A SUSTAINABLE FUTURE FOR SHARK BAY

A Response to the Shark Bay Region Plan

SHARK BAY ACTION GROUP

Representing:

the Australian Conservation Foundation

the Conservation Council of W.A.

August 10, 1987

PREFACE

Following the public release of the draft Shark Bay Region Plan, citizens concerned with the effect of the Plan on conservation values in Shark Bay, met in Perth and formed the Shark Bay Action Group. Conservation groups represented include the Australian Conservation Foundation, the Conservation Council of W.A.

Our primary aim has been to collaborate on the massive task of a comprehensive reponse to the proposals presented by the State Planning Commission and the Department of Conservation and Land Management.

In the process of reviewing the implications of the Plan, the need for a reorientation of guiding priorities toward the conservation of the beautiful and fragile Shark Bay system became obvious, i.e., and ecological approach was required. The need for legislation to implement these priorities, and the management needs of an interrelated marine and terrestrial system which includes human activities; also became apparent. This submission and draft legislation for a Shark Bay Marine and Terrestrial Park is the result, which we hope will reinvigorate serious consideration of alternative futures for Shark Bay and strategies to achieve them.

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CONTENTS

SECTION 1: INTRODUCTION

The Shark Bay region is composed of natural features of international significance. The interrelation between these features has evolved an unusual system of hypersaline inlets and embayments supporting a rich diversity of marine animals, extensive areas of coastal wilderness, and island refuges for endemic reptiles and mammals now extinct on the mainland. For a detailed description of the natural values of Shark Bay, the reader is referred to the Conservation Through Reserves Committee CTRC 1974) Report, and Nevill and Lawrence (1985.)

While there is currently a minimal commitment to conserving discrete parts of Shark Bay, (i.e., Bernier and Dorre Islands and some of the Small Islands are nature reserves), there is an urgent need to provide for the longterm conservation of the system as a whole.

There is also a need to assess competing and potential resource uses in the context of their significance from the regional to the international levels in order to determine the best long term use to the public. This, of necessity, requires wide public participation in the formative stages of planning for environmentally sensitive areas.

The draft Shark Bay Region Plan (SBRP) released in April 1987 purports to "provide an effective conservation framework for the area," (p.115). However, the draft Plan raises many questions regarding the State government's approach to environmental planning. Despite assurances to the contrary, it is apparent from the SBRP that conservation of Shark Bay's natural features is of secondary consideration to the preservation of the region's *status quo* for exploitive resource uses.

The Shark Bay region has been recommended for World Heritage nomination by several independent parties. The advantages that such designation would provide for the future management of Shark Bay's special areas require the solid support from regional planners in their position as community liaison experts. Ambivalence at this level in the face of undisputed benefits for longterm management puts assertions that "conservation of natural systems is the major theme," (SBRP, p.xvi) under justifiable suspicion.

This submission, therefore, consists of an assessment of the planning approach taken and the adequacy of proposals made in the draft SBRP for conservation of the Shark Bay environment, and constructive management alternatives and draft legislation to implement them.

SECTION 2: SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

It is clear from any discussion of the Shark Bay region that it possesses natural attributes of outstanding significance and hence deserves the best possible strategies for conservation to sustain them in their natural system.

SUMMARY AND RECOMMENDATIONS FOR ENVIRONMENTAL PLANNING

In principle, the opportunity to formulate regional plans under the State Planning Commission Act 1985, is a forward step toward integrated environmental and regional planning in W.A., and this initiative is welcomed. However, the deficiencies of the draft SBRP reflect the serious limitations on the state of environmental planning in W.A. generally which must be redressed before binding regions to inappropriate conventions for land use and development. In summary these are:

1. a lack of environmental planning policies to provide the context in which to carry out regional plans,
2. a lack of baseline data for resource capability assessment,
3. the extenuation of past and present land use allocations despite possible inappropriateness,
4. the reactive nature of environmental planning and management resulting in the isolated treatment of areas according to the perceived degree of visible and political conflict, rather than their context in a State-wide regional system, or their inherent ecological value,
5. the lack of mechanisms to facilitate meaningful public participation in the early formulation of environmental and regional planning.

These observations point to the urgent necessity of adopting a systems approach to successfully integrate human activities with our ecological support system for longterm compatibility.

In order for areas such as Shark Bay to be assessed and managed within the context of its hierarchy of affective regions (i.e., spheres of influence at region, state, national and international levels) - investment must be made in compiling a reliable bank of biophysical information. As Tinley (1986) points out, this need not comprise comprehensive surveys of epic proportion, but rather concentration on identifying the salient ecological factors for system management. (This approach has been illustrated to some extent by the numerous independant recommendations for Shark Bay to be acknowledged World Heritage status, based on the existing incomplete biophysical data base.)

In parallel to recognising the Shark Bay area's physical context and significance, the human system must also be referenced. By virtue of its

unusual natural features, reknowned beauty and relatively easy access, Shark Bay has demonstrated very definite emotive links with the State, National and global human community. Scientists, conservationists and holiday makers all have their legitimate concerns for the future of the area. These links have very pragmatic implications since the adoption of tourism by the local community as a major economic base. It is therefore incumbent upon our delegated public servants and decision makers to facilitate **wide** public input at as many stages of plan formulation as possible; to be evaluated and weighted **after** objective analysis of the message.

RECOMMENDATIONS FOR TOURISM PLANNING AND MANAGEMENT IN SHARK BAY

The following recommendations are based firstly, on conserving the exceptional natural attributes of Shark Bay, and, secondly, sharing them with other members of the public on a long term basis. It relies heavily on local involvement in education on conservation principles, determining social capacity levels for development, participation in management including monitoring change, and educating the touring public.

1. A resource capability assessment should be carried out to provide a framework in which planning objectives and policies for tourism.

2. Using conservation principles as a guide, establish a framework of tourism goals, from the World Heritage level through national, state, regional and to local.

3. Identify environmental criteria for monitoring physical change and capacity levels for different types of tourism activity.

4. Investigate social capacity levels for environmental, social and economic change and identify criteria for monitoring such change.

5. Actively explore innovative approaches to tourism opportunities which are compatible with the long term conservation needs of the unique natural system, for example, wilderness tours, natural history field courses and research, appropriate technology demonstration projects (desalination, photovoltaic) etc..

6. Develop a marketing strategy based on the unique local opportunities in order to target groups and individuals which would 'fit' the environmental and social capabilities of Shark Bay, rather than molding Shark Bay to fit fickle consumer 'demand'.

7. These recommendations would ultimately result in the determination of a ceiling on development and expansion appropriate within the environmental and social thresholds identified above, which would be incorporated into all long range plans for the region.

RECOMMENDATIONS FOR TERRESTRIAL COMPONENT OF THE RESERVE SYSTEM

1. There is an urgent need for a comprehensive review of pastoral lease boundaries in light of the outstanding conservation value of Shark Bay. We support the EPA's System 9 recommendations as an appropriate basis for a conservation reserve system.

2. The enactment of a reserve system for Shark Bay is paramount to ensure the area's needs in terms of environmental conservation of the terrestrial ecology are met.

3. Urgent steps must be taken to halt further land degradation in the Shark Bay region.

4. No expansion of the existing solar salt works should be permitted.

5. An on going monitoring programme of the salt works should be undertaken.

6. Gypsum mining should be phased out at the earliest possible opportunity.

7. No development of the Peron Point deposit should be permitted.

8. All areas previously mined should be rehabilitated to a suitable standard set by the EPA.

9. No further mineral developments including oil and natural gas should be permitted in Shark Bay. Expansion of existing operations or the commencement of new development would result in short term profit at the expense of a unique environment able to provide long term stable employment and income to the region.

RECOMMENDATIONS FOR THE APPLICATION OF BIOGEOGRAPHICAL PRINCIPLES

Biogeographical principles should be used as the basis for the designation of reserves, along with the objective for the protection of representative associations of flora and fauna habitat.

TERRESTRIAL RESERVE SYSTEM

ZONES	AREAS REPRESENTED	PERMITTED ACTIVITIES
Nature Conservation and Recreation	Edel Land, Tamala, Peron, Nangs, Wooramel Buffer	As consistent with A Class National Parks (no mining or pastoralism)
Special Management	Monkey Mia, road verges, Denham town buffer, etc.	No specific prescriptions; flexible management; Conservation emphasis
Wilderness	Dirk Hartog	Restricted recreation, Education and scientific research
Wildlife Preservation and Scientific Research	Bernier, Dorre, Faure and small islands	Consistent with A Class Nature Reserve. Restricted access

RECOMMENDATIONS FOR MARINE COMPONENT OF THE RESERVE SYSTEM

We support the EPA's System 9 recommendations as an appropriate basis for a conservation reserve system.

MARINE RESERVE SYSTEM

ZONES	PERMITTED ACTIVITIES
Dugong Protection	Scientific research/education Passive observation of dugongs and whales Commercial fishing other than trawling
Sanctuary	Scientific research/education Commercial fishing other than trawling
Marine Wilderness	Scientific research/education only
Marine Special Protection	Necessary restrictions and prescriptions to protect special features
General Access	All activities permitted except commercial trawling Policing and monitoring essential

RECOMMENDATIONS FOR WORLD HERITAGE NOMINATION

Shark Bay is recognised as fulfilling the criteria for World Heritage Listing. However, the SBRP in its present form does not satisfy the degree of protection required under the World Heritage Convention. The proposed reservation system in this submission would rectify this situation and facilitate Listing. To this end, the State and Federal governments should take immediate cooperative steps to have the Bay included in the World Heritage List.

SECTION 3: ENVIRONMENTAL PLANNING

It has been said that balance is the essence of the planning process. It has also been observed that planning policy in Australian is concerned essentially with development. Thus, the concept of balance underlying conventional planning practice applies only to those factors relevant to development, not a balance between development and conservation, (Fisher 1980, pp.99,135). For this reason several prestigeous bodies and informed individuals have proposed a reorientation of planning priorities from an economic development to an emphasis on ecological principles.

Under the State Planning Commission Act 1985, the State Planning Commission (SPC) is responsible for the "co-ordination and promotion of urban, rural and regional land use planning and land development in the State," (Sec. 18 (a)(i)). It is also responsible for the preparation of a State-wide planning strategy to co-ordinate the planning activities of other government authorities, and "to undertake research and develop planning methods and models relating to land use and development and associated matters," (Sec. 18 (d)).

Regardless of its broad powers under the Act, the SPC draws on the organisational experience, philosophies and methods of the pre-functioning Metropolitan Region Planning Authority which now comprises the majority of the SPC staff and management. It is not surprising then, that a management strategy used extensively in local and urban planning, the land use plan or scheme, would be applied to the Commission's new regional planning challenges, such as Shark Bay.

The case for incorporating environmental planning principles into resource planning is intuitively sensible and a basic goal of the conservation movement. A model of single and multiple use zones applied successfully over an extensive area exists in the Great Barrier Reef Marine park Act. It is, therefore, disappointing that the opportunity to research and develop more appropriate planning models for regions with high conservation values, such as Shark Bay, was not ventured by the SPC under Section 18 (d) of the Act. Instead, the Shark Bay Region Plan (SBRP) raises many questions regarding the approach to environmental issues taken by its major producers, the SPC and CALM.

The Planning Context

The implications and effectiveness of the draft SBRP, or any other planning exercise, must be assessed in its relation to other functional planning levels, i.e., where it 'fits' in the overall planning system. For the purpose of this discussion, the relevant planning levels can be regarded as:

i) the broad-scale policy level - such as the World, National and State Conservation Strategies, and the State Government Position Paper on Coastal Planning,

ii) the regional planning level - where the objectives and directions for the future management and decision-making in regions is set; and land uses and tenures based on resource capabilities are designated,

iii) the management planning level - where the 'ways and means' of achieving stated objectives for specific areas are laid out, e.g., Coastal Management Plans (formerly prepared by the Dept. of Conservation and Environment and now by the SPC); and National Park management plans (CALM), and

iv) the project planning level - normally EISs as administered by the Environmental Protection Authority for impact minimisation, but with the onus on project proponents.

Ideally, these levels are mutually supporting, with broad policies guiding planning objectives and conversely, plan implementation enforcing policies (Whitaker 1986). In W.A. the framework for regional planning is not yet integrated into a framework of State policies to site management. To date, the broadest scale of planning has been the Perth Metropolitan Region Plan which, along with other regional development plans such as Bunbury, dealt with problems of urban expansion. The need for

i) an overall planning framework,

ii) a logical basis for defining regional systems, and

iii) objectives set for the long-term sustainable operation of the entire system;

was advised in discussions on the State Conservation Strategy (DCE 1983, p.69) and by the Committee of Inquiry into Statutory Planning in W.A. (1984). The relevance of adopting a systems approach is discussed further in following sections.

1.2 Land Use and Environmental Planning

In 1975, the Australian Advisory Committee on the Environment (AACE) found that:

> The increasingly complex land-use conflicts and decisions faced within Australia by Federal, State and Local Governments have . . . created a situation whereby land-use management on the basis of expediency, tradition, short term economic considerations and other factors which frequently are unrelated or contradictory to sound use . . [is the norm].
>
> Decisions about the use of land can be properly made only in the light of basic data about the land and its ecological characteristics,

AACE 1975, p.3.

The Committee of Inquiry into the National Estate (1974) also found that regional land use plans would need to be based on regional ecology to ensure the wise use of land. A new system of land values was recommended to, among other things:

i) protect important natural areas and their associated wildlife,
ii) protect catchments from damaging uses, and
iii) withdraw vulnerable marginal land from production for other uses.

"An examination of existing planning reports [in W.A.] indicates that the level of environmental input into the planning system has been small," (O'Brien 1986, p.262). This is in spite of the State Government's commitment to a State Conservation Strategy (which in turn endorses the National and World Conservation Strategies). It was the World Conservation Strategy which proposed the integration of conservation and development through environmental planning on a systems basis. That is, ecological evaluation ranging from broad assessment to detailed soil capability assessment, and including marine areas. The advantages of a natural systems approach to comprehensive planning is that it provides a scientific basis to

i) guide development and management,
ii) evaluate cumulative impacts of multiple resource uses,
iii) evaluate sequential impacts of resource uses, and
iv) evaluate and monitor deliberate intervention in the system by resource managers (Whitaker 1986).

Between 1972 and 1977, the CRTC documented the necessity of environmnental conservation on a systems basis. Unfortunately, planning authorities have not followed their lead on the broader scale. Apart from the EPA's involvement in that epic evaluation of reserve systems across the State, integrated environmental planning in W.A. has been limited to project planning (EPA) and a series of discrete coastal management plans (DCE).

Coastal Management Plans for specific areas of the coastal zone are non-statutory or advisory documents prepared in response to requests by local authorities or other government departments. Site specific management mechanisms are recommended, such as subdivision and development control, works programmes, creation of reserves, use regulations, etc., to address situations of high use conflict or hazard (Chalmers 1985; Sansom 1985). In 1984 the DCE was requested to prepare a coastal management plan for the Shark Bay coastal zone by the Shire of Shark Bay via their town planning consultants, Taylor and Burrell. After considerable time spent by the DCE team, the issues of

high conservation values, the over-hanging recommendations of the CTRC, and that of existing land tenure, were found to be outside the terms of reference for a non-statutory coastal management plan. After some consideraton by the Department of the Premier and Cabinet, and with the absorption of the coastal managment section of the DC&E into the newly established SPC, the challenge of planning in Shark Bay was taken up under the broader powers of the SPC as its first non-urban regional plan.

Aspects of environmental concern to be addressed in the SPRP, were advised by the chairperson of the EPA (SBRP appendix 2, pp.110,115-116) and indicate the differences in scope between land use planning conducted by the SPC and environmental planning possible under EPA directives.

The directives given by the EPA were not met in the draft SBRP. (Refer to Appendix 1 of the SBRP). Conservation values are treated in the same manner as any other land use in an urban situation, i.e., as an isolated local issue, not in a systems context. This is clearly inappropriate as conservation values depend upon the prevention of irreversible change, whereas most other land uses can and do change. This fact is reflected in the contemporary approach to urban planning as a dynamic process, not a product in itself.

Under "Strategies for Implementation" the Plan proposes to: "Amend existing planning legislation to allow for the final Region Plan for Shark Bay to have statutory authority similar to a Town Plan," (p.96). Does this mean then, that the SBRP is subject to the same perogatives for amendment, bonus bargaining and negotiation of land uses and zone boundaries as conventional planning schemes?

A planning scheme limited to the objectives and *preferences* of local residents does not adequately address the needs of endemic flora and fauna for their long term survival. In other words, the non-human phenomena for which Shark Bay has received international recognition (and EPA recommendations for national park status) are not afforded consideration on a comparable basis with the present pastoral and other resource uses. The issue of referrent groups is discussed further in sec. 2.3.

2.0 OTHER ISSUES OF PRINCIPLE AND PROCESS

2.1 Terms of Reference and Definition of Study Area

In theory, the terms of reference should provide an explanation of how the study came about, its purpose, and which social groups are to be

served by it. Goals and objectives follow from the terms of reference and are essential for determining the scope of and emphasis on information to collect (Chalmers 1984). For the SBRP the objectives chosen were to:

> (a) identify the preferred and multiple uses for the land and marine environments of the region.
>
> (b) indicate the reservations of the land and marine environment required to give effect to the preferred and multiple uses and to protect the local environment.
>
> (c) include broad guidelines for subsequent formulation of management programs.
>
> SBRP 1987, p.2.

The repeated emphasis on *preferred and multiple uses* without specifying whose 'preferences' were to determine land and marine uses; and, as a consequence, the limits set on determining the **best** uses for the public resources in question, is disturbing.

2.2 Definition of the Study Area or Region

As with all classifications, regions are designed with a purpose in mind, i.e., the criteria are selected according to the terms of reference and objectives, whether explicit or implicit. In addition, regions like ecosystems can be expressed as a hierarchy of units of decreasing magnitude (Tinley 1986, 223). By way of example, it is interesting to compare the relationship between the terms of reference of past planning studies on Shark Bay and the corresponding study areas defined.

The CTRC Regions

Following from its terms of reference, the CTRC's 12-region system was based on natural and demographic factors, to assess W.A.'s needs for both representative biological systems and the projected public demand for access to natural areas. System 9 - the Central West Coast encompasses the west and east Gascoyne districts and the northwest part of the Murchison district. This region is further subdivided into three physiographic units, (of which Shark Bay is one), which formed the framework for the CTRC's proposed system of reserves. The main concern in considering conservation reserves in System 9 however, was the growth of recreation and tourism and the pressures that these activities impose on the environment, flora and fauna and primary industries, principally the coastal zone at Shark Bay (CTRC 1974, p.9-5). Additional pressures caused by solar salt operations, gypsum mining and dune erosion from fire and overstocking, resulted in Shark Bay comprising the

focus of most investigation and recommendations for extensive conservation reserves over the area.

Subsequent planning studies on Shark Bay show a similar connection between study terms of reference and the study area delineated. When planning consultants Taylor and Burrell were contracted by the Shire of Shark Bay to prepare a statutory plan, their study area was based on the Shire's legal terms of refernce to promote the development of the whole Shire. When the Coastal Management unit of the Department of Conservation and Environment (DCE) were in turn requested to resolve the thorny conflicts over land use and management along the Shire's coastal strip - that was precisely their study area.

The SPC's terms of reference under the SPC Act have already been noted. Following the broad objectives adopted for a regional plan to accommodate multiple uses of the marine and land environments, it would seem pertinent to assess and designate such uses over a correspondingly broad geographic system. Instead, the 'region' defined by the SBRP focusses only on the area of well-known conflict, thus extricating those conflicts from their regional context and significance.

2.2.1 Ecological Regions

W.A. is in the fortunate position of having a long history of research on natural regions. J.S. Beard (1980) cites Baron F. von Mueller as the first to draw attention to phytogeographic regions in W.A. in 1867. Clarke (1926) later proposed a regional subdivision of the State based on a synthesis of ecological factors, starting with broad physical regions and refined by reference to geologic and climatic factors. Gardner (1942 in Beard 1980) placed more emphasis on botanical provinces, but also integrated the influences of substrate and climate to produce a system of regions very similar to Clarke's. Referring to the the Vegetation Survey of Western Australia (Beard and Webb, 1969), Beard relates:

> In the course of field work for mapping the writer first came to appreciate the reality of the ecological regionalisations of Clarke and Gardner. Later when maps were prepared it quickly became obvious that the natural regionalisation made itself apparent . . .
>
> Beard 1980, p.44.

The Senate Standing Committee on Science, Technology and the Environment also found that:

> There was general agreement in evidence presented to the inquiry that natural land units would be the best basis for

> land use regions, and that the river valley and its catchment area was the obvious natural land unit.
>
> SSCSTE 1984, p.23

The importance of defining appropriate regions for planning and management in W.A. was reiterated by Tinley in discussions on a State Conservation Strategy (1986):

> To avoid the pitfall of studying or trying to resolve environmental problems in a piecemeal unrelated way it is vital that they are assessed within the contextual setting of their ecological area (arena) of influence and not in isolation ... The problems have to be dealt with in the context of a mimimum natural functional area, such as a river catchment, whose bounds are practically identifiable by most anyone on the ground, on maps and photographs.
>
> Tinley, 1986, p.221.

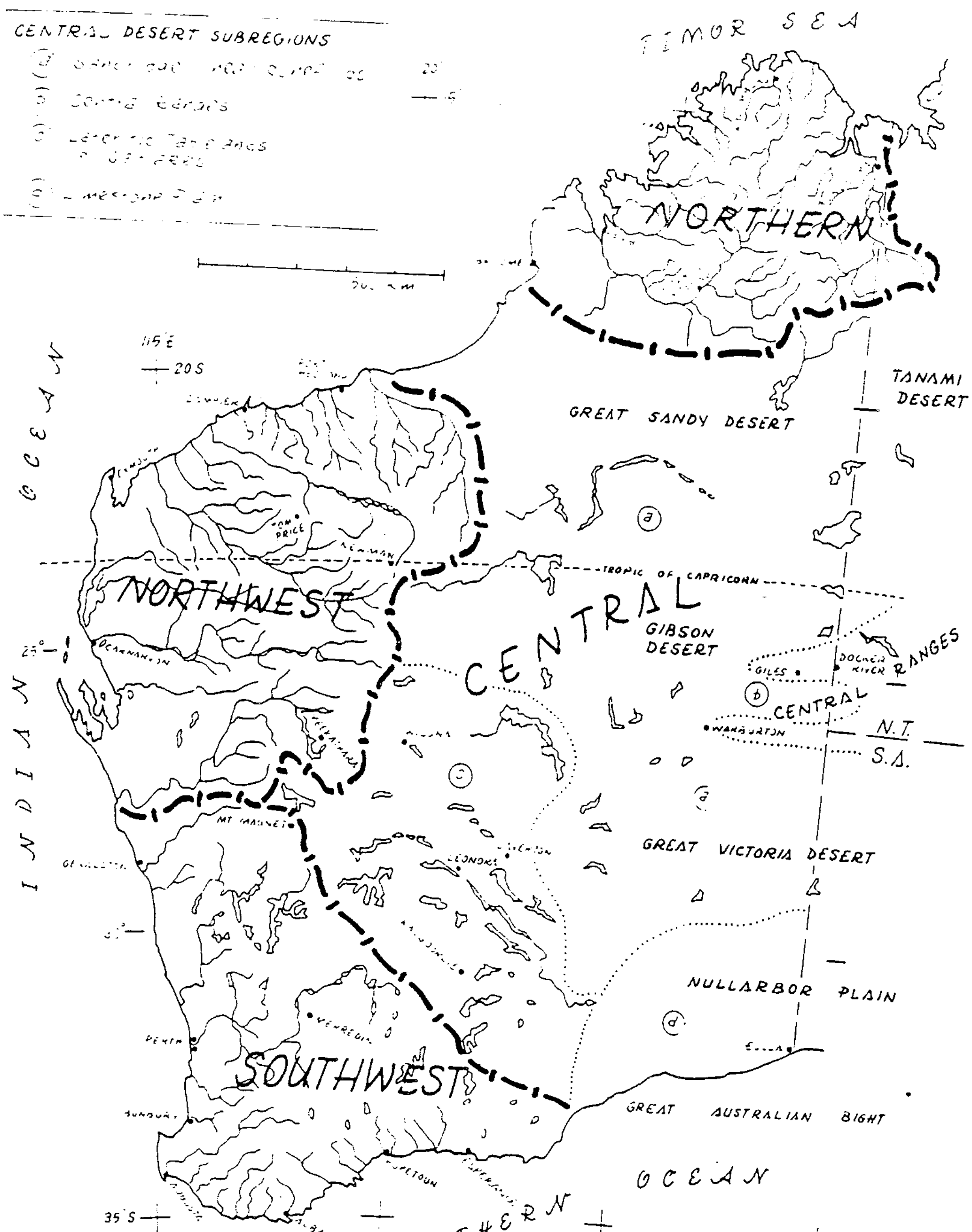
Tinley suggests four main ecological regions common to the greatest number of broad-scale planning objectives. These are based on a synthesis of climatic, physiographic, vegetative, hydrologic and human activity units. Subregions are divided into progressively smaller drainage units. Under this system, Shark Bay is located in the Northwest Region and the Wooramel drainage basin (ref.figure below). Hydrologic units such as the Wooramel are posited as the minimum area for studying local environmental problems and human activities (Tinley 1986, p.225-229).

