Towards the devopment of a research and monitoring program for Ningaloo/Cape Range

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Recommendations

A survey to determine the extent of *Drupella* infestation be carried out.

A survey of coral communities at Coral Bay be undertaken to determine the extent and causes of degradation.

Following a review of remote sensing techniques, a habitat map be produced for the whole of Ningaloo Reef.

A terrestrial survey be undertaken to provide a resource inventory for the area and to determine the distributions, abundances and management requirements of endemic species.

The Cape Range caves be surveyed with a view to preparing a caves management plan.

Further fish surveys be delayed until new techniques are developed.

CALM actively contributes to an interagency project to develop new coral reef fish monitoring techniques.

A control program for feral goats and foxes be developed and evaluated.

Park staff routinely monitor the following topics;

- the distribution and abundance of turtle nests,
- bird counts and distributions with an emphasis on ground nesting terns, migratory waders and seagulls,
- water quality and depth in bored aquafers and aquafers adjacent to effluent pits,
- visitor profiles and usage patterns,
- infringements,
- *Acanthaster* numbers,
- buffle grass distribution.

Towards the development of a research and monitoring program for Ningaloo/Cape Range.

Objective

To provide guidelines for the selection of research and monitoring projects to be funded by state and commonwealth organizations involved in the management of Ningaloo Marine Park and Cape Range National Park.

Priority areas for research and monitoring

1. Rare, threatened, endangered and endemic species which occur within Ningaloo Marine Park and Cape Range National Park.

2. Species which through their behaviour or restricted distributions are vulnerable to human activities and development in the area.

3. Species which are subject to extractive activities from within the park.

4. Feral and weed species and those which are prone to population increases.

5. People; their patterns of use, infringements, and impact on areas of high usage.

6. Environmental anomolies and perturbations.

Discussion

With the lack of staff to date, it has not been possible to develop a comprehensive research and monitoring program for the Ningaloo/Cape Range area. Research proposals have been generated by a variety of sources, some of which would not have had an overview of the whole park. With a new park manager and imminent appointment of a senior marine scientist, this situation is about to change and it will be possible for CALM to identify not only the priority topics for research, but also the precise objectives of work required.

This document is meant as a discussion paper to be used in the development of a comprehensive research and monitoring plan for Ningaloo/Cape Range. As a result of the development of a plan, it is hoped that future research which is publically funded will adhere to the plan.

1. Rare, threatened, endangered and endemic species which occur within Ningaloo Marine Park and Cape Range National Park.

Although survey work has been limited, many species recorded within the Ningaloo/Cape Range area are listed as either endangered, threatened, or vulnerable in the IUCN red data books. In addition, several waders which migrate south for the Australian summer are listed on international agreements with Japan and China. Regular monitoring of the distributions and abundances of these species within the park is therefore part of Australia's international responsibility.

Of special concern are species which are endemic to the area, as their survival rests solely in the hands of CALM. However, in most of these cases, the distributions, abundances, identification of key sites and special management requirements remain unknown. Although basic protection of habitat goes a long way towards the preservation of species, CALM would obviously be in a better position if management decisions were based on knowledge and understanding of the biota. Given that CALM has sole responsibility for maintaining the viability of endemic species in the area, survey work to acertain the distribution patterns, abundances, location of key sites, species management requirements and programs for future monitoring would have to be a high priority for research at Ningaloo/Cape Range.

So for discussion has centred on spieces which have been recorded during limited surveys of, and *ad hoc* visits to the Ningaloo/Cape Range area. Resource inventories are far from complete. Verbal communication with ANPWS indicates that bathymetric mapping of shallow marine areas at Ningaloo has been carried out by the Australian Survey Office. However, CALM neither possess copies of satellite images, nor data from ground truthing. If indeed this work has already been done, it would be worthwhile for CALM to purchase copies of TM and spot images of the Ningaloo/Cape Range area. This could the be used either in conjunction with existing bathymetric ground truth data, or if this in unavailable, consideration should be given to carrying out field work to assist in image interpretation.

Whereas significant changes in water depth are unlikely in the short term, one of the values of habitat mapping is being able to monitor changes in the distribution patterns and the extent of habitat types. Obviously fine resolution maps or images can be used to detect smaller environmental changes than course resolution images. Aerial photography provides much higher resolution than satellite images and with recent advances using special filters, this technique may provide more useful data for habitat mapping than satellite work. Satellite imagery may also have application in investigations into water currents and chlorophyll or eutrophication mearurements. However, with recent advances in aerial photography, it is recommended that additional satellite imagery is not undertaken until the applicability of all remote sensing techniques is reviewed. Then, whatever technique is selected for habitat mapping, the project must include adequate ground truthing if the photos/images are to be useful in managing the area. In the case of Cape Range, if a survey of known endemics is to be carried out, it is recommended that this be expanded into a more complete fauna and flora survey.

