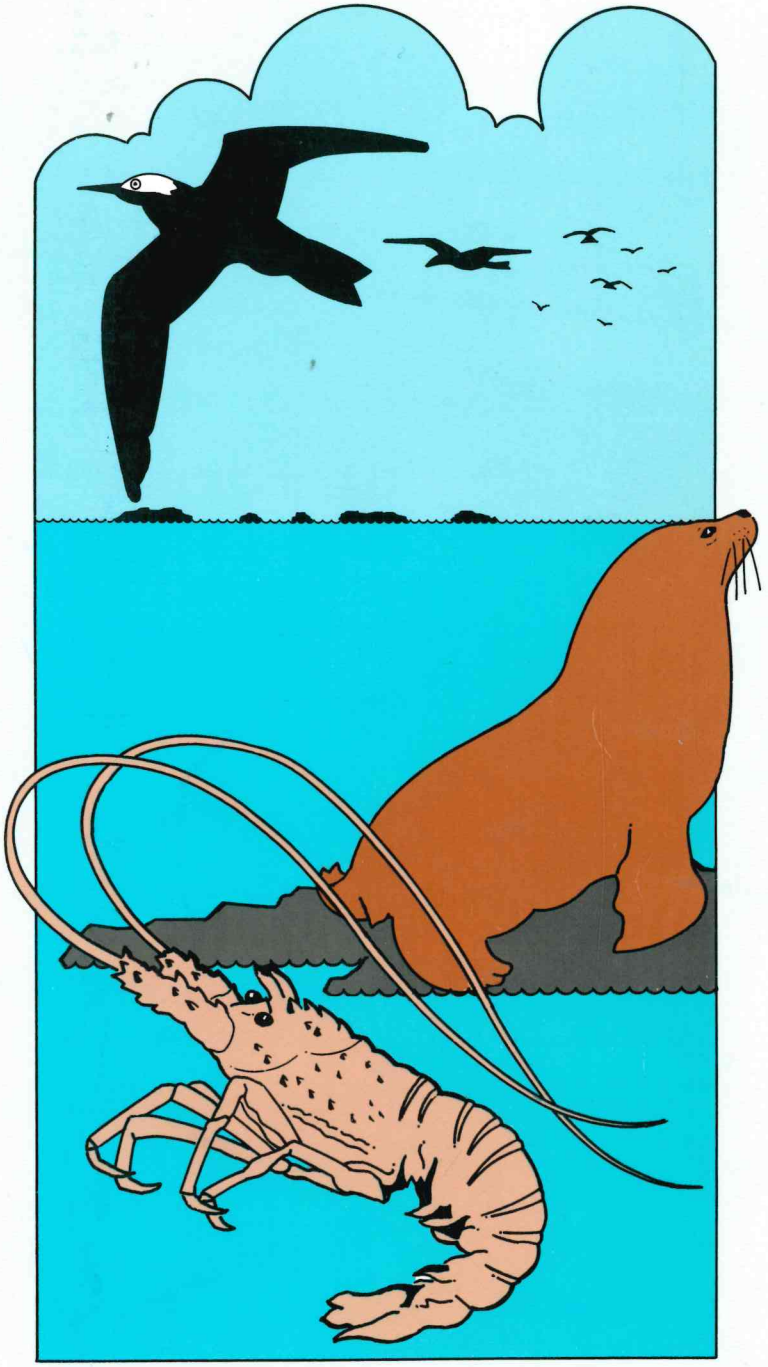

ABROLHOS ISLANDS
Planning Strategy

FINAL REPORT
January 1989

ABROLHOS ISLANDS CONSULTATIVE COMMITTEE
ABROLHOS ISLANDS TASK FORCE

ABROLHOS ISLANDS
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FINAL REPORT
January 1989

A report prepared by the
Abrolhos Islands Task Force for the
Abrolhos Islands Consultative Committee.

ABROLHOS ISLANDS CONSULTATIVE COMMITTEE

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Enquiries:

The Hon. J.F. Grill, LL.B., J.P., M.L.A.
Minister for Fisheries;

The Hon. B.J. Hodge, M.L.A.
Minister for Conservation & Land Management;

The Hon. R.J. Pearce, B.A., Dip. Ed., J.P., M.L.A.
Minister for Planning;

Dear Sirs,

ABROLHOS ISLANDS PLANNING STRATEGY

I am pleased to transmit to you the final planning strategy for the Abrolhos Islands. It was prepared by the Abrolhos Islands Task Force on behalf of the Consultative Committee.

The report is for your consideration and further endorsement by State Cabinet.

Yours faithfully,

R.W.Maslen J.P.,
CHAIRMAN
ABROLHOS ISLANDS CONSULTATIVE COMMITTEE

5 January 1989

ABROLHOS ISLANDS CONSULTATIVE COMMITTEE

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MR G CLARK	Department of Sport and Recreation
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MR P FREWER	Secretary

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REPORT OF THE ABROLHOS ISLANDS TASK FORCE

The Abrolhos Islands Task Force was commissioned by the Abrolhos Island Consultative Committee and the Government to prepare a planning strategy for the Abrolhos Islands, and report to State Cabinet by 31 July, 1988. The major aim of the strategy was to resolve conflicts between fishing, tourism and conservation on and around the Abrolhos Islands.

The draft planning strategy was released in September 1988 for a six week public submission period. Ninety one submissions were received and these were collated and analysed by the Task Force. The final plan has been amended, based upon the public comments received.

The Task Force has found that much of the past antagonism between fishing, tourism and conservation interests has been based on distrust and misunderstanding of each others 'motives. The Task Force believes that the identification of mutual goals which the plan has accomplished should ensure a common future direction. The degree of conflict has been more perceived than real, and translating these concerns into a planning framework which has included community consultation, has led to the definition of much common ground and identified some problem areas.

The planning strategy should form the basis for a future Government Policy on the Abrolhos Islands. The legislative framework exists to give effect to the plan. With the co-operation and agreement from leading agencies and fishermen, a sound management framework for the multiple uses which occur on the islands and surrounding waters, will be established.

The islands themselves are a Class 'A' Reserve for the purpose of "Conservation of Flora and Fauna, Tourism and Purposes associated with the Fishing Industry". In 1985 the Government decided that the islands should be vested in the Minister for Fisheries in recognition of their essential role in affording bases for the rock lobster fishermen.

The marine areas and reefs surrounding the islands may be regarded as "vacant Crown waters" where few controls apply, other than those applied by Fisheries Department and Mines Department.

In recent years recreational use of the area has increased with attendant scrutiny of the islands and fishing industry operations. There is a perception that recreational access to the islands is inequitable, being restricted to friends of fishermen and those owning large boats.

Concern by the conservation movement that fishing activity may be damaging the coral reef ecosystems has led to debate, heightened by a general public perception that the islands are closed to recreationists and are the domain of the fishing industry.

It is clear that the current policy framework for the Abrolhos is fragmented and does not provide equity of access to, and use of, the area.

This fragmented policy framework is reflected in the irregular administrative and management arrangements, wherein the Fisheries Department has the burden of managing on behalf of the Government, all activities at the Abrolhos. Thus some sectors feel that their interests are not properly served.

Notwithstanding, the Task Force admires the professional manner in which the Fisheries Department has performed its role, and observes that the remote off shore location of the Abrolhos predicates that the Fisheries Department, with its special expertise and facilities, should remain the central management agency to carry out Government initiatives at the Abrolhos, supported by other agencies such as the Department of Conservation and Land Management in joint and co-operative programs.

We therefore propose an overall strategy suggesting that Government adopt a strong equitable policy for the Abrolhos which provides for conservation, the viability of the Fishing Industry, access for appropriate forms of recreation and tourism and petroleum exploration.

Within this policy framework, Government should rationalise its administrative and management resources at the Abrolhos in order to clarify the role of the Fisheries Department by:

- *moving toward self management of fishermens camps to ease the administrative load on Fisheries Department and permit it to concentrate on management of the fishery*
- *progressively boosting the role of the Department of Conservation and Land Management in joint year round programs with Fisheries Department in conservation and recreation.*

While the range of legislative measures and powers available to the Government under various Acts is adequate to enable implementation and administration of the Abrolhos Island Policy, however, we propose rationalising the purpose and vesting of the islands, the establishment of two Marine Parks under the CALM Act, and the reservation of the remaining waters as an Aquatic Reserve under the Fisheries Act in order to provide equity of access to secure conservation and management objectives and permit effective administration.

The findings of the Task Force are:

PREVIOUS STUDIES

1. *Considering the number of government reports on the Abrolhos Islands there has been a lack of success in implementing recommendations. The principal reason for the inaction is attributed to the absence of a properly funded, effective administrative and management framework which reflects the multiplicty of values, uses and interests at the islands.*

CONFLICT OF USES

2. *The study brief was to develop a plan to resolve conflict between fishing, tourism and conservation interests. Following community consultation and research into marine ecology and fishing patterns, the Task Force finds that the scale and extent of the conflict is geographically restricted and temporally separated. The major area of conflict is within the marine areas where rock lobster fishing occurs on and around some sensitive reef environments which also have conservation and recreation value. These reef areas represent a small proportion of total Abrolhos Island area and of the total fishing effort. There is a small number of islands for which several uses are competing.*
3. *The Task Force is confident that community input to the planning strategy has identified mutual concerns from fishing, tourism, conservation and mining interests. As a result there is much common ground upon which future co-operative management can be based.*
4. *The present purposes of the island for which the islands are vested, that is for the Purpose of the Fishing Industry, Conservation of Flora and Fauna and Tourism have created a set of community expectations which are unrealistic. There is a need to review the purposes and vesting of the islands in order to clarify management responsibilities.*

CONSERVATION

5. *The Abrolhos coral reefs are exceptionally beautiful and diverse, in spite of their high latitude location, and have high conservation values.*
6. *Research into the resource data for the islands has highlighted the national and international significance of bird breeding areas, and the presence of rare and endemic fauna, flora and associated key habitats. Many of these habitats are relict from a period when the islands were part of continental Australia. These areas need to be secured and managed.*
7. *The Abrolhos Islands historic sites have an important place in the heritage of Western Australia but there is no effective management in place to protect and promote these sites.*

FISHING

8 *The Abrolhos Island fishery makes a significant contribution to the State's economy. Thus the conservation of reef areas is central to both the fishing industry and recreation.*
9. *Recognising the value of the on-shore facilities to the fishing industry, the Task Force finds there is a need to provide for the future security of these areas.*

TOURISM

10. *Uncontrolled tourism can have adverse impact on the marine and terrestrial environment, however, current tourism occurs at low levels in selected areas. Visitor numbers are expected to increase in future with heightened public interest. At present the degree of conflict with other activities is low. Management of visitor activities is the key to future recreation use of the islands.*

COMMUNITY INTEREST

11. *Considering the value of the Abrolhos Islands to the Geraldton Mid-West Region community, there is a high level of community concern regarding the future of the islands. This concern must be translated into ongoing community consultation and participation in future planning and management of the islands.*

With regard to the findings the Abrolhos Islands Task Force proposes the following strategy:

1. *All matters related to fisheries management should remain with the Minister for Fisheries and the Fisheries Department.*
2. *An integrated fisheries management programme for all aspects of the Abrolhos fishery.*
3. *Establishment of a system of self management by fishing communities with representative corporate bodies. These should enter into formal agreements with Minister for Fisheries regarding continued use and management of residences, community and industry facilities.*
4. *Establishment of an aquatic reserve under the Fisheries Act for State Waters at the Abrolhos. Marine parks are to be established in specific areas.*
5. *Islands with fishing industry interests should remain vested in the Minister for Fisheries for the purposes of the Fishing Industry.*
6. *Other islands should be regarded as National Park, recognising their conservation and recreation values and be vested in the National Parks and Nature Conservation Authority.*
7. *Development of management plans for areas of terrestrial and marine conservation areas.*
8. *Tourism should be boat-based augmented by fly-boat or flyover tours at this time.*
9. *Protection of areas of historic significance, including those sites associated with the Batavia and Zeewijk wrecks.*
10. *Joint use of facilities by management agencies to reduce management costs and increase efficiency.*
11. *Formation of a restructured Advisory Committee to advise the Minister for Fisheries and Minister for Conservation and Land Management.*

ABROLHOS ISLANDS PLANNING STRATEGY

SECTION 1. INTRODUCTION

1.1 BACKGROUND TO THE REPORT

In May 1986 the Abrolhos Islands Consultative Committee (A.I.C.C) was formed to provide advice to the Minister for Fisheries and Minister for Conservation and Land Management on matters pertaining to the Abrolhos Islands.

The Committee was constituted with members from the local Geraldton community and Government Departments with interest on the islands. In early 1987, the A.I.C.C. advised the Government that there was a need to prepare a planning strategy for the islands. A Task Force consisting of Fisheries Department, Department of Conservation and Land Management and the State Planning Commission was formed to prepare the strategy.

The draft planning strategy was released in September 1988 for a six week public submission period. Ninety one submissions were received and these were collated and analysed by the Task Force. The final plan has been amended, based upon the public comments received.

1.2 STUDY AREA

The Houtman Abrolhos islands are located about 50 km offshore from the City of Geraldton. They consist of four island groups extending over 80 km from north to south. In all, there are 108 islands. The islands are surrounded by State Territorial Waters which extend for 3 nautical miles from baselines established on the islands (see Figure 1).

The islands are located at the edge of the continental shelf, and are surrounded by the most southerly extant coral reefs in the Indian Ocean. The islands and surrounding waters support the most productive and valuable rock lobster fishery in Australia and are also used by scallop and wetline fishermen.

The Houtman Abrolhos is the gazetted name for the Island group. Popular usage, however, refers to the Islands as the Abrolhos Islands and for the sake of brevity this term has been used throughout the Report.

The Abrolhos Islands are the site of a number of historic shipwrecks including the Dutch ships Batavia and Zeewijk. The Batavia shipwreck and subsequent mutiny is one of the bloodiest stories in Australia's history.

The seabird population of the islands are outstanding in terms of their number and diversity and some rare species use the islands for breeding. The terrestrial flora and fauna have a number of species which are endemic to the islands.

The islands are a Class 'A' Reserve 20253 vested in the Minister for Fisheries for the Purposes of Conservation of Flora and Fauna, Tourism and For the Purposes Associated with the Fishing Industry. Prior to the formation of separate Department of Fisheries and Department of Conservation and Land Management in 1985, the islands were vested in the Minister for Fisheries and Wildlife. The waters surrounding the islands are not formally vested in any Authority.

1.3 PREVIOUS STUDIES

There have been numerous scientific studies and papers which have been written about the islands. Early scientific expeditions which noted the outstanding biological attributes of the islands include Saville-Kent (1897) and Dakin (1919).

Following a request by the Geraldton Municipality, the Abrolhos Islands were declared an A Class Reserve on 1 November 1929. The islands were placed under a board of trustees, consisting of Geraldton residents, in accordance with the vesting powers of the Parks and Reserves Act 1895, for the purpose of Public Recreation and Tourist Resort. As no Government grant was paid to the board and it was not allowed to exploit the Islands at will, little development occurred.

In 1965 a Special Departmental Committee was formed to report to the Minister for Lands on future control of the Abrolhos Islands. At this stage the islands were still controlled by Trustees. The committee made the following recommendations:

a) The Trustees of Houtman Abrolhos Islands be requested to surrender the Vesting Order granted in their favour on 21 November, 1965.

b) The purpose of 'A' Reserve No. 20253 be changed from "Public Recreation and Tourist Resort" to "Conservation of Flora and Fauna, Tourism and for the purposes associated with the Fishing Industry".

c) That no tourist development be permitted on any part of the reserve prior to investigation and report by government instrumentalities.

d) Vest the whole of the Reserve in the Minister for Fisheries and Fauna.

On 16 August 1966, the vesting was transferred to the Minister for Fisheries and Fauna. In 1976 the Environmental Protection Authority in the Conservation Reserves for Western Australia (Systems 1, 2, 3, 5) recommended that:

1) boundaries of Class 'A' reserve 20253 be extended to low water mark. (This was gazetted on February 29, 1980);

2) any future tourism be carefully planned and strictly controlled, and that no developments be permitted that conflict with the primary purpose of the islands as a wildlife sanctuary and commercial rock lobster fishing grounds; and

3) a research programme on the biology of the reefs be carried out by the Estuarine and Marine Advisory Committee with a view of delineating an aquatic reserve or reserves in the Abrolhos area.

A report was prepared in 1982 by the Geraldton Mid-West Regional Development Committee on the Houtman Abrolhos. The study made five recommendations regarding administration, tourism, management and research. These were:

1) that the management of the Houtman Abrolhos be vested under one single Authority;

2) that the [management authority] be responsible for the development and implementation of a long term integrated management plan for the Houtman Abrolhos Group giving due regard to the preservation and/or protection to the environmental, historic and economic components;

3) no island based tourism on the Houtman Abrolhos be approved;

4) that Government support be given to the implementation of an ongoing research programme to provide for an increased data base for the Houtman Abrolhos; and

5) that until some firm decision is made regarding the future long term management of the Houtman Abrolhos improved surveillance and management of the present permitted use of the Houtman Abrolhos is urged.