The lack of such a planning model in the past to integrate physical and economic systems "has resulted in organisational problems of coordination where the programmes and activities of groups are defined by contrived unit areas convenient to their particular interests," (Tinley 1986, p.230).

In appendix 2 (*Environmental Review of Proposed Regional Plan*) it is stated that "the plan attempts to treat Shark Bay as a whole and accordingly, it embraces an area far greater than that covered by the EPA [System 9 Redbook]," (p.114). However, according to the CTRC:

> It [System 9] extends along the coast from just north of Kalbarri to the Mary Anne Islands north of Onslow, and inland to Gascoyne Junction (Fig.9.0), and is some 94,910 km^2 in area.
>
> CTRC 1974, p. 9-1.

Clearly, the CTRC assessed the Shark Bay area **within** this larger region.



THE MAJOR ECOLOGICAL REGIONS OF WESTERN AUSTRALIA.

(AS IDENTIFIED BY THE CLOSEST FIT OF CLIMATE, PHYSIOGRAPHY & VEGETATION TO HYDROLOGIC DIVIDES)

SOURCE. TINLEY, K.L. 1986

It formed a focus of attention precisely because of its inherent ecological value and its potential uses for conservation, recreation and tourism and subsequently for its controversial recommendation for extensive reserve status. The draft SBRP focussed only on this controversial sub-region to balance all potential uses.

Without an explanation of how this study area was determined in relation to its broad terms of reference and objectives, it appears that the 'region' was drawn along lines of convenience based on past study areas (e.g., CTRC subregion of Shark Bay), deference to local resource users' dislike of 'outside' scrutiny (keeping the study area small to minimise the number of existing users affected), and the lack of biophysical data to adequately assess the implications of local activities on an ecological region scale.

The CTRC's brief necessitated study areas to be narrowed down as a function of their conservation values, in contrast to the Shark Bay Project Team's which was to "*provide for the region's development, community and conservation needs*" (p.2). A rough calculation indicates the study area to be less than 50% of Shark Bay Shire. The focus on only a **portion** of the total shire (the administrative unit for community development) and, an even smaller portion of the natural region (the very portion which is of acknowledged world conservation values) is reflected in the resultant draft zoning scheme.

2.3 Public Participation and Referrent Groups

The point has been made that *ad hoc* plans must be conducted and evaluated in their wider context of regional and state planning systems. It is equally instructive to reassess the context for opportunity for public participation in the planning process.

From a review of government publications and legislation, Colman found that in Australia public participation is ". . . at most token with the format largely determined by technocratic rather than democratic considerations".

> . . . participation is viewed primarily as an information-exchange mechanism, coupled perhaps with infrequent formalised opportunities for interaction on the content of a planning scheme or ordinance. Selected predigested information passes from those who have it to those who do not. Plans prepared by 'them' (local or state bureaucrats) are momentarily displayed to 'us' (the community) - usually with an invitation to comment on or object to the *fait accompli*.
>
> Colman, 198-, p.2).

It seems that there are few legal impediments to citizen involvement in social policy, but restrictions lie in conventions and the lack of appropriate machinery to facilitate meaningful participation. Colman also suggests that in the cultural context, we have inherited a national suspicion of free-thinkers and outsiders.

Given this 'framework' for participation, it is not surprising that many community groups find themselves outside of orthodox politics simply because the established political arrangements are inappropriate and inadequate for their purposes. It is, therefore, not unusual when action is required, for such 'outside' concerns to bypass token participatory efforts and to go straight to 'the top' in the person of the relevant Minister.

The establishment of multi-disciplinary project teams or commitees clearly improves the range of views on the issues under study, but must also recognised as remedial attempts to communicate and placate, as opposed to continuing two-way dialogue. Because such committees have little impact on established political arrangements, representation on them is limited to groups who have already established their political legitimacy.

Section 2 (iii) of the Shark Bay Project Brief clearly states that "local and public involvement and consultation during the formulation of the strategy will be maximised," (p.2). However, the Study Management Structure provided in the Brief shows linkages between the departmental Project Team (CALM, SPC, D. Ag, D. Fisheries) and consultants for "Specialist", "Technical", and "Community" groups only. No formal mechanism for obtaining "public involvement and consultation" beyond the Shark Bay region is provided.

For the purpose of comparison, the Great Barrier Reef Marine Park Authority is commited both by legislation and in practice to public participation,

> Participation of all sectors of the public in decisions about the use of a common resource helps to ensure that the public good - conservation of the common resource - prevails over the private good of maximization of profit,
>
> Kelleher and Hay 1984, p.51.

Despite numerous acknowledgements throughout the draft SBRP of the values of Shark Bay for international science, education, heritage and associated implications for tourism, the Plan reflects and entrenches the preferences of only one major referrent group - local resource users. It is not surprising, given this narrow approach, that the result is an essentially parochial land use scheme, narrow both in the range of

objectives and alternatives considered and in geographic perspective - a predictable reinforcement of the *status quo*

While the necessity of full consultation and consideration of local preferences for land use is not disputed, the scientific values of Shark Bay and concept of heritage, by definition, extend far beyond the delineated study area or the administrative boundaries of the shire.

2.3.1 Evaluation of Public Input

The explicit weighting of one group's preferences over all others is the job of politicians, to be justified **after** the objective analysis of the costs and benefits to **all** affected parties is carried out.

To bypass the values and objectives held by other groups with an interest in Shark Bay's unique attributes

i) denies the concept of public resources and legal status of crown land,

ii) restricts the identification of a range of alternative objectives and management options considered and, hence, potentially greater benefits,

iii) restricts the evaluation of alternatives which are difficult to quantify, such as conservation values, option value, intrinsic value, etc.,

iii) avoids objective comparison of Shark Bay's pastoral, fisheries, mining and conservation values in the wider context of region, state, and national systems.

2.4 Values and Facts

Throughout the Plan values are confused with fact and facts are presented in a misleading manner.

While generally accepting that planning cannot be value free, planners are obligated to address and differentiate between the values held by affected groups and individuals, before adopting an advocacy position, if at all. The values of the planners and the planning process itself affect the final product, e.g., emphasis on low risk, short-term responses and 'hard' facts are generally favoured over long-term, holistic responses and serious consideration of intangibles. It is contended that such value assumptions as reflected in the SBRP objectives, pre-empted the conduct of a proper ecological inventory or objective analysis of alternative futures for Shark Bay.

Appendix 3 illustrates the way in which the EPA recommendations for Shark Bay are freely translated into 'intent' in an attempt to rationalise the *status quo*. Surely, if the intent of the EPA had been to zone Shark Bay for continued grazing and commercial fishing and increased mining activity, they would not have recommended national park and nature status for it?

Unfortunately, several other examples of inconsistent presentation of information occur, e.g.,

i) despite the acknowledged lack of biophysical data available, existing pastoral uses are defended for their contribution to conservation,

ii) the upgrading of certain leases in value from the Dept. of Agriculture's agricultural capability maps is not explained,

iii) conservation values, floristic diversity and low pastoral values are only discussed in relation to proposed conservation reserves, i.e., no comparison of values is offered for the remaining 'zones',

iv) there is no discussion of the impacts of past and present land and marine uses except that no adverse effects are 'known',

iv) 'protective' zones are set up for coastal, vegetation and marine resources, but exploitive uses are allowed in all of them,

v) the "pastoral uses zone" is referred to as representing only 35% of zoned uses, but in reality is included in some 90% of 'protective' zoning by definition in Table 3, SBRP.

3.5 Biophysical Resource Assessment

According to the Task Force on Land Resources Management in W.A. "the fundamental prerequisite to good land management is an understanding of the processes involved in the ecosystems that are being managed," Dept. of Premier and Cabinet 1984, p.40).

The widespread neglect of ecological factors in land use decisions can be attributed to:

i) a lack of ecological information in a form relevant to planning issues,

ii) planners' lack of understanding of biological and physical sciences, and

iii) politicians find it hard to designate areas for conservation in the face of development pressure, (Luff and Ojamaa 1977).

In the Shark Bay situation, the first condition is acknowledged and dismissed in the SBRP; the second is unlikely; while the third condition is patently obvious.

Approaches adopted by agencies with similar responsibilities elsewhere have regarded knowledge of the biophysical resource as essential for regional planning. For example, the Australian Advisory Committee on the Environment (1975) found that effective land use planning must be based on:

i) basic data about the characteristics of the land,

ii) an evaluation of the suitability of the land for various uses,

iii) an evaluation of the present and future needs of the community for land for various uses, and

iv) an assessment of the state and national requirements of land for various uses.

This view was readily supported by the W.A. Commissioner for Soil Conservation in his address on 'Land Capability Assessment' to the Coastal Planning and Management Seminar sponsored by the then Dept. of Conservation and Environment,

> The assessment of land capability, particularly the resource inventory stage, is time consuming. However, it is naive to think that it is possible to sensibly plan without such assessment. In fact planning either by Government, a council or a developer will be inefficient, if not grossly misleading, unless capability assessment is carried out first.
>
> Graeme Robertson, 1984, p.37.

The two main concepts in land capability assessment and classification are:

i) capability - the potential of the land for use in specified ways, and

ii) limitations - characteristics which have such an adverse effect on land as to lower its capability rating.

According to Riney (1984), agricultural capability classifications have placed too much emphasis on present land condition and not enough on trend and potential. The main concern is that once overuse has reached the threshold point, degradation proceeds at an accelerated rate and continues long after the physical use has stopped. In addition, such classifications are limited to arable uses and as such are best used for the purpose for which they were designed (Riney 1984, pp.59-65).

The technique of map overlays for determining appropriate land uses was developed by the eminent American planner, Ian McHarg (1968), and was used in close conjunction with **an ecosystem inventory, analysis of natural processes and an evaluation of limiting factors for different land uses.** Resources were thus explicitly rated for all prospective land uses, classified into compatible or incompatible groups and then synthesized into a suitability map.

Sadly, the Shark Bay Study Brief indicated that the Planning Strategy had only to identify the "preferred and multiple uses" for Shark Bay, not the resource capabilities or best long-term uses for the public good.

The SBRP describes the land use plan as its major planning strategy to achieve its stated objectives. Maps indicating "areas which have a

significant importance for each use relevant to each objective were prepared as overlays to topographic base maps," (p.49). The criteria for establishing and rating the degree of 'importance' are not explained.

3.6 Multiple Use

The economic 'rule' for multiple use of versatile resources is that

> . . . if two or more simultaneous uses of a resource will yield a greater benefit than one use alone, then the resource must be used on a multiple-use basis. . . the primary use should give way to other uses to the extent that the net benefit from these other uses exceeds the sacrifice in the primary use,
>
> (Pearse 1977 in Krueger and Mitchell, p.15).

A major shortcoming of the multiple use approach is the common failure to consider non-priced benefits and costs due to the difficulty of evaluating them on a comparable basis with monetary benefits and the outdated conviction that our resources are so vast that substitutes can always be found for non-exploitive uses of resources, (Pearse 1977, p.25).

The AACE (1975) endorsed the multiple use approach to resources management when the total benefits to society are greater than for single use of resources. The Committee cautioned, however, that

> The advantages of multiple use of land may be nullified unless the public understands the concept and is educated to use the land in accordance with the zoning and restrictions which may be necessary to segregate conflicting uses,
>
> AACE 1975, p.32.

The multiple use concept has been applied most frequently to forestry resources and is considered by CSIRO to be suited to areas of high rainfall (CSIRO 1974, in AACE 1975, p.32). In W.A., CALM manages the forests for "several purposes, some of which may be incompatible," (p.27) Hence the (former) delineation of forests into Management Priority Areas, each with a designated management priority which determines the single use or combination of uses through specific policies and management procedures.

Multiple use management areas also comprise one of eight possible categories of conservation defined by the IUCN as: large areas containing considerable territory suitable for rural production such as forestry,

water or pasture, but not containing nationally unique or **exceptional natural features** (Lausche 1980, p.78).

The Great Barrier Reef Marine Park is probably the best known example of a multiple use protected area in Australia. The three main categories of zones group compatible uses and exclude incompatible ones. These are:

i) Preservation Zones and Scientific Research Zones - for strictly controlled scientific research only;

ii) Marine National Park Zones - for the multiple uses of science, education and recreation; and

iii) General Use Zones - for commercial and recreational fishing which does not jeopardize the ecosystem or its major elements (Kelleher and Hay 1984).

3.7 Resource Substitution and Option Values

No attempt was made in the SBRP to openly compare the values of potential land uses relative to their total supply and the availability of substitute products at the regional, state or national level.

Presumably, the assymetry in the availability of substitutes between grazing and fishing, and conservation of a world reknown and unique area was too obvious for discussion in the draft Plan. Unfortunately, the reality of this situation was not reflected in the Plan proposals for conservation.

The tendency for productive technology to concentrate resources in the most efficient means of production would suggest that extensive agriculture on fragile lands will be eventually be replaced by more intensive production from a more resilient resource. In contrast, as the supply of natural systems decreases through development, technology cannot create substitutes for representative or unique ecosystems (Clawson and Knetsch 1959).

For any particular tract of land not yet developed, there are a wide range of options, ranging from leaving it in a completely natural state through to completely removing the wild vegetation and animal life and converting it to urban or industrial uses. Up to a certain point of development, the option remains open to revert to a more natural state again.

> A rational and sensible choice from among the options available must be based on ecological and economic considerations, as well as on other grounds . . . Where alternative areas exist that are suitable for more intensive uses, it would be absurd to use an

> environmentally unique area for any purpose that [illegible] damage its environmental values,
>
> Dasman et al. 1986, p.23.

When comparing commercially profitable land uses to conservation, the CTRC based its subjective judgement on the community's acknowledgement that "unique, beautiful or scientifically important features have a real value ... which must be recognised when there are conflicting demands for land use," (CTRC 1974, p.0-13). In addition, only when there were no substitute areas which could fulfill the requirements for representative reserves, were conflicting use areas, such as pastoral leases, recommended for reserve status.

Summary and Recommendations regarding Regional Planning

In principle, the opportunity to formulate regional plans under the State Planning Commission Act 1985, is a forward step toward integrated environmental and regional planning in W.A., and this initiative is welcomed. However, the deficiencies of the draft SBRP reflect the serious limitations on the state of environmental planning in W.A. generally which must be redressed before binding regions to inappropriate conventions for land use and development. In summary these are:

1. a lack of environmental planning policies to provide the context in which to carry out regional plans,
2. a lack of baseline data for resource capability assessment,
3. the extenuation of past and present land use allocations despite possible inappropriateness,
4. the reactive nature of environmental planning and management resulting in the isolated treatment of areas according to the perceived degree of visible and political conflict, rather than their context in a State-wide regional system, or their inherent ecological value,
5. the lack of mechanisms to facilitate meaningful public participation in the early formulation of environmental and regional planning.

These observations point to the urgent necessity of adopting a systems approach to successfully integrate human activities with our ecological support system for longterm compatibility.

In order for areas such as Shark Bay to be assessed and managed within the context of its hierarchy of affective regions (i.e., spheres of influence at region, state, national and international levels) - investment must be made in compiling a reliable bank of biophysical information. As Tinley (1986) points out, this need not comprise comprehensive surveys of epic proportion, but rather concentration on identifying the salient ecological

factors for system management. This approach has been illustrated to some extent by the numerous independant recommendations for Shark Bay to be acknowledged World Heritage status, based on the existing incomplete biophysical data base.)

In parallel to recognising the Shark Bay area's physical context and significance, the human system must also be referenced. By virtue of its unusual natural features, reknowned beauty and relatively easy access, Shark Bay has demonstrated very definate emotive links with the State, National and global human community. Scientists, conservationists and holiday makers all have their legitimate concerns for the future of the area. These links have very pragmatic implications since the adoption of tourism by the local community as a major economic base. It is therefore incumbent upon our delegated public servants and decision makers to facilitate **wide** public input at as many stages of plan formulation as possible; to be evaluated and weighted **after** objective analysis of the message.

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SECTION 4: BIOGEOGRAPHICAL PRINCIPLES OF CONSERVATION

One of the most important questions to be asked in examining the integrity of an area is how big must an ecosystem reserve be in order to maintain its general community and species content integrity. The answer to this question 'probably rests at the intersection of two bodies of knowledge - community ecology and the recently formalized theories of island biogeography' (MacMahon, 1979, p.128). The species diversity-stability model of community ecology broadly states that the inherent stability of a community increases as the count of included species increases. Stability may be defined as 'the maintenance of the ecosystem's equilibrium integrity in the face of perturbation' (MacMahon, 1979, p.128). However, it should also be recognised that stability can also be a function of the diversity of species and/or the internal organization of the component species.

Studies of island biogeography (MacArthur and Wilson, 1967; Diamond, 1975) suggested that the number of species/unit area may be approximated by the formula:

$S = CA^z$ where S = number of species on an island;
C = a parameter characteristic of the particular taxon and archipelago of interest;
z = a power assuming values in the range 0.18 - 0.35 and approximated *a priori* by assuming that species abundance are distributed in a lognormal manner.

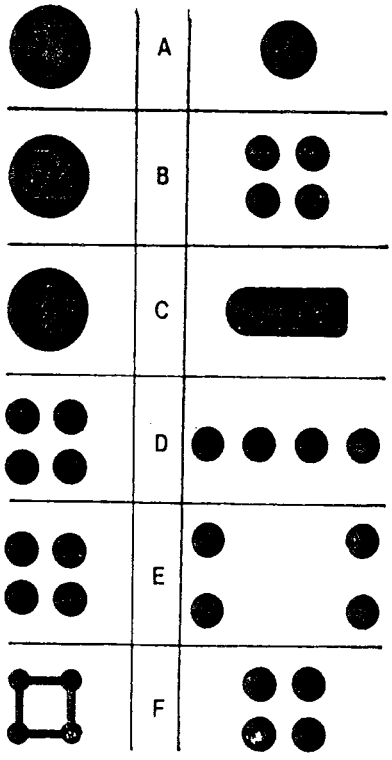
This relationship may be used to infer the optimum size of nature reserves. Given a certain number of species, it is possible to calculate the area necessary to maintain them. A point of difficulty does arise in that the calculation requires estimates for the values of z and C. However, appropriate studies of habitat and species characteristics should be able to provide reasonably accurate estimates of these values. One of the conclusions to be drawn from island biogeographical research (MacMahon, 1979, pp.129,130) is that:

> communities composed of fragile, specialized, rare, sensitive, large-sized species and lots of them in a complex (heterogeneous) environment may require large areas to maintain their integrity... The obvious solution in a practical sense is to study and meet the needs of the species in the community of interest which has the greatest areal requirements. For communities as a whole, the island biogeography rule of thumb is that it takes a 10-fold increase in area to house twice as many species.

Furthermore, island biogeographic theory suggests that in order to help prevent the tendency for species to become extinct replicate reserves of equal size should be used. 'A nature reserve surrounded by a totally different community may be constantly bombarded with potential competitors and thus may have a high species replacement rate, while an isolated area with few infiltrating competitors loses species at a lower rate' (MacMahon, 1979, p.130). The consequences of the relationships observed in island biogeographical studies has led to the positing of the appropriate shape and size of nature reserves (Diamond, 1975; Wilson and Wills, 1975).

The figure below depicts several postulates derived from island biogeographical research:

GEOMETRIC RELATIONSHIPS OF RESERVES BASED ON BIOGEOGRAPHICAL PRINCIPALS



Relationship in the left hand column is always more desirable than that in the right hand column. A. Larger reserve better than small; B. large reserve better than four small ones of equal area; C. circular reserve better than any other shape; D. mutually adjacent areas better than linearly arranged; E. close replicate reserves better than any other; and F. smaller but connected reserves better than separate but equal area reserves (after Diamond, 1975; Wilson and Wills, 1975; MacMahon, 1979).

A biogeographical approach to preserving the integrity and stability of the Shark Bay region would appear clear. First, determine the minimum area necessary to maintain community type. Second, assess the rate of extinction for the most sensitive species. Third, establish replicate natural areas making the practical trade-offs among size, number and proximity, with the ideal being 'a large number of large areas adjacent to and mutually interconnected' (MacMahon, 1979, p.131).

The SBRP (1987) makes no mention of the problems of size and shape of the conservation areas it proposes. Furthermore, the SBRP (1987) tends to see zones of land use as isolated units rather than as an integrated structure. This major shortcoming of the plan casts serious doubts on its ability to provide for sound ecological management and for the Western Australian Government to establish a regime of implementation which would ensure that the region is preserved.

The Environmental Protection Authority's (EPA) (1975) System 9 recommendations provide a far more appropriate management strategy for the Shark Bay region, and with relatively minor modifications to allow for some of the values identified in the SBRP, should be used as the basis for the conservation of the region. The System 9 recommendations paid explicit attention to the need to preserve habitat and to treat the biological resources of the region as an interdependent unit. Such an approach, which is expressly related to notions of the ecological integrity of the Shark Bay area with its particular marine and terrestial environments, is essential if the heritage values of the region are to be preserved.

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SECTION 5: HUMAN IMPACTS ON THE SHARK BAY REGION

The purpose of the present section is to outline the current major human impacts on the Shark Bay region. In particular, this section focuses on four facets of commercial use of the natural resources of the area: pastoralism, mining, tourism, and fishing.

PASTORALISM

The failure of the Shark Bay Region Plan (SBRP) to put the various existing and proposed land uses in a truly regional perspective is one of its greatest shortcomings. In terms of the pastoral industry, it is essential that it is put in perspective with the industry state-wide and regionally.

Pastoralism dominates the terrestrial component of the study area both in terms of existing land-use and the proposed zoning under the SBRP. The developmental bias inherent in the zoning scheme has resulted from a distorted perception of the extent and, therefore, the value of pastoralism. This bias has been at the expense of a representative, secure system of national parks and nature reserves that would ensure the protection of the outstanding natural features of Shark Bay. While it may be argued that pastoralism has equal standing with conservation as a competing land-use, the immense conservation values of Shark Bay far outway the area's value as a pastoral resource. The present section will provide a broad overview of the pastoral industry at the State, regional and SBRP levels.

THE WA PASTORAL INDUSTRY

The most comprehensive analysis of the State's pastoral industry is found in a report titled The Present and Future Pastoral Industry of Western Australia (Jennings, 1979). The following facts and figures are taken from that document (pp.17-18):

> The Pastoral Industry:
>
> * involves about 427 station businesses which represent less than two percent of the number of active rural holdings in Western Australia;
>
> * directly supports about 4,000 people including owners, the employed labour units and their families;
>
> * currently has about seven percent of the State's sheep population when in 1912 it comprised fifty percent;
>
> * currently has about 45 percent of the State's cattle numbers;

* produces about seven percent of the wood sold in WA and accounts for about 12 percent of the cattle sales made in the State;

* is based on the State's most fragile ecosystems many of which have suffered irrepairable harm through ignorance and ambition;

* controls assets approximately $60 million and has liabilities approaching $19 million with a resultant equity of 68 percent;

* currently contributes about four percent of the State's rural income;

* is subject to greater variations in income than any other rural industry;

* costs the State Government in excess of $7,300 for each station in each year to administer;

* contributes about $315,000 each year in lease rentals;

* earns large profits for some pastoralists in the past, and continues to do so;

* like all industries, is characterised by a great variation in the size of enterprises and managerial expertise, but, too many enterprises are at the lower end of the size scale and the environment does not readily forgive management errors;

* includes large contiguous areas which should never have been made available for pastoral pursuits and are now less suitable for grazing then they were initially;

* is facing increasing competition from conservationists, environmentalists, mining enterprises, tourism, aboriginal enterprises and National Parks for the use of the land;

* in general terms is not subject to the isolation and lack of facilities which were once a feature of the industry;

* is not precisely identified or subject to any economic or physical measurement by Government or statisticians.

From this summary it is possible to make the following observations:

- the pastoral industry does not make a large contribution to the State's economy in terms of employment or earnings;

- if the cost of repairing and rehabilitating degraded areas was included on the balance sheet it is almost certain that the industry would be deemed uneconomic;

- in addition to these huge costs to the State, direct Government subsidies such as rent relief and freight subsidies are paid to the industry. In 1978/79 these subsidies amounted to $250,000 or 79% of the rent for the

whole industry for that year; (Jennings, 1979, p.121)

- rents amounted to 10.1% of the cost of administering the industry in 1979. This cost was incurred entirely by the State;

COMPARISON OF COSTS OF ADMINISTRATION

	PASTORAL INDUSTRY	HORTICULTURAL IND.
Number of units	427	Approx. 2950
Gross Income 1977/78	Approx. $25m	Approx. $47m
Area	95,000,000 ha	14,000 ha
Gross cost of admin. Per Unit	Approx. $7,300	Approx. $722

Figures from Jennings, 1979, p.121.

- although the environmental effects of pastoralism will be dealt with later, it must be stated here that pastoralism has had and continues to have a fundamental effect on the environment that has lead to a decrease in the species diversity of both flora and fauna.

PASTORALISM IN A REGIONAL CONTEXT

Section 2 of this document 'Environmental Planning' pointed out the absence of a truly regional perspective of the SBRP and the glaring deficiencies that result.