2. Species which through their behaviour or restricted distributions are vulnerable to human activities and development in the area.

Three situations spring to mind in connection with this category. Firstly, animals which use beach areas for roosting and/or nesting. Secondly species which inhabit the stable environments of caves and thirdly, species which inhabit fresh water aquafers earmarked for bores. Animals which inhabit the aquafer are potentially under threat as a result of fresh water depletion. This last problem is discussed in categoray three.

Seabirds and waders use the coastal strip to feed, roost and breed. Sea turtles also nest on the beaches. All of these species are sensitive to human disturbance, so the identification and monitoring of key sites associated with them is essential for sound management. Some work has already been undertaken to identify key sites, but more work is necessary to ensure a comprehensive knowledge of bird and turtle behaviour throughout the year. After obtaining comprehensive base line data a regular monitoring program should be undertaken by CALM staff and/or interested amateurs to assess distributions, abundances and disturbance.

Several caves have been discovered in Cape Range and one is already being visited by tourists on a regular basis. Apart from endemics which have been discovered in

the freshwater aquafer, the Cape Range caves are reported to provide refuges for species remnant of previous humid climates. Cave fauna is notoriously sensitive to environmental changes to the extent that visitors breathing in confined spaces may deleteriously effect troglodyte populations. With visitation predicted to rise over the next few years, cave communities will be under increasing pressure. CALM will need to know not only what lives in each cave, but also how the communities will be affected by human intrusion. It is recommended therefore that a thorough biological cave survey be undertaken to compile resource inventories, acertain the vulnerability of each cave community and provide management recommendations so that a management plan can be developed for Cape Range caves.

3. Species which are subject to extractive activities from within the park.

Fishing is considered a legitimate activity within Ningaloo Marine Park. Although restricted entry is proposed for commercial fisheries and a system of bag limits is proposed for amateur fishing, certain table fish species may be under considerable pressure. Fish monitoring would therefore seem an obvious priority for a monitoring/research program within the area. However, following rigorous analyses of existing techniques by Crimp (1986, 1987) management agencies are left without any reliable methods for measuring coral reef fish population sizes or size frequency distibutions. For this reason, it is strongly recommended that further fish surveys at Ningaloo are delayed and that instead resources are channelled into the development of survey techniques. Such development should be undertaken jointly with other relevant agencies; WA Fisheries, GBRMPA, QNPWS and ANPWS.

Extraction of fresh water from aquafers within Cape Range National Park is proposed for the purpose of human consumption. Public inconvenience through over use and subsequent withdrawl of fresh water supplies would be obvious, but of far greater importance is the potential for both rising salt, and degradation of the precious freshwater habitat of at least three endemic species. Every effort should be made to determine the extent of aquafers before they are tapped. Then following the construction of bores, careful monitoring of salinity land the depths of both upper and lower limits of the fresh water lens must be undertaken.

4. Feral and weed species and those which are prone to population increases.

With limited resources it might be several years before thorough surveys to acertain resource inventories, distribution patterns and special management requierements are completed. In the interim, CALM will have to rely on maintaining habitats in order to conserve the viability of little known rare and endemic species in the area. Undoubtedly the presence of feral and weed species in Cape Range threaten the viability of native flora and fauna either directly of through degradation of the environment.

Of particular concern are goats and foxes, the control of which is one of the most important aspects of Cape Range management. Regular evaluation of these control programs should be undertaken to determine their effectiveness. Buffle grass distribution and its effect on the environment should also be investigated.

Experience elsewhere has shown that certain native species recorded within the Ningaloo/Cape Range area are prone to significant and damaging increases in population. Of particular concern are crown of thorns, *Drupella* and seagull numbers. The importance of baseline data is discussed again in section six and to identify particular species here simply emphasises areas where change is likely and CALM will need to know the extent of changes occurring. *Drupella* is also discussed in section six.

5. People; their patterns of use, infringements, and impact on areas of high usage.

The importance of visitor data in park management has recently been recognised by the planning branch which proposes to run a state wide data base. Although still in the final stages of development, the proposed system (VISTAT) will be co-ordinated in Perth where data collected by regional staff is to be digitized and analysed. In addition, advice on methods of data collection will be availabled from social scientists within the organization. Assuming that the VISTAT program operates as planned, it will provide an important avenue for monitoring trends in visitor profiles and usage patterns within Ningaloo/Cape Range. The following information has been identified as important for management and should be monitored routinely; visitor numbers, their ages and origins, length of stay, sites visited, activities within the park and equipment carried.

It is dangerous to undertake large programs and individual projects without evaluating their effectiveness. As a management agency, CALM will benefit from critical evaluation both of routine operations and the provision of visitor facilities. This is not considered a high priority for the first couple of years, but when Ningaloo Marine Park is fully established, such evaluation would provide valuable feedback for subsequent management planning in the area.