The report was noted by State Cabinet. Subsequent action on the report led to the formation of the Abrolhos Islands Consultative Committee.

In 1984 the W.A. Branch of Australian Marine Sciences Association held a workshop to provide a forum for the exchange of scientific and technical information (Hatcher and Walker, 1984). The papers covered a wide range of issues such as flora, fauna, historical sites and marine ecology.

1.4 AIM AND OBJECTIVES OF THE PLAN

The decision by the Government to instigate an overall planning strategy has arisen from a combination of factors. There are some concerns that the long term use of islands and competition between the uses could lead to a deterioration of the economic, cultural and environmental values of the islands. The direction from Government to the Task Force which forms the principal aim of the study is:

"To develop a planning strategy for the Abrolhos Islands. The strategy will consider existing and potential uses of the islands and marine natural resources and propose a plan and suitable tenure and management to ensure resolution of conflicts between fishing, tourism and conservation values."

1.4.1 Objectives

a) Fishing Industry

The fishing industry at the Abrolhos is of national significance. Rock lobster fishing is the largest income earner, and the major employer in the local economy. The industry generates significant export earnings.

Recently scallop fishing has developed into a variable but important fishing activity and wet line fishing also occurs.

Fishing will continue to be an important facet of the economy and the future of the Abrolhos.

Objective

To provide the conditions and secure areas within which the fishing industry can operate effectively.

b)Tourism and Recreation

A number of forms of recreation occur at the Abrolhos. The islands and surrounding waters have historical, biological and physical attractions which are generating increasing interest from visitors. Nevertheless tourism opportunities are limited by strong winds, inhospitable conditions and the remoteness of the area makes access difficult.

Objective

To provide and direct recreation and tourism opportunities which enhance public use and understanding of the marine environment and the islands, in such a way that conservation values and fishing industry installations are secured.

c) Conservation

The Abrolhos Islands and aquatic ecosystems have significant natural and cultural values. The islands and surrounding waters contain unique biotic assemblages, rare species of plants and animals, and they have a long and interesting history. Aspects of the natural environment require particular conservation measures which will benefit the overall community.

Objective

To conserve and protect the natural and cultural values of the islands and surrounding waters whilst providing for appropriate levels of use and to provide effective legislative controls of areas which contain features of exceptional natural significance.

d)Management Administration

There is a need to provide management and administrative structure within which the plan can operate. Failure of previous studies on the Abrolhos Islands to be implemented has been because of the lack of a framework which takes into account the multiplicity of uses on and around the islands and the lack of commitment of resources.

Objective

To provide a practical management and administrative framework to enable the Government to effectively administer the Abrolhos Islands and surrounding waters ensuring on-going consultation with community interests.

1.5 APPROACH TO THE PLAN

The plan was approached in two phases, the first phase consisted of collection of data and public participation and the second phase, the development of options and strategies to deal with the planning issues raised in the first phase.

A major deficiency in the data which had been collected for the Abrolhos was the lack of systematic, island-wide information. Some areas or particular attributes had been studied intensively, but there was little which dealt with the islands in an overall sense.

Consultants were employed to map and describe the ecological units found around the islands, and to determine the extent of rock lobster fishing in the area (Hatcher Research Associates, 1988). The study was commissioned because of the conflict which had developed between rock lobster fishing and conservation interests. There were claims that irreversible damage was being done to the coral ecosystems by fishing, in particular rock lobster fishing. The consultants report identified the scale of the problem and areas which have potential for damage. The results have been incorporated in this report.

Other information that was gathered covered a wide range of issues. These included:

i) vegetation survey

ii) visitor survey

iii) compilation of economics data

iv) identification of recreation use patterns

v) compilation of fisheries information

vi) preparation of 1:25000 and 1:75000 base mapping.

Public consultation was used to ascertain the community's thoughts and perceptions regarding the future of the islands.

Public participation included a public workshop, written submissions (167 received), press and radio interviews, meetings with local groups including professional fishermen, recreation and tourism interests and conservation groups.

The data was analysed and mapped using a series of overlays. Using this method, areas of compatibility and conflict were identified. This method, and public consultation raised planning issues which are addressed in this plan.

The plan identifies key issues and strategies related to fishing, conservation, tourism and future administration. Other issues which have been raised during the course of the study such as mining, research and historic areas are also discussed.

SECTION 2 OVERVIEW OF THE ISLANDS AND PLANNING IMPLICATIONS

2.1 NATURAL ENVIRONMENT

2.1.1 Climate

There is no weather station located at the Abrolhos Islands, however, general patterns can be described from records at Geraldton and those of passing ships.

Mean daily temperatures in February range from 32.4degreesC maximum to 19.1degreesC minimum whilst in July the range is from 19.5degreesC to 9.3degreesC. Average rainfall is 469mm from 89 raindays.

The weather pattern is influenced by the north-south movement of the sub-tropical anticyclonic wind belt, and an eastward progression of high pressure cells. Dominant wind direction in summer is from SE-SW with high speeds, 76% of wind speeds exceeds 11 knots and 44% exceed 17 knots (Scott, in Hatcher and Walker, 1984). Calm conditions are rare and occur mainly in winter.

Storm events are a concern in winter, and the area has been influenced by tropical cyclones. The possibility of wind speeds reaching 165 kph is once every 50 years, and 176 kph once every 100 years (S.E.S. pers comm).

Planning Implications

1. The high wind speeds experienced in the Abrolhos for much of the year reduces the islands attractiveness for visitors and constrains the activities of the fishing industry.
2. Storm events are critical factors in the destruction and reformation of coral structures and islands.
3. Tropical cyclones are a distinct, though low level, threat to communities on the Abrolhos.
4. Rainfall and tank storage is the only reliable source of water on the islands at present.
5. There is no weather station on the Abrolhos Islands.
6. The weather pattern has a direct influence on the pattern of fishing use around the islands.
7. Distribution of marine ecosystems is predicated by exposure to climatic conditions.

2.1.2 Geology and Geomorphology

Studies of the surface geology and geomorphology of the Abrolhos Islands have been published by Teichert (1947) and Fairbridge (1947), and the islands were geologically mapped by Playford et al (1970). France (1985) prepared a dissertation on the sedimentology of the Pelsaert Group.

The islands are underlain by about 900 m of Tertiary and Cretaceous limestone, siltstone and marl. These sediments form the basement for the islands and reefs. Beneath the Cretaceous section are at least 2800 m of Jurassic sandstone, siltstone and shale. On the basis of regional geology, this is expected to be underlain by Triassic, Permian, Devonian and Silurian rocks.

The islands themselves consist primarily of Pleistocene and Holocene limestone. Most of this limestone formed as coralgal reefs and in back-reef lagoons, with the reefs initially developing on an eroded hardground of Tertiary sediments. On East and West Wallabi Islands, the reef deposits are overlain by younger dune limesands, similar to those in the Perth area. Recent storm-beach shingle deposits occur locally.

Several features on the islands record fluctuating sea levels over the last 120 000 years. High sea-levels are indicated by wave-cut benches in limestones and beach ridges, and marine deposits that are presently above sea level. Deep circular depressions in the islands probably formed by solution of exposed limestone at a time when sea level was considerably lower during glacial periods of the Pleistocene.

Extensive living coral reefs are present on the northern and eastern sides of each of the three island groups, with broken reefs elsewhere. They are the southernmost well-developed reef in the Indian Ocean and attained their present form about 4000 years ago.

Planning Implications

A. Island Surface Features

1. The surfaces of the islands have varying levels of resistance to erosion. Dune areas on North, East Wallabi and West Wallabi islands are highly susceptible to wind erosion. Soil cover is skeletal, covering limestone or coral rubble, or non-existent. On most other islands removal of vegetation cover by man-induced events (trampling, fires) or by natural events (sand blasting, storm damage) can lead to erosion problems.
2. Geomorphological features such as wave cut benches, fossil soil horizons and limestone weathering reflect the evolution of the islands and are of educational interest.

B. Environmental Aspects of Petroleum and Gas Exploration

1. The Abrolhos Islands is recognised as an environmentally sensitive locality with relation to oil spills in the marine environment. The islands are surrounded by an eight kilometre inner protection zone and an outer 42 km special conditions zones (see Figure 1a).

2. Previous drilling within the island area was subject to special conditions in order to safeguard the fishing industry, fauna and flora, and features of historical importance.
3. An oil spill contingency plan was drawn up by Esso and Western Mining in 1977, which is identical to contingency plans now in use offshore.
4. Seismic surveys can only be undertaken outside the rock lobster fishing season.

C. PROSPECTIVITY FOR OIL AND GAS

1. There has been continuing interest in oil exploration in the Abrolhos Sub-basin which includes the Abrolhos Islands.
2. The principal oil source rocks in the onshore northern Perth Basin can be expected beneath the Abrolhos Islands.
3. The section penetrated by Gun Island drilling contained suitable source, reservoir and seal rocks which could form an oil or gas field should a trap be mapped in the area. No structural traps have been recognised to date.
4. Petroleum prospects of the area have not been fully evaluated,however the area is considered to have potential for oil and gas.
5. Present airgun energy sources for marine seismic work are regarded to have minimal environmental impact.
6. There may be a requirement for land bases on the islands if oil or gas fields are discovered nearby.

2.1.3. Flora and Fauna

a) Terrestrial Areas

The Abrolhos islands have long been recognised as having high conservation values. The island groups are geomorphologically diverse, with some major islands (North, East and West Wallabi, Rat Island) being of continental origin. That is, they were joined to the mainland over 7000 years ago. Other islands were formed more recently by the erosion and deposition of sediments during the rise and fall of sea levels and by cyclical storms, waves, winds and swell. Fauna and vegetation on these islands is relict, and provides important reference areas on ecological interactions. Virtually all islands have bird nesting and breeding areas.

Vegetation

The vegetation of Islands consists of a number of communities which are of special conservation interest (see Figures 2a-d). These are:

i. Mangrove community *(Avicennia marina)*. These are nutrient rich communities which provide an important link in the food chain and provide an ideal habitat for fish, the Lesser Noddy *(Anous tenuirostris melanops)* and the Australian Sea-lion *(Neophoca cinerea)*. They also protect the shoreline from storm damage and erosion and in places grow in land-locked lagoons.

ii. *Atriplex cinerea* dwarf shrubland which occurs on sandy soils or shellgrit. The deeper soils are suitable for burrowing seabirds such as Shearwaters and Petrels to build nests.

iii. Pavement limestone, dunes and consolidated dunes on North and East and West Wallabi Islands are unusual, easily disturbed and have a slow rate of regeneration. These islands also support concentrations of rare animals.

iv. *Eucalyptus oraria* on East Wallabi Island - gazetted rare species.

v. Salt Lake and saltbush flats on islands such as North and West Wallabi do not occur extensively elsewhere in the Abrolhos. Indeed, salt lake communities are rarities in offshore islands in South Western Australia.

Birds

Birds are the most noticeable and numerous fauna on the Abrolhos. A summary of all birds sighted at the islands is in Storr and Johnstone (1986). The Abrolhos support hundreds of thousands of seabirds and is regarded as one of the most important bird breeding areas in Australia (Fuller et al, 1981 see Figure 2a-d). General features of the bird populations are:

1. The Abrolhos Islands support the largest breeding colonies in Western Australia for the: Wedge-tailed Shearwater (*Puffinus pacificus*) and Little Shearwater *(Puffinus assimilis assimilis)*; White-faced Storm Petrel *(Oceanites marinus dulciae)*; White-breasted Sea Eagle *(Haliaeetus leucogaster)*; Common Noddy *(Anous stolidus pileatus)*; Lesser Noddy; and the Caspian Tern *(Sterna caspia)*, Crested Tern *(Sterna bergii)*, Roseate Tern *(Sterna dougallii)* and Fairy Tern *(Sterna nereis nereis)*. The Islands are also important breeding grounds for the Eastern Reef Heron *(Egretta sacra)*, Pacific Gull *(Larus pacificus georgii)* and the Bridled Tern (*Sterna anaethetus anaethetus*).
2. Two species of seabirds identified as rare or likely to become extinct or in need of special protection under the W.A. Wildlife Conservation Act have been recorded on the Islands. The Red-tailed Tropic Bird *(Phaethon rubricauda)* formerly nested on Rat and Pelsaert Islands. Birds are still occasionally seen but they no longer

breed there. There is no real reason why they shouldn't in the future. Three Islands, (Morley, Wooded and Pelsaert) support the only breeding colony in Western Australia of the Lesser Noddy. The only other population of this species is located in the Seychelles Islands.

3. The Islands support two endemic bird subspecies, the Painted Button-quail *(Turnix varia scintillans)* and Lesser Noddy.
4. The Islands are important as they support species whose overall numbers are decreasing. This includes the Sooty Tern *(Sterna fuscata)* (few other W.A. breeding sites) Fairy Tern, Little Shearwater and Brush Bronzewing *(Phaps elegans)* (decreasing mainland populations).
5. In Western Australia, autumn is usually the important breeding season for seabirds; however, at the Abrolhos 90% of all laying occurs during spring months. This may extend from late winter to early summer. The factor(s) responsible for this is unknown, but it is thought to be related to a peak in food supply. Only the Little Shear water and White-breasted Sea Eagle breed during the winter months.

Mammals

Only two species of indigenous land mammals have been recorded on the Abrolhos Islands. The Tammar Wallaby *(Macropus eugenii)* has been recorded on East and West Wallabi, and, formerly, North Islands. This species has been gazetted rare or otherwise in need of special protection under the Wildlife Conservation Act. The Bush Rat *(Rattus fuscipes)* has been recorded on East and West Wallabi Islands.

A number of feral species have been recorded on the Islands. The Rabbit *(Oryctolagus cuniculus)* has been recorded on Antilla, Middle, North and Morley Islands. Feral Cats *(Felis catus)* were introduced on the Islands (particularly Rat Island) by the Guano diggers to control the rats. The Black Rat *(Rattus rattus)* has been recorded by the W.A. Museum from Pigeon Island. Mice *(Mus musculus)* were observed by O'Loughlin (1969) on Rat Island. There was a plague of mice on North Island in 1981.

The Australian Sea-lion was formerly abundant on the Wallabi Group even though the Abrolhos tends towards the northern limit of its range in W.A. (Storr, 1960). A Sea-lion was observed off Pigeon Island and North Island. W.A. Museum have records of the seal from Rat, Leo, Suomi, Serventy, Morley, Shearwater, Alexander, Pelsaert, and West Wallabi Islands. O'Loughlin (1969) notes that from the log of the Zeewijk it is evident that seals were once abundant around the Pelsaert Group. Recent observations show that there is still a colony of seals present in this group (N. McLaughlin pers. comm.).

The Minke Whale *(Balaenoptera acutorostrata)*, Brydes Whale *(B. edeni)* and Bottlenose Dolphin *(Tursiops truncatus)* have been recorded in the vicinity of the Islands. Humpback whales, Killer whales and Sperm whales are also reasonably common.

Reptiles

Twenty six species of reptiles have been recorded by the W.A. Museum on the Abrolhos Islands. The Wallabi Group, particularly East and West Wallabi, has been identified by Storr (1983) as the richest for reptiles. Twenty two species of reptiles, representing seven families have been recorded from this group. Storr (1983) notes that although 'the fauna of the Wallabi Islands is continental in diversity it differs considerably from that of any comparable area in the mainland'. Four species, *Diplodactylus spinigerus, Delma grayii, Lialis burtonis,* and *Vermicella littoralis,* have been recorded only from the Wallabi Group.

The fauna of the Easter Group is peculiar in composition (Storr, 1983). Only nine species have been recorded from these islands. Two of these, *Delma australis* and *Lerista distinguenda* have not been recorded from any other group. Further, *D. australis* is not found on the mainland opposite (Storr 1983).

The Islands support two species which have been identified as rare or otherwise in need of special protection under the W.A. Wildlife Conservation Act, the Spiny-tailed Skink *(Egernia stokesii stokesii)* and Carpet Python *(Morelia spilota imbricata)*. The subspecies of Spiny-tailed Skink and Bearded Dragon *(Pogona minor minima)* are endemic to the Abrolhos Islands.

It is possible North Island is the southern most breeding site of Green Turtles *(Chelonia mydas)*. This species has been recorded on the Island, but it is unknown whether they are actually breeding there.