Defining pastoralism in a regional context requires a choice between at least three regional perspectives, the Gascoyne Pastoral Inspection District, the Carnarvon Basin or the EPA's System 9 (CTRC, 1974) depending, on the specific objective of the exercise (see appendix 2). Indeed, a combination of all three may be appropriate due to the fragmentation of information. For instance, the Gascoyne Pastoral Inspection District provides specific information about the pastoral industry in that region. The Carnarvon Basin provides information related to geomorphology and land systems, while System 9 was defined on 'natural and demographic' parameters. System 9 also provides information on the extent of existing and proposed conservation areas.

For the purpose of this section, the Gascoyne Pastoral Inspection District (GPID) is appropriate for several reasons: it is defineable in terms of pastoral administration, rangeland type, presence/absence of conservation areas, vegetation type and landform and to a large degree coincides with a statistical boundary. The GPID covers an area of 12.4m ha and in 1979

comprised 80 leases averaging 155,000ha in area. This amounts to approximately 13% of the State's pastoral region. From this area the State Government derived $50,173 in rent at an average of $627 per lease or 41c/ha. 27.5% of leases in the Gascoyne were classified as 'non-viable' (Jennings, 1979, p.90). Using average figures from Jennings (1979) it cost the State $584,000 to administer the GPID.

PASTORALISM IN THE SHARK BAY REGION PLAN STUDY AREA

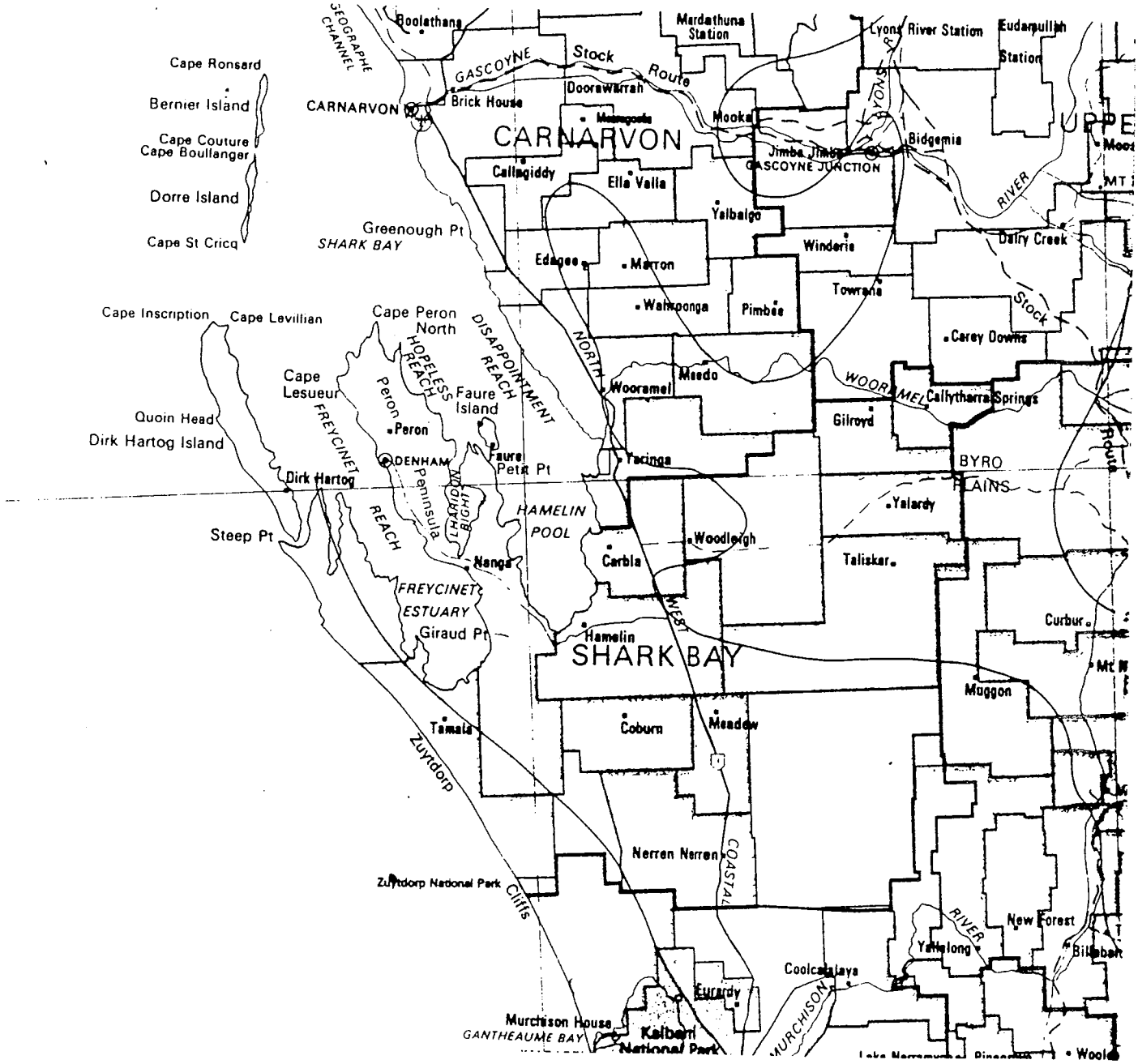
There are fifteen pastoral leases in the Shark Bay Shire. These cover an area of 1,853,200 ha. Of these, seven leases are entirely and eight partly inside the SBRP study area, which amounts to 1,110,000 ha or 59.9% of the Shire's pastoral leases and 8.95% of the GPID.

Pastoralism is not a major component of the Shark Bay region's economy, contributing only $1 m. dollars at present according to the SBRP (1987, p.24). This figure may be compared with commercial fishing ($25m), Mining ($16m) and 'other' ($2m) (SBRP, 1987, p.24).

Tourism is ranked equal last with pastoralism but it must be noted that tourism is a growth industry, particularly in Shark Bay, while pastoralism has been 'stagnant' for quite some time. It is also likely that the figure for tourism does not include all the 'spin-offs' associated with it. In terms of direct financial input to the Shire, i.e., rates, the pastoral leases constitute an extremely small percentage of the Shire's income. Of the $740,700 the Shire receives (the vast majority of which comes direct Government grants) only $67,300 is from rates (ABS, 1985). Of its rates derived income only 25% comes from pastoral leases (B. Pollock, 1987, Shire Clerk, Pers. comm.). This amounts to 2.27% of the Shire's total income. As approximately only half the leases in the Shire are in the SBRP study area, the economic benefit derived by the Shire from these leases, both directly (rates etc.) and indirectly through income expenditure, is negligible.

Income expenditure by pastoralists has been analysed by Morison and West (1983) and is summarised in Ledgar (1987). In terms of purchases, a large percentage are not directly derived from the Shire or in many cases from Western Australia. These include such things as wire, steel posts, and vehicles. In the Northern Territory, it was found that "of the total gross income only 10% is spent in local sectors" (Ledgar, 1987, p.63).

The establishment of a representative system of conservation reserves (as discussed in section 6) will require the resumption of several pastoral leases in the SBRP study area. These leases will amount to approximately 8% of the pastoral leases in the GPID. In terms of the resultant loss of revenue to the State, the alienation of these areas will be negligible. The



PASTORAL LEASES IN THE SHARK BAY SHIRE AND SURROUNDS.
DEPARTMENT OF LANDS AND SURVEYS, 1982.

loss of income to the Shire will be of minor significance. This sum will be more than adequately compensated for by the expansion of tourism, based on a world class national park. With the increased tourism growth will come additional infrastructure, rates and hence a major boost in income to the Shire- something that pastoralism will never provide. **Therefore, there is no basis in fact to the assertion that the creation of a national park will jeopardise either the pastoral industry or the Shire's viability.**

THE ENVIRONMENTAL EFFECTS OF PASTORALISM

The assessment of rangeland condition does not give an overall picture of the effects of pastoralism on the fragile ecology of arid lands. What is good for pastoral production may not be good for the environment. Rangeland condition surveys deal with two narrow criteria:

* vegetation condition including the presence/absence of shrubs and herbs and:

* the extent and nature of erosion.

This is obviously a simplistic analysis of how rangeland condition is assessed. The overriding emphasis of the assessment is how these factors will effect production as opposed to the ecological stability of an area. Although it is acknowledged that rangeland assessment is a positive step, it must also be stated that assessment criteria are far too narrow to allow an accurate assessment of an area's condition and the effects of pastoralism upon it.

Local Shark Bay pastoralists have expressed the opinion that "pastoralism does not interfere with the major conservation interests of the area" (SBRP 1987, p.34). The Pastoralists and Graziers Association (1986) have also stated "nor does [pastoralism] cause damage to these [conservation] areas. Indeed, the positive contributions of the pastoral lessee far outweigh any minor negative affects which may be identified."

These two statements do not reflect the reality of the situation. There is a considerable body of evidence to suggest that grazing hard hoofed animals in the 'pastoral' zone of Western Australia and elsewhere substantially alters the area's ecological balance (Ledger, 1987; Hall, forthcoming). The direct physical effect of grazing on vegetation has had profound effects on the region's native fauna population. Arid zone ecology is extremely complex and is not fully understood by specialists in the field, let alone pastoralists. Subtle yet fundamental changes to the rangeland ecology occur over varying time frames and may go unnoticed by

pastoralists. As Jennings (1979, p.102) stated "the Committee is concerned that only a very few pastoralists recognise the increasing loss or productivity of pastures".

Types of Degradation Caused by Pastoralism

Although the SBRP study area has not been subjected to a rigorous study of the effects of pastoralism on the area's ecology, it is clear that there has been a significant impact that has resulted in some degradation. The Western Australian Department of Agriculture (1986, pp.5-7) had reported five main types of land degradation being observed/encountered in the Shark Bay region:

(1) General loss of shrub cover, with or without soil erosion.
(2) Loss of understorey shrubs and perennial herbs.
(3) Invasion of undesirable (inedible) shrubs.
(4) Hummock grassland degradation.
(5) Near-coastal degradation and dune blow-outs.

Methods to counteract these problems include the introduction of exotic annual species, paddock spelling, prescribed burning, and mechanical removal (Dept. of Agriculture, 1986, pp.5-7). In addition to the stress already placed on the environment by the pastoral industry, many of these 'precriptions' will have an added detrimental effect on the remaining native flora and fauna through yet more alteration of habitat. Ovington (1984) lists some of the effects of grazing of stock on five ecological processes:

SOME EFFECTS OF GRAZING BY DOMESTIC STOCK ON FIVE ECOLOGICAL PROCESSES

Ecological process	Effects
Natural succession	a. Modification of natural succession by treading and selective grazing leading to dominance of unpalatable species. b. Invasion of weeds and exotic species. c. Reduction of palatable tree, shrub and perennial species and expansion of grassland particularly of annual species. d. Increased competition with native herbivores. e. Excretion of dung and urine making vegetation unacceptable with native species. f. Disturbance of native animal species by domestic grazing.
Organic production and decomposition	a. Primary production diverted to ground level with loss of trees and shrubs. b. Reduction in total biomass and possible energy capture. c. Decrease in biomass of native animals. d. Natural decomposition process circumvented by

	grazing animal cycle. e. More of primary production diverted to large herbivores. f. Increased herbage intake leading to less litter and lower rates of decomposition.
Nutrient circulation	a. Reduction in nutrient pool with fewer nutrients in vegetation. b. Local and uneven re-allocation of nutrients according to distribution of faeces and urine. c. Increased rate of nutrient circulation. d. Replacement of slow cycling through soil organisms by more rapid, plant animal cycling pools. e. Initial stages of decomposition in rumen and gut of grazing animals. f. Loss of nutrient capital with removal in animal products.
Water circulation	a. Increased surface run off. b. Reduction in interception and transpiration. c. Soil surface layers drier. d. Increase in evaporation from soil surface with loss of vegetation cover.
Soil development	a. Localised overgrazing resulting in soil erosion. b. Increased exposure of soil especially where animals congregate. c. Increased salinity with loss of trees and shrubs. d. Increased soil compaction due to treading.

SOURCE: Ovington, 1984, p.63.

Working from a different perspective, Ledgar (1987) categorised pastoral impacts not in effects on processes but in terms of five types of degradation:

* Vegetative changes;
* Erosion
* Salinity;
* Natural waters;
* Weeds.

The following section is a brief summary of Ledgar's analysis of the physical effects of pastoralism.

Vegetative Changes

Australia's arid zone vegetation is superbly adapted to the region's harsh climate and poor soil. In addition to this the vegetation is 'designed' to cope with and cater to the physical characteristics and needs of the native fauna.

Native Australian herbivores are soft footed and had relatively little

effect on native flora. The relationship was ecologically balanced. This balance took tens of thousands of years to evolve. The arrival of hard hoofed animals that accompanied European occupation meant dramatic, unprecedented and often devastating change. To a large extent, the native flora had not developed any protective mechanism to cope with the presence of hard hoofed animals. The presence of these animals has resulted in fundamental changes in both composition and density of the vegetative cover.

Because of the diet preferences of sheep and cattle, grazing leads to a decline or loss of palatable perennial species and an increase in inedible annual species. The change in floral species composition has not been checked. "Pastoralists in the shrubland area [such as the GPID] have begun to rely on annual species, and have failed to note consciously, the diminishing role of the more reliable perennials" (Jennings, 1979, p.102). This shift from perennials to annuals reduces the ability of the rangeland to cope with decreased rainfall and drought. "The principle changes which have occurred are those of losses of perennial plant cover and degradation of the soil surface, both of which render the land less durable in times of drought" (Jennings, 1979, p.39). Therefore, floristic 'shifts' such as those described must be viewed as highly undesirable.

In the Gascoyne Pastoral Inspector's District a study of floristic composition and density over time, based on eight properties in the Gascoyne River catchment, noted significant changes:

CHANGES IN AVERAGE PLANT COVER PER HA ON EIGHT ASSESSMENT SITES

YEAR	Total Plants/ha	Desirable Plants/ha
1975	1140	272
1978	609	157
% CHANGE	-53	-42

from Jennings, 1979, p.93

Trampling of vegetation is a specific problem related to the grazing habits of hardhoofed animals. Plants can be crushed which either destroys or severely weakens them. A change in density of vegetation cover as a result of grazing leaves soil exposed to the elements of erosion, wind and rain. Vegetation absorbs the destructive energy of both wind and rain, offering the fragile soil protection from these potentially destructive forces. A parallel consequence of decreased density is a reduction in the level of organic matter, with a consequent reduction in soil stability. Soil compaction and loss of soil structure can also result from the grazing of

hard hoofed animals. Concentration of animals around watering holes compounds these problems.

Although indiscriminate use of fire has caused degradation elsewhere, the fire history of Shark Bay since white occupation is not known. Fire affects rangelands in the following ways:

- seedling damage;
- micro organism destruction (affects nutrient uptake by flora);
- nutrient loss;
- damage of mature trees;
- increased erosion risk.

Some current practices such as promotion of 'green pick' for introduced stock can be extremely damaging.

Erosion

Erosion as a natural process is an integral part of soil formation. At an accelerated state and stimulated by artificial circumstances, it is a principal component of land degradation. The most common forms of erosion are:

- sheet erosion;
- rill erosion;
- gully erosion;
- wind erosion;
- scalding;
- erosion of stream banks and drainage lines; and
- landslip.

In a natural situation, areas are able to minimise the effects of these processes because of their vegetative cover which dissipates the explosive energies of wind and water. Vegetation is an important factor in soil infiltration and soil structure. This has a bearing on water flow over the soil surface, run off and consequent soil loss.

In arid land soils most nutrient accummulation is near the surface, making wind and water erosion extremely serious problems. Related specifically to the GPID, erosion has caused extremely serious problems. The Gascoyne River catchment was used as a study of the processes of desertification. Wilcox and McKinnon (1974) reported that "approximately 15% of the Basin was found to be badly eroded and irreversible degradation could follow continued grazing; 52% was degraded and had some erosion. The remaining 33% was in an acceptable condition, but this was mostly hill or stoney shortgrass pasture of low natural productivity ...".

The Department of Agriculture Rangeland Condition Survey Maps for Shark Bay reveal that numerous areas are subject to varying degrees of erosion. The worst of these are on Carrarang, Dirk Hartog, Tamala and Wooramel Stations.

Salinity

Although salinity does not appear to be a problem at Shark Bay, it does serve to highlight the wide ranging detrimental effects pastoralism has on an area.

Natural Waters

The limited availability of fresh water in arid and semi-arid areas can result in the over-utilisation of existing supplies at specific points. Erosion is the main problem, though damage of naturally occurring aquatic habitat and eutrophication can also occur.

In Shark Bay there are several examples where degradation has occurred around water sources. The Wooramel River and several watering points on Carrarang are examples of this. Rehabilitation techniques are limited in success and extremely expensive as indicated by the Ord River regeneration scheme.

ESTIMATED COST OF LAND MANAGEMENT TREATMENTS NEEDED ON PASTORAL LAND
($'000s at mid-1975 cost levels)

TREATMENTS	$'000
Fencing	2,960
Watering points	1,300
Cultivation and seeding	4,436
Cultivation only	507
Stock reduction	17,500
Total	26,703

from Jennings, 1979, p.160.

Weeds

Weed invasion is of great concern because they generally upsets the floristic balance. Overgrazing, misuse of fire and soil disturbance which destroy native species give weeds an opportunity to establish themselves. Weed infestation is a good example of the inappropriateness of comparing

and confusing high pastoral value with an area's conservation values.

The dominance of a single species of weed or other introduced species of flora lessens an area's ecological stability and leads to a decrease in species diversity. This limits the ability of an area to support the range of other organisms that form the complex web of a healthy ecosystem. Obviously, the diminished diversity of species and the lack of stability lowers the value of any such area in terms of its conservation value. However, in terms of its pastoral value it may be acceptable or even high. A case in point is the area surrounding Tamala Homestead in the SBRP study area (P. Curry, pers. comm., 1987).

Pastoralism and Native Fauna

The effect of pastoralism on the environment does not end with the physical impact. Along with the alteration of the floristic diversity and density, pastoralism has a detrimental effect on native fauna which rely on the flora for food and habitat.

Since European arrival, Australia has lost numerous species of fauna in the arid zone including the:

* Crescent Nailtail Wallaby (*Onychogalea lunata*)
* Lesser Stick-nest Rat (*Leporillus apicalis*)
* Long-tailed Hopping-mouse (*Notomys longicudatus*)
* Pig-footed Bandicoot (*Chaeropus ecaudatus*)
* Lesser Bilby (*Macrotis leucura*)

The same fate has met a number of species on the mainland of Shark Bay. For instance, Bernier and Dorre Islands are refuges for the Varigated Fairy Wren, the Boodie, the Rufous Hair Wallaby, Banded Hair Wallaby and the Shark Bay Mouse. Many of these later species were found on the mainland prior to the arrival of the pastoral industry. Jennings (1985, 134) cited statements by authorities that "have associated pastoral management and the establishment of exotic mammal populations in Australia with the disappearance of many native mammals". Ledgar (1987, p.12) summed up the situation in arid Australia:

> A change in [floral] species composition has major consequences throughout the foodchain. For example, the loss of perennial grasses reduces the availability of seed for birds, a change of density removes the protective canopy for small ground dwelling animals. The most common animals to have suffered are small ground mammals and seed eating birds, of which up to 50% are no longer found in the arid zone.

RECOMMENDATIONS

1. There is an urgent need for a comprehensive review of pastoral lease boundaries in light of the outstanding conservation value of Shark Bay.

2. The enactment of a reserve system for Shark Bay is paramount to ensure the area's needs in terms of environmental conservation of the terrestrial ecology are met.

3. Urgent steps must be taken to halt further land degradation in the Shark Bay region.

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MINING

Two mines are currently operating in Shark Bay. The Solar salt works operates at Useless Loop and gypsum mining on Heirisson Prong.

Gypsum is essentially a high volume low value product (Department of Mines, 1986) and its mining constitutes an environmental hazard (EPA, 1986). The original gypsum mining site of Useless Loop is now largely depleted and mining has shifted to a smaller deposit at Bibby Giddy. This too will eventually be depleted and it is envisaged that a deposit on Peron Peninsula will be exploited.

This deposit occurs inside the proposed Peron Peninsula component of the Shark Bay National Park as proposed by the SBRP. This project should not be allowed to proceed. Mining is inconsistent with the purpose of National Parks (see Appendix 3). In addition to the proposed mine site, the SBRP provided for the establishment of a loading facility at Guichenault Point. Such a facility would pose a serious threat during construction and operation to nearby Herald Bight, which is an extremely important area in terms of Shark Bay's marine environment. **Under no circumstances should either of these developments proceed.**

Gypsum mining poses a considerable threat to the area. Bulldozers strip off the overburden exposing the gypsum which is then freely dug with a back hoe. On occasions drilling and blasting is required. Ore is dumped in continuous windrows and allowed to drain for several days before being loaded into trucks for transportation into the processing plant (Department of Mines, 1986, p.32).

In 1982 approximately 340,000+ of gypsum was mined at Shark Bay. This magnitude of tonnage along with associated overburden and processing work poses a serious threat to the environment. Processing involves crushing and washing and stockpiling to drain after which it is conveyed to the loading facility for shipping. Apart from the mine pit, haulage road, processing plant and port facility problems associated with water supply and waste water management would be acute. The windy conditions exprienced at Shark Bay would also cause problems. All in all the operation would cause massive disruption to the landscape and constitute a serious environmental hazard.

Gypsum is plentiful in Western Australia as it is elsewhere in Australia.

There are numerous proposals to exploit various deposits particularly in the south of the state, shipping the product through existing facilities at Esperance (Department of Mines, 1987). Growth in West Australian gypsum exports is likely to be mainly limited by fluctuations in demand level as well as competition from alternative sources. Thailand's gypsum mining industry is expanding rapidly and poses a considerable threat to Australia's market position. It has advantages in geographical position and pricing. Another limiting factor in market demand is competition from by product gypsum from various industrial processes.

The expansion of the Solar Salt works in Shark Bay has resulted in the destruction of large areas of important fish nurseries. Further expansion would result in greater losses. Areas in the vicinity of the works are the breeding grounds for many marine species including those that support Shark Bay's vital fishing industry. Whiting, mullet, tailor, bream, snapper, scallops and prawns are some of the species which rely on these nursery areas. Reports of expansion as recent as September 1986 evoked a strong response from local fisherpeople who were "unanimous in their condemnation of such a move". (Edwards BC, Letter, September, 1986).

Recommendations:

1. No expansion of the existing solar salt works should be permitted.

2. An on going monitoring programme of the salt works should be undertaken.

3. Gypsum mining should be phased out at the earliest possible opportunity.

4. No development of the Peron Point deposit should be permitted.

5. All areas previously mined should be rehabilitated to a suitable standard set by the EPA.

6. No further mineral developments including oil and natural gas should be permitted in Shark Bay. Expansion of existing operations or the commencement of new development would result in short term profit at the expense of a unique environment able to provide long term stable employment and income to the region.

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TOURISM

An ecological perspective and a systems planning approach are very applicable to tourism activity, with its multiple planning levels and potential symbiotic relationship between sustained benefits and a healthy environment (Murphy 1983, p.185).

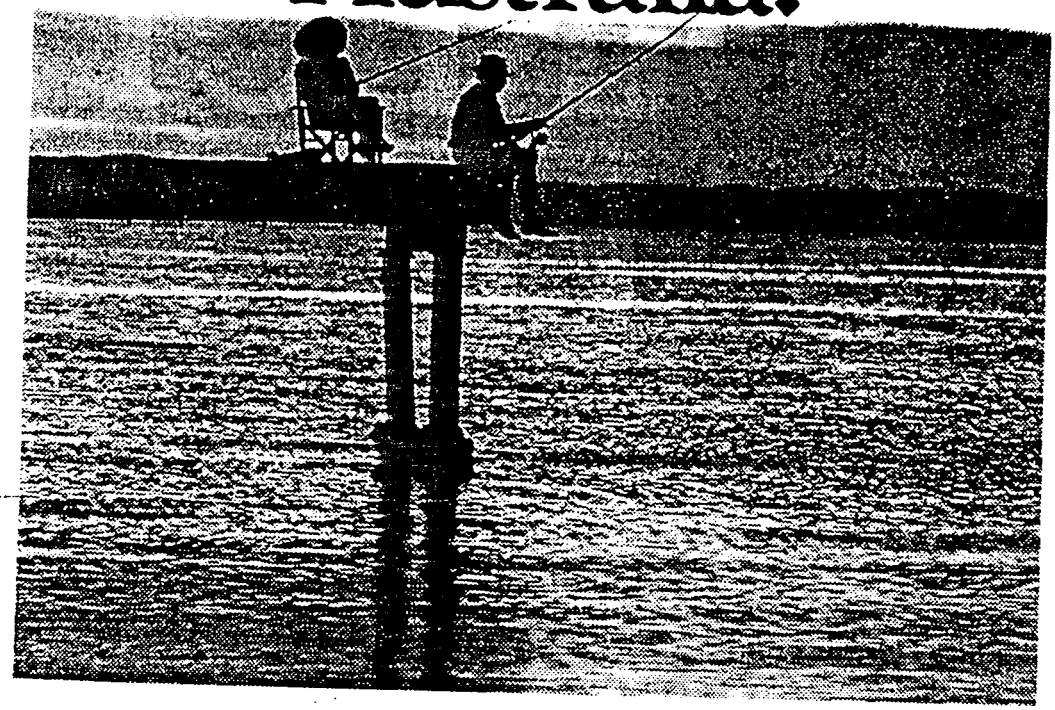
As for any other resource use, consideration of a region's biophysical capability is necessary to assess the relative merits and costs of alternative types and levels of tourism development. It is generally accepted among tourism researchers that there is a carrying capacity for tourists which varies with the fragility of the environment, the social tolerance of locals and the type of tourist activity (Dasman et al. p.115; Mathieson and Wall 1981; Butler 1980; Wall 1982; Stankey et al. 1979; Pitts 1984)

A major issue raised in several background papers submitted for the draft SBRP was the **existing and increasing levels of tourism, and their effects on the natural environment and on pastoral activity.** Indeed, it would seem that this was a major factor in initiating the need for a management plan for Shark Bay (through EPA recommendations; DCE coastal management study; and now SPC and CALM). As tourism activity affects and is affected by almost all other activities in the study area, particularly life-style and economic opportunities, the omission of tourism as the major planning issue facing Shark Bay is surprising.

