah forest.
- Implement a priority listing of translocation sites for release of rehabilitated possums and seek funding through corporate sponsorship or other avenues to ensure translocations are only carried out when released possums can be effectively monitored.
- Implementing the translocation priority list should be subject to findings from previous translocations.
- Longer term use of rehabilitated possums as a source for translocation should establish protocols to deal with the issues of parasite burden, disease transmission, consideration of management units (MUs) as determined by the extent of divergence in allele frequency (Moritz, 1994), minimising time in care/captivity and management to encourage natural behaviour (Snyder *et al.*, 1996).

Information dissemination

Two recent publications promoting the success of CALM's Western Shield program have referred to the success of translocations to Lane Poole Reserve and Yalgorup National Park.

Curry and Kierath (1999) claimed:

> "... *there have been numerous successful species reintroductions. These include ... the western ring-tail possum (*Pseudocherus occidentalis*) to Lane Poole Conservation Park, Yalgorup National Park ....* ".

Similarly, the 8 page March 2000 "WA forests today" insert in all local newspapers claimed:

> " ... *Other endangered native animals such as the ... ring-tailed possum are also beginning to thrive after being reintroduced into forest inside and outside reserves*".

In neither case did the authors check the validity of the claims with the researchers concerned. Neither the Lane Poole nor the Yalgorup National Park translocations can yet be considered successful, and in the Lane Poole case, the translocation may have failed. Similarly Curry and Kierath's mis-spelling of the scientific name would have been detected had the relevant researchers been consulted.

These unsubstantiated claims of translocation success can only serve to undermine the validity of genuine successful translocations and the achievements of Western Shield in general.

Recommendation

- Prior to publication, all references to research programs should be verified for accuracy by the relevant researcher(s).

Corporate data-basing of location and distribution records

Location records of dubious nature or unable to be validated were not included in this review. All records are maintained on a CALMScience database linked to a Geographic Information System (MapInfo GIS software). The database conforms to database normalisation principles and all entries are attributed. The database was interrogated to ensure all verified, attributed and reliable records, including sub fossil and surface cave deposits, published and unpublished accounts and all relevant museum records, were used for the conservation status review.

This degree of attribution and validation is essential for accurate recording and maintenance of presence and distribution data, however, it requires a considerable commitment of time.

Incidental sightings recorded by CALM field staff provided critical information and have increased CALM's knowledge of the distribution of *P. occidentalis*.

Recommendations

- CALMScience continue to maintain the database and ensure data are appropriately attributed and validated.
- Data be made available via the CALM web through a GIS interface and in a read only format. Data should be selectable to provide relevant information to CALM staff.
- Ensure CALM field staff are appropriately trained in native fauna identification and encourage recording of all incidental and other sightings for inclusion in the corporate database.
- Publications on distribution should ensure appropriate acknowledgement of the contribution from CALM field staff.

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