Planning Implications

1. The Abrolhos Islands have some of the most important bird nesting areas in Australia. Bird nesting occurs seasonally at the islands, with the major period from June to February. There is a need to control access to these areas during the breeding season.
2. There are a number of critical habitats which support bird populations.
3. The islands have species of rare or geographically restricted birds, reptiles, mammals and flora.
4. The islands flora and fauna provide opportunities for further scientific study and education.
5. The flora and fauna of the islands have some potential interest for special interest groups visiting the islands.
6. There is a need to manage the conservation values of the islands to ensure that degradation does not occur.
7. There is community concern that the purposes for which the islands are reserved does not give them adequate protection.

b) Marine Areas

The Houtman Abrolhos are the southernmost coral reefs in the Indian Ocean, having unusual geology, physiography and oceanography. They are one of the best examples of luxuriant and diverse coral growth at high latitude in the world.

Because the coral reefs of the Abrolhos are at high latitude (south of 28degreesS) they have a mixture of tropical and temperate components. The maintenance of the coral communities has been suggested to be due to the existence of the southerly flowing Leeuwin current which bathes the reefs in warm water during the colder parts of the year (Dakin, 1919, Cresswell and Golding, 1980). Almost 200 identifiable Ecological Units are spread amongst the three distinct ecosystems of the Abrolhos Reef Groups (Hatcher et al. 1988). They are classified into 12 Geomorphological Units which encompass predictable physical habitats and suites of biological communities, each having characteristic organisms.

The general pattern of distribution of Ecological Units across each Reef Group shows a transition from limestone rock covered with marine plants in western regions, to rich coral communities in north-eastern lagoons and reef margins. The Reef Groups differ in the relative abundance of marine community types. The only extensive live coral development on western reef margins occurs in the Pelsaert Group, while all three groups have similar areas of coral-rich Units in their north-eastern regions.

Hatcher et al (1988) recognise 16 separate biological communities in the marine areas surrounding the Abrolhos (less than 30 metre depth). These consist of six major groups:

i. Plant communities - including macrophytes (seaweeds), sea grasses, and coralgal pavements
ii. Coral communities - including high and low energy assemblages
iii. Coral - Macroalgal communities
iv. Filter feeding communities inlcuding sponges and ascidians
v. Sedimentary communities
vi. Planktonic communities

A feature of the Abrolhos marine ecosystem is the relationship between coral and macro-algae. Corals of the Abrolhos are slow growing compared to their tropical counterparts, and seaweeds compete with the coral for space, nutrients and available light. Some areas are coral dominant, others seaweed dominant, in others a fine balance between coral and seaweed co-exists with neither managing to gain advantage. Hatcher et. al. (1988) have noted that algal abundance appears to be increasing, although at present there is insufficient data to clearly identify the pattern of determinants of the interaction.

In combination, the biological and geomorphic units can be rated according to their sensitivity to physical disturbance. Disturbance can either be by natural events such as storms, or by human activities, such as anchor damage, boat impact or pot drops. Table 1 shows the relative sensitivity of the marine biological communities at the Abrolhos. The highest intensity of fishing effort (pot drops/ha) occurs in units with moderate to low indices of sensitivity. Fishing effort is much lower in zones with significant cover of coral or filter feeding communities. The areas where fishing effort coincides with sensitive areas is shown in Figure 3a-d.

The ecological units which are of greatest interest to user groups other than fishermen are those with high proportions of living coral communities. Specific areas of exceptionally prolific and highly diverse coral communities include:

i. the dark patches on the back reef behind the southern section of Half Moon Reef in the Pelsaert Group
ii. the drowned doline field surrounding the Mangrove Islets in the Pelsaert Group
iii. the lagoon slopes of the Wooded Island reef flat in the Easter Group
iv. "The Maze" in the Easter Group
v. the "Lumps" in Leo's Channel in the Easter Group
vi. "The Lagoon" in the Wallabi Group
vii. the eastern slopes of Goss Passage in the Wallabi Group
viii. the "pot holes" in the Beacon Island reef flat in the Wallabi Group
ix. the dissected limestone platform south of Barker's Passage near North Island

TABLE 1.Ranking of Biological Classes of the marine environments of the Abrolhos according to their relative sensitivity to human damage (Hatcher et al, 1988).

BIOLOGICAL COMMUNITY CLASS		SENSITIVITY	RANK
8)	Low energy coral assemblages	High	1
9)	High diversity coral assemblages	High	2
7)	High energy coral assemblages	High	2
11)	Filter-feeding community	High	3
10)	Coral-macroalgae assemblage	Moderate	4
3)	Seagrass	Moderate	4
1)	Mixed macrophytes	Moderate	5
2)	*Sargassum* spp.	Moderate	6
4)	Meso-macro algae	Low	6
5)	Coralgal pavement	Low	7
6)	Calcareous algal field	Low	7
12)	Depauperate sediments	Low	7
13)	Infaunal sediments	Low	7

Planning Implications

1. All three island groups at the Abrolhos have similar areas of coral-rich ecological units in the eastern regions of the lagoons and there are no overall significant differences between island groups in the relative abundance of coral communities.
2. The marine areas consist of a range of different biological communities, with varying levels of sensitivity to disturbance by natural and man-made events. A significant proportion of the reefs are in the low to moderate sensitivity class.
3. A low level of fishing effort occurs in the most highly sensitive coral areas. This low level of fishing effort indicates that the scale of the problem of pot drops in coral areas is limited, and it will not cause a catastrophic collapse of the reef system. More research is required to determine rates of change and causal factors.
4. Some coral communities and their structural diversity make the Abrolhos reefs outstanding attractions to visitors. There is some degree of conflict with recreation use highest in areas where the highest diversity and most sensitive corals exist.
5. The marine areas have great potential value for further research and educational purposes.

2.2 SOCIAL ENVIRONMENT

2.2.1 History

The Abrolhos Islands have connections with the earliest periods of European history in Australia. The islands position on the western margin of the continental shelf, the surrounding reefs and frequent heavy seas made them a dangerous area for early navigation. There are two wrecks at the Abrolhos associated with Dutch trade with East India. These are the Batavia (1629) and Zeewijk (1727).

The Batavia is the second oldest known shipwreck in Australian waters. Following the shipwreck was a bloody mutiny during which scores of people were murdered. The Batavia sites include the shipwreck on Morning Reef in Wallabi Group, and land sites associated with the survivors and the mutineers. These are on West Wallabi, (the oldest remains of any building in Australia), Long Island and Beacon Island (see Figures 4a-d).

The Zeewijk was wrecked on Half Moon Reef in Pelsaert Group. The wreck site consists of the main site, the seaward side of the reef, and an extensive shallow water area on the leeward reef slope. The survivors camped on Gun Island where they constructed a boat from the wreckage and sailed to the Indies.

Since these early wrecks, there have been sixteen other wrecks at the islands (see Table 2).

During the colonial period guano mining occured on several islands at the Abrolhos. Small scale removal of guano probably commenced in 1847 in Southern Group when a private firm established a fishing company on the islands. Large scale mining commenced in 1883 when another private company gained leases over 20 islands. Rat Island, Gun Island and the southern part of Pelsaert Island were extensively mined. Mining activities continued until the 1920's when chemically derived fertilisers replaced guano.

With the reduction in supply of phosphates during World War II the British Phosphate Commission were granted leases on the southern end of Pelsaert Island. Buildings and jetties were erected, and production occured from 1944 to 1946. The buildings were left, and an attempt to provide tourist accommodation using these buildings failed. (W.A. Museum) (see Figures 4a-d).

TABLE 2. Shipwrecks at the Abrolhos Island Since European Settlement

DATE	SHIP	SIZE AND TYPE	AREA
1842	Ocean Queen	268t. wooden barque	Southern Group
1851	Venus	Small wooden schooner	Unknown
1855	Preston	20t wooden schooner	Southern Group
1861	Cochituate	347t wooden schooner	Unknown
1877	Hadda	316t barque	Wallabi Group
1878	Marten	28t wooden schooner	Southern Group
1879	Ben Ledi	1107t iron sailing ship	Southern Group
1891	Evalyn Marie	18t wooden cutter	Unknown
1897	Nautilus	Private yacht	Southern Group
1890's	Guano Barge	Barge	Wallabi Group
1901	Neptune	22t wooden cutter	Grelvint Channel
1908	Windsor	1853t iron steamer	Southern Group
1914	Ivy	35t wooden lugger	Easter Group
1921	Ada	Wooden fishing boat	North Island
1961	Jon Jim	37t wooden freezer boat	Southern Group

(From W.A. Museum in Geraldton Mid-west Regional Development Committee (1982))

Planning Implications

1. The islands have significant historic sites associated with Dutch shipwrecks (Batavia and Zeewijk). These are both wreck sites and land sites. Other colonial wrecksites are of historic interest.
2. Guano mining has disturbed areas on some islands. These areas and the associated infrastructure that remains have some historic interest.

2.2.2 Fishing and Related Facilities

The fishing industry at the Abrolhos is controlled by

i. the Fisheries Act (1905)

ii. regulations made under the Fisheries Act

iii. various notices and proclamations made under the Fisheries Act and published in the Government Gazette.

Outside of State Territorial Waters the Offshore Constitutional Settlement with the Commonwealth Government gives the State Fisheries Department legislative competence.

Rock Lobster Fishing

The rock lobster fishery started to export greentails to the United States in the late 1940's. During the 1950's and 60's there was rapid growth of the industry. The limited entry fishery was introduced in 1963. The Abrolhos Islands, for the purposes of the Fisheries Act and Regulations is classed as a separate fishing area, Zone 'A'. It is a limited entry fishery where only licenses with Zone 'A' authorisation able to fish within this zone. There are currently 205 boats with Zone 'A' licenses. The season for rock lobsters lasts from 15 March to 30 June and there are 19 000 pots allowed to be used in the area. Currently, Fisheries Department policy is to reduce pot numbers. A permanent 2% reduction over the next 5 years to being implemented from the 1987/88 season.

Fisheries Department policy does not allow for any more Zone 'A' concessions, although swaps of pot quotas between fishing zones are allowable providing numbers are within 10% of each other.

Many Zone'A' fishermen are based on the islands. Overall, there are 188 island based boats, which employ 445 fishermen. A further 17 boats are based on the mainland and fish Zone 'A' waters. This gives a total of 205 vessels and 490 fishermen seasonally employed in the Abrolhos Island Zone 'A' of the rock lobster fishery.

The pattern of rock lobster fishing varies during the season. Three periods of use have been identified (Hatcher et al, 1988).

I. OPENING PERIOD

During the opening period of the season after March 15, nearly all boats fish within the island lagoons, or close to the main reef structures. This period generally lasts less than one week, usually 2 to 3 days.

II. MIDDLE PERIOD

This follows from the remainder of March and April. Most of the fishing effort is expended in this period, with fishermen working virtually every day. Generally, the middle period of fishing concentrates on the western sides of the Abrolhos reefs. Weather patterns during this period reflect a late summer transition with reasonably predictable wave and swell patterns.

III. CLOSING PERIOD

When fishermen perceive that the summer weather pattern is being replaced by a winter pattern, they move to more sheltered areas. Winter swells are less predictable, but the deep swells disturb entrenched rock lobsters in the eastern parts of the island lagoons and reef systems. The eastern portions of the lagoons are fished much less intensively than the western portions, but they are also in areas which are more susceptible to physical damage.

Whilst these are overall patterns, individual fishermen fish in many different ways. Some are concentrated, others dispersed.

Island Camps

The island based fishermen have camps on the islands. Twenty islands are occupied; nine in Southern Group, five in Easter Group, four in Wallabi Group and North Island. Camps are controlled by Fisheries Department policy. A 'camp' can be comprised of main quarters, one married crew quarters, one single crew quarters, one store shed, one lighting plant, or a combination of the last two structures. Other fishing interests such as scallops and wetline fishermen are not allowed camps on the islands.

Infrastructure to service the camps is generally rudimentary. Water is supplied via roof and tank catchments, power via generating plants, and sewage is disposed directly into the ocean via toilets with no treatment. Disposal of solid and liquid wastes is a significant problem. All infrastructure on the islands has generally been developed by the fishermen on their own initiative and funding.

Community services are limited with schools provided on Big Rat, Little Rat, Pigeon and North Islands. This is supplemented by correspondence tuition. Police and customs services visit the islands on an "as needed" basis.

Transport to the islands is via carrier boats, helicopter, and charter fixed wing aircraft. Although marine radios are compulsorarily fitted to all vessels, and a few VHF radios are used, communications with the mainland are restricted. These systems are also prone to interference during adverse weather conditions.

Scallop Fishing

There are currently 30 vessels licensed to trawl for scallops at the Abrolhos Islands Limited Entry Scallop Fishery. Twenty seven boats fished during the 1987 season, employing between 75 to 100 crew. The boats generally operate on the periphery of the reef margins in areas of sandy bottom.

Catches in the scallop fishery fluctuate markedly. These range from 219 tonnes in 1984 to 10 tonnes in 1985. The major area fished is the sandy bottom areas on the periphery of the island groups. Value of the scallops ranges from $2 million in 1984 to $0.1 million in 1985. Catches in 1986 and 1987 were valued at $1.0 and $1.5 million respectively.

Wetline Fishing

Approximately 28 wetline vessels working mainly from Geraldton obtain a large proportion of their total catch from the Abrolhos Islands. Total number employed is approximately 56. Occasionally boats from Port Gregory and Kalbarri fish the area.

These vessels work for most of the year by droplining and handlining. The principal target species are Pink Snapper, Jewfish, Baldchin Groper, Northwest Snapper, Emperor Cod, Coral Trout, and some shark and Spanish Mackerel. It is estimated the industry was worth $0.7 million in 1985/86 (Fisheries Department estimates).

Amateur Fishing

At present there is a relatively small recreational fishery at the Abrolhos. Because of the islands remoteness, a large boat is required to gain access to the islands. The extent of the amateur catch is not known, but fishing is controlled by Fisheries Regulations which stipulate bag limits and sizes for particular species. Rock lobsters are not allowed to be taken by diving (see Section 2.2.3 on Tourism and Recreation).

Planning Implications

1. The Abrolhos Islands rock lobster fishery is part of the most valuable single species fishery in Australia.
2. The area produces significant but variable yields of scallops and wet fish.
3. Fishing licences are restricted entry for rock lobster and the scallop fishery at the Abrolhos. The numbers are not expected to increase.
4. Fishing camps are restricted to Zone 'A' rock lobster fishermen. Other professional fishermen are not allowed to use the islands for accommodation.
5. Fishermen are resident on 20 islands spread throughout the four island groups.
6. Community services are limited on the islands, and infrastructure on the islands is of a low standard. In particular, waste disposal is a significant problem on all island groups.

2.2.3 Tourism and Recreation

Existing Situation

Tourism to the Mid-West Region is an important part of the economy. In 1985/86 income from regional tourism amounted to $28.6 million with nearly 800 000 visitor nights spent in the area. The major reasons for visiting the area was for holiday/recreation (81%) and business (10%). Origin of visitors is from within Western Australia (96%), interstate (2%) and overseas (2%). Average length of stay in the area was 3 to 4 days (W.A. Regional Tourism Research Monitor).

Access for recreation on the Abrolhos occurs via three main methods:

i. Boat Charter Operators c.1000 visitors per year

ii. Recreational boating from coastal ports eg. Geraldton, Fremantle, Port Gregory

iii. Visiting friends and relatives (V.F.R) of fishermen on the islands c1500 visitors per year.

The scale of operations is currently quite low with two charter boat operators and one air charter operator with permission to land at the Abrolhos. The main period of use is from January to June because of adverse climatic conditions such as high winds at other times. The main activities which people participate in are diving, fishing, photography and birdwatching. Occasional visits are made to historic sites on the islands. Many groups are interested in specific sporting activities, whilst others are part of education and research groups. Charter operators tend to go to well-known spots which have outstanding coral areas suited to diving and snorkelling activities. Figures 5a-c shows the existing areas of major recreation use at the Abrolhos.

There is a growing number of yachts from Geraldton, other Mid-west and southern ports which visit the islands regularly.

Air charter fly-over tours are not heavily used, attracting approximately 100 - 120 people per year (C. Shine pers. comm). The major influx of visitors in the visiting friends and relatives market is during the Easter period.

A visitor survey was undertaken to define usage of the islands. Preliminary results from a small sample indicate that people went to islands in groups ranging from 2 to 30, and stayed from 1 to 21 days. Many people have been visiting the islands for 5 to 10 years (see Table 3 for summary).

Planning Implications

1. Tourism occurs in several forms at the Abrolhos, and takes the form of access for recreational pursuits of several kinds.
2. Access is currently by boat and by air with people visiting fishermen.
3. There is no existing management of recreation activities on and around the islands other then outside existing regulations controlling recreational fishing and charter boat operations.
4. With increased public awareness, it is expected that demand for recreation opportunities will slowly increase.