Unfortunately, the draft Plan's reductionist approach to analysis also serves to isolate tourism from its area of impact, even though it is judged to be the activity holding "the greatest potential for economic development at Shark Bay," (p.66). Ironically, 'tourism infrastructure' and 'visitor use' is included in discussions of the current economic environment and under 'Strategies for Achieving Further Development'; but not as a 'Planning Issue' for the natural or social environment. Apparently, as long as the resources remain, tourism will take care of itself. This laissez-faire attitude is dangerous in light of a multitude of hindsight analyses of the consequences of unplanned tourism development (Keys 1985, Butler 1981, Mathieson and Wall 1982).

While it is true that tourism is an essentially diverse industry, the growing dependence of Shark Bay on attracting outsiders to the area demands that planning for it be integrated into long term goals, objectives and ceilings for regional growth. The impacts of different styles of

Secure the best fishing spot in Australia.



Fish. They breed them big at Shark Bay. Not to mention the crayfish!

You could own your own fishing paradise at Shark Bay. A house and land by the ocean — boating, fishing, relaxing in the sun.

But there's more to Shark Bay than just fish! Wildflowers, natural bushland, native birdlife, the dolphins at Monkey Mia. And restaurants, a hotel, shops, a baker and medical facilities.

Enquire now about the attractive house and land packages available at Shark Bay. It could be the beginning of your best fishing trip ever!

In Perth, phone Syd Hatch Realty on 274 5711. In Geraldton, phone Sheila Murray at Geraldton Real Estate on 099-211-733.

Shark Bay

The Fisherman's Paradise.

WORKHOUSE ADV

If you've always dreamed of retiring to a house of your own, somewhere away from it all where all you have to concentrate on is the fish, consider the paradise at Shark Bay.

Fishing and boating. Sunshine. Wildflowers, natural bushland and birdlife. The dolphins at Monkey Mia. Not to mention all the comforts of a hotel, excellent restaurants, shops, a bakery, and medical facilities.

What more could you want in a retirement paradise? Enquire now about the attractive house and land packages available at Shark Bay.

In Perth, phone Syd Hatch Realty on 274 5711. In Geraldton, phone Sheila Murray at Geraldton Real Estate on 099-211-733.

Shark Bay

The Retirement Paradise.

tourism on facilities required, water consumption, lifestyle and entertainment, vary substantially and the implications for planning are at least as far reaching as for existing resource uses, which are analysed as 'Planning Issues'. Experience elsewhere indicates that there is both an environmental and social threshold for tourism which must be identified and addressed in a rational planning forum. A regional plan presents the ideal opportunity.

Despite passing acknowledgement in the draft Plan of some of the current tourism impacts in Shark Bay, e.g., trespassing, use of off-road vehicles in sensitive environments, (p.68) and major developments unsuitable for proposed sites, (p.66); the only assessment recommended is a *consumer demand study!* (Consumerism rules, O.K.?).

The primacy of consumer demand-lead marketing is reinforced in subsequent statements, i.e., "Denham should incorporate all levels of tourist infrastructure, including hotel/motel and resort/holiday village complexes," (p.67), and the Shire should consider the recommendations of the Gascoyne Region Tourism Development Plan. Obviously, in such an environmentally sensitive area and where natural attractions predominate, a supply-side strategy would be the rational and appropriate planning approach. Pearce and Moscardo (1985) point to the comprehensive use and abuse of the scenic appeal of Kakadu National Park by the tourism industry to attract the widest possible market to the Northern Territory. The result is an unaccounted proportion of visitors deceived and dissatisfied with the lack of modern comforts in the rugged park, a consequent lack of understanding for the sensitivity of their surroundings, and too many uncontrolled impacts on the environment. This situation is analogous with uninformed tourists in overseas cultures, lead by glossy brochures to unrealistic expectations and conflict with local customs. The use of selective marketing strategies is suggested to attract the type of tourists that are compatible with the other park values of scientific and historic interest and nature conservation; in other words, supply-side marketing rather than demand-lead. Not only the physical capacity but social objectives and thresholds must be paramount, not secondary to what uninformed consumers and investor-speculators want supplied.

Tourism and National Parks

Fifteen years age, the then Shark Bay Shire President and two councillors expressed to the Minister for Tourism the need for an improved road between Denham and Hamelin in the following terms:

> By now the very existence of this town [Denham] is at stake because of this so-called road. No doubt you realise that tourism is now the major income earner. The season

> will commence on the 31st instant with visitors to Shark Bay bringing expensive power boats and caravans. It is certain that the road as it is now will deter even the hardiest of them. The loss of this income to the town will be fatal,
>
> Hoult, Colliver and Rowley, 1972.

This strong statement on the pre-eminence of tourism for Denham stands in contrast to the defensive stance taken in the SBRP, i.e., asserting that the option of resuming coastal pastoral leases for conservation and recreational uses under the National Park Act would threaten the viability of the whole Shire (ref. to p.x SBRP). Tourism activity has clearly not diminished since the early 'seventies.

In 1974, the CTRC's concern about recreation demand in Shark Bay was based on the figure of 7,000 tourists visiting Denham in 1972-73 and the 800 small craft which were based in the area for sport fishing (ref. to Section 5.4 of this submission). Substantial increases were forecast following the sealing of the Denham access road. The CTRC's call for forward planning was not unfounded.

By 1981-82 approximately 15,900 tourists passed through the four caravan parks alone - double that of the previous year's total (Logue 1983, p.12). Despite this and other evidence of increasing uncontrolled use of other natural attractions in Shark Bay, such as Steep Point; no analysis of the economic patterns and trends with regard to tourism or pastoralism is attempted in the draft SBRP.

As a result, important questions go unanswered: What is the area's capacity for increasing levels and types of tourism activity? What are the viable options for further tourism development, given environmental and social thresholds? The supply of potable water, in particular, requires analysis as one limiting factor for tourism carrrying capacity. According to the Director of Operations of the Water Authority: "the quantities of such water are very small and are insufficient for development as public water supplies," (Shelton 1987).

How would tourism and recreation be affected by the designation of national parks and nature reserves in the area? While the perceived effects of extensive national parks on existing pastoral use and tenure forms the implicit basis for rejecting such an initiative, the effects on the promising tourism industry and future options is not accorded similar consideration.

F.G. Logue, former director of the W.A. Department of Tourism, predicted (by his admission, conservatively) an annual growth in tourist numbers of

15% at Shark Bay (Logue 1983, p.13). On the basis of this substantial growth rate and the level of interest in capitalising on tourism by Shark Bay investors which he encountered during his study , Logue went on to say:

> It is considered that there is ample evidence to support the view that the State, the community and the tourism industry would be well served by the reservation of the Peron Station land as a National Park . . .
>
> Logue 1983, p.55.

According to the draft SBRP, the growth rate of tourist visitation to Shark Bay has been at least double Logue's estimate between 1981-82 and 1986 when an estimated 50,000 stayed in commercial accommodation there (SBRP p.39).

The misperception by some local factions that national parks automatically prohibit all recreational use fuels opposition to such designation further. The submission made by the Shark Bay Tourist Committee highlights many contradictory sentiments based on fear and a misunderstanding of the purposes of national parks, which have apparently flourished in the absence of informative consultation by CALM or SPC officials.

> The current environment should remain intact; restictions on access would preclude the simple enjoyment of people seeking holidays in natural surroundings,
>
> Shark Bay Tourist Committee, 1987, p.3.

While it is conceded that specific environmental features (such as Hamelin Pool, the Wooramel seagrass beds, dugong, dolphins) do require special protection, and that certain activities do deserve restriction (4W-driving, mining) - yet, they remain adamantly opposed to Peron Peninsula, Edel Land and Dirk Hartog becoming national parks. The methodology of the Tourist Committee's questionaire which they used to 'prove' their opinions was not provided in the submission, rendering it open to question.

Wilderness Tourism

Advice that the Shires continue their "flexible approach to bush camping" (p.68) does not address either the existing or future opportunities and constraints for this sector of the travelling public.

The option for wilderness recreation and tourism, particularly on Dirk Hartog Island where the opportunity exists to manage the system in its entirety thus regulating the numbers of visitors and types of activities,

was not explored in the SBRP. Wildlife viewing on the Indian Ocean side (whales and large sharks etc.) and on the landward side (seabirds, raptors, dugongs, sharks, rays, turtles) provides an ideal opportunity for an innovative tourism experience consistent with objectives for conservation of scientific and heritage values (Anderson 1987). The current absentee-pastoral operation's contribution to the community's social and economic viability demands comparison to its potential as a public recreational and educational resource.

Gypsum Mining, National Parks and Tourism

Under 'Strategies for Mining Development' (p.66), section (4) suggests that a gypsum mine in a national park on Peron Peninsula is desirable and appropriate, subject to routine EPA regulations. The apparent willingness to encourage an environmentally destructive industry for the sake of a road to open up access to areas which have not yet been assessed for their capacity to withstand different types and levels of recreational use, or their importance as marine nurseries; defies planning logic. The unassessed significance of isolated mangrove colonies (Di Walker 1987, pers. comm.) and possible turtle rookeries (Paul Anderson 1987, pers. comm.) around the proposed loading facility, renders this development particularly suspect. In addition, the prevalence of substitute gypsum sources outside of this area of outstanding conservation values, (indeed, outside of the Australian market) indicates that long term costs will surely be greater that short term profits.

no pg.46and 47

Proposed Tourism Development

Sites suitable for minor development and day use access - *Waarame/ Crossing* and *New Beach* are not indicated on accompanying maps, making the merits of these recommendations difficult to assess. In fact, how suitability for development was determined is not explained for any of the proposed tourist developments. Steep Point has already suffered serious degradation (Zekulich 1984). In 1984, damage at Steep Point, touted as one of Australia's 'hottest' fishing spots, caused the Shark Bay Shire to consider cutting off all vehicular access.

> The vehicles [4W-drives] have created serious erosion problems by cutting tracks through the low scrub to get at the spectacular area prized by anglers for a wide range of big fish. Sand drifts have already begun in the peaks of damaged dunes.
>
> Zekulich, 1984, p.16.

Instead, the pastoral lessee, Clough Engineering (who coincidently have proposals for more elaborate tourist development at the site) have

(refer to the following section of this submission for further discussion).

This attitude has typified the evolution of tourism areas around the world where sequential stages of development resemble the biological model of invasion-succession. As described by Butler (1980) the tourist cycle is characterised by a rapid rate of growth, stabilisation, and subsequent decline as a function of the number of tourists increasing over time. As particular destinations become known and popular the recreational explorers' low threshold for crowding is exceeded and they move on to other unspoiled places. Because tolerance for crowds and modifications of the natural environment increases with each successive wave of tourists, the setting itself evolves through a series of changes towards a built environment. Decline of the area's attractions and value for tourism sets in when critical capacity thresholds, i.e., environmental, infrastructural and social, are exceeded.

The major implication of these observations is that it contradicts the optimistic belief in the unlimited growth potential for tourism. In addition, decline can be avoided through the identification and adjustment to all capacity levels to maintain a much reduced but sustainable rate of visitation. Subjective capacity levels can only be determined through interaction between research and planning. Objectives for the area must also be explicitly prioritised to guide in the ultimate trade-offs between the costs and benefits of alternative management options.

RECOMMENDATIONS FOR TOURISM PLANNING AND MANAGEMENT IN SHARK BAY

The following recommendations are based firstly, on conserving the exceptional natural attributes of Shark Bay, and, secondly, sharing them with other members of the public on a long term basis. It relies heavily on local involvement in education on conservation principles, determining social capacity levels for development, participation in management including monitoring change, and educating the touring public.

1. A resource capability assessment should be carried out to provide a framework for planning objectives and policies for tourism.

2. Using conservation principles as a guide, establish a framework of tourism goals, from the World Heritage level through national, state, regional and to local.

3. Identify environmental criteria for monitoring physical change and capacity levels for different types of tourism activity.

4. Investigate social capacity levels for environmental, social and

economic change and identify criteria for monitoring such change.

5. Actively explore innovative approaches to tourism opportunities which are compatible with the long term conservation needs of the unique natural system, for example, wilderness tours, natural history field courses and research, appropriate technology demonstration projects (desalination, photovoltaic) etc..

6. Develop a marketing strategy based on the unique local opportunities in order to target groups and individuals which would 'fit' the environmental and social capabilities of Shark Bay, rather than molding Shark Bay to fit fickle consumer 'demand'.

7. These recommendations would ultimately result in the determination of a ceiling on development and expansion appropriate within the environmental and social thresholds identified above, which would be incorporated into all long range plans for the region.

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THE SHARK BAY FISHERY

The 'health' of Shark Bay's marine ecosystem will determine the viability and well being of the local community of Denham. In the past, commercial fishing has been the region's largest income earner. As such, the region has been dependent on the marine environment and this situation is unlikely to change in the near future. Indeed, as tourism grows in importance, the Shire will be merely reinforcing this dependence, as Shark Bay is already a well renowned recreational fishing spot and a good percentage of future tourists will come to the Bay to fish. Monkey Mia's dolphins continue to attract an increasing number of tourists who contribute to the local economy and environmental impact in a variety of ways.

The collapse of the scale fishing industry in the 1950s illustrated quite clearly that the marine resource is finite in terms of what it can provide. Like the terrestrial resource, the Bay has a carrying capacity. Just as the Bay can support so many Dugong, it can only support a limited number of fishing units, be they commercial or recreational. Over exploitation of fishing grounds in the past had led to the restriction of access and other measures to prevent a re-occurance of the 1950s.

Experience in Shark Bay and elsewhere has demonstrated that intervention through regulation and restriction is necessary if the health of the fishery is to be maintained in the face of exploitation above and beyond the sustainable threshold. The growth of recreational fishing activity also poses threats to the resource if it goes unchecked through lack of responsible management. Competition between professional and recreational fisherpersons for the finite resource will become increasingly important. This increase in pressure on the environment will require forward planning to minimise the impact. Hard decisions will have to be made regarding access to the Bay.

In planning for existing and future uses, it is essential that decisions are made on the basis of detailed knowledge. Several studies on various aspects of marine ecology have been undertaken in Shark Bay (Anderson, 1985; Nevill and Lawrence, 1985). From these studies it is clear that the extensive seagrass beds are a primary producer for the complex food chains that supports the vast array of organisms which occur in the Bay. **Protection of the seagrass beds is paramount to ensure the**

survival of the marine environment, the commercial and recreational fisheries, the tourist industry and ultimately the local community. Therefore, it is essential that the environment be put at the head of the list of priorities and that the necessary decisions are made that ensure its future integrity.

COMMERICAL FISHING

Although Australia's commercial fishing industry is small by comparison with other countries, fishing operations are important regionally and in many cases are the basis for the existance of local communities. Commercial fishing operations, if strictly managed and policed can offer long-term stable employment and income. Shark Bay's fishery amounts to 18% of the State's catch in dollars and 15% by weight.

The community at Denham derives a certain amount of benefit from the Shark Bay fishery but it is important to note that the majority of the benefits are felt outside, namely Carnarvon where landbased processing and maintenance is carried out.

There are three main categories of commercial fishing in Shark Bay:

a) Prawns.

The prawn catch in Shark Bay represents approximately 65% of the total West Australian catch (Fisheries Department, 1985, p.6). Species such as King, Tiger and Endeavour form the basis for the industry, which occupies a fleet of 35 vessels from 1 March to 31 October. The 1985 catch shows a decrease of 270 tonnes on the previous year.

All is not well in the Shark Bay prawning industry. In 1985, Tiger prawns accounted for 236 tonnes of the catch. This was the second lowest catch since 1963. The warning signs are there. As the Department of Fisheries (1985, p.6) stated, "the continuing low catches since 1980 indicate that the stock has been over exploited".

b) Scale Fish.

The scale fishery is based on several species including whiting, sea mullet, tailor, western yellow fin, bream and snapper. It has been classified as a restricted entry since 1978. Techniques consist of small net boats or deep sea line fishing. Restrictions to access were introduced in 1986. Although moves have been made to improve management, the future still holds problems: "Amateur fishing pressure may eventually lead to a depletion of the snapper stocks in the inner Shark Bay" (Dept. of Fisheries, 1985, p.13). The reason cited for this potential conflict was the

sealing of the Denham road and the corresponding increase in tourism.

c) Scallops.

The saucer scallop catch by trawlers in Shark Bay in 1985 decreased by 54% over the previous year. This was attributed to lower levels of "recruitment" into the Fishery (Dept. of Fisheries 1985, p13). Recruitment refers to the level of replacement of scallops from year to year in any fishing ground.

Scallop fishing involves dragging a net either on or close to the sea bed, thus removing the greater percentage of scallops and marine fauna in the area. This form of farming has two fundamental effects. Firstly, the dragging action causes substantial disturbance to the sea bed and secondly, this method of fishing is indiscriminate for scallop age and sex, all individuals in an area are taken.

The non-specific harvest leads to the severe fluctuations in catch levels experienced in Shark Bay and elsewhere. Indeed, present scallop fishing techniques have been equated with mining of the resource (Dr D. Walker, University of Western Australia, Pers. Comm., 1987). In addition to this, there has been no detailed study carried out in Western Australia as to the environmental effects, both short and long term, of bottom trawling the sea bed (John Pen, Dept. of Fisheries, Pers. Comm., 1987). There is an urgent need for such basic research to be carried out if we are to prevent potentially large problems from occurring in the future. An integral part of this would be the design of a detailed monitoring programme which should be put into place at the earliest opportunity. In terms of the net dragging's effect on the scallop population itself and the stability of the industry; again research into alternative, innovative harvesting techniques which are more environmentally benign, sustainable and add to the stability of the industry, should be investigated.

RECREATIONAL FISHING

Recreational fishing is increasing due to the upgrading of the Denham road and an advertising campaign geared to attract the fisherperson.

At present, amateur fishing does not pose a significant threat to commercial operations, but with the growth of tourist visitation to Shark Bay there is little doubt that this situation could change rapidly.

The Fisheries Department has already recognised the threat of unregulated recreational fishing. Again, the concept of the Bay's carrying capacity is all important. The exploitable resource is also a finite one. Beyond a certain point (yet to be determined), the Bay's fish stocks will be depleted with corresponding impacts on marine ecology and the industries

dependent upon it.

IMPACTS OF RECREATIONAL FISHING

In terms of the species harvested by amateur anglers, there is direct competition between recreational and commercial fishing. Whiting, mullet, tailor, bream and snapper are taken by both groups. There may be more species involved but at this stage, snapper and whiting are the most important areas of conflict.

At present, amateurs approaches 8% of the commercial snapper taken. The Government is already aware of the stress being placed on the snapper fishing in Shark Bay and has imposed restrictions on commercial fishing by closing the fishery in July 1986 (Fisheries Department, 1986, p.3). This restriction will not apply to amateurs.

The President of the Denham Fisheries Association, Mr Dick Hoult, in his submission to the SBRP study, quoted a senior Fisheries Department officer as saying: "Shark Bay is the greatest whiting producing area in Australia, if not the world." Mr Hoult went on to express concern over the conflict looming between the amateurs and professionals. "The danger as I see it to the net fishing industry is traffic on the waters, numbers of small boats travelling close inshore disturbing schools of fish before they can be caught" (Hoult, 1986).

The Australian Anglers Association (AAA) (1986, p.4) submission to the landuse study, although representative of only a small sample of the Shark Bay users is typical of a single interest group whose sole purpose is to satisfy short term wants of individual members as opposed to the long term needs of an area. The AAA is antagonistic towards any form of regulation or restriction other than those concerned with "cosmetics". The AAA recognises the need "for some form of control" (p.5) only where that control enhances utilization of the resource. Controls deemed acceptable to the AAA are largely cosmetic such as litter control, control of abusive persons, breakdown assistance, provision of firewood, and road identification (pp.4-5). This token regulation in no way addresses the long term environmental problems that make an overall management plan for the area essential. Typical of the unrealistic and irresponsible view of Shark Bay as an unlimited source of entertainment is the concluding statement of the AAA's submission:

> We do not support restricted access in any form in the Shark Bay area and urge the State Planning Commission to consider Shark Bay as an open access area for the enjoyment of everyone.

'Everyone' presumably means the amateur fisherpeople who will travel to

Shark Bay in the next ten years or so. 'Everyone' does not include those who will follow to find the area severely depleted and degraded, or those who live in the region and rely on stable long term employment through tourism and the fishing industry. As the Denham Fisherman's Association (1986) stated:

> The economy of the town is structured around the fishing industry whose history of nearly 100 years, is the basis of most activities. It is realised (sic) that the tourist industry also contributes substantial wealth to the area, but is however, seasonal and the consistant (sic) income and associated employment provided by the fishing industry is essential for existence of business during the total year.

Tourism to a great degree is based on recreational fishing. The growth of tourism will therefore have a fundamental effect on the Bay's marine area. The ability to regulate and control the impact of recreational fishing will ultimately determine the viability of the regional economy in terms of commercial fishing and tourism.

Everyone relies on the health of the Bay's ecosystem to provide the 'goods and services' that people seek. Due to the growth of demand placed on the marine ecology, it is essential that regulations are implemented (and policed) to ensure the area's long term viability.

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SECTION 6: A MARINE RESERVE SYSTEM FOR SHARK BAY

The marine environment of Shark Bay has been subject to over exploitation in the past and will again face mounting developmental pressures in the very near future. The enormous decline in whaling stocks in the early part of the century due to the now infamous "great whale slaughter", the decline of the commercial fishing industry in the 1950's and the encroachment of the solar salt industry into important marine nurseries (culminating in the loss of those areas) in the 1970's should serve as clear warnings for the future.

Shark Bay is a limited fragile resource which must be protected from indiscriminate development. As with the proposed terrestial 'land use zones', the zoning system for marine reservation in the SBRP has an inherent bias towards the existing economic status quo at the expense of long term responsible management of the marine environment.

GENERAL ACCESS ZONE

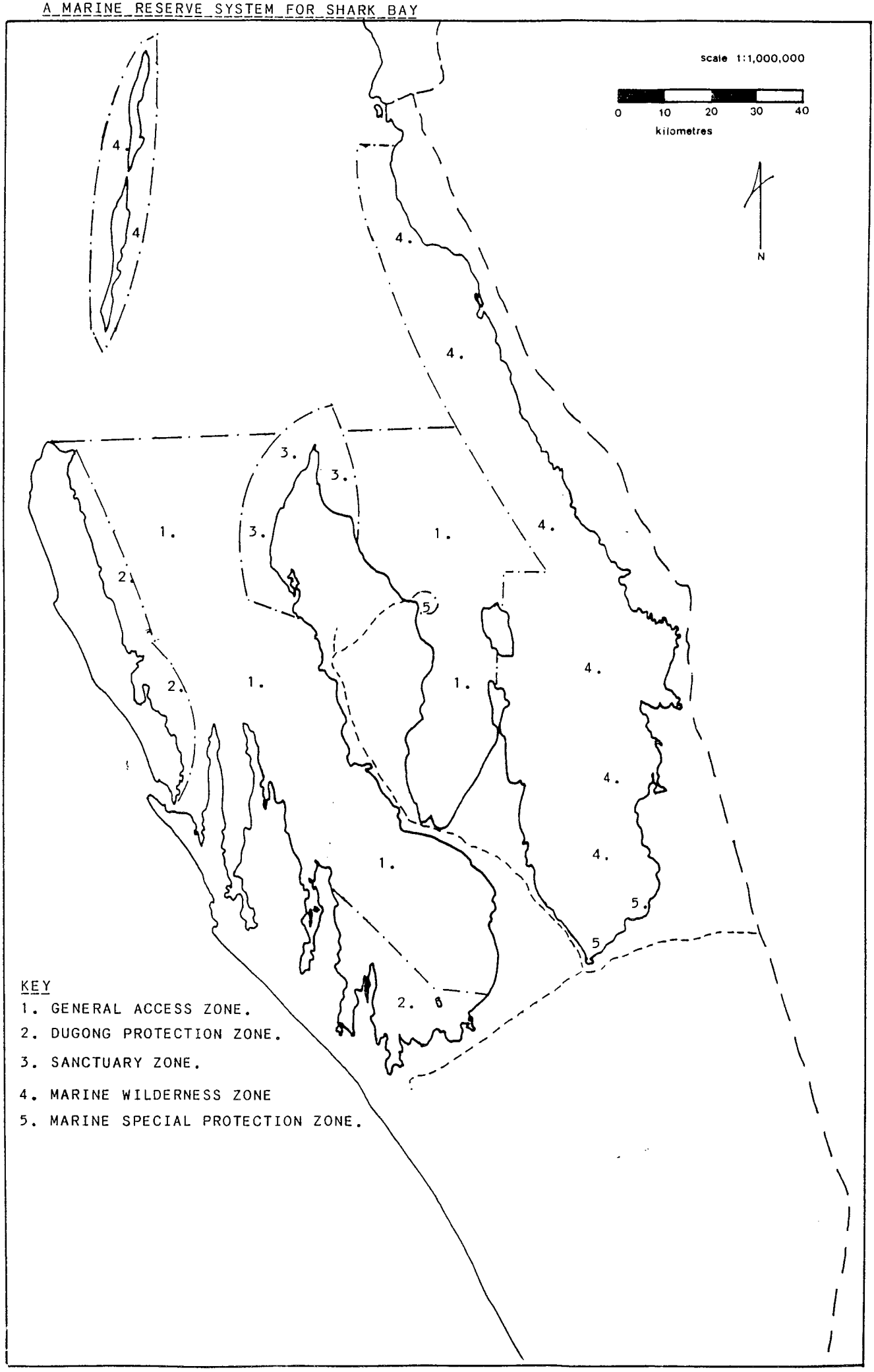
This zone, which includes the vast majority of Bay is, as the name implies, open for recreational boating and fishing, commercial fishing and general access. This is not to say that access and activities should be unregulated. Access points for boating must be clearly defined and strictly managed.