When regulations are drawn up for Ningaloo Marine Park, a thorough record of observed infringements should be maintained by park staff. The numbers and types of infringements together with patrol roster records will provide valuable information for designing education programs and staff patrols.

Environmental impacts and suspected health hazards associated with heavy usage at Coral Bay should be assessed regularly. The coral community adjacent to the beach is a rare recreational and educational resource of great value. With large numbers of visitors together with conflicting and largely uncontrolled activities within the bay, reports of coral damage and death are not surprising. When proposed plans to separate conflicting activities and restrict boat access to the area are brought into effect, it will be interesting to know whether environmental recovery takes place.

Other factors may well be contributing to coral degradation at Coral Bay. Eutrophocation caused by nutrient leaching from a polluted aquafer cannot be ruled out. This possibility also raises alarming questions concerning potential health hazards in the area. Such a matter would be of concern not only to CALM but also to other government departments. However, even in the absence of a health hazard, the detection of eutrophication from polluted underground water will necessitate design restrictions in the adjacent township.

6. Environmental anomolies and perturbations.

The possibility of massive environmental disturbance (oil spills, cyclones, nuclear attact?) is always present. However, the problem so often encountered when trying to study effects of such disturbances is the lack of information about areas before events took place. The value of baseline data in assessing the extent of unforeseen events cannot be overestimated. It is difficult to justify the collection of detailed baseline data as a high priority when we are so ignorant about areas and species which are obviously already under pressure within the park. However, a

program identifying sample areas both for detailed study and broader analysis would be useful. Once again satellite imagery and/or aerial photography would be useful tools for broad environmental classification. Recent developments in manta tow surveying should also be investigated. Even simple photographs provide useful baseline data.

One factor reported to be causing massive coral death on Ningaloo Reef, is *Drupella cornus*. Although reports indicate that plague proportions are new to the area, unfortunately no baseline data are available. If the *Drupella* affect parallels that of *Acanthaster*, it has the potential to become very extensive and very public. This is an issue therefore over which CALM must not only channel resources, but must be seen to be responsibly concerned.

With the lack of information to date, the highest priority for work on *Drupella* would be to survey their distribution, abundance and distruction over the whole of Ningaloo Reef. Care must be taken to ensure that the technique used in such a survey is statistically viable and easily repeated. Once a technique has been developed, this is possibly an area in which amateur or defence force divers could be used to collect valuable data.

In terms of managing population explosions such as crown of thorns and *Drupella*, it is essential for the management agency to determine whether the event is natural or induced by unnatural causes. An effort should be made to obtain records; written, verbal and photographic, of reef history to see whether there is any evidence of previous infestations at Ningaloo and what the fate of other infested reefs has been throughout the world. It might also be timely to contract a reef sedimentologist to search for evidence of past population explosions in reef sediments at Ningaloo.

Unless evidence indicates that the present *Drupella* infestation is a natural phenomenon, research into its causes and control is perhaps the highest priority for a Ningaloo/Cape Range program. Following a detailed survey of the impact of *Drupella* at Ningaloo and an exhaustive search for evidence of previous infestations, I recommend that an effort be made to involve research scientists of high callibre and that CALM applies with them for substantial commonwealth funding.

Summary

The following research and monitoring projects are seen as having the highest priority for outside funding;

The *Drupella* phenonenom

objectives; - record *Drupella* distribution and abundance patterns,
- determine the extent of coral degradation resulting from *Drupella*,
- search for evidence of previous infestations.

Terrestrial survey

objectives; - determine the distribution, abundance, and key sites for endemic plants and animals,
- provide guidelines for management of endemic species,
- record habitat types for ground truthing remote sensing data,
- produce a resource inventory of flora and members of major faunal groups.

Cave survey

objectives; - produce resource inventories of flora and fauna within known caves,
- assess the vulnerability of each cave community to human visitation,
- provide recommendations concerning tourism in Cape Range caves.

Reef habitat mapping

objective; - record the distribution of reef habitats over the whole of Ningaloo Reef.

Coral Bay survey

objectives; - quantify the extent of coral community degradation,
- identify all major causes of the degradation,
- provide recommendations on methods to reverse the degradation process.

Resources should also be channelled as a matter of priority into; contributing to the development of fish monitoring techniques and both developing and evaluating control programs for goats and foxes.

Other information should be gathered routinely by park staff;

- the distribution and abundance of turtle nests,
- bird counts and distributions with an emphasis on ground nesting terns, migratory waders and seagulls,
- water quality and depth in bored aquafers and aquafers adjacent to effluent pits,

- visitor profiles and usage patterns,
- infringements,
- *Acanthaster* numbers,
- buffle grass distribution.

References

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