Table 3. Summary of Results of Visitor Survey

1.	Type of Group	43% organised group			
		30% single family			
		23% group of friends			
2.	Group Size	9			
3.	Age of Visitors	0-14	8%		
		15-19	8%		
		20-29	28%		
		30-39	31%		
		40-49	20%		
		50+	5%		
4.	Purpose of Visit	Holiday		50%	
		Weekend trip		25%	
		Day trip		25%	
5.	Major Attractions	Natural Environment			28%
		Recreation	diving		20%
			fishing		17%
			photography		11%
			History		8%
			Other		16%
6.	Suggested Improvements				
	Management Plan/Ranger	30%	Reduce Pollution/Clean Up		16%
	Maintain Restrictions	20%	Provide Moorings		7%
	Basic Facilities	16%	Leave as they are		20%

2.3 ECONOMIC ENVIRONMENT

2.3.1 Fisheries

The value of the Abrolhos fisheries production, and the relative importance of the rock lobster catch within this total, is illustrated in Table 4 below. With a total catch value estimated at around $15m in the 1985-86 season, the rock lobster catch is clearly predominant, with a value of close to 90% of the total. The other sectors of the fishing industry are of relatively minor significance, with scallops accounting for around 6.5% of the 1985/86 catch, with a remaining 3.5% being fin fish.

Table 4. Abrolhos Island Fisheries Total Production Value 1985 / 86[1]

	($)	(%)
Fish	515,700	3.4
Scallops[2]	1,000,000	6.5
Rock Lobster	13,486,000	90.0
	15,001,700	100.0

1. based on WA Fisheries Dept figures
2. estimated value for 1986

The total size of the Abrolhos fishing industry is estimated at around 650 fishermen and 250 vessels for all forms of fishing. This estimate is subject to some fluctuation, depending on the particular vessels and crew levels in a particular year. However, it provides a broad indicator of the scale of the fishing effort, as well as Abrolhos related fisheries employment levels. Table 5 indicates the distribution of this effort according to the type of activity.

Table 5. Fishing Industry Fleet and Employment Size - 1987

	Fishermen	Vessels
Rock Lobster	490	205
Scallop	100	30
Fin fish	56	28
Total	646	263

Source: WA Fisheries Department

Based on production values in Table 4, and the size of fleet as indicated in Table 5, the production figures per fishermen and vessel use estimated in Table 6 below, giving an indicator of the relative rates of return to the three sectors. While these figures are subject to fluctuation from year to year, due to changes in catch and prices, they nevertheless provide an interesting comparison between the sectors.

Table 6. Per Capita Production Value ($)

	Per Fishermen	Per Vessel
Rock Lobster	27,522	65,785
Scallop	10,000	33,333
Finfish	9,208	18,418

The rock lobster fishermen have a considerably higher per capita production value than either scallop or fin fish. While scallop fishermen are able to achieve significantly higher returns in a good year due to the extreme volatility in catch, the returns to fin fishermen would not be expected to vary greatly, and provide a relatively accurate reflection of the differential rates of return and profitability between the sectors.

Rock Lobster

The rock lobster catch in the Abrolhos Islands is of the order of 1,000 - 1,500 tonnes per annum, though there are some difficulties in precise measurement, due to problems of data differences between various sets of available fisheries statistics. The differences between ABS and WA Fisheries figures do result in some uncertainty as to catch size, which could lead to some variance in the estimated value of catch. These issues are presented in Tables 7 and 8, which provide alternative sets of estimates and their implied catch values.

As shown in Table 7, the ABS catch by the defined Abrolhos fishing blocks 1 (Row A) show a catch range of 1,100 - 1,500 tonnes during the last 3 years. However, some block statistics have not been reallocated into the appropriate block, and an appropriate pro rata allocation of these figures would result in some upwards adjustment of the figures, as indicated in Row B. (Source: ABS, Cat No. 7601.5, own estimates).

Table 7. Rock Lobster Catch - Tonnes

	By Block		
	83-84	84-85	85-86
27131	20	1	6
28131	1,348	1,266	1,021
28141	27	31	9
29131	34	10	45
29141	109	46	50
Row A Total Abrolhos*	1,538	1,354	1,131
2713	8	146	141
2813	13	45	23
2814	1	1	--
2913	1	--	--
2914	8	2	3
Row B Total Reallocated*	31	194	32
TOTAL	1,569	1,548	1,163

Table 8. Rock Lobster Catch (Value)

Based on Fisheries Department Figures

	83-84	84-85	85-86
Kg	1,329,412	1,311,598	1,049,457
Average price $/kg	10.00	16.50	12.85
Value ($m)	13.294	21.641	13.486

Based on ABS Catch Figures ($m)

	83-84	84-85	85-86
Value, ABS defined blocks	15.380	22.341	14.533
Value, total inc reallocated blocks	15.690	25.541	14.945

The value of catch based on WA Fisheries estimates of rock lobster catch in kilos and average prices are given, showing a range of values from $13.3 - 21.6m (see Table 8). However, using the two alternative sets of ABS based catch weights in combination with the WA Fisheries price estimates yield significantly higher catch figures, ranging from $14.5 - 22.3m for the 3 year range using the defined Abrolhos blocks, and even larger figures, ranging from $15-22.5m when the adjusted block figures are used.

While the somewhat complicated issue of statistical discrepancies does cause some difficulties in terms of precise measurement, nevertheless the range of values indicates a catch value of between $13.5 - 15m for 1985-86, compared to the $21.6-25.5m range for 1984-85. This indicates some volatility in annual returns, which declined by around 40% in 1985-86 compared to the year before. In 1986-87 the total rock lobster catch was estimated to be similar to that in 1985-86, though detailed catch returns are still being processed. However, the 1987-88 rock lobster catch is significantly higher, with the total WA catch up from 8.5k.t. in 85-86, to 11 k.t. in 86-87 due to a recovery in stocks and favourable weather conditions.

Because of concerns over the maintenance of the fisheries resource, and in order to prevent overexploitation of the rock lobster fisheries, the total number of pots authorised each year has remained relatively static in the 1983-86 period.

Further measures to improve the resource were taken in 1987, when a temporary 10% pot reduction was imposed for the entire west coast of Australia for 1986/87; with the reduction to be made permanent by 1992-93 via 2% annual reduction each year from 1987-88 to 1992-93, until a 10% permanent reduction has been achieved.

Scallops

The scallop catch in the islands fluctuate considerably from year to year, though it has been averaging around $1m since 1984. There are currently 30 vessels licensed to trawl for scallops in the Abrolhos Fishery, with total crew of between 75-100 engaged during the three month season.

TABLE 9 SCALLOP CATCH 1984-1987

	1984	1985	1986	1987
Tonnes	219	10	74	100
Value ($m)	2.0	0.1	1.0	1.5

Source: WA Fisheries Department

While scallop fishing is relatively minor in terms of revenue compared to rock lobster, accounting for only 6.6% of total revenue compared to 90% for rock lobsters in 1985-86, nevertheless it provides an important source of seasonal employment, providing around 15% of total Abrolhos fisheries employment, compared to 75% in the rock lobster sector (see Table 9).

Fish

The fishing effort for fin fish is considerably smaller than for either rock lobster or scallops, with scallops being somewhat more lucrative on average than the fin fishing take. The average fishing take for the last two years for which figures are available indicate that the value was roughly half that of the scallop take.

The breakdown of catch by type of fish and by value, shows the predominance of jewfish and snapper in terms of landed values, with jewfish accounting for about 40% of the 1985-86 fish values, and snapper accounting for a further 32%.

2.3.2 Tourism and Recreation

Tourist and recreation activities on the Abrolhos Islands are based on a number of biological and cultural attributes. Tourist traffic to the island has been sustained indirectly, via charter boats and yachting traffic. The existing economic benefits for the Abrolhos Islands from tourism are therefore accruing to the offshore operators who gain additional revenue from charters specifically for the islands. These economic benefits are likely to be mainly flowing through to the Geraldton economy, both for charter trips, as well as for fuel and provisions for yachting visits.

While quantitative data on existing Abrolhos related tourism is not available, a recent visitor survey carried out by the Department for Sport and Recreation may offer some insights. While the survey has had very limited response, with almost 80% of the 500 surveys still outstanding as of 30 May 1988, some patterns are noticeable from the responses, though extremely limited statistical confidence should be attached to this sample.

Of the responding visitor sample, almost half were organised groups, with similar proportions involved in diving, and, to a lesser extent other maritime interests, primarily fishing. In addition half the sample had visited the islands previously during the year, with almost 90% having visited the islands in previous years, indicating a high proportion of repeat trips among the sample. The main attractions were environmental, diving and fishing, with an average length of stay of 5 $^{1}/_{2}$ days. The average expenditure per trip in the Geraldton area was just under $400.

A further aspect of tourism in the area relates to visits to the islands from friends and relatives visiting the fishermen during the fishing season. These numbers could account for well over 1,000 visitors annually, with air traffic figures indicating around 700 such visitors, and an unquantified number of such visitors arriving by boat. These visitors would be classified as tourists according to the WA Tourism Commission (WATC) definition.

The potential for developing tourism use of the islands is therefore an important factor to consider in planning the future management of the islands. This is because any steps to curtail existing activities could have an adverse impact on existing tourist-related jobs, while inadequate consideration of further development potential would result in possible income and employment creating opportunities being overlooked.

The potential role of the Abrolhos Islands in relation to tourism in the Geraldton region was considered in a major WATC document produced in 1986. Several of the tourism development strategies proposed in the report propose the enhancement of the Abrolhos Islands role in the development of the Midwest tourism industry, particularly noting the importance of the Batavia Coast as a tourist drawcard from the central feature in terms of historical events. The concept of a Batavia Coast theme was also supported by the findings of the Geraldton Midwest Study in 1987.

Apart from highlighting the role of the Abrolhos Islands as a focus for the maritime attractions of the Midwest, the report also has identified a local tourism development strategy, involving the location of a field studies centre on the islands, either land-based or on a floating platform. The report recognised the need for such a proposal to carefully consider the environmental implications of such a centre, albeit mainly intended to serve an ecologically conscious target group, with an environmental education theme to the centre. While the potential adverse aspects of such a centre need to be considered, it must also be recognised, in such a cost-benefit analysis, that existing ad hoc, unmanaged visits to the islands are already causing environmental damage.

The economic importance of the fishing grounds is certainly of considerable value to the economy of the region and the state in terms of employment and export revenue generated, both directly and indirectly via the downstream processing activities onshore. Recreation use must be subject to certain safeguards to ensure any plans do not pose a physical risk to the flora and fauna of the area.

A sizeable proportion of expenditure generated by the islands will be concentrated in the Geraldton economy. This will relate to visitors who are including the Abrolhos on their itinerary, but may spend the majority of their visit on the mainland. This area is one which is likely to continue to grow in importance, as Geraldton is now the proposed centre for a maritime theme redevelopment, which could include a major hotel. A proposal in relation to this development is for a high speed ferry service to allow visitors to see the islands. This type of tourism may become increasingly relevant if Geraldton and other regional centres grow in tourism traffic. This is also likely to result in growing interest in the islands for brief trips for specific items.

Therefore the Abrolhos Islands could substantially augment Geraldton's tourist economy, albeit indirectly, in addition to the existing revenue stemming from charters and other Abrolhos related tourist activity.

2.3.3 Outlook

Fisheries

The demand for Abrolhos fisheries rock lobster output in the medium-term is unlikely to experience any downturn in trend demand, though some cyclical fluctuations in relation to international economic conditions are likely to be experienced. This could be related to an international recession, particularly in the US economy, where demand for rock lobster as a luxury good may be subject to negative substitution effects towards less expensive products, while adverse income effects could also be expected to reduce demand. As supplies to hotels and restaurants form an important component of total rock lobster sales, the impact of any reduction in tourism and fisheries trade for these establishments would be a significant aspect of a recession. However, underlying demand for rock lobster is likely to show steady growth in the medium term, as real disposable incomes in the major markets continues to rise.

Supply factors are more likely to be a constraint to rock lobster exports in the Abrolhos Islands given the existing need for careful fisheries management in order to ensure future supplies. Therefore, cyclical fluctuations in rock lobster supplies can be expected to continue, with little trend improvement in catch, barring improved technology to boost rock lobster production rates. With local supplies constrained and world demand expected to rise, the trend effect on prices will depend on international rock lobster supplies, and the possibility of emergence of substitutes, such as marron farming. While world rock lobster supplies are not expected to show growth, the latter factor may become an increasingly important element in determining world prices, though a strong luxury market for rock lobster will probably be sustained, particularly in the hospitality industry and in the Japanese market.

In summary, volume constraints on rock lobster production will mean little scope for any growth in catch effort, though steady growth in prices can be expected in real terms, which will be, sufficient to sustain the existing trend of profitability in the fishing industry.

Tourism

The direct tourism prospects for the Abrolhos are constrained by environmental considerations and the relatively hostile physical conditions on the islands. However, there is a considerable specialist interest in the islands for those participating in activities such as diving and bird-watching. While trips to the Abrolhos would remain highly specialist activities, in the long term rising real disposable incomes and population growth in WA are likely to continue to increase demand for such adventure style and natural history based excursions. In addition, rising leisure time for the workforce should support this trend.

Although limited recreation use is unlikely to have any deleterious effect on the fishing industry, this would nevertheless require careful supervision and controls on visitors. From the economic viewpoint, the Abrolhos Islands are likely to continue to be the focus of specialist activity trips, and while these should be profitable for the charter operators involved, it would not be environmentally acceptable to expand beyond a small-scale tourist focus.

From the regional tourism standpoint, however, the Abrolhos does have a very important role to play as an historical and environmental flagship for the Geraldton Midwest area, to assist the region in developing a marketing identity for future development.

SECTION 3. KEY ISSUES AND STRATEGIES

3.0 INTRODUCTION

The Abrolhos Islands and surrounding marine areas have a wide range of bio-physical attributes and uses and have significant environmental and conservation values. Through the fishing industry they provide one of the most important economic resources in the Mid West Region. The islands are also the basis of a small, but developing tourism and recreation industry. The status of the area should recognise these values, and emphasise and secure the basis of these industries.

Concept

The area around the Abrolhos Islands can be regarded as a Key Resource Management Area. On a Statewide and region basis, the terrestrial and marine areas of the Abrolhos Islands contribute significantly to economic, social and material needs of the community. The area has the capability and values to sustain a range of uses. This plan recognises the multiplicity of demands on the area, and seeks to guide these uses into appropriate areas. There is a need to provide for sustained yields of natural products, and to protect natural features and systems.

i. **Sustained yields**

It is in the interests of all sectors of the community that the viability of the fishing industry at the Abrolhos be maintained. Although the plan cannot directly influence the vagaries of nature, it can provide the pre-conditions within which the fishing industry can operate effectively.

ii. **Protect natural features and systems**

The basis of the fishing and tourism industries on the Abrolhos is the maintenance of the ecosystems which occur on the islands and in the surrounding waters. The diversity of species, the existence of rare or endemic flora and fauna, and the existence of commercial target species all rely upon the maintenance of environmental quality.

The concepts should be embodied in a Government Policy for the Abrolhos islands.

It is not sufficient, however, to merely adopt plans and policies for the area. The Abrolhos islands requires a vigorous, properly staffed management and administrative presence to ensure the protection of the area and its industries, and, in consultation with interest groups, to develop policies on use and management for consideration by Government.

3.1 FISHING INDUSTRY

Issues

ACCESS	- Maintenance of access to fishing grounds.
CONTROL OF FISHERIES	- Continuing security of Fisheries Department management of the fishing industry.
IMPACT OF FISHING TECHNIQUES	- Effect of fishing techniques on the islands environment, including pot drops, trawling and cleaning of scallop shells and fish stock reduction.
FISHERIES MANAGEMENT	- a) Sustainable yield of fisheries. b) Equity of access between fishing sectors, and professionals and amateurs.
ENFORCEMENT	- a) Adequacy of enforcement levels in fisheries management. b) Need for control of island users. c) Formality of control over island residents.
EDUCATION	- Education programme for island users including fishermen.
MARICULTURE	- Establishment of mariculture industry at the Abrolhos.

Discussion

There is an existing major fishing industry focussed on rock lobster, scallops and finfish that requires continued access to the waters of the Abrolhos Islands. Maintenance of fishing grounds, management of fish stocks and enforcement of regulations, is critical to the sustained productivity of the resource.

There has been concern expressed by some sectors of the fishing industry that control of the fishing industry may not remain with the Fisheries Department.

The Fisheries Department has the enabling legislation, staff and expertise to continue managing the fishing industry at the Abrolhos, and there is no reason or intention for this to change.

Current fishing techniques around the islands have variable effects on parts of the islands marine ecosystem, including fish stocks, mechanical damage from the use of gear (rock lobster pots, trawling, boat and anchor damage) and disposal of scallop shells. There is a high level of public concern that certain aspects of fishing activities may lead to irreversible changes to the islands environment. Of particular interest is the level of territorial reef fish stocks which are target species of both amateur and professional fishermen. Although there is no scientific evidence at present, observations from fishermen and charter boat operators consistently indicate that reef fish stocks are diminishing.

In conjunction with this is the issue of enforcement of fisheries regulations, including the adequacy of enforcement levels, restriction of fishing techniques, such as spearfishing and net fishing and revision of bag limit.