Likewise, activities and their impacts must be monitored. This will require an upgraded management presence in the area. We support provision of extra fishery inspectors at Exmouth which will free up the duties of the Carnarvon inspectors and allow them to concentrate more on Shark Bay.

Monitoring such a large area is a difficult task. The restriction of access to specific parts will result in maximising the effectiveness of staff. Random checks on gear, catch and the continuation of the creel census will all be aided by accesss restrictions. Existing access points at Denham and Monkey Mia should be continued. Access through Monkey Mia shuld be limited to those persons staying at the caravan park. Because of the dolphin visits there is a real need for caution. Any dramatic increase in use of this ramp and surrounding areas could mean the loss of the dolphins.

A second ramp could be established on the eastern side of the Peron Peninsula to facilitate access and replace Gladstone (see Marine Wilderness Zone). This ramp should be close to existing roads to limit the environmental impacts of its establishment. A management presence is

A MARINE RESERVE SYSTEM FOR SHARK BAY



appropriate, again to check and maintain boating and fishing.

Consistent with the views of the Shark Bay Chamber of Commerce (letter 29/10/86), this submission recommends that the trawling should be allowed in this zone. This would necessitate closing the existing trawling ground between Dirk Hartog Island and Peron Peninsula. "The Chamber feels that the operators of trawlers should be restricted in an area south of the line drawn between Withnell Point and Cape Peron which would assist in the protection of the Dugong population to a greater degree" (p.2).

The increase in recreational fishing and boating will necessitate the provision of a greater management presence. We would support any move in this direction. Likewise any increase in research and monitoring would be supported. Both these aspects of management are fundamental to the long term well-being of the Shark Bay marine environment.

DUGONG PROTECTION ZONES

Dugong are classified as rare and endangered and this, logically, is the principal cause for concern about the Shark Bay population. However, in addition to the precarious position of the species, the Shark Bay population is of added significance for it is one of the two largest remaining populations in Australia. A feature of this population is its vulnerability due to nature of its habitat (Anderson, 1985). Shark Bay's Dugong population exists at the southern extension of its normal range which places a considerable stress on the population.

Three factors limit the distribution of Dugong within the Bay. These include depth of water, water temperature and the nature of the vulnerable seagrass communities. This limits the animal's range and highlights the importance of conserving the few areas where Dugong congregate, including seasonal forage grounds. Each season the animals congregate in the warmest available waters in the Bay. Anderson (1985, p.17) viewed the integrity of these seasonal foraging grounds as crucial to the population's survival: "I suspect this small delta [Wooramel] area is a critical resource for the Dugong population and that if it were curtailed, or if the Dugong were driven off by disturbance, the carrying capacity of Shark Bay for Dugongs would be dramatically reduced."

The severe limitations and the stress placed upon the Dugong means the population is vulnerable. It is therefore imperative for the preservation of this population that any plan of management gives top priority to its ecological needs. At this stage there is nothing to suggest that commerical fishing activities in anyway threatens the Dugong (Anderson pers. comm., 1987). However, an increase in recreational boating poses a significant threat. For this reason it is essential that activity in these

areas is kept to a minimum to ensure that the dugong population is protected. It must also be noted that with further research new evidence may come to light, which calls for stricter management prescriptions, flexibility to change access conditions must be maintained.

Prescription:

Dugong Habitat Protection Zones are also classified as limited sustainable access areas. Commercial fishing activity is permitted, while recreational boating and fishing is excluded. Scientific research and educational activities are permitted. Other commercial activities such as passive observation of Dugong and, in the event of repopulation, whales, may be permitted in these zones but this activity must be regulated.

SANCTUARY ZONE

This zone includes an area encompassing the top of Peron Peninsula which includes two major occurances of mangroves, extensive areas of seagrass and important areas of habitat (turtles and dugong). The zone stretches from Guichenault Point on the eastern side of Peron around the peninsula's tip to the southern side of the entrance to Big Lagoon.

This reservation is consistent with the EPA's concerns and desire that "attention be given ... to the conservation of shallow marine inlets, animals, seagrass banks and mangrove flats (Chalmers, 1986, p.1). This zone follows the 10 metre bathymetric line and the extent of seagrass beds. The most significant areas are Big Lagoon and Herald Bight. There is little documented information as to the ecological importance of these areas. However, the presence of seagrass in combination with mangroves and the accompanying diversity of marine fauna strongly suggest the area is significant. In terms of the commercial fishing industry Big Lagoon has already been recognised by local fisherpeople as vital for the continuation of a viable commerical fishing industry (Dick Hoult, pers. comm., 1987).

Prescription:

In terms of access this area is classified as sustainable limited entry. Commercial fishing, scientific research and educational activities are acceptable. Recreational boating and fishing is not. This zone, along with the Marine Wilderness Zone, will act as benchmark areas to guage the effects of human activity elsewhere in the Bay. Sustainable limited entry will ensure commercial fishery access to these important fishing grounds which form the second tier in terms of the three tiered access scale. As with Shark Bay's terrestrial ecology, it is essential to have representative samples of the region's marine ecology in secure reservation.

MARINE WILDERNESS ZONE

This proposed zone encompasses four important features of the Shark Bay marine ecosystem:

1. Hamelin Pool.
2. Dugong summer forage grounds.
3. The Wooramel Seagrass Bank.
4. Bernier and Dorre Islands.

It is envisaged that access to the zone would be severely restricted in order to guarantee its long term integrity. This could be achieved with minimal effect on the commercial fishing industry but would require a repositioning of the boating access point at Gladstone to a more appropriate position.

> Hamelin Pool and the Faure Sill is of paramount scientific importance as a unique marine environment and a major field laboratory for continuing education and research in carbonate sedimentation, marine biology, physical oceanography and geochemistry. The environment also is an integral part of the Shark Bay ecosystem, and conservation of commercial fisheries and marine biota of the embayment requires the maintenance of the hydrological system to which all marine species are geared (CTRC 1974, p.9-15).

The second feature included in the Marine Wilderness Zone are the Dugong summer foraging grounds. As cited in the section dealing with Dugong Habitat Protection Zone, it is essential that this area is protected from all interference.

The third component of the zone is the Wooramel Seagrass Bank. The importance of this structure and its significance in a regional context is well documented (see appendix 1; CTRC, 1974; Davies, 1970; Environmental Protection Authority, 1986). It is undeniably an area of great significance and a major part of the Shark Bay ecosystem.

Prescription:

Other than essential management practices, scientific research and education, no access should be permitted in this area of the Bay, including commercial and recreational fishing. Access to the eastern section of Shark Bay should be facilitated through the establishment of an alternative ramp and launching facility. The SBRP (p.15) described Gladstone as, "One of the few places where easy access to the Bay waters is possible along the eastern coast".

The plan did not offer alternatives to Gladstone as an access point, though now doubt there are plenty of suitable areas on Peron peninsula. While realising the added distance to some people of an access point relocated on Peron, in terms of management of numbers of boats etc. this option is preferable. Having an access point closer to Denham would make regular inspections by designated officers possible. Such monitoring and policing is essential in order to minimise adverse impacts of increased recreational fishing and boating. Additional inconvenience caused by such a relocation will be seen by reasonable recreationalists as a trade-off for the preservation of a valued recreational fishery resource.

Bernier and Dorre Islands are of outstanding significance in terms of their fauna and flora. To ensure the islands integrity and consistent with their current status of A class nature reserves, this study recommends that both islands are buffered by a restricted entry zone to the 10 m Bathymetric line which would encompass the majority of islands including seagrass beds.

Marine Special Protection Zones:

Within all the above zones, it may be necessary to establish special protection 'sub' zones to ensure the protection of special features, for example the stromatalites in Hamelin Pool (allowing access to them for viewing but with strict prescriptions) and examples of unusual coral formations elsewhere in the Bay. These areas could be managed by the Australian National parks and Wildlife Service. This prescription is necessary because of the demonstrated inability of State Authorities to manage special features elsewhere.

Section 7: Recommendations for a Representative System of Terrestial Reserves for Shark Bay.

For the purpose of understanding why various components of Shark Bay should be conserved, the area has been divided into eight "sub-regions" with each addressed separately (see accompanying map). Under the proposed Shark Bay Marine and Terrestrial Park, the nomenclature of the components would deviate from the existing CALM Act. However, categories or zones would not otherwise alter significantly. Four zones are proposed:

1) Nature Conservation and Recreation Zone.

This category is consistent with the present definition of a National Park where limited 'passive' recreation is permitted, access is open, including by motor vehicle via designated access roads. These areas should be subjected to a detailed plan of management and cater for a variety of needs in terms of overnight camping facilities, walking tracks and interpretation centres.

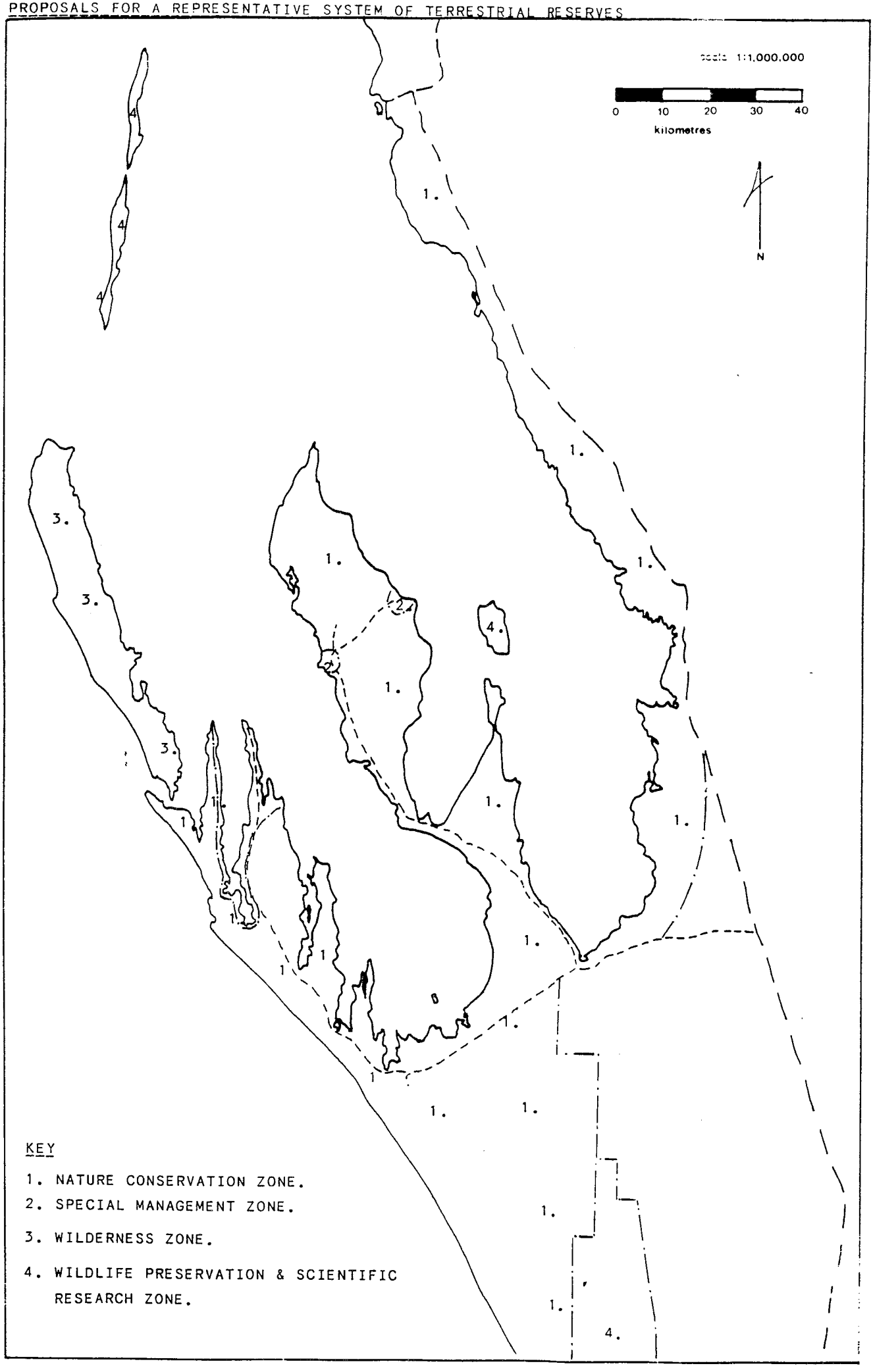
2) Special Management Area.

These areas provide for a degree of flexibility in terms of management. This is designed to take account of special situations by they existing or in the future to allow for appropriate management of the specific situation. The dominant theme is conservation. For example, such a zone either side of the Denham Road would allow regular maintenance to be carried out, major reconstruction and possibly upgrading. These activities require heavy machinery and large quantities of materials which must be temporarily stored near the work site. Prescriptions minimizing damage during construction could be implemented along with rehabilitation programmes.

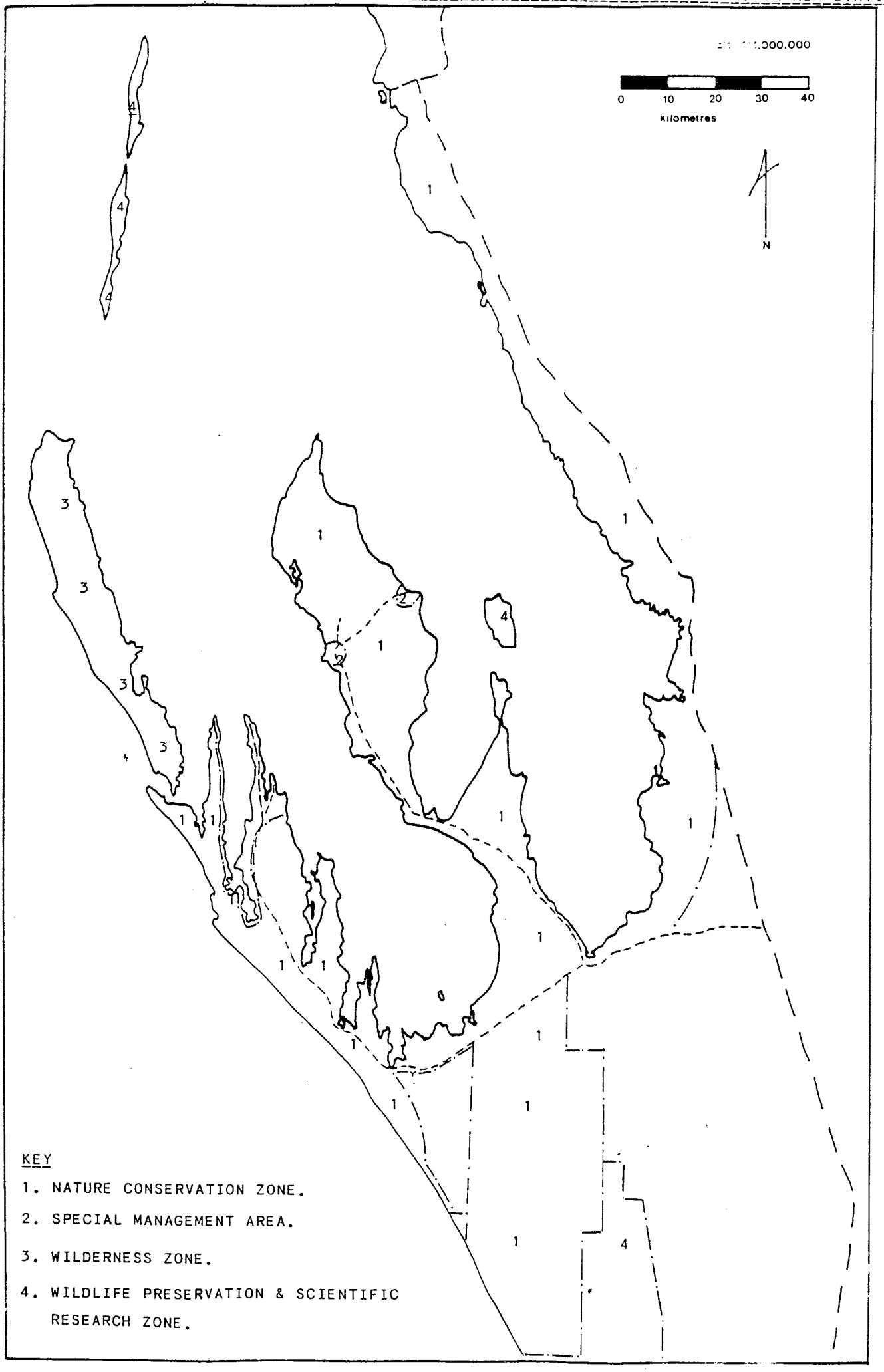
Other areas where this zoning could apply are:

- Monkey Mia
- Cape Inscription
- Homestead interpretation and camping facilities
- Denham town buffer
- Other interpretation sites eg Hamelin Post Office
- viewpoints
- day use picnic areas, and
- walking track access panels.

PROPOSALS FOR A REPRESENTATIVE SYSTEM OF TERRESTRIAL RESERVES



PROPOSALS FOR A REPRESENTATIVE SYSTEM OF TERRESTRIAL RESERVES EXCLUDING TAMALA STATION.



3) Wilderness Zone.

This zone is primarily dedicated to wildlife conservation but with restricted access to recreation. Recreation activities would centre on wilderness experience which would require restriction of numbers of peple, size of parties and mode of transport. Guidance and supervision would be required to varying degrees. Education and wildlife viewing would be a central theme with the area open for scientific research by permit.

4) Wildlife Preservation and Scientific Research Zone.

Consistent with the existing State category of A Class nature reserves, these areas would have restricted access to individuals able to obtain permits for research, and designated officers of the managing authority to carry out essential management functions.

Land Systems in the Terrestrial Zones:

1. Bernier and Dorre Islands.

Presently these areas are A Class nature reserves administered by CALM. Under the Terrestrial Park Zoning it would be classified as a Wildlife Preservation and Scientific Research Zone. The values of these islands are indicated by their present reserve status. Numerous publications and studies have documented their values in terms of flora and fauna.

2. Dirk Hartog Island.

Dirk Hartog Island is the largest island off the West Australian coast. Presently it is covered by pastoral lease. Being an island, its suitability for a conservation reserve is indisputable. Under the proposed zoning Dirk Hartog would be designated a Wilderness Zone. The Island's homestead could be the base for wilderness experience holidays, which could allow limited access to people while ensuring minimal impact. Wilderness recreation is extremely popular elsewhere and affords another dimension of the recreation spectrum to the visitor.

Being an island, fringe effects from surrounding land uses are negligible, control of access is possible, and introduced species eradication can be achieved. Re-introduction of species lost through competition by exotic carnivores and herbivores(eg. cats and rabbits) should be given high priority.

The conservation values of the Island are well documented. Plant life is diverse with over 250 species being recorded (CTRC, 1974). The Island is

dominated by two principle vegetation types, Halos and Edel (Beard, 1974) (For further details of Dirk Hartog's value as a component of a representative reserve system see the section on vegetation associations). The Island is of marginal pastoral value because the majority of it, although able to be grazed, has serious limitations. This area is classified as coastal dune shrub and is extremely unstable. Other areas on the Island are designated 'very low' with some of high value. Blowouts as a result of overgrazing occur throughout the island but mainly on the southern end.

Considering the limited value of the Island as a pastoral lease as opposed to its outstanding value for nature conservation and limited recreation, it is recommended that Dirk Hartog Island be withdrawn as a pastoral lease at the earliest opportunity.

3. Edel Land.

Like Dirk Hartog Island, the shape of Edel Land, although not an island, lends itself well to management prescriptions for controlled access, and feral animal eradication once vested for conservation. A zoning of nature conservation and recreation is appropriate for this area for three reasons. First, it is an area already heavily used for recreation. Steep point has been under increasing pressure which has led to the need for a management preserve an is cited by the SBRP as a potential national park. Second, like Dirk Hartog large areas of Edel Land are unsuitable for pastoralism being fragile coastal systems and inherently unstable (SBRP, 1987, p.35). Third, according to Beard's (1974) classification of vegetation in Australia, Edel Land is part of the intermediate vegetation zone found only in Shark Bay where the Eremean and South-west botanical provinces intersect. Three of Beard's (1974) vegetation types dominate Edel Land including Peron, Lharidan and Edel. For a more detailed analysis of the significance of this association, see the section on vegetation types.

In summary, Edel Land is important in terms of botanical diversity manageable size and shape, outstanding recreational and scenic values. The establishment of a nature conservation and recreation zone would not include the existing operational mining tenements including the Solar Salt works and gypsum mines. A buffer zone should be created where the two Land use Zones coincide. This buffer would be zoned a 'special management area' and managed appropriately.

All areas of degraded pa sture, most notably areas surrounding watering points, should be rehabilitated. Feral animal eradication programmes should be undertaken to take advantage of the area's shape by fencing off Edel Land at its southern reaches.

4. Tamala

There appear to be two options for Tamala, inclusion as a bridging corridor between the proposed Cooloomia nature reserve extension and the proposed nature conservation and recreation area in Edel Land or the continuation of a proportion of the existing pastoral lease based on the most productive areas.

Tamala station is one of the more productive leases in the area. However, its conservation value is limited because of large scale infestation of exotic annuals and areas of severe degradation. Exotic annuals also mean it is of high pastoral value. Although management prescriptions could mean, in the long term, the re-establishment of native vegetation, the option of allowing the area to remain a lease should be considered. If this option was deemed appropriate, buffer zones to the south, east, north and west should be established where the lease coincides with the Cooloomia extension, fragile coastal zone and the unsealed access road to the north (see accompanying map). North of the access road would be included as part of the nature conservation and recreation zone surrounding Freycinet Estuary. This area would have to be subject to extensive rehabilitation to limit further spread of exotics and allow standard management practices to be carried out. Option B is to relinquish 'Tamala' and include it as part of the nature conservation and recreation zone adjacent to the Cooloomia nature reserve extension.

5. Peron Penninsula.

The Peron Peninsula, like Edel Land and Dirk Hartog Island, affords a unique opportunity to establish a large viable and manageable conservation reserve. A small sector of the northern half of the peninsula has already been earmarked for reservation by the SBRP. This would be done in stages with no specified time frame and is inadequate in terms of size and shape. The other unacceptable feature is of course the proposed establishment of a gypsum mine and port facility in the park.

Because of its natural attributes and existing recreational use, the area should be zoned nature conservation and recreation. Special management zones should be established at Monkey Mia and Big Lagoon. No gypsum mine or port facility should be permitted in this significant conservation area. A special management zone should also be established at the Coquina Shell Beach to facilitate limited controlled extraction of this material for back loading.

Peron provides a great variation in land form with the accompanying diversity of habitat and species diversity. For more details of vegetation see section headed vegetation associations. Bird life is prolific. Over 100

species have been recorded in the area. An abundance of mammals are also found in the area. Eradication of feral pests is possible on Peron due to is manageable shape.

Moderate expansion of the Denham township must be catered for. A special management zone should be established in the conservation and recreation zone surrounding this area. Likewise existing roads such as those to Monkey Mia and the coastal highway should include a special management area to ensure appropriate maintenance and ecological protection.

6. Nanga.

As part of the Peron-Nanga complex, Nanga was cited for reservation by the CTRC (1974). This alternative plan fully endorsed the reservation of Nanga for conservation as a nature conservation and recreation area. Its nature conservation values are consistent with those of Peron, the area being unusual due to the combination of being at the interface of two botanical provinces and the added influence of climate and its proximity to the ocean.

In terms of shape, Nanga does not offer all the exciting opportunities other areas in Shark Bay do. However, Nanga's shape offers the advantage of not being totally land locked which allows substantial benefits in terms of management of both itself and adjacent marine areas, particularly as a buffer for Hamelin Pool. As the section on vegetation associations illustrates, the vegetation types diversify considerably toward the southern tip of Hamelin Pool. These should not be under estimated.

7. Faure Island

As described by the CTRC (1974), Faure Island supports several important seabird breeding colonies. The biogeographic advantages for managing islands for conservation have already been explained in this submission (see sec. 4).

The impact of grazing goats was not considered in the draft SBRP, but experience elsewhere suggests that it is substantial. Similarly, reasons behind for the apparent 'upgrading' of the Faure pastoral condition from 'high' on Dept. of Agriculture rangeland capability maps to 'very high' in the SBRP was not explained.

For these reasons Faure Island should be reserved for Wildlife Preservation and Scientific Research to provide a valuable scientific benchmark between the relatively pristine nature of Bernier and Dorre Islands and the proposed controlled use of Dirk Hartog Island and the Peron Peninsula for wilderness and general recreation, respectively.

Small Islands

The recommendation for continued protection of the small islands in Shark Bay is supported. Consistent with their current reservation as 'A' Class nature reserves, these areas will be zoned for Wildlife Protection and Scientific Research under the Shark Bay Marine and Terrestrial Park Act. (ref. sec. 9).

6. Toolonga and Wooramel Delta.

The reservation of these areas has a dual purpose. First, the areas contain examples of vegetation mosaics found nowhere else in the state. The ecotonal variations and the accompaying diversity of species is worthy of reservation. These features are not represented elsewhere. See vegetation association section. Second, the area between the north west coastal highway and the waters of Shark Bay offers a great opportunity to establish a manageable buffer zone for the Wooramel Seagrass Bank, the Wooramel Delta and Hamelin Pool. The significance of buffers is explained in section 4.

As a boundary, the highway is appropriate in terms of manageability. Ecologically, there are probably more appropriate areas but the highway offers an appropriate compromise between manageability and representativeness. As prescribed elsewhere, provision should be made in the form of special management zones for road maintenance and existing facilities such as the Wooramel Road house and various homesteads.

The pastoral value of the area varies but it should be noted that with the possible exception of Wooramel Station, the proposed buffer consistutes only a small percentage of the total lease. It is proposed that the buffer be zoned nature conservation and recreation.

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VEGETATION ASSOCIATIONS

A combination of geology, soils, topography and climate has produced a variety of vegetation units in the Shark Bay region which are of worldwide conservation significance. Much of this vegetation is unique in species composition, and as well there are vegetation types with unusual physiognomy (structural development).

The coastal situation has contributed significantly to the uniqueness of the flora and vegetation of the Shark Bay region as, obviously, the habitats developed can not be widespread and in fact do not even extend for any significant distance along the coastline.

An interesting aspect of the vegetation of the region is the 'localized form' which a number of the plant species take in this area only.

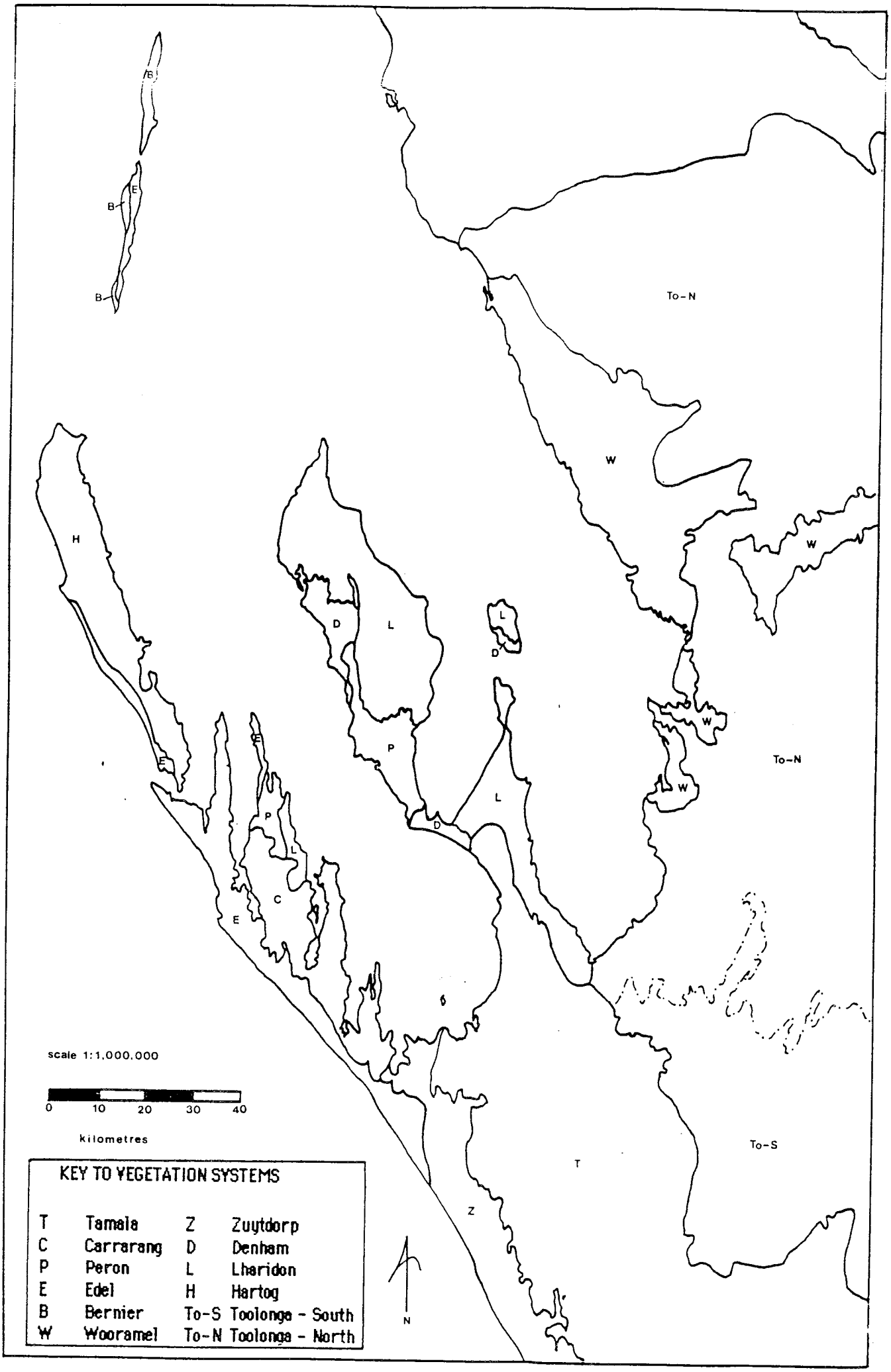
State of knowledge of the vegetation of the area

The vegetation of much of Western Australia is very poorly known, with only the gross variation being mapped on a statewide basis (at a scale of 1: 1,000,000 by J. S. Beard, various publications). Unfortunately the only vegetation surveys incorporating the Shark Bay region are part of this series (Beard, 1976a) and a specific publication on the Shark Bay and Edel Area (Beard, 1976b) which has basically the same information with the map at an enlarged scale but with no significant differences. It has to be borne in mind that even though Beard's survey highlights the unique nature of the vegetation of the Shark Bay region it is a very broad survey and much of the variation in the area has not been described. It is likely that a survey at a less superficial level would discover much more variation than is described below, both in the vegetation and in the range of species known for the area. Such a survey would enable better assessment of the conservation values of the area and would probably highlight the necessity of a large reserve to adequately protect the natural variation of the vegetation.

Comments below on the extent of particular vegetation types found in the 'study area' are based on examination of these vegetation maps. Table Two shows comparison of the representation of the vegetation types, and thus systems of the study area in 'secure conservation reserves' between the Shark Bay Region Plan (1987) and this submission.

Description of the Vegetation of the Shark Bay Region

Beard (1976b) divides the vegetation into a series of nine systems (see table one) based on the physiognomy (ie. the structural form), of the vegetation, from grasses to shrubs to tree mallees. He then divides these



Vegetation Systems of the Study Area, after Beard (1976b)

into sixteen vegetation units based on their floristics (species composition). Each of the Systems is described briefly below with comments on their distribution. This submission covers a slightly larger area than that considered by Beard (1976b) and as a consequence it has been found necessary to describe two further systems (Toolonga and Wooramel) which are divided into a further fourteen vegetaion types.

Tamala System. This system covers part of the Toolonga Plateau where it slopes gently down to Shark Bay. The soil is red-brown sands which form small sand-ridges with occasional limestone outcrops. Beard refers to the typical "tree heath" vegetation of this system as being unique, a scrub heath with scattered trees and states that "nothing resembling this formation has been found elsewhere in the state" (Beard 1976b, p.14). Structurally it consists of herbs, grasses, small and large shrubs and small trees, indiscriminately arranged without discernible stratification with the trees reaching any height up to six metres. Its conservation value is considerable as apart from its unique structural form many of the species in this system have their major occurrence within it. Where they occur outside of it they are limited both in their number and their range. Near the Bay the interdunal depressions often become small salt pans.

Of the 52 species recorded for this system five are localised endemics and four are undescribed taxa which are possibly also restricted to it. There is also an unsual variant of the grass *Plectrachne danthonioides* which usually has the hummock form of a 'spinifex' but which does not develop this typical form in this vegetation type.

CONSERVATION VALUE. With the exception of a small area of this system which crosses the southern boundary of the study area, it is restricted to the submission area. Beard (1976b) gives special reference to this system as being unusual both in its species composition (many species are geographically restricted to this system) and physiognomy.

RESERVATION. A small area of this system is within the Zuytdorp National Park. The SBRP does not recommend inclusion of further areas in secure conservation reserves, but does recommend inclusion of the north-western section in a 'vegetation protection zone'. However these zones allow pastoral use (Table 3. SBRP) and grazing will inevitibly reduce the conservation value of this area. There is none of the shoreline area of this vegetation type within a secure conservation area (such as a National Park) and such an inclusion (representing the range of this system from

the leeward slopes of the steep coastal limestone cliffs to the shores of Shark Bay) is desirable.

Table One: List of the vegetation systems of the Shark Bay region showing their position in geographic units and in botanical districts and provinces (from Beard, 1976b, with modifications to include the two systems described here).

VEGETATION SYSTEM	GEOGRAPHIC UNIT	BOTANICAL DISTRICT	BOTANICAL PROVINCE
Tamala	Mainland	Irwin	South-Western
Zuytdorp	Mainland	"	" "
Carrarang	Edel Land	Austin	Eremaean
Denham	Peron Peninsula	"	"
Peron	Peron Peninsula, Edel Land	"	"
Lharidon	Peron Peninsula Edel Land	"	"
Edel	Edel Land, Dirk Hartog Island, Bernier Island, Dorre Island	"	"
Hartog	Dirk Hartog Island	"	"
Bernier	Bernier Island, Dorre Island	"	"
Toolonga	Mainland	Carnarvon	"
Wooramel	Mainland	"	"

Zuytdorp System. This occurs on the high, massive hills of coastal limestone and the less rugged limestone areas which lead into the southern area of the Freycinet Estuary. The vegetation on the hills is

dense thickets of *Melaleuca cardiophylla* with scattered *Acacia ligulata* over dense low shrubs of ***Rhagodia? obovata*** and ***Ptilotus divaricatus*** To the east of the hills the vegetation of this system has suffered from fire and grazing and now has only annual grasses and weeds with scattered shrubs of *Acacia ligulata, A. tetragonophylla, A. xanthina, Heterodendron oleaefolium* and *Exocarpos sparteus*. Depressions or salt clay plans and the heads of the sea inlets have an open shrub layer of salt tolerant Samphire species.

The mallee *Eucalyptus oraria* reaches both its greatest height (6-10 m, a 'tree' form as opposed to 'mallee') and greatest abundance withinin the Zuytdorp system where it is present in depressions. This Eucalypt occurs from Dongara to Bernier Island, it is confined to coastal limestone.

CONSERVATION VALUE. With the exception of a small area of this system which crosses the southern boundary of the study area, it is restricted to the submission area. Consequently it has high conservation value where it has not been badly degraded.

RESERVATION. A very small area of this system is managed for conservation purposes within the Zuytdorp National Park. The SBRP does not make recommendations for inclusion of adequate areas of this system in secure conservation reserves, but it does propose part of it should be included in 'vegetation protection' and 'coastal protection zones'. However, pastoral use will be allowed and inevitibly this will lead to degradation of the conservation values of the vegetation. In particular, no recommendations were made for reservation in secure reserves for the north-western areas of this system where the tree mallee *Eucalyptus oraria* reaches its greatest height and abundance and the *Melaleuca cardiophylla* shrubland units occur above the cliffs.

Lharidon System. This sytem extends down the east side of both the Peron Peninsula (except where the peninsula is narrowed at the Taillefer Isthmus) and Faure Island. It has undulating sand hills vegetated with a scrub dominated by *Acacia ramulosa* ('bowgada') with other species including *Acacia sclerosperma, A. tetragonophylla, Exocarpos sparteus, Grevillea eriostachya, Dodonaea inaequifolia, Eucalyptus oleosa, Heterodendron oleaefolium* and *Eremophila platycalyx*. To the northwest of the Peninsula the bowgada scrub is replaced by an *Acacia-Lamarchea* thicket. In the depressions between the sandhills there are scattered salt clay pans which have a mixture of samphire and saltbush species.

CONSERVATION VALUE: This system is restricted to the submission area. The 'birrida' to the north-west is the largest on Peron Peninsula and within the submission (SBRP) area. The *Acacia-Lamarchea* shrubland which surrounds Big Lagoon is of importance as it is the only occurrence

of this vegetation type within the submission area and appears to be the **only stand of this unit mapped by Beard. Two small stands of mangroves** occur at the edges of this system, at Guichenault Point and at Big Lagoon.

RESERVATION: There are no areas of this unit within secure conservation reserves and the SBRP made no recommendations to amend this, but did propose that the northern half of this system, where it occurs on the Peron Peninsula be included in an 'environmental protection and recreation zone'. The proposal is to initially only include the near coastal strip, which over time will be added to, and eventually be given the status of a National Park. Pastoral activity will continue both in the areas before they are added and it is probable that recreational pressure will be concentrated in the near coastal area. Both these activities have the potential to degrade the conservation value of the vegetation. A proposed gypsum mine and associated loading facilities may be developed near the tip of peron Peninsula. This would be quite incompatible with conservation of the vegetation of the areas affected.

Peron This system lies at the southern end of the Peron Peninsula and surrounding Useless Loop. It has low, gently undulating sand hills on which there is open grassland of *Triodia plurinervata* with scattered low shrubs (1.2 m) of *Acacia ligulata, A. tetragonophylla, Exocarpos sparteus* and *Heterodendron oleaefolium*, over lower shrubs including *Atriplex humburyana, Scholtzia umbellata, Ptilotus obovatus* and *Solanum orbiculatum*

CONSERVATION VALUE. This vegetation system is restricted to the Peninsulas and Prongs of the submission area and must be rated as having high conservation value.

RESERVATION. There are no areas of this restricted vegetation system in secure reserves and the SBRP did not recommend that any significant areas of this system be included in secure conservation reserves. A very small portion near the townsite of Denham was proposed for inclusion in an environmental protection and recreation zone. However it is a part of the areas to be added at a later date and in the interim will be subject to grazing activities.

Denham System. This system occurs west and north of Denham to the mouth of the Big Lagoon, along the narrowest section of the Taillefer Isthmus and the south west section of Faure Island. In all three areas it partially adjoins the Lharidon System. It differs from the Peron System in that the hummock grass *Triodia plurinervata* only occurs sporadically rather than forming a distinct grassland. *Acacia ligulata* is the most abundant species in the scrub layer.

CONSERVATION VALUE. This vegetation system is only found on the Peninsulas and Prongs of the submission area and is of very restricted distribution. It should be accorded high conservation value.

RESERVATION. There are no areas of this vegetation system currently in secure conservation reserves and the SBRP does not recommend that this situation be redressed. However, it does recommend that the largest area of this unit (between Denham townsite and Big Lagoon) be included in an 'environment protection and recreation zone'. However it would not be added immediately and ongoing pastoral activities until it is added could lead to the degradation of the vegetation. Because of the proximity of this area to both the townsite of Denham and Big Lagoon it is likely that the impact of tourism will be high.

Carrarang System. This system covers most of the eastern part of Edel Land, including all of the Carrarang Peninsula and the peninsula to the south-east of it. It is underlain by Quaternary aeolianite and calcareous sands of various ages of deposition. The low rises have an *Acacia ligulata* scrubland within which there are saltbush and samphire salt clay pans and flats which lead to the inlets. Other shrub species present include *Diplolaena dampieri, Melaleuca cardiophylla, Thryptomene? baeckeacea, Olearia axillaris, Acanthocarpus preissii, Atriplex bunburyana* and *Frankenia laxiflora*.

CONSERVATION VALUE. This vegetation system is only found on the Prongs of Edel Land in the submission area and is of very restricted distribution. It should be accorded high conservation value.

RESERVATION. There are no areas of this vegetation system currently in secure conservation reserves and the SBRP does not recommend any such security. The SBRP recommends only a small portion of this system be included in a 'coastal landform protection zone'. This zone allows pastoral use (Table 3. SBRP) where grazing will inevitibly reduce the conservation value of this area and it will stay within the pastoral system, largely relying on the goodwill of the pastoralist of the day.

Edel System. This sytem covers the high hills of the west coast to Steep Point and out along Bellfin Prong, the south-western edge of Dirk Hartog Island and with the exeption of its two most westerly portions, Dorre Island. All areas of this system are underlain by Recent, poorly consolidated calcareous sands and it is within this system that most of the large drift-sand or blow-out areas occur. A low heath (0.3-0.4 m tall) dominated by *Melaleuca cardiophylla* and *Thryptomene? baeckeacea* with the "Spinifex", *Plectrachne* sp. is the main vegetation of this system. Within this low heath the taller shrubs *Acacia ligulata, Diplolaena*

dampieri and *Melaleuca cardiophylla* occur in patches scattered throughout the area (usually between the ridges) and there are samphire and salt bush dominated depressions.

The areas above the sea cliffs have scattered shrubs of *Atriplex*, *Frankenia*, *Senecio lautus* and *Swainsona* sp. This open vegetation grades into a windswept variant of the heath described above or into a less salt and wind spray damaged low shrublands of *Frankenia pauciflora*, *Acanthocarpus preissii*, *Olearia axillaris* and *Atriplex?* *paludosa*.

CONSERVATION VALUE. This vegetation system is restricted to the western area of Edel Land, and the Islands of Dirk Hartog and Dorre and as such is one of Western Australia's most westerly vegetation systems. It should be accorded very high conservation value.

RESERVATION VALUE. Currently the area on Dorre Island is the only area of this vegetation system secured within an A-class Conservation Reserve and the SBRP does not recommend any additions to such a security. It does however recommend inclusion of the remainder of the system on Edel Land and Dirk Hartog Island in either an 'environment protection and recreation zone' or a 'coastal landform protection zone'. The latter of these zonings allows pastoral use and the degradation of the vegetation would be detrimental to the conservation value of these areas. The exposure and fragility of this system needs to be given proper consideration when land-use activities are designated.

Dirk Hartog System. This system covers most of Dirk Hartog Island, with the exception of the south-western coastal strip (where the steep cliffs are included in the Edel System).

Beard (1976b) describes four vegetation communities within this system. The most widespread is an *Acacia ligulata* shrubland below which there are hummock grasses. The *Acacia* occurs either as a scattered individual or in localised thickets. *Diplolaena dampieri*, *Exocarpos sparteus*, *Heterodendon oleaefolium* and *Alyogyne cuneiformis* also occur in this unit. Smaller shrubs present include *Acanthocarpus preissii*, *Atriplex humburyana*, *Cassia chatelainiana*, *Eremophila glabra*, *Frankenia pauciflora*, *Melaleuca huegelii*, *Myoporum ascendens* and *Olearia axillaris*. Beard (1976b) noted that the understorey tends to vary with the soil, *Acanthocarpus*, *Atriplex* and *Frankenia* being common on the more alkaline sites such as on poorly weathered calcarenite or slopes receiving salt spray with *Melaleuca* and *Thryptomene* on the more weathered red soils. *Scaevola spinescens* or *Lasiopetalum angustifolium* also occur over *Plectrachne* sp hummock grasslands. The less consolidated sand deposits on the east coast have an open mixed shrub layer of *Diplolaena dampierei*, *Myoporum* sp., *Carpobrotus aequilaterus* and *Conostylis* sp. with many

annual species. On the rockiest, driest and most exposed sites a mixed heath and spinifex community occurs.

It is estimated there are 300 plant species present on Dirk Hartog Island.

CONSERVATION VALUE. Dirk Hartog Island is the only area within the state where this system occurs. The conservation value of this vegetation system and the Island is extremely high.

RESERVATION. Currently there are no areas of this system within secure conservation reserves and the SBPP does not propose any such security. It does however recommend that the entire system be included in a 'coastal landform protection zone' where continued grazing practices will eventually reduce the conservation value through degradation of the vegetation. The importance of this vegetation system, the fragility of the westerly vegetation units, faunal habitats and the 'island' landform all contribute to this area requiring the highest conservation security possible.

Bernier System. This system covers Bernier Island and the westerly areas of Dorre Island. Four main vegetation types were distinguished for this unit by Royce (1962). Old calcrete hard-pans which have been exposed by deflation have a low scrub (0.6-0.9 m) dominated by *Diplolaena dampieri*, other species in this unit can include *Scaevola crassifolia*, *Westringia rigida*, *Carpobrotus aequilaterus* and *Capparis spinosa*. Unconsolidated sand dune areas have a transition in vegetation cover from very open and patchy low shrubland to a low (0.3-0.5 m) closed heath with a mixture of *Olearia axillaris*, *Acanthocarpus preissii* and the coastal hummock grass, *Spinifex longifolius*. *Beaufortia dampieri* and *Fileanthus limacis*, which also occur in this unit, are endemic to the Shark Bay area. Pink sandy soils overlying calcrete have an open steppe. The majority of this unit was burnt during a wildfire in 1973 and the observations of Royce (1962) are the only record of its original state. It consisted of a dense hummock grassland of *Triodia plurinervata* with a mixture of low shrubs including *Thryptomene baeckeacea*, *Melaleuca cardiophylla*, *Acanthocarpus preissii*, *Beyeria canescens* and *Stylobasium spathulatum*. An isolated stand of stunted trees of *Eucalyptus oraria* and *E. dongarriensis* (1.2-2.5 m) occurs within this unit. The remaining unit occurs on the consolidated dunes of red sands. In it the shrubs *Atriplex bunburyana*, *Ptilotus obovata*, *Rhagodia obovata*, *Diplolaena dampieri*, *Acacia ligulata*, *A. coriacea*, *Pimelea microcephala*, *Pittosporum phylliraeoides* and *Santalum acuminatum* form a mixed dense thicket which lacks any hummock grasses.

CONSERVATION VALUE. This vegetation system is only found on Bernier Island and a portion of Dorre Island. This restricted vegetation system has

a very high conservation value in both the species composition and the habitat value for fauna.

RESERVATION. The entire area of this vegetation is currently secured within A-class Nature Reserves and this level of security should be maintained.

"Toolonga" System. This system is described here to cover the mainland section of the Toolonga plateau that lies in the area covered by this submission, i.e. the area from the border of the South-West Botanical District north towards the Wooramel Delta. It is a mostly flat sand plain of red earthy sands, brown calcareous soils and shallow loamy soils over limestone (which outcrops in places).

The vegetation of this system is quite varied, forming a mosaic of different types. The southern section is a mix of *Acacia ramulosa* (bowgada) shrubland with various combinations of *Eucalyptus dongarriensis*, *E. foecunda*, *E. oleosa*, *E. manniensis* and *Callitris collumellaris* as scattered emergent trees. Within this southern section there is a restricted area that has *Eucalyptus dongarriensis* and *Eucalyptus foecunda* forming an open woodland over a *Triodia plurinervata* hummock grassland with only scattered additional shrubs. The northern section of this system has a range of wattle dominated shrublands. *Acacia sclerosperma*, *A. ramulosa* and *A. linophylla* tend to dominate on the deeper soils, with *Acacia sclerosperma* and *A. grasbyi* on the relatively shallow soils while *Acacia victoriae* and *A. eremea* occur on localised clay areas. The diversity in the vegetation units of this system is also illustrated on the Land System Maps produced by the Department of Agriculture. On these maps the areas is shown as a mosaic of different *Acacia* shrubland units.

CONSERVATION VALUE. Within the Shark Bay submission area, the only area of this system is restricted to the south-east corner, however it does extend over a considerable area to the south and east. In the southern section of this system the mixed Eucalypt over wattle units and particularly the restricted *Eucalyptus dongarriensis*, *E. foecunda* woodland over *Triodia plurinervata* are of high conservation value. The mosaic of units in the northern section adjoining Hamelin Pool which is illustrated in both vegetation (Beard, 1976a) and land system (Dept. Agric, 1982) maps of the area is also of high conservation value.

RESERVATION. There are no areas of this vegetation system currently in secure conservation reserves and the SBRP does not propose that this situation be redressed. It makes no recommendations for the representation of any of the important vegetation types which are in this system in a conservation zone of any description. Protection of particulary

the northern section would conserve this restricted mosaic of wattle types and give increased protection to the stromatilite populations in the adjoining Hamelin Pool.

"Wooramel" System. This system is described here to cover the Wooramel Delta area. The main vegetation units are bluebush (*Maireana* spp.) shrublands on low lying mud flat and sand plain areas with the wattles *Acacia sclerosperma*, *A. victoriae*, *A. eremaea* and *A. xiphophylla* forming low shrublands on the sandy dunes. One of the small mangrove stands in the submission area occurs on this system just north of the Wooramel River mouth, the others are along the Peron Peninsula at Guichenault Point and Big Lagoon.