Strategies

1. *All matters related to fisheries management at the Abrolhos should remain with the Minister for Fisheries and the Fisheries Department.*
2. *An integrated fisheries management programme for rock lobster, scallop, wetline and amateur fishing should be developed by the Fisheries Department, focussing on State Territorial Waters, and in particular the area within the 30m depth contour.*

   This management programme should include:

   - *research into territorial reef fish communities to establish their population levels and dynamics*
   - *review of fishing techniques within the island lagoons with a view of regulating trawling, droplining, speargun use and nets*
   - *monitoring programme for commercial fish and crustacean stocks to ensure sustainable yields*
   - *public consultation in the development of the programme.*

   Regulations for fisheries should be amended according to the management programme.
3. *Applications for mariculture at the Abrolhos should continue to be assessed by the Fisheries Department and the Environmental Protection Authority to ensure that operations do not conflict with existing fishing uses and biological values.*

3.1.1 Fishing Industry Facilities and Island Services

Issues

ISLAND CAMPS	- Security of tenure of fishing camps on the islands.
	Management of camps - siting, numbers, involvement of fishermen in decisions, equity, safety standards.
INFRASTRUCTURE	- Solid and liquid wastes disposal.
	Communications
	Power generation.
LIFESTYLE	- Maintenance of traditional use and lifestyle values.

The Fisheries Department has had a huge responsibility placed upon it to manage what is essentially a remote, dispersed townsite of over 1000 people during the fishing season. This has over-stretched the traditional role of the Department and diverted its energies away from fisheries management. The situation was partly alleviated by the appointment of an Abrolhos Islands manager in 1987. The Department is still faced with the management of a complex social structure which, if it existed on the mainland, would have been subject to controls through State and local government agencies. The remoteness and fragmentation of the communities and the transient nature of habitation have led to the social and community needs being treated by government agencies in an ad hoc manner. This in turn has led to an irregular reactive management of community needs rather than an active, planned approach. In general fishermen have had to organise themselves to address problems of community management. Whilst this has been successful in many instances it is evident that a fishermen's co-ordinating body with appropriately defined powers and responsibilities would greatly assist them to participate more actively in self government.

The fishing camps on the islands are a traditional but essential part of the Abrolhos fishery. Camps on the islands have been a major factor in the continued productivity of the industry. They have allowed immediate access to the most productive grounds, and have overcome the problem of constantly travelling to and from the mainland with catches. Although there are some larger boats with high storage capacities operating at the Abrolhos which allow for short trips to the fishing grounds, the majority of use is for traditional rock lobster boats and small jet boats.

The camps are a necessary part of the fishing industry, but they do not have any security of tenure. The camps were developed on Crown land as the fishing industry grew. In many cases, they represent a considerable investment from the fishermen. By formally recognising the camps, the fishermen will have acknowledgement that the camps are a legitimate and permanent part of the fishing industry, and as well as formalising their control and management.

Infrastructure to support the camps is of a low standard. The relatively short period of the fishing season, the inhospitable nature of the islands, their remoteness, limited space and individuality of fishermen have combined to result in little capital being expended on island infrastructure. The Health Act and Uniform Building By-Laws do not apply as the islands are Crown land.

The major area where problems exist is waste disposal. There has been a build up of rubbish in some areas, but at present there are concerted efforts through the Fisheries Department and the Geraldton Professional Fishermen's Association to remove rubbish from the islands. The problem extends beyond the immediate vicinity of the camps, into

marine and natural areas where litter such as bait bands and plastic bags has accumulated from island visitors, passing ships and fishermen.

Power generation on the islands is usually by individual generators. There may be opportunities for rationalisation or alternative power sources to be utilised.

Strategies

1. *The Government should move toward a system of self management and regulation of fishing communities on the Abrolhos by progressively establishing a system of appropriate administration such as corporate bodies. These should enter into formal agreements with the Minister for Fisheries regarding the continued use and management of the islands and should provide joint and several security of tenure. Membership of these bodies should be only available to licensed Zone 'A' fishermen. Conditions of the agreements should include proper maintenance and upkeep of the buildings and surrounding areas, provision of community facilities and infrastructure.*
2. *A Working Group should be established with the Crown Law Department, Department of Local Government, the Geraldton Professional Fishermen's Association and the Fisheries Department to guide the establishment of the administrative framework for the fishing communities.*
3. *The overall strategy for fishing facilities is to consolidate uses on particular islands and ensure that environmental disturbance is minimised. The existing policy of permitting only Zone 'A' fishermen to maintain accommodation and other facilities on the island should continue. Fishermen should be required to remove any structures where approved sale and transfer to another Zone 'A' fisherman cannot be effected.*
4. *No further islands should be used to accommodate the fishing industry. The camps on Leo Antillas Island should be cleared on the sale or transfer of the existing licenses.*
5. *The situation of camps on West Wallabi Island should be reveiwed to ascertain the long term suitability of this use on the island.*
6. *In the long term, subject to the availability of suitable alternative sites and payment of compensation, the fishermens camps on Beacon Island, on the sale or transfer of the fishing license, should be removed and arrangements made for their re-location to other inhabited islands.*
7. *Waste disposal on the islands should be subject to an overall study which examines the existing system, options for improvement and implementation. Relevant health and engineering authorities should be consulted. The aim of the study should be to ensure that rubbish disposal occurs by the most environmentally acceptable methods. In the long term the removal of non-combustible material to the mainland should be investigated. Disposal of antagonistic chemicals and oils should be regulated.*
8. *The rationalisation and use of alternative power sources should be investigated, including centralised power generation and solar energy.*
9. *Upgrading of communication systems, including provision of telephones on the islands is required. Liaison with relevant State and Commonwealth agencies should occur as a matter of priority.*
10. *The Geraldton Professional Fishermen's Association is to be commended and encouraged in its efforts to represent the interests of fishermen at the Abrolhos Islands. These efforts should be recognised and supported by the input and advice from Fisheries Department, CALM, W.A. Museum and other relevant agencies in addressing management issues on the islands.*

3.1.2 Meteorological Information and Counter Disaster Measures

Issues

METEOROLOGICAL INFORMATION	- Provision of a weather station at the Abrolhos.
	Need for early warnings of storm and cyclone events.
	Sea level rise.
COUNTER DISASTER MEASURES	- Need for effective counter disaster plan.

At the moment there is no weather station at the Abrolhos. The acquisition of meteorological information is piecemeal, utilising passing ships. There is a need to provide a weather station on the islands for fishing industry purposes, research and improve warnings on storm events.

A long term phenomenon that has been identified is the "Greenhouse Effect". This is caused by the build up of specific gases including carbon dioxide in the earth's upper atmosphere, which lead to a gradual heating of the lower atmosphere. This in turn is predicted to lead to rises in sea level. This is a gradual process, but it should be monitored at the islands.

The State Emergency Services developed a counter disaster plan which addresses the impact of cyclone events on the islands. At present, transport is inadequate to cope with likely demand for pre-cyclone evacuation and the most likely scenario is for people to shelter on the islands. Improvements to the airstrip on Rat Island, however, would allow for improved evacuation provisions (see Section 3.3). The Task Force is concerned at the potential impact that a major cyclone would have on the islands, and there is a need for counter disaster measures to be developed and for fishermen to be made aware of these measures.

Strategies

1. *A weather station should be established at the Abrolhos Islands to service the needs of the local fishing industry, shipping and to provide predictive information on storm and cyclone events. A sea level measuring device appropriate to the role of long term measurement of changes in sea level should be installed in the Abrolhos Islands. The proposed weather station should be sited so as not to intrude on areas of cultural or biological significance.*
2. *Counter disaster measures should be reviewed and updated to ensure that island residents and visitors are given the earliest possible warning to storm or cyclone events. Procedures for evacuation and/or shelter should be developed and circulated to island residents. Investigations into the establishment of appropriate shelters should be instigated through the State Emergency Service..*

3.2 CONSERVATION

Issues

DAMAGE TO CORALS	- The damage to coral environmentas by natural (storm events) and human activities (pot drops, anchors, trawling, jet boats, trampling).
ENVIRONMENTAL PROTECTION	- Protection of sensitive terrestrial and marine areas from unnecessary disturbance including bird breeding areas. Control of feral animals and exotic plants. Effects of pollution. Natural sustainability of the ecosystem.
TENURE	- Establishment of marine protected areas.
RESEARCH	- Need for fundamental and applied research into the Abrolhos environment.
EDUCATION	- Education programmes for island users.
MINING	- Mining of the islands. Rehabilitation of disturbed areas.

The issue which is perhaps the most contentious at the Abrolhos Islands is the impact that human activities have on the coral reef areas. There are assertions that the continuing impact of pot, boats and anchors on these areas will result in the short term collapse of the system. Research that was undertaken as part of this planning study has highlighted the following:

1. The most intensively fished areas (more than 200 pot drops per hectare per season) are submerged limestone platforms between North Is. and Wallabi Is., reef crest and back reef areas supporting coralgal pavement, meso/macro algae, and scattered coral communities in Easter Group, and submerged limestone platforms supporting similar assemblages in Southern Group.
2. Fishing intensities which are lowest are associated with bare sediment, storm rubble fields, emergent lime stone platforms, complex karst platforms and drowned doline fields.
3. Among all the islands groups, the intensity of fishing effort is significantly lower in areas that contain extensive live coral or filter feeding commmunities. This corroborates with the fishermen's claims that they do not often set pots directly on corals. Of the 200 ecological units mapped by Hatcher et al (1985), 34 units can be identified in which rock lobster fishing occurs and there is cover of live corals (see Figures 3a-d).

That is not to say that damage is not occurring; there is some evidence of pot shaped holes in the corals, but these are limited in extent. Hatcher et al, (1988) conclude that "the present circumstantial evidence [of damage] is an inadequate basis for any conclusions about the magnitude of long term effects on coral communities of physical damage by human users of the Abrolhos."

Damage to corals occurs by natural forces such as storm events and natural senescence. Many people have noted the extensive damage which results from major storms. These catastrophic events are of high intensity and long period and have resulted in the building of many of the Abrolhos Islands such as Pelsaert Island.

The corals at the Abrolhos are subject to different dynamics than those in tropical coral reefs. Their growth rates are slower, and there is competition from macro algae (seaweeds) for space and light. The effects of chronic damage from pot drops and anchors (low intensity, and short period events), may lead to highly localised changes. The degree of change depends on the nature of the coral community (high energy coral communities are more robust than low energy coral communities) and the scale of impact.

Given the diversity of individual biological communities; their variation in growth rates and resistance to disturbance, and the variable level of impacts which they absorb at present, there cannot be definitive statements made on the dynamics of each community following impact. The main conclusion from research to date is that fishing effort in the sensitive coral communities is low and the effects of that fishing is highly localised. The determination of the long term dynamics of the reef systems will require further research.

3.2.1 Marine Reserves

The principle of the establishment of marine reserves at the Abrolhos can be derived from the common concerns of the community.

These common concerns are the need to:

a) conserve the islands marine habitats to ensure the sustainability of fisheries production including prevention of the over-exploitation of reef fish stocks.

b) conserve areas of special interest for recreation.

c) minimise the damage that occurs in sensitive areas from human activities.

d) control the activities of tourists in private and charter vessels.

e) provide "bench mark" areas for research and monitoring.

The establishment of marine reserves recognises the need to cater for wider community use at the Abrolhos Islands, and to provide effective management of those uses.

There are arguments against the establishment of marine reserves which include enforcement problems, potential availability of commercial fishing resources and delineation of boundaries. These issues are recognised by the Task Force, but they are not insurmountable. They should not present obstacles to the long term establishment of marine reserves at the Abrolhos.

Because of the value of the fishery, there is no intention of taking any fishing control away from the Fisheries Department. As such, the establishment of a large marine park is not appropriate. To translate the common ground of the community into action, there is a need to establish a system of smaller marine parks which can ensure continued, controlled access to the marine resources within the reserves and reflect the needs of :

- production
- conservation
- recreation.

The greater part of the Abrolhos Islands State Territorial Waters should be declared an Aquatic Reserve under Section 30 of the Fisheries Act. This empowers the Minister for Fisheries to regulate a wide range of uses (see Section 4).

3.2.2. Terrestrial Areas

On the islands, there has been concern with disturbance to bird breeding areas and key habitat types (see Section 2.1.3). Disturbance includes trampling, fire, feral animals, invasion of weeds and the effects of pollutants.

The key to the reduction of impacts on the islands terrestial and marine environments is the need for effective management. The first step in establishing this framework is the development of a management plan which is based on community consultation and incorporates proposals for environmental protection, community education and access. Future tenure of the islands and marine areas is addressed in Section 4.

Strategies

A) General

1. *In consultation with all relevant groups the Department of Conservation and Land Management should prepare management plans for marine areas and terrestrial areas of high conservation value. These plan should be linked to those developed for fisheries management in adjacent marine areas.*
2. *These management plans should be considered and endorsed by the future administrative body.*

B) Marine Areas

1. *The overall strategy is to establish marine parks which will protect significant coral habitats from disturbance. Criteria for selection of areas include:*

Ecological	*a)*	*Areas of highest sensitivity to disturbance.*
	b)	*Areas of highest diversity of corals.*
	c)	*Size of minimum 450 ha.*
	d)	*Areas which incorporate a range of habitats.*
Social	*a)*	*Areas which are agreed to by various user groups.*
	b)	*Areas which have wide appeal for passive recreation.*
	c)	*Areas which present high education and interpretation values.*
	d)	*Areas within which public safety can be maximised.*
Economic	*a)*	*Areas which will have least impact on the fishing industry.*
	b)	*Areas which have the highest potential social and economic value for recreation.*
Management	*a)*	*Areas which have easily identifiable boundaries.*
	b)	*Areas which form discrete and contiguous management units.*
	c)	*Areas which can be pragmatically and effectively policed.*

The following areas should be set aside as marine parks under the C.A.L.M. Act:

(i) The southern section of the Beacon Island platform in Wallabi Group, bounded by Beacon Island, Traitors Island, Morning Reef, Seal Island to Hall Island.

(ii) The eastern section of Southern Group bounded by Pelsaert Island, Square Island, and the arc from Mangrove Island to Robinson Island.

(iii) Waters and fringing reefs surrounding the island arc from Gilbert to Wooded Islands; the eastern part of "the Maze" area; the Eastern Islands (Leo Island platform) and the portion of the Eastern Channel between these two areas in Easter Group .

(see Figure 6 for an approximation of these boundaries).

2. *Management of these areas should ensure that other potential sources of damage such as anchors and boat damage; and disposal of shells by scallop fishermen does not occur. The areas should allow for appropriate managed recreation use and commercial rock lobster fishing. Taking of fin fish by amateurs and professional fishermen in these areas should be discontinued.*
3. *A code of conduct should be drawn up for charter boat operators and yacht clubs to provide guidelines for boat usage and visits on and around the Abrolhos Islands.*
4. *Systematic research into marine areas should be undertaken and appointed as part of the development of future management plans for the area.*

Terrestrial Areas

1. *Protection of key habitat areas from disturbance is essential to ensure that conservation values of the islands are maintained. Future management should ensure protection from potential sources of disturbance such as fire, feral animals and exotic plants. Of particular value are mangroves, Atriplex, Eucaluptus oraria and salt lake fringing communities.*
2. *Access to bird breeding areas should be restricted during breeding seasons. Restriction of flight paths for fixed wing and rotary aircraft during breeding seasons should be investigated in consultation with the Department of Transport.*
3. *Systematic research and monitoring of island fauna populations including invertebrates should be encouraged.*
4. *Future management should incorporate the provision of education and interpretation materials regarding the islands environment.*

3.2.3 Areas of Historic Significance

Issues

PROTECTION AND MANAGEMENT - Management of historic sites.
Identification of historic values.
Access to land and wreck sites.
Promotion and interpretation of sites.

There are a number of historical sites at the Abrolhos which date from Dutch and colonial times. Some of the sites have suffered with the passage of time, and uncontrolled access. Given the significance of these sites, there is a need for carefully considered plans which should protect and manage the sites.

There has been a proposal for a Heritage Wreck Trail, which focusses on a number of the wreck sites. The Abrolhos marine environment is notoriously rough and often is subject to unpredictable wave, wind and swell conditions. Any proposal for this trail would need to include hazard assessments of the sites. The Task Force is concerned that promotion of access to some wreck sites could have disastrous consequences for inexperienced boat operators.

Strategies

1. *Site management plans should be prepared for historic sites at*
   a) West Wallabi Island
   b) Beacon Island
   c) Long Island
   d) Gun Island
   e) Middle Island
   f) Pelsaert Island

   The plans should include access provisions, information regarding the significance of the sites and where appropriate, restoration. Plans should be prepared in consultation with the WA Museum, CALM, Tourism Commission and Fisheries Department. Where appropriate, marine and terrestrial historic sites should be protected by the Maritime Archaeology Act (1973).