CONSERVATION VALUE. This vegetation system is unique to the Wooramel Delta area and is thus restricted to the study area. The combination of the bluebush flats with mixed *Acacia* species on sandy rises is an important area of mudflat and sandplain vegetation where the *Maireana* species dominate over samphire and saltbushes together with this being the only river delta system in the study area highlights the importance of the conservation value of this system.

RESERVATION. There are no areas of this vegetation system currently in secure conservation reserves and the SBRP made no recommendations for any such security. As well as the conservation of this important set of vegetation types, the protection of this vegetaion system will also give added protection to the internationally important dugong feeding areas of the Wooramel sea grass beds.

Table Two: Representation of vegetation systems of Shark Bay in current and proposed (SBRP) reserve systems

		REPRESENTED IN SECURE RESERVES	
VEGETN. SYSTEM	**VEGETATION TYPES**	**SBRP PROPOSALS**	**SBAG SUBMISSION**
Tamala	tree heath-Banksia ashbyi and Grevillea gordoniana	Yes	Yes
Zuytdorp	Acacia rostellifera/ A. ligulata thicket	-	Yes
	mixed heath with wattle patches	Yes	Yes
	Eucalyptus oraria low woodland	-	Yes
	Melaleuca cardiophylla thicket	-	Yes
	wattle and saltbush mixed steppe	-	Yes
	samphire succulent steppe	-	Yes
Carrarang	mixed scrub heath	-	Yes
	wattle, ti-tree and saltbush succulent steppe	-	Yes
	samphire succulent steppe	-	Yes
Denham	Acacia ligulata-A. rostellifera thicket	Yes	Yes
Peron	A. ligulata-A. rostellifera /Triodia shrub steppe	-	Yes

	samphire succulent steppe	-	Yes
Lharidon	Acacia ramulosa (bowgada) scrub	Yes	Yes
	Acacia-Lamarchea thicket	Yes	Yes
	samphire succulent steppe	Yes	Yes
	Avicennia marina (mangrove)	Yes	Yes
Edel	ericoid shrubs and Plectrachne dwarf shrub steppe	Yes	Yes
	samphire succulent stepppe	-	Yes
	mixed heath with wattle patches	-	Yes
	mixed scrub heath with patches of wattle and ti-tree	-	Yes
Hariog	A. hg. x rostell., Plectrachne and ericoid shrub steppe	-	Yes
	samphire succulent steppe	-	Yes
	heath shrubs on recent sands	-	Yes
	ericoid shrubs and Plectrachne dwarf shrub steppe	-	Yes
Bernier	Acacia ligulata/A. rostellifera thicket	Yes	Yes
	open ericoid dwarf srub	Yes	Yes
Toolonga	Acacia ramulosa/A. linophylla A. grasbyi shrubland	-	Yes
	Acacia victoriae, A. ramulosa/A. linophylla shrubland	-	-
	Acacia sclerosperma., A. victoriae shrubland	-	Yes
	Acacia coriacea, A. victoriae shrubland	-	Yes
	Acacia sclerosperma, A. grasbyi shrubland	-	-
	Acacia sclerosperma, A. ramulosa/A. linophylla shrub	-	Yes
	Acacia ram/ lino, A sclerosperma, Grevillea shrubland	-	-
	Acacia ramulosa/A. linophylla, Grevillea shrubland	-	-
	Acacia xiphophylla, A. eremea with saltbush	-	Yes
	mixed Eucalyptus and spinifex tree steppe	-	-
	Eucalyptus oleosa, E. sp. tree streppe	-	Yes
Yooramel	samphires + patches of wattle scrub	-	Yes
	samphire succulent steppe	-	Yes
	Atriplex succulent steppe	-	Yes
	Acacia victoriae shrub with saltbush	-	Yes
	bluebush, saltbush with patches of wattle scrub	-	Yes
	Avicennia marina (mangrove)	-	Yes

CONCLUSION

It is apparent even from the limited and gross scaled vegetation mapping and land system mapping that has been completed for the study area that the vegetation is both uniq ue within the area and within the state as a whole.

As the study area is where the boundary of the South-West and Eremaean Botanical Provinces meet, the conservation value of the subtle variations in the vegetation units is again highlighted.

Unfortunately the diversity of vegetation and habitats has not been realised in the Shark Bay Region Plan, with the main 'conservation zones' being directly correlated to the pastoral value and thus the conservation

of the natural environment has been poorly adressed. Added to this, these 'conservation zones' proposed have included incompatible landuses such as pastoral grazing which will only accelerate the degradation of these unique and restricted vegetation and land systems.

The general absence of any conservation reserves in the wider context of the Murchison region only emphasises the need to look at the region from a conservation point of view in conjunction with more detailed biological surveys.

IMPLEMENTATION OF CONSERVATION OBJECTIVES - PROBLEMS AND SOLUTIONS

The almost total domination of pastoralism in Shark Bay has precluded the implementation of a representative conservation reserve system in the Central West Coast region. The system of reserves proposed in this submission will require the relinquishment of five leases and portions of ten others of the 90+ pastoral leases in the Gascoyne Pastoral Inspection District.

Two points must be made. Firstly, it must be recognised that the pastoral operations involved are based on public land, i.e., it is owned by the people of W.A.. As such, it is up to society to decide the most appropriate use for it. In Shark Bay's case, the choice is between a natural environment of global significance or the perpetuation of an industry which has profound effects on these values, occupies some areas of low pastoral value, and provides little return for the local economy or the State as a whole. While supporting the urgent need for conservation reserves in the region, conservationists recognise that a change in land tenure will involve a small, but nonetheless important, social impact which must be considered.

To this end, there are at least two options which should be investigated at the highest level. They address four major problems in replacing pastoral leases with conservation reserves, as per recommendations in this submission:

1. the large outlay in compensation by the State,
2. dislocation of the lessee,
3. provision of alternative management presence on the land, and
4. provision of managed access for local recreation and tourism.

Under the first option proposed here, the former lessee would be compensated a percentage of the pastoral lease's calculated value. The lessee would retain the right to lease back both the homestead and an

adjoining designated area. This area would provide the focus for low impact tourism accommodation and educational interpretation. This would be managed as part of the park in strict accordance with a management plan. The advantage to the lessee is compensation for the loss of income from the pastoral operation while retaining the option for a lifestyle on the land. It is also cheaper for the government to implement. Rangers stationed in Denham would be responsible and liaise with the homestead-centre manager on aspects of overall park management.

In the second option, the lessee relinquishes the lease but trades cash compensation for guaranteed retraining and employment by the government as a park ranger. They also retain the right to occupy the homestead as a ranger's residence. A small designated area around the homestead would be used for regulated bushcamping, as opposed to the commercial opportunity outlined in Option One. This second option satisfies all four concerns regarding compensation costs and relocation as well as management presence.

It is suggested that these options must be considered to facilitate the necessary change of land tenure while minimising cost to the government and individuals affected.

SECTION 8: SHARK BAY AND WORLD HERITAGE

> The philosophy behind the Convention is straightforward: there are some parts of the world's natural and cultural heritage which are so unique and scientifically important to the world as a whole that their conservation and protection for present and future generations is not only a matter of concern for individual nations but for the international community as a whole.
>
> RALPH SLATYER, 1983 (p.138)

The purpose of this section is to review the World Heritage Convention and its relationship to Shark Bay in the context of the recently formulated Shark Bay Region Plan (State Planning Commission, Department of Conservation and Land Management, 1987). As Davis (1984, p.196) has commented, the lay public has 'a rather confused view' of what the World Heritage Convention entails and how the nomination procedure operates. The following pages are therefore designed to clarify the implications of any listing of Shark Bay as a World Heritage site. In particular, attention is paid to the operations of the World Heritage Convention, the suitability of Shark Bay for the World Heritage List, the relationship between World Heritage Listing and various human impacts on the region including mining, fisheries, pastoralism, and tourism, and the implications of World Heritage listing for the management of the region.

THE WORLD HERITAGE CONVENTION

The Convention for the Protection of the World's Cultural and Natural Heritage, commonly known as the 'World Heritage Convention' was adopted by a United Nations Scientific, Education and Cultural Organisation (UNESCO) Conference on 16 November, 1972. The Convention was designed to enable nations to cooperate in the protection of cultural and natural sites of outstanding value to mankind.

The Convention came into force in 1975 when twenty nations had ratified it. As of early 1987 ninety-two countries had ratified or accepted the Convention. Signatories to the Convention commit themselves to assist in the identification, protection, conservation and preservation of World Heritage properties. According to Slatyer (1983, p.136):

> They recognise that the identification and safeguarding of those parts of the heritage which are located on their own territories is primarily their responsibility, and agree that they will do all they can, with their own resources and with what international assistance they can obtain, to ensure adequate protection.
>
> RALPH SLATYER, 1983 (p.138)

inclusion in the List only in exceptional circumstances or in conjunction with other criteria); and
b) meet the test of authenticity in design, materials, workmanship or setting (the Committee stressed that reconstruction is only acceptable if it is carried out on the basis of complete and detailed documentation on the original and to no extent on conjecture).
LIST OF CRITERION FROM INTERGOVERNMENTAL COMMITTEE FOR THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE, 1984, 7-8.

Natural property nominated to the World Heritage List should.

24.(i) be outstanding examples representing the major stages of the earth's evolutionary history; or
(ii) be outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment; as distinct from the periods of the earth's development, this focuses upon ongoing processes in the development of communities of plants and animals, landforms and marine areas and fresh water bodies; or
(iii) contain superlative natural phenomena, formations or features, for instance, outstanding examples of the most important ecosystems, areas of exceptional natural beauty or exceptional combinations of natural and cultural elements; or
(iv) contain the most important and significant natural habitats where threatened species of animals or plants of outstanding universal value from the point of view of science or conservation still survive.
INTERGOVERNMENTAL COMMITTEE FOR THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE, 1984, p.8-9.

no pg 81

Within Australia, at least in theory, 'anyone can approach UNESCO suggesting listing of cultural and natural property, but in practice all sites thus far nominated have been selected by State or Commonwealth Government agencies, often with the support and encouragement of the voluntary conservation movement' (Davis, 1984, p.197), most notably the Australian Conservation Foundation (Mosley, 1983). The Australian Heritage Commission is actively involved in the documentation of suggestions for World Heritage listing and engages in a detailed consultation process with the relevant Commonwealth, State and local authorities, as well as a wide range of experts.

Nominations need to provide a detailed account of the characteristics of each site. Each nomination must be endorsed at the government level, and be signed by the government authority which is responsible for the implementation of the Convention. Following endorsement, the nomination is sent to the UNESCO Secretariat via the UNESCO National Commission of the nominating signatory. In Australia, this task is undertaken by the World Heritage committee of the Australian National Commission for UNESCO.

The Secretariat passes nominations onto ICOMOS or ICCROM for cultural

properties and IUCN for natural properties where the nomination is rigorously analysed to determine whether or not the property concerned meets the World Heritage criteria and is of outstanding universal value. The World Heritage Bureau, acting upon the advice of ICOMOS, ICCROM or the IUCN , can make three types of recommendations to the World Heritage Committee. Nominations may be accepted, rejected, or deferred until further information on a property is available.

As of early 1987, 247 sites had been inscribed as World Heritage Property. However, a large majority of the sites are 'cultural' rather than 'natural' properties. Through the international and national attention which is focussed on the nomination process, 'the inclusion of a property on the World Heritage List should give added protection to the site' (Slatyer, 1983, p.142) In addition to the prestige attached to a World Heritage site, a degree of protection under international law, and a possible increase in the attraction of the site as a tourism destination may be expected. Yet, the World Heritage List is not necessarily unchanging. Properties which have been degraded through either manmade or natural causes may be deleted from the World Heritage List and placed on the World Heritage in Danger List. It is hoped that the prospect of a country's site being placed on the World Heritage in Danger List will focus enough attention on such sites to save them.

On August 22, 1974, Australia became the twenty-second country to ratify the Convention. Since then six Australian nominations for World Heritage listing - the Great Barrier Reef, Kakadu, Lord Howe Island, Willandra Lakes, Western Tasmanian National Parks, and the Australian East Coast Temperate and Subtropical Rainforest Parks - have been accepted by the World Heritage Committee. A seventh nomination - Uluru Park (Ayers Rock) - is presently under consideration by the Commitee. A cultural property, the Sydney Opera House and surrounding waterways, will probably be nominated when suitable criteria are established for such modern architectural sites (Hall, 1987), while the Commonwealth Government has foreshadowed the nomination of the North Queensland rainforests to the Convention. However, the implementation of the World Heritage Convention in Australia has often been surrounded by controversy (Mosley, 1983) in the cases of hydro-electric development in south-west Tasmania and mining in Kakadu, which has in turn led to a misunderstanding of the aims and objectives inherent in World Heritage Listing.

SHARK BAY AND WORLD HERITAGE LISTING

The Shark Bay region 'is an environmentally sensitive area' (Department of Conservation and Land Management, 1985, p.1) which has a number of faunal and floral (Chalmers, 1986; Prince, 1986; Woods, 1986), geological (Chalmers, 1986; Woods, 1986) aesthetic (Fisher, 1983) and cultural

(Western Australian Museum, 1986) attributes that make it suitable for World Heritage Listing (Nevill and Lawrence, 1985). However, the environmental characteristics which make it worthy of consideration for the World Heritage List are threatened by a variety of human activities which, if uncontrolled, have the potential to severely degrade and even destroy the heritage values of the Shark Bay region (Nevill and Lawrence, 1985). These activities include mining (Chamber of Mines of Western Australia, 1986; Department of Mines, 1986), grazing (Department of Agriculture, 1986), sandalwood extraction (Department of Conservation and Land Management, 1985), fishing (Fisheries Department, 1986), and tourism (Clough Engineering, 1986)

International Significance of Shark Bay

The international significance of the Shark Bay region is recognised in the IUCN's (1982) indicative inventory of natural sites of World Heritage quality. The four criterion for including a natural property on the World Heritage List are all met by the Shark Bay area (IUCN, 1982, p.56). Under the heading of universal significance, the IUCN recorded the following description of the Shark Bay area:

> Covering an area of over 500,000 ha., Shark Bay has numerous bays, inlets, and islands scattered throughout the shallow seas of the area. Interspersed sand banks and seagrass meadows support a profusion of aquatic life, including undisturbed populations of dugongs, green turtles, rays, sharks, and shell fish. In the highly saline waters of the Hamelin Pool, high rates of evaporation and low rates of circulation have caused the formation of algal stromatilites, structures of blue green algal mats bound together by sediment; these formations are exactly like those known from 300 million years ago. Of particular interest are two islands contained within the site, Bernier and Dorre, which form the northwestern boundary of Shark Bay. On these islands are found several species of mammals which have become extinct on the mainland, including the banded hare wallaby, the barred bandicoot, the western hare wallaby (also found in one part of the Northern Territory) and the boodie, a rat kangaroo.
>
> IUCN, 1982, p.56

The Shark Bay Region Plan (hereafter known as SBRP) produced by the West Australian State Planning Commission and the Department of Conservation and Land Management (1987, p.106) also observed that, 'with respect to Shark Bay, the area as a whole is seen to fit a number of natural values indicated in the criteria suitable for it to be included in the World Heritage List'. Similarly, Nevill and Lawrence (1987) and several reports (Gare, 1985; Country Planning Council, 1986; Woods, 1986) prepared for the Shark Bay Study, which was conducted as a preliminary to the SBRP (1987), have recognised the region's World Heritage values. As Woods (1986, p.2) wrote:

> From a conservation point of view, Shark Bay is unusual and **therefore the region as a whole has conservation value. Within the region there are also large areas containing sensitively** balanced or evolving systems which contain unique, rare or unusual natural features. These large areas have high conservation value.
>
> PETER WOODS, 1986, p.2

The World Heritage significance of the natural property of the Shark Bay region are also strengthened by the areas cultural values. Shark Bay contains sites of the first known European landings on the west coast of Australia. In addition, there is a long history of scientific exploration in the region which is of 'international interest' (State Planning Commission, Department of Conservation and Land Management, 1987, p.107). The cultural values of Shark Bay appear to fit the World Heritage Committee's (1984, p.8) criterion (a)(vi) for the assessment of cultural property, whereby the cultural property must be 'directly and tangibly associated with events or with ideas or beliefs of outstanding universal significance'. However, except in only the most exceptional circumstances, *such a criterion does not by itself justify nomination to the World Heritage list.* It is a criterion that should be used in conjunction with other criteria (World Heritage Committee, 1984, p.8), which in the case of Shark Bay represents the natural values of the region. A situation which the SBRP (1987) failed to recognise. The region's land use history, such as that related to grazing, the guano trade, mining, pearling, the sandalwood trade or whaling, may hold some heritage values, but they do not fit the criteria of universal significance necessary for the World Heritage list and neither do they necessarily justify the continuation of such land use practices, especially in the case of grazing and mining.

The Aboriginal sites of the region have not been fully documented, as the West Australian Museum (1986, p.1) have noted, 'no comprehensive examination of the whole area for Aboriginal sites has been undertaken'. However, the Museum (1986) did observe that a number of Aboriginal and European sites of some significance do exist in the Shark Bay region.

Shark Bay: World Heritage Values.

The following provides a preliminary account of the values of the Shark Bay region for World Heritage listing. It should be noted that this list is by no means complete and, given appropriate research, would undoubtedly receive additions.

CRITERION	SHARK BAY PROPERTY FULFILLING CRITERION
Natural	
(i)	The algal stromatilites of Hamelin Pool, exposures of

calcrete soils (especially at Bede Head), marine Pleistocene sequences (Edel Land peninsula).

(ii) **Hypersaline embayment of Hamelin Pool and its** associated communities, the Faure Sill, Wooramel Seagrass Bank, evaporite pans in the interdune depressions in the Peron-Nanga area.

(iii) The Zuytdorp cliffs, cliffs on the ocean side of Dirk Hartog Island (notably Herald heights), Herrisson and Bellefin prongs, and Edel land; Hamelin Pool and the Faure Sill, the Wooramel Seagrass Bank, bays and inlets at the eastern margin of the Edel Land Peninsula, island ecosystems (notably Dirk Hartog, Bernier and Dorre Islands), the southern parts of Tamala station have been recorded as fulfilling the requirements of a wilderness area although with appropriate management the majority of the Shark Bay area could be conserved as wilderness, especially the islands, the western coastline and the north of Point Peron.

(iv) Fauna: Rare and endangered species of mammals include the Banded Hare-wallaby (Lagostrophus fasciatus), Rufous Hare Wallaby (Lagorchestes hirsutus), Marl or Barred Bandicoot (Peramales bougainville), the Rabbit-eared bandicoot (Macrotis lagotis) Shark Bay Mouse (Pseudomys praeconis), Western Hare-wallaby (Lagorchestes hirsutus), Burrowing Bettong (Bettongia leseur), Ashy gray mouse (Pseudomys albocenereus), Sandy Inland Mouse (Pseudomys hermannsburgensis). Shark bay is the northernmost limit of the Western grey Kangaroo (Macropus fuliginosus). A peculiar form of the widely distributed Little bat (Eptesicus sp. nov.) is found at Shark Bay.

Rare and endangered endemic reptiles include the skinks Menetia amuara, Ctenotus youngsoni, Ctenotus zastictus, the Baudin Island skink or Spiny-tailed skink Egernia stokesii aethiops, Lerista humphriesi, Lerista petersoni, Lerista connivens and an undescribed Lerista on Hamelin - Coburn stations; the legless lizards Aprasia haroldi, Aprasia smithi and Pletholax gracilis edelensis; and a dragon lizard Tympanocryptis buteri. The isolate population of the agamid lizard Ctenophorus rubens may represent a distinct subspecies. The rare python Aspidites ramsayi is located on the north of Peron peninsula. At least six species of sea snake have been recorded at Shark Bay, including an endemic form of the seasnake Aipysurus laevis pooleorum. Another species endemic to Shark bay is the Round (Sandhill) Frog (Arenophryne rotunda). The area represents the southernmost west coast nesting grounds for the Green (Chelonia mydas) and Loggerhead turtles (Caretta caretta).

The Shark Bay Dugong (Dugong dugon) population is of international conservation significance, while the Bay is an important wintering area for the Humpback Whale (Megaptera novaeangliae). Other whales considered to be returning to the area following past exploitation include the Southern Right Whale (Eubalaena australis) and the Killer Whale (Orcinus orca). The Shark Bay dolphin (Tursiops truncatus) population, although not threatened, is of major scientific interest because of their close contact with

humans.
Over 100 bird species have been recorded and the area is the site of several breeding colonies, including the only Australian breeding site for the white-breasted morph of the wedge-tailed shearwater (Puffinus pacificus). Of special scientific and conservation interest is the endemic form of the Black-and-white wren (Malurus leucopterus), the White Winged Fairy wren, the Southern Emu-wren and the Thick-billed Grasswren (Amytornis textilis). The area is the southern limit of the Yelow Silvereye (Zosterops lutea) and the northern limit of the Mallee-Fowl (Leipoa ocellata) and the Southern-Scrub Robin (Drymodes brunneopygia).

Flora: The region contains a wide diversity of genera, including species which are little-known or undescribed and are endemic to the area. Families which have a rare or restricted distribution include Aizoaceae, Amaranthaceae, Apiaceae, Asteraceae, Chloanthaceae, Dasypogonaceae, Haemodoraceae, Liliaceae, Orchidaceae, Mimosaceae, Myrtaceae, Papilionaceae, Poaceae, and the Proteaceae. Peron Peninsula contains the southernmost stand of the mangrove Avicennia with an associated mangal fauna community. The coast between Denham and Point Peron contains scientifically important coral reefs. The significance of the flora of the region will certainly be enhanced by further scientific studies, as the area has not been fully investigated.

Cultural

(iii) Aboriginal sites may possibly fit this criterion but the area has not been properly examined.

(iv) Historical importance in terms of European discovery and exploration of Australia; long history of scientific exploration of region. However, continued conservation of the region's marine and terrestial ecology would contribute to the values of the area as a cultural property.

As the above has demonstrated, the Shark Bay region fulfills several criterion for listing as a World Heritage site. However, it is important to recognise that the World Heritage values identified above should neither be seen to exist nor managed in isolation from each other. As the World Heritage Committee (1984, p.9) has stressed the criteria for natural property must fulfill the condition of *integrity*.

Conditions of Integrity

The World Heritage Committee (1984) has reported that World Heritage sites should fulfill the following conditions of integrity for natural property:

(i) the site contained in 24(i) should contain all or most of the key interrelated and interdependant elements in their natural relationships; for example, an "ice age" (i.e. glaciated)

area would be expected to include the snow field, the glacier itself and samples of cutting patterns, deposition and colonization (striations, moraines, pioneer stages of plant succession, etc.).
(ii) The sites described in 24(ii) should have sufficient size and contain the necessary elements to demonstrate the key aspects of the process and to be self-perpetuating; For example, an area of tropical rainforest may be expected to include some variation in elevation above sea level, changes in topography and soil types, river banks or oxbow lakes, to demonstrate the diversity and complexity of the system.
(iii) The sites described in 24(iii) should contain those ecosystem components required for the continuity of the species or of the other natural elements or processes to be conserved. This will vary according to individual cases; for example, the protected area of a waterfall would include all, or as much as possible, of the supporting upstream watershed; or a coral reef area would include the zone necessary to control siltation or polution through the stream flow or ocean currents which provide its nutrients.
(iv) The area containing threatened species as described in 24(iv) should be of sufficient size and contain necessary habitat requirements for the survival of the species.
(v) In the case of migratory species, seasonal sites necessary for their survival, wherever they are located, should be adequately protected. The Committee must receive assurances that the necessary measures be taken to ensure that the species are adequately protected throughout their full life cycle. Agreements made in this connection, either through adherence to international conventions or in the form of other multilateral or bilateral arrangements would provide this assurance.

WORLD HERITAGE COMMITTEE, 1984, p.9.

Any nomination of the Shark Bay area to the World Heritage List would therefore have to fulfill the above conditions of integrity for natural property. The Shark Bay Region Plan (SBRP) (State Planning Commission and Department of Conservation and Land Management, 1987) in its current form does not adequately provide for the protection of natural property nor does it meet the conditions of integrity for the natural property of World Heritage value in the Shark Bay area.

THE NEED TO PROTECT THE INTEGRITY OF THE SHARK BAY REGION

As section four has demonstrated, one of the most important considerations in the development of a management plan for the Shark Bay region is the size and shape of reserves designed to protect both marine and terrestial environments and their interface, particularly tidal flats and mangals. The SBRP does not deal with this problem. Biogeographical theory points to *the need to preserve large areas of habitat*, or if this is not possible, to *provide for as many large habitat fragments as near to each other as possible* (Kent, 1987, p.100). The larger the area, the greater the number of species it can hold at equilibrium because extinction rates can be reduced. Each species has a minimum viable area

for it to survive. However, no attention is paid in the SBRP (1987) to the notion of minimal viable area. This stands in stark contrast to the EPA's (1975) recommendations which provided for the protection and maintenance of larger areas of habitat. Similarly, the proposed management plan needs to pay attention to the migratory habits of a wider variety of birds and animals than well known marine fauna such as the dugong. A facet of management which was addressed to a greater degree in the EPA System 9 report. Furthermore, consideration needs to be paid to the interrelationships between animal ranges and predator-prey relationships in the selection of management boundaries for any World Heritage area. Habitats are interconnected and should not be dealt with in isolation.