2. *Removal of any material from these sites should be prohibited.*
3. *An assessment of risk hazard associated with access to wreck sites should be undertaken prior to the development of any diving wreck trail. Sites should be graded according to the experience of the visitor, including boating and diving skills. Any information promoting these sites should include warnings of natural hazards.*
4. *Further research into archaeological and historical sites on and around the islands is to be encouraged.*

3.2.4 Mining and Petroleum Exploration

Issues

ENVIRONMENTAL IMPACT - Need to protect the islands marine and terrestrial environment from the negative impact of mining, particularly petroleum exploration and production.
Combat of spillage
Emergency procedures
Need for on-shore facilities.

There are deposits of sand and limestone on the islands but these are of little economic value. The area is, however considered to have potential for economic accumulations of oil and gas.

Previous petroleum exploration in the area has led to the preparation of contingency plans in the case of oil spillage, and agreements with the rock lobster fishing industry. The Environmental Protection Authority has also set down procedures for the protection of the Western Australian marine environment from oil spills (D.C.E. Bulletin 104 Nov. 1984). The Abrolhos Islands are afforded the highest level of protection under the classification used to define marine environments. The islands are classed as Environmentally Significant Locality (E.S.L). This is surrounded by an 8 km Immediate Protection Zone (I.P.Z) and a 42 km Special Conditions Zone (S.C.Z). The E.P.A. has set down guidelines for drilling within these areas.

Strategies

1. *Ensure that the existing arrangements, whereby all proposals for exploration, petroleum production or mining are forwarded by the Mines Department to the E.P.A. for assesment are maintained*
2. *Drilling and seismic surveys on the islands, in island lagoons and within the 30m depth contour around the islands should not be supported unless the proponent can demonstrate that biological and cultural values will not be adversely affected.*
3. *Any offshore drilling application within 50 km of the islands should be referred to the E.P.A. and the State Combat Committee (for oil spills) for assessment. Under existing guidelines this may require a Notice of Intent or an Environmental Review and Management Programme. Consultation with the relevant professional fishermen's association should be undertaken.*
4. *Where required, oil spill contingency plans should be prepared by the proponent with emphasis on having sufficient resources based locally to combat a spillage.*
5. *Development of any future oil and gas finds on or adjacent to the islands which would require on-shore facilities should be referred to the EPA for assessment.*

3.3 TOURISM AND RECREATION

Issues

TOURISM MODEL - Land based facilities versus water based facilities.
MARKET - Definition of demand.
MANAGEMENT - Control and management of tourist and recreation activities on and around the islands, such as reef walking, boat use.
FACILITIES - Provision of facilities for recreation purposes, including moorings, airstrip.

There is a great deal of public concern regarding the impact of tourism on the islands. Although there is conditional support given to boat based tourism on the islands, land based tourism is regarded as a threat to the islands by both fishermen and conservation interests.

There are a number of constraints on the development of tourism on the islands. Although the islands possess a number of natural and cultural attractions, the environment is quite inhospitable with high winds most of the year and little or no vegetation cover. Many islands have important bird breeding areas for part of the year, and the surface of many islands are easily erodible. Water supply is limited and disposal of solid and liquid wastes would be difficult. Whilst it is acknowledged that capital and technology can be used to overcome these limitations eg. desalination, large investment would be required which would in turn require a highly capitalised facility. The Task Force does not consider this appropriate.

Public consultation during the study has highlighted the general agreement that exists amongst tourism operators. "Bricks and mortar" tourism is not desirable and the focus should be on recreation use of the islands. The market segment which is the most likely to be attracted to the area are those special interest groups attracted by the natural and historical features of the islands. The model for tourism on the Abrolhos should be:

- Boat based with defined areas for charter and recreational boats to moor.
- Visitor activities which focus on non-exploitative activities such as bird watching, photography and diving.
- Geraldton should be regarded as the centre of accommodation for visits to the Abrolhos.
- Aerial access via fixed wing and rotary aircraft should be encouraged in the form of fly-over or fly-boat visits.
- Careful management of recreation activities to ensure that impact on the islands and conflict with other uses is minimised.

On balance the Task Force agrees with these points. In terms of the spectrum of recreation potential the Abrolhos presents an opportunity for the public to recreate in an undeveloped setting. The trip to the islands is an integral part of the Abrolhos experience.

At present the tourism industry in Geraldton is undergoing a gradual upgrading of accommodation and facilities and this will be accelerated by the proposed development of the Geraldton foreshore. This includes the provision of high quality accommodation. In its regional context to ensure that the tourist development in Geraldton appeals to the widest possible market, then the accommodation for Abrolhos visitors should be in Geraldton. This plan has highlighted the need for improved management of the islands and until such time as this has been set in place, the Task Force believes that the establishment of built accommodation on the islands is not desirable. This situation should be reviewed when management plans are prepared for the island areas. At that time there will be a need to consider:

(i) protection of significant habitat areas, and cultural sites

(ii) effects on the fishing industry

(iii) adequacy of infrastructure technology and building controls to minimise effects on the environment

(iv) sufficient regional tourism levels and demand to justify any development

Strategies

1. *The development of management plans for the proposed National Park and Marine Park will incorporate specific strategies for the management of future recreation and tourism use of the islands. This will include provision of day use sites on the islands, visitor facilities such as bird observation points, preferred landing and mooring areas, and interpretive facilities at sites of natural and cultural significance. Siting of these facilities should ensure that sensitive areas are protected (see Section 3.2).*
2. *The Abrolhos Islands should not be developed for tourist accommodation at this time. A review should occur within the context of the mangement plans, incorporating the above criteria. In the meantime, tourism accommodation should be located in Geraldton and nearby towns.*
3. *The dominant form of recreation and tourism at the Abrolhos should be boat based, augmented by aerial tours.*
4. *Areas should be set aside in each island group for permanent moorings for recreation users. These areas should be identified by the Department of Marine and Harbours, Fisheries Department, CALM, professional fishermens association and tourism interests.*
5. *Arrangements should be made to enable the licensing of charter boat operators in the Abrolhos Islands area. A code of conduct should be prepared for island charter operators and other island visitors.*
6. *The opportunity exists for controlled fixed wing and rotary aerial access to boat based tours. This should be done with agreement from the Minister for Fisheries. No further airstrips should be constructed on the islands. The airstrip on Rat Island should be investigated to ascertain suitability for upgrading to Authorised Landing Area (A.L.A) standard to accommodate increasing use and associated safety requirements. Other airstrips on North Island and East Wallabi Islands should be retained and maintained strictly for fishing industry purposes. Suitable landing sites for rotary wing aircraft should be identified, to ensure that bird nesting areas are not adversely affected. Float plane use should be investigated and appropriate landing areas identified to ensure that fishing operations are not interfered with.*

SECTION 4 MANAGEMENT AND ADMINISTRATION

4.1 MANAGEMENT AND ADMINISTRATION

Future administration of the Abrolhos Islands should reflect the multiplicity of uses of the islands, the nature of the resource and its management requirements. Its role should include:

i) Co-ordination and development of strategic policy requirements.

ii) Advisory body to government on relevant issues.

At present the Abrolhos Islands Consultative Committee (A.I.C.C.) provides a community and government based committee to advise relevant Ministers on matters pertaining to the Abrolhos Islands. It is imperative that community input to future policy development on the islands is maintained. This ensures that decisions are not made in isolation, and that these decisions have a degree of public accountability. There are numerous issues in this plan which will require on-going consultation with the community.

Strategy

1. *Review the membership, role and function of the Abrolhos Islands Consultative Committee to ensure that effective community involvement is maintained in future policy development. This new arrangement should include an independent chairperson, with representatives from professional fishermen, tourism interests, Fisheries Department, CALM, Geraldton Mid-West Development Authority, Mines Department and local community interests.*

Joint Management

The management of the Abrolhos should recognise the multiplicity of uses which apply to the area. There is need to provide more effective on-the-ground management to implement proposals in this plan. The Task Force recognises, however, that there is a need for sharing of the limited and expensive facilities which support island management. It is inappropriate that costly duplication of patrol boats and island facilities occurs. It is intended that joint arrangements will reduce overall costs and increase efficiency.

Strategies

1. *The Fisheries Department and the Department of Conservation and Land Management enter into joint agreements to ensure minimisation of costs and increased effectiveness of future management. This should include use of boats and island based facilities.*
2. *Arrangements should be made with W.A. Museum to formalise the additional use of the Beacon Island camp for research and management by Fisheries Department and CALM.*
3. *Adequate funding should be made available to ensure the effective implementation of the plan.*

4.2 PURPOSE AND VESTING OF THE ISLANDS

The islands are Class 'A' Reserve 20253 for the purpose "Conservation of Flora and Fauna, Tourism and For Purposes Associated with the Fishing Industry", vested in the Minister for Fisheries with power to lease. A small lighthouse reserve is located on North Island. There is, however, a number of principal Acts which affect management of the Abrolhos.

A major issue is the appropriateness of having three purposes for all of the islands at the Abrolhos. Many problems at the Abrolhos result from confusion as to the intent of the islands purposes. There are many islands where multiplicity of purpose is inappropriate, and where the values of particular islands to the fishing industry or for conservation and recreation are dominant. Some islands have the capacity to cater for several uses and should be subject to agreements between vesting authorities.

The most suitable tenure arrangement for islands not utilised by the fishing industry is "National Park". This recognises the high natural and cultural conservation values of the islands, whilst allowing for recreation activities in appropriate areas. There are many attractions to which both islands residents and visitors will want access. Future planning for the proposed National Park should ensure that public consultation occurs in the preparation of the management plan.

Strategy

1. a) Overall the strategy is to reserve islands so that the highest and best use is reflected in the purpose. The following islands should remain vested in the Minister for Fisheries For Purposes Associated with the Fishing Industry and other purposes cancelled. The Wildlife Conservation Act still applies to these islands.

SOUTHERN GROUP

Robinson Is	*Post Office Is.*
Foale Is	*Mangrove Is.*
Jackson Is	*Burnett Is.*
Rotondella Is.	*Basile Is.*
Newman Is	*Other small islands between Basile and Robinson Islands.*
Coronation Is	

EASTER GROUP

Leo Is *Rat Is.*

Roma Is *Bushby Is.*

Little Rat Is.

WALLABI GROUP

Little Pigeon Is *Pigeon Is.*

Alcatraz Is

b) *Areas which have fishing camps should be excised from the following islands and vested in the Minister for Fisheries. The remaining part of the islands should be declared for the purpose of "National Park" and vested with the National Parks and Nature Conservation Authority (NPNCA).*

North Is.

West Wallabi Is.

c) *Beacon Island should remain vested with the Minister for Fisheries until such time as the camps are removed. It should then be vested in the NPNCA for the purpose of "National Park" (see Section 3.1.1).*

2) *Agreements should be reached between Fisheries Department and CALM for continued use of the airstrips on East Wallabi and North Island.*

3) *Islands not mentioned in (a) and (b) above should have the sole purpose of "National Park" and be vested in the NPNCA (see Figure 6, Strategy Plan at the back of the report).*

4.3 MARINE AREAS

Marine areas and their control are a fundamental part of the planning strategy. These are some relevant points:

- At present there is no formal vesting over any of the waters of the Abrolhos. The Minister for Fisheries controls fishing activities, but the water is not vested. This is a popular misconception based on the fact that Fisheries Department is a highly visible manager of the fishing industry.
- Fisheries Department controls fishing activities within State waters (within 3 nautical miles of the baselines established at the Abrolhos) as well as in Commonwealth waters through the mechanism of the Offshore Constitutional Settlement.
- The establishment of marine reserves for the purposes of conservation of marine and aquatic flora and fauna can only be established under the CALM Act. The Fisheries Act allows for the establishment of aquatic reserves generally to protect fisheries interests.
- The vesting of marine reserves ie. marine parks and marine nature reserves is in the National Parks and Nature Conservation Authority.

There are a number of options which can be pursued to support the objectives of the plan. It is acknowledged that only certain areas are subject to competing uses (see Section 2.1.3) and that a major public concern is damage to some coral areas.

It is the opinion of the Task Force that, in order to enable protection of the coral areas which are subject to disturbance from human use, there is a need to establish a series of marine reserves at the Abrolhos.

Strategy

1. *The area within State territorial waters around the Abrolhos Islands should be declared an Aquatic Reserve under Section 30 of the Fisheries Act. This recognises the high value for fisheries production of the area, and regulatory measures should be developed in conjunction with the proposed fisheries management programme.*
2. *Within this area establish a series of marine reserves which are primarily for the purposes of Conservation of marine flora and fauna (see Section 3.2).*

4.4 RESEARCH

The Abrolhos Islands have long been recognised as areas of outstanding natural values (Hatcher and Walker 1984). The need for improved research at the islands was identified during public consultation and by the consultants report as an important planning issue. Until the present, research effort at the Abrolhos Islands has been sporadic with tertiary institutions, W.A. Museum, C.S.I.R.O. and Fisheries Department having separate priorities.

The development of the integrated fisheries management programme and the management plans for the islands and marine areas will require further research. The lead agencies in this research will be Fisheries Department and Department of Conservation and Land Management.

Strategies

1. *Liaison between CALM, Fisheries Department and W.A. Museum should occur to establish research priorities for the Abrolhos Islands.*
2. *Co-operation of the W.A. Museum should be sought to enable the Beacon Island camp to be made available to bona fide research and supervised special interest groups on a user pays basis. Administration and use of the camp should remain within the sphere of the Government of Western Australia.*
3. *Co-operation should be sought from the CSIRO by CALM and Fisheries Department to jointly use the facility on Rat Island in Easter Group for research and management purposes.*
4. *An informal subcommittee of the Western Fisheries Research Committee consisting of C.A.L.M, Fisheries Department, W.A. Museum and where appropriate tertiary institutions should be established to promote research proposals for the Abrolhos Islands.*
5. *Greater priority should be afforded by Government to meet the research needs of the Abrolhos, where possible research efforts should be jointly undertaken to maximise benefits.*

4.5 NOMENCLATURE

There are many islands at the Abrolhos which are currently un-named. Amongst those that have gazetted names there are many which are not in common use.

Some gazetted names have either never been properly applied or have been replaced with a colloquial name eg. Uncle Margie Island is gazetted, Mangrove Island is the popular name. This causes difficulties in that island identification becomes confused and long term research effort can become erratic.

Strategy

1. *The Nomenclature Committee of the Lands Department in consultation with Fisheries Department and G.P.F.A. should review the existing gazetted names of the Abrolhos with a view to:*
   i) providing un-named islands with names
   ii) amending existing gazetted names that are not used with those in common usage.

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ACTS

Conservation and Land Management Act 1985

Fisheries Act 1986

Maritime Archaeology Act 1973

Wildlife Conservation Act 1950-1985

Western Australian Petroleum (Submerged Lands) Act 1982

Petroleum Act 1976-81

ACKNOWLEDGEMENTS

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Special thanks to Mr Kevin Altham for his assistance with field work, the staff and crew of the Fisheries Department vessel MV Abel Tasman and all the fishermen and their families who provided accommodation and hospitality to the Task Force during their time on the islands.