The shape of reserves is also an important consideration. The greater the ratio of the boundary of a reserve to the area of a reserve, the greater is the opportunity for exotic species to invade the reserve. The SBRP (1987) does not deal with this major aspect of biogeographic theory. Compounding problems of the delimitation of the shape and size of nature reserves is the nature of the activities that occur outside a reserve. If an activity that occurs immediately outside of a reserve has repercussions for the ecological integrity of the reserve, then consideration should be given to placing some form of control on the area immediate to the reserve through the use of buffer zones. Such zones are established in order to achieve the goal of maximising both the natural values of a reserve and the cultural and natural values attached to the surrounding area (Eidsvik, 1980, p.186). The utility of buffer zones to help protect World Heritage property has been recognised by the World Heritage Committee:

> Whenever for the proper conservation of a cultural or natural property nominated, an adequate "buffer zone" around a property should be foreseen and should be afforded the necessary protection. A buffer zone can be defined as an area surrounding the property which has an essential influence on the physical state of the property and/or on the way in which the property is perceived; the area constituting the buffer zone should be determined in each case through technical studies. Details on the size and characteristics of a buffer zone, as well as a map indicating its precise boundaries, should be provided in the nomination file relating to the property in question.
>
> WORLD HERITAGE COMMITTEE, 1984, p.6.

In the case of Shark Bay, the SBRP (1987) pays inadequate attention to the buffer zone concept in the protection of the natural property of the region. For the conservation of the heritage values of Shark Bay provision needs to made for the use of buffer zones in lands or waters contiguous to areas of high heritage value. Therefore, controlled usage through buffer zones should be considered in relation to the drainage basins of the area, shorelines, and areas which are highly sensitive to human impacts.

human impacts

At section 5 has demonstrated one of the most important aspects of the conservation of the Shark Bay region is the impact of humans on the integrity of the marine and terrestial ecosystems. Specific attention needs to be paid to the impact of mining, fishing, grazing and uncontrolled tourist and visitor access. For instance, mining is incompatible with the purposes of national parks. However, any management plan needs to pay attention to existing land uses which can continue without major adverse environmental effects over a wide area of the region.

Mining

The existing salt mining operations at Useless Loop should be allowed to continue provided they do not interfere with fish nursery areas vital for the local fishing industry and the habitat of trans-equatorial, migratory waders. Upon completion of the salt mining operations the land should become a national park. Proposed development of a gypsum mine on Peron Peninsula should not go ahead because both the mining site and the loading facilities would adversely reduce the conservation and recreation values of the area. The siting of the mine in an area of high environmental value is also of concern in relation to the introduction of exotic species into the area and the potential for uncontrolled access.

Fisheries

There has been a long history of fisheries activity in the waters of Shark Bay and, given an appropriate management programme, there is no reason why fishing should not continue. The experience of the Great Barrier Reef Marine Park Authority should prove invaluable in the management of the Shark Bay region's marine environment. The case of the Great Barrier Reef has demonstrated that, through the application of zoning plans which prescribe usage for a given zone, it is possible to balance demands for commercial fishing and marine conservation within an Australian World Heritage area (Kelleher and Kenchington, 1984). Similarly, and although at a smaller scale than the Great Barrier Reef example, a balanced approach to commercial fishing and marine protection has been achieved at the Lord Howe Island World Heritage Area.

The conservation of the marine environment of Shark Bay is a vital issue for conservation, fishing and tourist interests alike. Shark Bay's incredibly diverse and complex marine ecosystems, which include coral reefs, hypersaline waters, seagrass beds, mangals, tidal flats and deeper waters with sandy and rocky bottoms, provide habitat for a wide number of species. Any management plan must provide the fullest possible protection for this range of habitats. Furthermore, fishing practices may need to be

curtailed or modified in certain instances in order to prevent either the depletion of certain populations of marine fauna, including nursery stock, and/or the degradation of certain marine habitats.

Grazing and Pastoralism

There is a long history of pastoralism in the Shark Bay region. The SBRP (1987, p.34) reported that 'Local pastoralists have expressed the view that pastoralism does not interfere with the major conservation interests of the area'. However, this viewpoint would appear to be at odds with several research reports on the effects of animal grazing and trampling of the environment (Weaver and Dale, 1978). The effects of grazing by domestic stock on ecological processes has been clearly documented (Ovington, 1984, p.63).

The pastoral industry is likely to have had a major impact on the ecological integrity of the Shark Bay area. Unfortunately, the necessary research has not been conducted in the region with which to measure the full ecological impact of pastoralism. However, land degradation of the lands included in the Shark Bay study is recognised as a major problem (Department of Agriculture, 1986). The West Australian Department of Agriculture (1986, pp.5-7) have reported five main types of land degradation being encountered in the Shark Bay region:

(1) General loss of shrub cover, with or without soil erosion (occurs with major erosion over parts of the Wooramel delta and on the Tamala land system).

(2) Loss of understorey shrubs and perennial herbs (occurs throughout the Shark Bay area).

(3) Invasion of undesirable (inedible) shrubs (occurs as a local problem on alluvial plains systems, Carbla plateau systems and on the Edel land system).

(4) Hummock grassland degradation (present on the southern part of the Peron Peninsula).

(5) Near-coastal degradation and dune blow-outs (occurs as active, mobile sand drifts on Tamala, Carrajang and Dirk Hartog).

Methods to counteract these problems for the pastoral industry include introduction of exotic annual species, paddock spelling, prescribed burning, and mechanical removal (Department of Agriculture, 1986, pp.5-7). In addition to the stress already placed on the environment by the pastoral industry, many of these management practices will have severe consequences for the indigenous faunal and floral populations through alterations to habitat. The pastoral industry, as it presently exists in the Shark Bay region, does not provide a basis for the management of the area

along the lines required for World Heritage listing. Impacts are such that they threaten the integrity of the region as an ecological unit and, hence, reduce the possibilities for fulfilling the criteria for World Heritage listing.

Tourism

Tourism is regarded as the major potential growth industry for Shark Bay (SBRF, 1987). However, it is vital that tourism does not degrade the resource base upon which it is founded i.e. the scenic attractions and diverse marine and terrestial environments of Shark Bay.

The acceptance of a site to the World Heritage List does not mean that the area will be closed off to tourists and visitors. In fact, evidence suggests that World Heritage Listing enhances the appeal of an area or site as a tourist destination (UNESCO, 1980). As the Australian Department for Arts, Heritage and Environment (1986, p.11) have noted, 'Any site that is added to the World Heritage List in the future might therefore be expected to benefit from an increased level of tourism as a result of the international recognition of the area. This in turn will benefit the local economy'. In the twelve months to April, 1986, 790,000 Australians (excluding children under fifteen) visited World Heritage areas. The Great Barrier Reef being the most popular with 486,000 visitors. In the same period, 4.1 million Australians (about 35%) visited at least one national park (excluding World Heritage Areas) (Department of Arts, Heritage and Environment, 1987, p.1). However, these figures do not indicate the importance of repeat visits to parks and visits of overseas travellers.

Since their nomination to the World Heritage list all of Australia's World Heritage areas have experienced a significant increase in the number of tourists and visitors. In the Northern Territory, construction of one of Australia's premier tourist destinations, the Yulara Resort in Uluru (Ayers Rock - Olgas) National Park, was directly related to the scenic attractions of the National Park (see Conservation Commission Northern Territory, 1983, p.10) a recent World Heritage nomination. The folowing table provides a brief outline of the growth of visitor numbers for Kakadu National Park in the Northern Territory:

KAKADU NATIONAL PARK: VISITOR DAYS.

YEAR	VISITOR DAYS
1972[1]	19,000
1982	164,257
1983	209,625

1. Before the National Park was established

SOURCE: Gard 1984

There was a 28% growth in visitor days to Kakadu National Park between 1982 and 1983. An increase which occurred before the rise of the [illegible] awareness of the natural features of Australia's country. Tasmania's appeal as a tourist destination is also largely dependent on its natural environment and in particular its national parks such as those which comprise the Western Tasmanian Wilderness Parks World Heritage area (Murrell 1984). As the proceedings of the 57th National Conference of the Royal Australian Institute of Parks and Recreation (Wells, 1984) indicated, national parks form a vital component of Australia's domestic and international tourist industry. A contribution which is perhaps sometimes ignored when alternative proposals for national park and reserve land, such as mining or grazing, are proposed.

However, the attraction of tourists to a World Heritage quality area, such as Shark Bay, may not be without its environmental and social costs. Tourism has been shown to have had major effects on the environment (Pigram, 1980). Trampling of vegetation by humans can have an enormous impact on the environment, causing soil compaction, exposure of soil, the destruction of certain species of flora, and the replacement of sensitive plant species by more hardy species (Dale and Weaver, 1974; Goldsmith, 1974a, b; Walter, 1975; Wall and Wright, 1977). In addition, the presence of humans may have an impact upon wildlife through habitat disturbance. This is especially the case with some of the more sensitive marine mammals of Shark Bay such as the dolphin and the dugong. However, a greater concern is the uncontrolled use of off-road vehicles (Weaver and Dale, 1978; Mathieson and Wall, 1982) which are able to cause far more damage than that caused by walking, especially in arid landscapes such as Shark Bay. Off-road vehicular use in the Shark Bay region should be strictly managed, unless this is done the environment which at present proves attractive to the visitor will be degraded. Vehicles should be encouraged to use specific routes by means of upgrading of roads, signposting and legal enforcement.

Recreational activities in the Shark Bay region should be confined to passive activities, such as bushwalking and boating, which when properly managed cause minimal damage to the environment. Emphasis needs to be placed on the reduction of habitat disturbance and in the prevention of the decline of aesthetic landscape qualities through the creation of off-road tracks. Wilderness recreation, controlled under a permit system for purposes of management as in the United States, should be developed. Employment can be created by the need for visitor guides and interpretive services. Similarly, encouragement should be given to the use of the waterways of Shark Bay as a means of access to various points of scenic and scientific interest. This should not only open up employment opportunities but also lessen the impacts on the terrestial environment.

[illegible] for [illegible]
of Shark Bay to examine the marine fauna and flora. This form of tourism would have little impact on the marine environment and would serve useful educational purposes. The return of various species of whales to the Bay would also appear to open up opportunities for whale-watching cruises which are presently very popular overseas.

Denham should continue as the regional centre for Shark Bay. By concentrating tourist infrastructure such as resorts in the Denham area, environmental impacts will be minimised and the financial benefits of increased tourism will flow more directly to the present inhabitants. Denham should act as the point from which boat and charter cruises operate and also as the administrative focus for environmental management. The major limit to the growth of tourism in Denham, as throughout the Shark Bay region, is the lack of an adequate water supply. This environmental constraint may well provide an index of the capacity of the area to adsorb tourists.

Despite the likelihood of economic benefits accruing to the residents of the Shark Bay region from an increase in tourist activity in the area, no mention is made in the SBRP (1987) of the possible social impacts of tourism. Research has clearly demonstrated that tourism affects resident populations in a variety of ways, including resident opposition to tourist activity which is perceived to affect local lifestyles, the seasonality of tourism, and the perception that tourism will bring with it a range of socially disruptive activities such as an increase in crime (Mathieson and Wall, 1982). In order to minimise undesirable impacts, a social impact assessment of the prospective increase in tourists to Shark Bay should be conducted.

Tourism is a human impact on the environment which, provided it is properly managed, is compatible with the need to preserve the integrity of any prospective World Heritage area. In the case of Shark Bay, tourism can provide a means of educating visitors in the values of conserving the natural environment and can also provide a sound economic justification for the nomination of the sight to the World Heritage List.

The above section has discussed the implications of World Heritage listing in terms of the major human impacts on the region. The next section of this report will concentrate on the institutional arrangements of any prospective World Heritage site at Shark Bay.

THE MANAGEMENT OF THE REGION UNDER WORLD HERITAGE LISTING

Before any property can be accepted to the World Heritage list the nominating country must ensure that the legislative and administrative

arrangements essential for the continued conservation of the property has [illegible] the integrity of the property have not been established then a nomination may fail or otherwise be placed on the World Heritage in danger list. As Justice Mason (at ALR 625 at 702) notes in delivering his judgement in the Tasmanian Dam Case, 'Implementation of the Convention and of the obligation which it imposes on Australia in relation to the property, calls for the establishment of a regime of control which will ensure protection and conservation of the property.'

As pointed out above, six Australian sites are at present on the World Heritage List. A seventh nomination, Uluru park, is presently under consideration by the World Heritage Committee. The following tables indicate the legislation and management authorities which surround Australia's World Heritage sites:

AUSTRALIAN WORLD HERITAGE SITES (Legislation)

SITE	LEGISLATION
Great Barrier Reef	Great Barrier Reef Marine Act 1975 (Commonwealth), Continental Shelf (Living Natural Resources) Act 1968 (Comonwealth), Whale Protection Act 1980 (Commonwealth), State Forests and National Parks Act 1903-1948 (Queensland), Forestry Act 1976 (Queensland), National Parks and Wildlife Act 1976 (Queensland), Fish and Oyster Act 1914 (Queensland), Fisheries Act 1976 (Queensland), Fauna Conservation Act 1974-1979 (Queensland).
Kakadu	National Parks and Wildlife Conservation Act 1975 (Commonwealth).
Lord Howe Island	Lord Howe Island Act 1953 (New South Wales), Lord Howe Island (Amendment Act) 1981(New South Wales), Environmental Planning and Assessment Act 1979 (New South Wales).
Willandra Lakes	Western Lands Commission Act, New South Wales National Parks and Wildlife Service Act.
Western Tasmanian Wilderness Parks	National Parks and Wildlife Act 1970 (Tasmania), World Heritage Properties Conservation Act 1983 (Commonwealth), The World Heritage (Western Tasmanian Wilderness) Regulations issued under the National Parks and Wildlife Conservation Act 1975 (Commonwealth).
Temperate Rainforest Parks	New South Wales National Parks and Wildlife Service Act.
Uluru	National Parks and Wildlife Conservation Act 1975 (Commonwealth).

AUSTRALIAN WORLD HERITAGE SITES (Management Authority)

SITE	MANAGEMENT AUTHORITY
Great Barrier Reef	Great Barrier Reef Marine Park Authority, Queensland National Parks and Wildlife Service, Queensland Fisheries Service.
Kakadu	Australian National Parks and Wildlife Service
Lord Howe Island	Lord Howe Island Board (with the assistance of the New South Wales National Parks and Wildlife Service).
Willandra Lakes	Western Lands Commission, New South Wales National Parks and Wildlife Service.
Western Tasmanian Wilderness Parks	Tasmanian National Parks and Wildlife Service, Joint Commonwealth - Tasmanian Management Committee.
Eastern Australian Temperate Rainforest Parks	New South Wales National Parks and Wildlife Service.
Uluru	Australian National Parks and Wildlife Service.

The above tables indicate a diverse set of institutional arrangements which vary from state to state. However, two main points emerge. First, the arrangements are such as to prevent the degradation of any World Heritage area. Second, the Commonwealth Government has a high degree of involvement in ensuring that World Heritage sites are managed in accordance with the Convention and the World Heritage Committee's (1984) operational guidelines for the implementation of the Convention.

The principal legislative tool for the implementation of the World Heritage Convention in Australia is the Commonwealth's World Heritage Properties Conservation Act 1983 and any regulations that may be issued under that Act. The Commonwealth are also involved through the activities of the Australian National Parks and Wildlife Service and the Australian Heritage Commission, which are able to give both advice and financial assistance to responsible state authorities in the management of World Heritage areas. The Australian Heritage Commission, in particular, is important in ensuring that sites are adequately managed and that nominations may meet the requirements of the Convention.

The SBRP (1987, p.107) observed that World Heritage listing is important in terms of prestige, tourism, funding, research, management and presentation, and conservation and protection. However, the SBRP (1987, pp.107-108) also noted that listing, 'may be seen to have some disadvantages':

> [illegible] unwarranted scrutiny from an external party eg. UNESCO. However this is unlikely to happen to a properly managed area.
>
> Concern that the Commonwealth's role under the World Heritage Properties Conservation Act can be used in a way to sway unreasonably, or to dominate the State and the people of Shark Bay, in the management of the area. This problem can be overcome by ensuring at the outset that the management plan and any relevant State legislation is consistent with the principles of a World Heritage Property namely one which is to be managed for a range of purposes including the promotion of free enterprise in a conserved landscape. The basic thrust, therefore, in both the State's and the Commonwealth's aims should be toward complimentary goals.

Concern over outside interference probably arose because of the conflict which surrounded the Franklin Dam case. However, it is important to note that this conflict only emerged because of the failure of the Tasmanian Government to conserve the Western Tasmanian World Heritage nomination in the manner prescribed by the Convention and the World Heritage Committee. As the SBRP (1987) implied, given a properly managed area it would be unlikely for such a controversy to develop over Shark Bay.

It should be recognised that as the government of the nominating state the Commonwealth must, of necessity, ensure that it plays an active role in reviewing the management of any Australia World Heritage area. A 'regime of control' does not imply that the Commonwealth would unduly interfere in the region, rather the Commonwealth would be fulfiling the obligations of the Convention. To ensure the minimum desired level of direct Commonwealth involvement in the region the management plan for a Shark Bay nomination should meet the requirements of integrity laid out by the World Heritage Committee (1984). Unfortunately, the SBRP (1987) does not fulfill these requirements, and any nomination of Shark Bay under the SBRP (1987) may well result in either the rejection of the nomination, placement of the nomination on the World Heritage in Danger list, or acceptance of the site subject to modification of the management plans. These options will undoubtedly be influenced by the opinions of scientific experts on the adequacy of the management plan for the conservation of the region.

The SBRP (1987, p.108) noted the desire for a Shark Bay nomination to be 'managed for a range of purposes including the promotion of free enterprise in a conserved landscape'. The establishment of a World Heritage site does not prohibit commercial activites. However, free enterprise does not mean freedom to conduct any business activity. Commercial activities need to be compatible with the conservation of the site. Hence, mining and pastoralism should not be allowed within the boundaries of any World Heritage nomination proposed for the Shark Bay

region. As the case of the Great Barrier Reef has demonstrated, fisheries and tourism can be compatible provided they are properly managed. Given this situation, there exists a clear need for a reformulation of the SBRP (1967) to ensure that it meets the stringent requirements of the World Heritage property nomination process.

In order for a World Heritage nomination to succeed the institutional arrangements surrounding the conservation of Shark Bay need to be organised so as to ensure that legislative and management objectives are met. This should be done by:

1) The creation of State legislation to cover the area of the nomination. This legislation should be matched by the enactment of regulations at the Commonwealth level under the World Heritage Properties Conservation Act 1983. A body similar in structure to the Great Barrier Reef Marine Park Authority would be ideally suited to the particular needs of the Shark Bay area. Such a body would also provide an avenue for the channelling of Commonwealth funds to assist in the management of the World Heritage site.

2) The establishment under legislation of a board of scientific advisers to provide a sound basis for the management of the natural and cultural property of the World Heritage site.

3) The establishment under legislation of a management body which would include input from Commonwealth, State and Local Government consistent with the objects of the legislation.

The SBRP (1967, p.108) contained three recommendations regarding World Heritage listing:

> It is considered that the State Government should appoint a special committee composed of Ministers of the relevant portfolios and representatives of Local Government, to investigate the benefits and implications of World Heritage Listing for Shark Bay.
>
> The Committee would have discussions and negotiations with the Commonwealth, the Australian Heritage Commission, and State and Local Government bodies affected by areas currently listed.
>
> The committee should be empowered to travel to World Heritage areas and receive evidence from other persons and bodies before reporting to Government.

The above recommendations are not entirely suitable for the task of discussing the full range of subject matter required for World Heritage listing. To ensure full consideration of the implications of World Heritage nomination an independent committee of inquiry should be established to investigate the benefits and costs of listing. During the period that the

committee meets no new projects should be undertaken in the Shark Bay region which would substantially damage the resources that listing would be designed to conserve.

CONCLUSIONS

This report has reviewed some of the considerations that bear on assessing the prospects of world heritage listing for the Shark Bay region. However, far more research needs to be conducted and the management plan presented in the SBRP (1987) needs to be dramatically improved to ensure the conservation of the natural and cultural resources of the region. Nevertheless, it is apparent that Shark Bay is clearly of World Heritage quality and that steps should be taken as soon as possible to nominate the region to the World Heritage List.

RECOMMENDATIONS AND CONCLUSIONS: SUMMARY

(1) The Shark Bay region 'is an environmentally sensitive area' which has a number of faunal and floral, geological, aesthetic and cultural attributes that make it suitable for World Heritage Listing. However, the environmental characteristics which make it worthy of consideration for the World Heritage List are threatened by a variety of human activities which, if uncontrolled, have the potential to degrade and even destroy the heritage values of the Shark Bay region. These activities include mining, grazing, sandalwood extraction, fishing, and tourism.

(2) The international significance of the Shark Bay region is recognised in the IUCN's (1982) indicative inventory of natural sites of World Heritage quality. The four criterion for including a natural property on the World Heritage List are all met by the Shark Bay area. International significance of the natural values of the region are further enhanced by the presence of fauna (including migratory birds and whale species) that are subject to international conventions and treaties concerning their conservation and the protection of their habitat.

(3) The World Heritage significance of the natural property of the Shark Bay region are also strengthened by the area's cultural values.

(4) The 'cultural property' aspects of Shark Bay do not by themselves justify nomination to the World Heritage list.

(5) The World Heritage values of Shark Bay should neither be seen to exist nor managed in isolation from each other.

(6) The Shark Bay Region Plan (SBRP) (State Planning Commission and Department of Conservation and Land Management 1987) in its current form does not adequately provide for the protection of natural property neither does it meet the conditions of integrity for the natural property of world heritage value in the Shark Bay area.

(7) One of the most important factors in examining the integrity of an area is related to its size and shape. The SBRP (1987) makes no mention of the problems of size and shape of the conservation areas it proposes. Furthermore, the SBRP (1987) tends to see zones of land use as isolated units rather than as an integrated structure. This is a major shortcoming of the plan and casts serious doubts as to its ability to provide for sound ecological management and for it to establish a regime of implementation which would fulfill the conditions and requirements of the World Heritage Convention.

(8) The Environmental Protection Authority's (EPA) (1975) System 9 recommendation's provide a far more appropriate management strategy for the Shark Bay region, and with relatively minor modifications to allow for some of the values identified in the SBRP, should be used as the basis for World Heritage nomination.

(9) No attention is paid in the SBRP to the notion of minimal viable area. Similarly, consideration needs to be given to the provision of buffer zones.

(10) The existing salt mining operations at Useless Loop should be allowed to continue provided they do not interfere with fish nursery areas vital for the local fishing industry and the habitat of trans-equatorial, migratory waders. Upon completion of the salt mining operations the land should become a national park.

(11) Proposed development of a gypsum mine on Peron Peninsula should not go ahead because both the mining site and the loading facilities would adversely reduce the conservation and recreation values of the area.

(12) Fishing practices may need to curtailed or modified in certain instances in order to prevent either the depletion of certain populations of marine fauna, including nursery stock, and/or the degradation of certain marine habitats.

(13) The System 9 study recommended the creation of an aquatic reserve on the eastern shoreline of Shark Bay. This recommendation should be

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SECTION 9 LEGISLATIVE REQUIREMENTS FOR THE IMPLEMENTATION OF PROTECTION AND MANAGEMENT OF THE SHARK BAY REGION

The piecemeal approach to the administrative and legislative requirements for the conservation of Shark Bay in the SCRFA considered inadequate [illegible] and can best be achieved under one all-encompassing administrative structure and complementary legislation modelled on the Great Barrier Reef Marine Park Authority and Act (GBRMPA).

The proclamation of the proposed Shark Bay Marine and Terrestrial Park Act will provide for Shark Bay, as the GBRMPA has for the Great Barrier Reef. Under the Act, the park will be declared in stages and be a cooperative effort between local, state and commonwealth governments. As the park is implemented, areas of pastoral leases which become conservation areas will be subject to zoning. Persons directly affected by this change will be offered compensation and the option for retraining for employment within the park system or other suitable arrangements for relocation (ref. sec.6).
It is envisaged that as soon as the legislation is proclaimed, the Commonwealth will establish the Park's main office in Denham, after consultation with the Shire and the W.A. Government. Given that the total staff employed by the GBRMPA exceeds 70 persons, Denham can expect a substantial boost to its permanent population.
It is also anticipated that a permanent research facility will be established at Denham. This research facility will attract and be supported by the scientific community, both in Australia and internationally. Such a facility would also have its spin-offs for the local community.

The Commonwealth, given the precedent set under the GBRMPA would substantially assist the State government with funding. A grant to establish the office and essential staff would be made in the first year. Thereafter, the Commonwealth and State governments would negotiate on a ratio of Commonwealth-State funding per year.

The proposed legislation would provide for representation of Western Australians on both the Authority and on the Consultative Committee. It is envisaged that the Commonwealth would recruit the core of professional staff.

The proposed Act will prevail over other State Acts and therefore many of the present problems of conflicting legislation will not arise.

The proclamation of the legislation and the Authority would bring substantial acclaim to Local, State and Commonwealth Governments as well as the essential environmental protection.