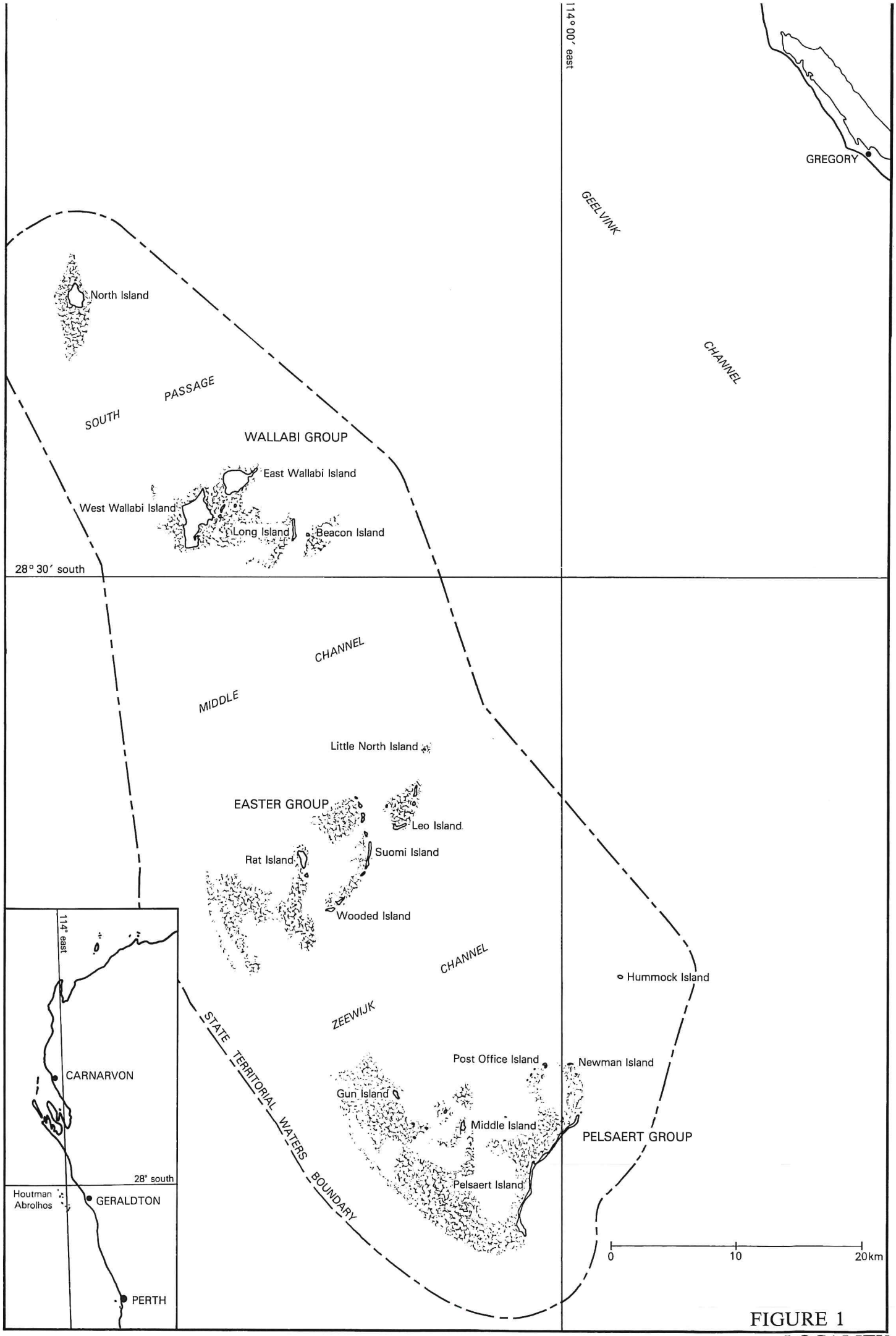


FIGURE 1
LOCALITY

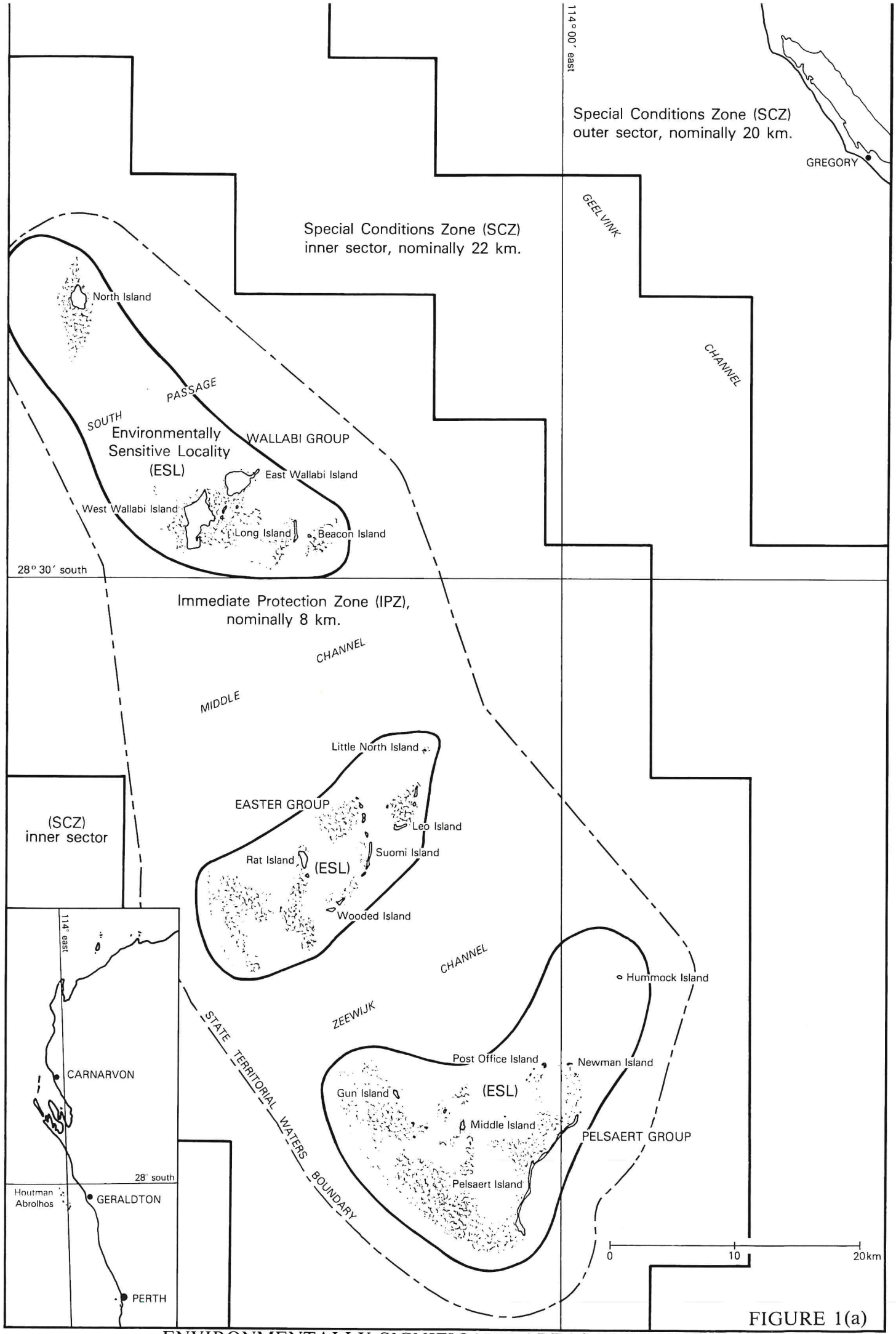
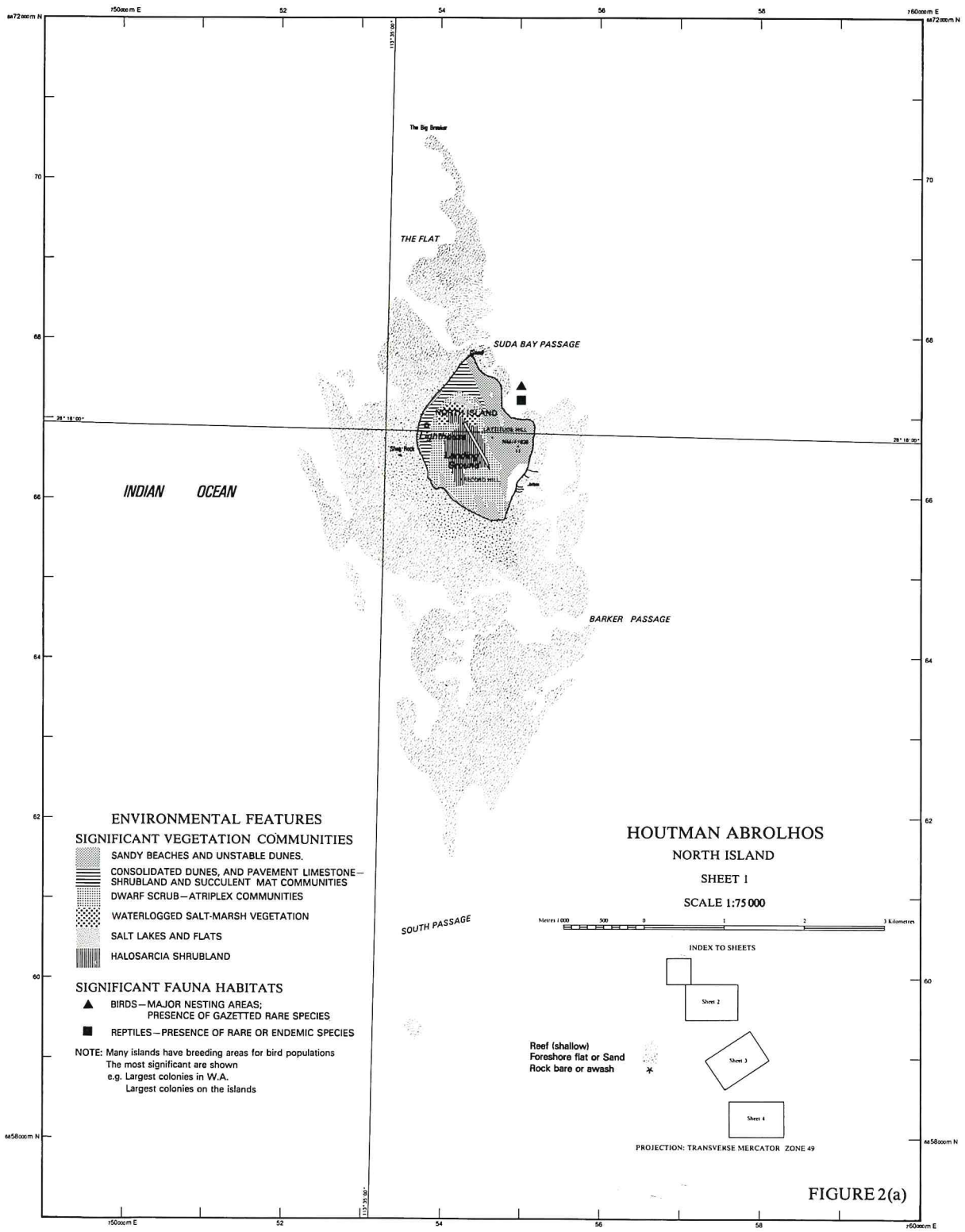


FIGURE 1(a)

ENVIRONMENTALLY SIGNIFICANT AREAS PERTAINING TO OIL SPILLS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THE FLAT
SUDA BAY PASSAGE
NORTH ISLAND
INDIAN OCEAN
BARKER PASSAGE
SOUTH PASSAGE
ENVIRONMENTAL FEATURES
SIGNIFICANT VEGETATION COMMUNITIES
SANDY BEACHES AND UNSTABLE DUNES.
CONSOLIDATED DUNES, AND PAVEMENT LIMESTONE—SHRUBLAND AND SUCCULENT MAT COMMUNITIES
DWARF SCRUB—ATRIPLEX COMMUNITIES
WATERLOGGED SALT-MARSH VEGETATION
SALT LAKES AND FLATS
HALOSARCIA SHRUBLAND
SIGNIFICANT FAUNA HABITATS
BIRDS—MAJOR NESTING AREAS; PRESENCE OF GAZETTED RARE SPECIES
REPTILES—PRESENCE OF RARE OR ENDEMIC SPECIES
NOTE: Many islands have breeding areas for bird populations
The most significant are shown
e.g. Largest colonies in W.A.
Largest colonies on the islands
HOUTMAN ABROLHOS
NORTH ISLAND
SHEET 1
SCALE 1:75 000
Metres 1 000 500 0 1 2 3 Kilometres
INDEX TO SHEETS
Sheet 2
Sheet 3
Sheet 4
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 2(a)

INDIAN OCEAN

ENVIRONMENTAL FEATURES

SIGNIFICANT VEGETATION COMMUNITIES

- SANDY BEACHES AND UNSTABLE DUNES
- CONSOLIDATED DUNES, AND PAVEMENT LIMESTONE—SHRUBLAND AND SUCCULENT MAT COMMUNITIES
- MANGROVE COMMUNITY
- DWARF SCRUB—ATRIPLEX COMMUNITIES
- SALT LAKES AND FLATS
- HALOSARCIA SHRUBLAND
- *Eucalyptus oriaria*

SIGNIFICANT FAUNA HABITATS

- ● MAMMALS—PRESENCE OF GAZETTED RARE SPECIES
- ▲ BIRDS—MAJOR NESTING AREAS; PRESENCE OF GAZETTED RARE SPECIES
- ■ REPTILES—PRESENCE OF RARE OR ENDEMIC SPECIES

NOTE: Many islands have breeding areas for bird populations
The most significant are shown
e.g. Largest colonies in W.A. Largest colonies on the islands

HOUTMAN ABROLHOS

WALLABI GROUP

SHEET 2

SCALE 1:75 000

Metres 1000 500 0 1 2 3 Kilometers

INDEX TO SHEETS

Sheet 1
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Sheet 4

Reef (shallow)
Foreshore flat or Sand
Rock bare or awash

PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 2(b)

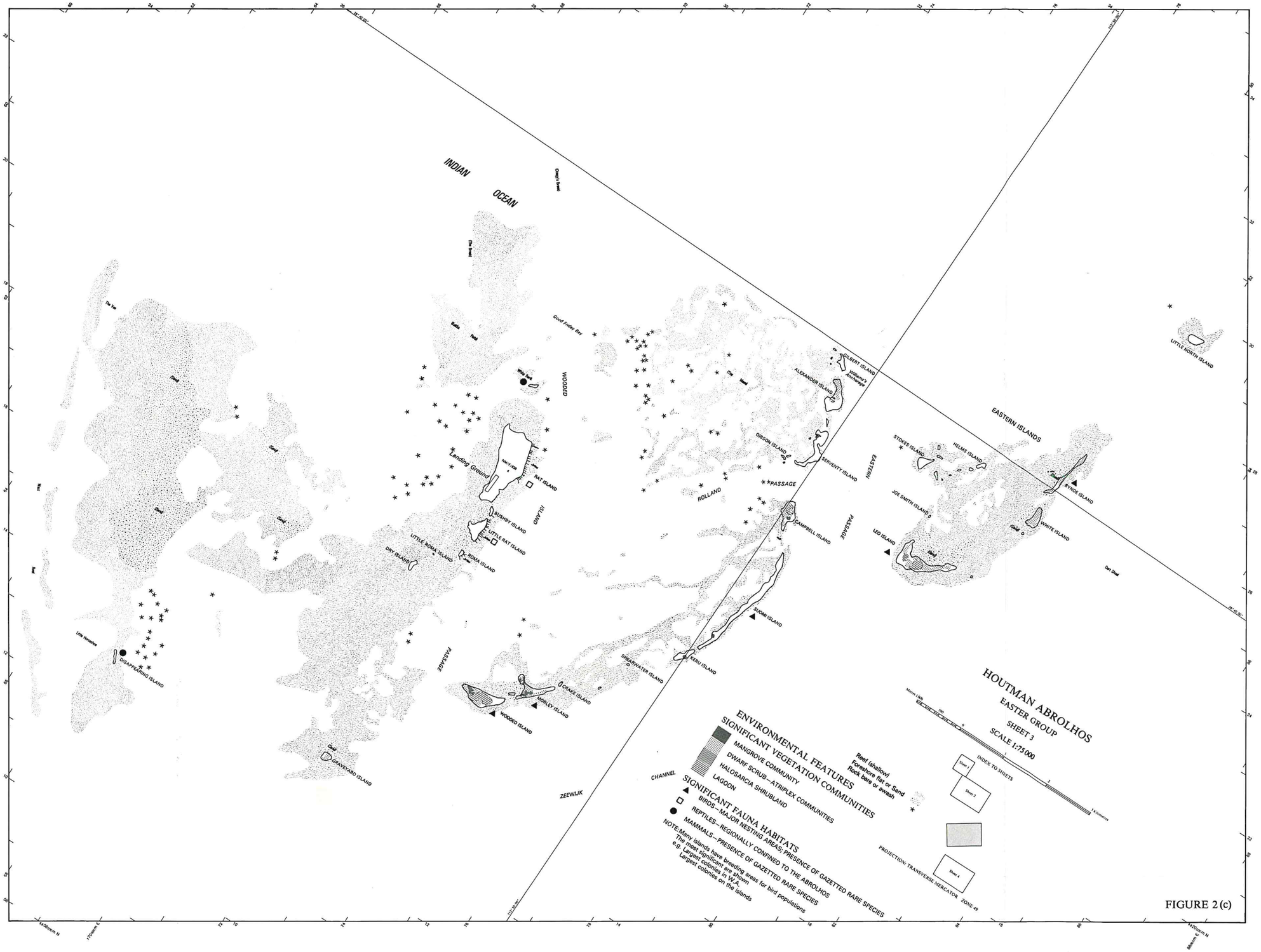
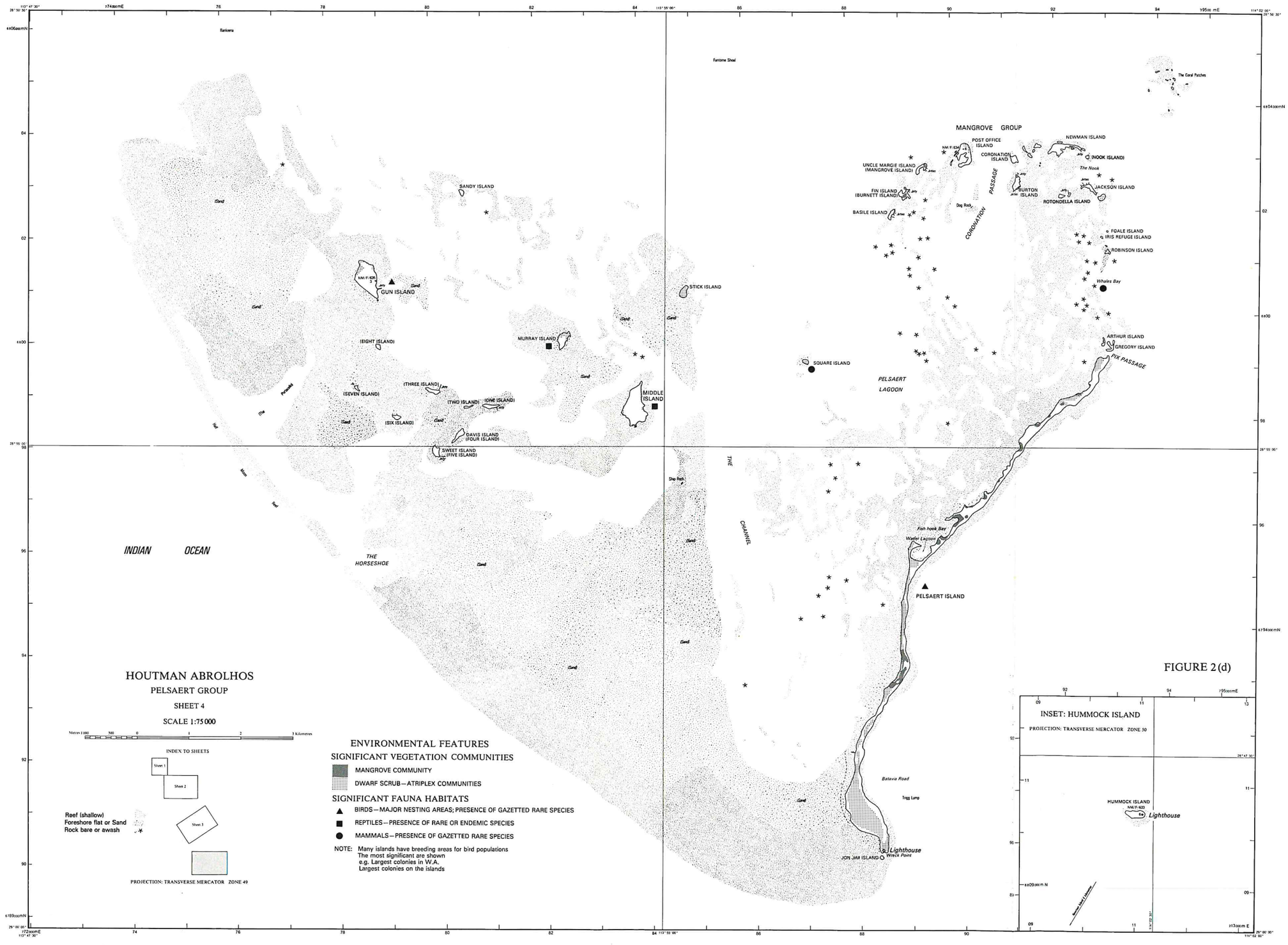

INDIAN OCEAN
Owen Swell
Ellis Swell
Good Friday Bay
WOODED
Landing Ground
MAY ISLAND
RAT ISLAND
BUSHBY ISLAND
LITTLE RAT ISLAND
LITTLE ROMA ISLAND
ROMA ISLAND
DRY ISLAND
DISAPPEARING ISLAND
GRAVEYARD ISLAND
CHAKE ISLAND
MORLEY ISLAND
WOODED ISLAND
SUGARWATER ISLAND
PASSAGE
ROLLAND
PASSAGE
KERU ISLAND
SUOMI ISLAND
CAMPBELL ISLAND
GIBSON ISLAND
SERVENTY ISLAND
EASTERN
EASTERN ISLANDS
ALEXANDER ISLAND
GILBERT ISLAND
Wallaroo's Anchorage
LITTLE NORTH ISLAND
STOKES ISLAND
HELMS ISLAND
JOE SMITH ISLAND
LEO ISLAND
WHITE ISLAND
BRADE ISLAND
CHANNEL
ZEEWIJK
ENVIRONMENTAL FEATURES
SIGNIFICANT VEGETATION COMMUNITIES
MANGROVE COMMUNITY
DWARF SCRUB – ATRIPLEX COMMUNITIES
HALOSARCIA SHRUBLAND
LAGOON
SIGNIFICANT FAUNA HABITATS
BIRDS – MAJOR NESTING AREAS; PRESENCE OF GAZETTED RARE SPECIES
REPTILES – REGIONALLY CONFINED TO THE ABROLHOS
MAMMALS – PRESENCE OF GAZETTED RARE SPECIES
NOTE: Many islands have breeding areas for bird populations
The most significant are shown
e.g. Largest colonies in W.A.
Largest colonies on the islands
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
INDEX TO SHEETS
Sheet 1
Sheet 2
Sheet 4
PROJECTION: TRANSVERSE MERCATOR ZONE 49
HOUTMAN ABROLHOS
EASTER GROUP
SHEET 3
SCALE 1:75 000

FIGURE 2 (c)



HOUTMAN ABROLHOS

PELSAERT GROUP

SHEET 4

SCALE 1:75 000

ENVIRONMENTAL FEATURES

SIGNIFICANT VEGETATION COMMUNITIES

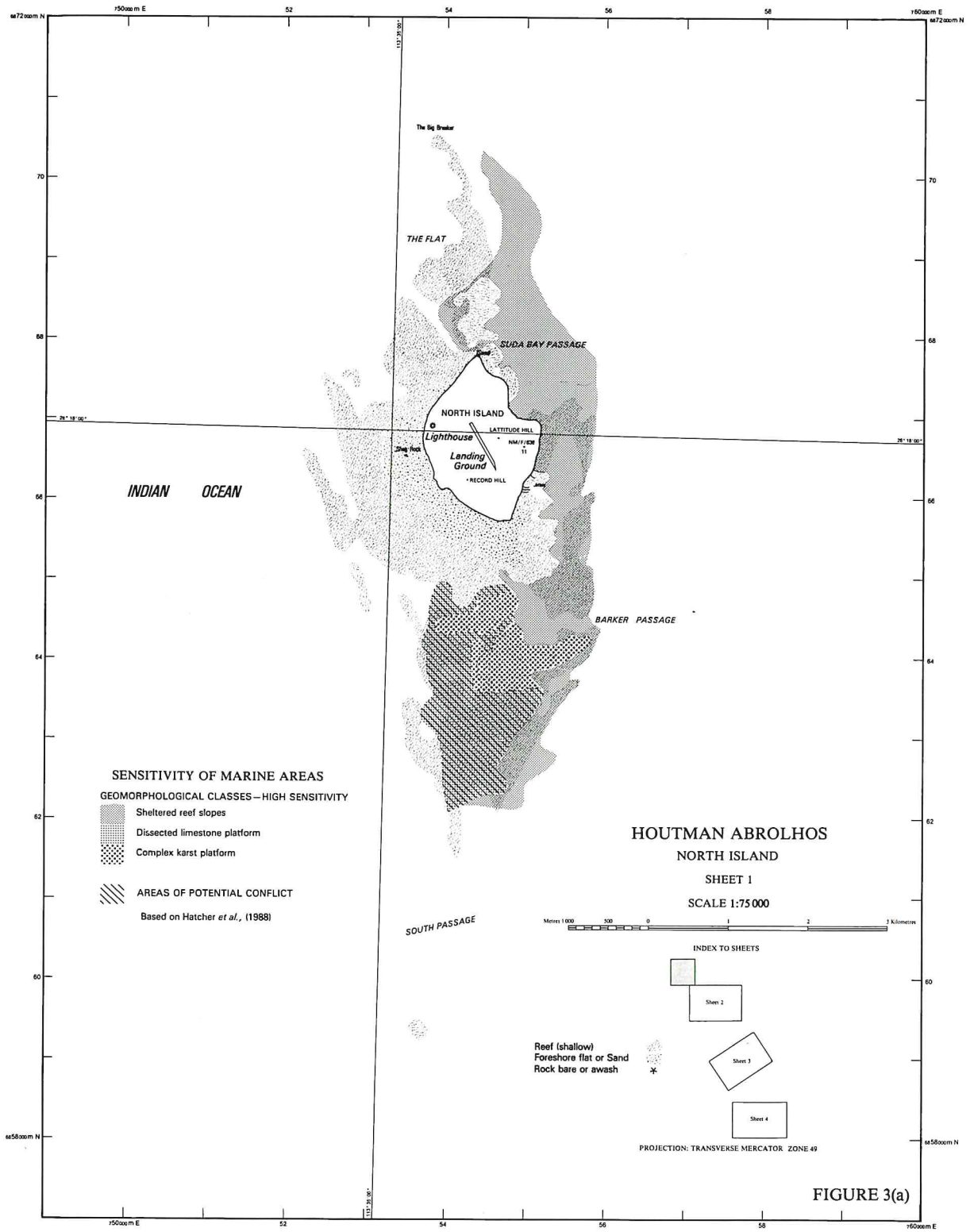
- MANGROVE COMMUNITY
- DWARF SCRUB—ATRIPLEX COMMUNITIES

SIGNIFICANT FAUNA HABITATS

- ▲ BIRDS—MAJOR NESTING AREAS; PRESENCE OF GAZETTED RARE SPECIES
- ■ REPTILES—PRESENCE OF RARE OR ENDEMIC SPECIES
- ● MAMMALS—PRESENCE OF GAZETTED RARE SPECIES

NOTE: Many islands have breeding areas for bird populations
The most significant are shown
e.g. Largest colonies in W.A.
Largest colonies on the islands

FIGURE 2 (d)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The Big Breaker
THE FLAT
SUDA BAY PASSAGE
Reef
NORTH ISLAND
Lighthouse
LATTITUDE HILL
NM/F/E36
11
Landing Ground
RECORD HILL
Jetty
Shag Rock
INDIAN OCEAN
BARKER PASSAGE
SOUTH PASSAGE
SENSITIVITY OF MARINE AREAS
GEOMORPHOLOGICAL CLASSES – HIGH SENSITIVITY
Sheltered reef slopes
Dissected limestone platform
Complex karst platform
AREAS OF POTENTIAL CONFLICT
Based on Hatcher et al., (1988)
HOUTMAN ABROLHOS
NORTH ISLAND
SHEET 1
SCALE 1:75 000
Metres 1 000 500 0 1 2 3 Kilometres
INDEX TO SHEETS
Sheet 2
Sheet 3
Sheet 4
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 3(a)

INDIAN OCEAN

EAST WALLABI ISLAND
Landing Ground
FLAG HILL
EAGLE HILL
Turtle Bay
Fish Point
Blowfish Point
The Spit
Shag Bay
Pelican Point
TURNSTONE ISLAND
SEAGULL ISLAND
PELICAN ISLAND
Pigeon Island Anchorage
PIGEON ISLAND
LUMLEY ISLAND
LITTLE PIGEON ISLAND
OYSTERCATCHER ISLAND
WEST WALLABI ISLAND
Horseyard Bay
Tattler Bay
TATTLER ISLAND
Rocky Bay
MANGROVE ISLAND
Oyster Dam
Snake Flat
Eagle Point
West Reef
Shag Rock
Sand
PASSAGE
SHEETER ISLAND
SANDY ISLAND
LONG ISLAND
SMALL ISLAND
FAR ISLAND
EASTERN ISLAND
HALL ISLAND
SAVILLE-KENT ISLAND
DAKIN ISLAND
SEAL ISLAND
GOSS PASSAGE
THE LAGOON
THREE SISTERS
DICK ISLAND (GOSS ISLAND)
North East Reef
Evening Reef
Crazy Corner
Noon Reef

SENSITIVITY OF MARINE AREAS

GEOMORPHOLOGICAL CLASSES – HIGH SENSITIVITY

- Sheltered reef slopes
- Dissected limestone platform
- Complex karst platform
- Drowned doline field
- Isolated patch reefs

AREAS OF POTENTIAL CONFLICT

Based on Hatcher *et al.*, (1988)

HOUTMAN ABROLHOS

WALLABI GROUP

SHEET 2

SCALE 1:75 000

Metres 1 000 500 0 1 2 3 Kilometres

INDEX TO SHEETS

Sheet 1
Sheet 3
Sheet 4

Reef (shallow)
Foreshore flat or Sand
Rock bare or awash

PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 3 (b)

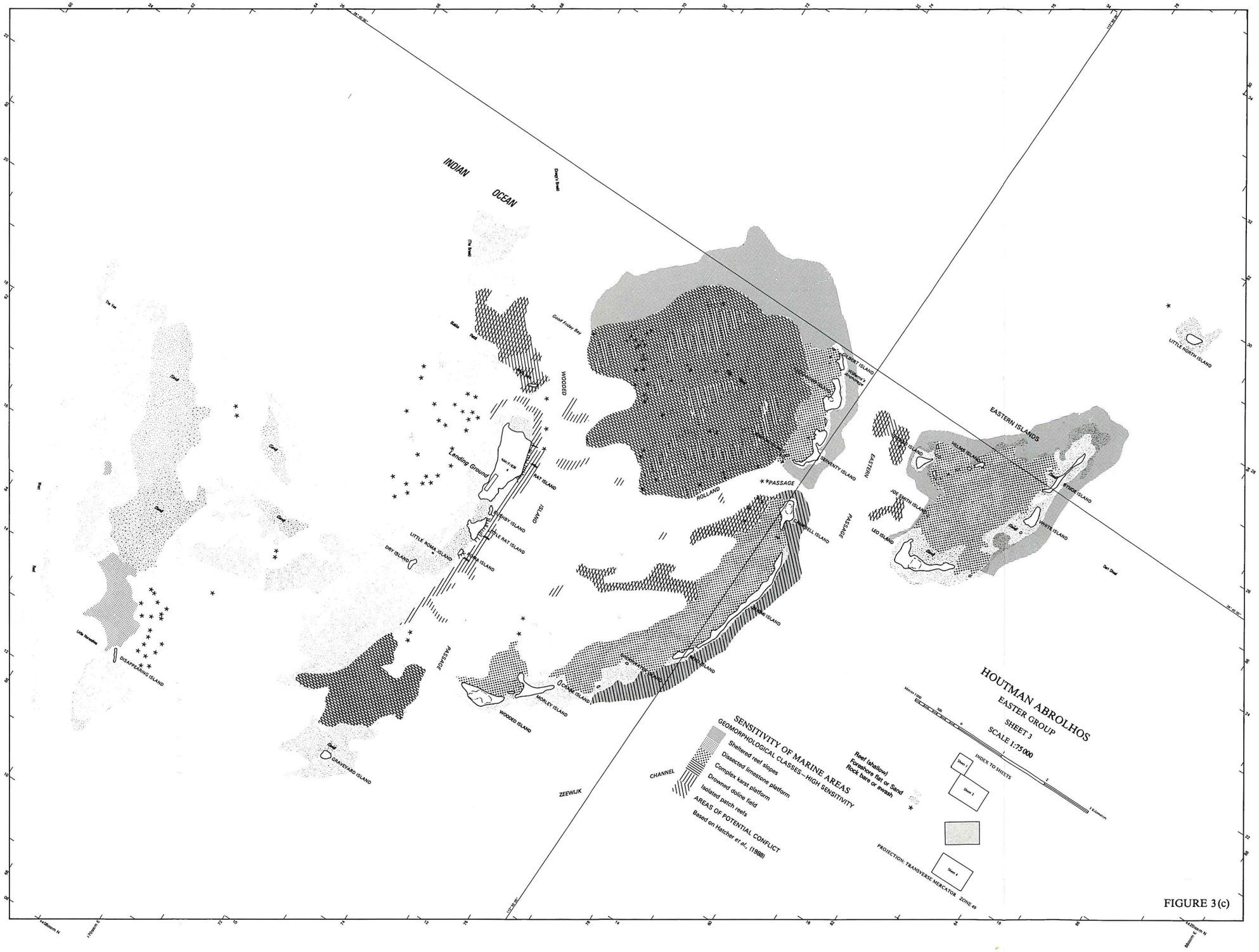

INDIAN OCEAN
Good Friday Bay
WOODED
Landing Ground
PASSAGE
ROLLAND
EASTERN ISLANDS
LITTLE NORTH ISLAND
LITTLE ROMA ISLAND
ROMA ISLAND
DRY ISLAND
DISAPPEARING ISLAND
GRAVEYARD ISLAND
MOBLEY ISLAND
WOODED ISLAND
ZEEWIJK
CHANNEL
SENSITIVITY OF MARINE AREAS
GEOMORPHOLOGICAL CLASSES – HIGH SENSITIVITY
Sheltered reef slopes
Dissected limestone platform
Complex karst platform
Drowned doline field
Isolated patch reefs
AREAS OF POTENTIAL CONFLICT
Based on Hatcher et al., (1998)
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
HOUTMAN ABROLHOS
EASTER GROUP
SHEET 3
SCALE 1:75 000
INDEX TO SHEETS
PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 3(c)

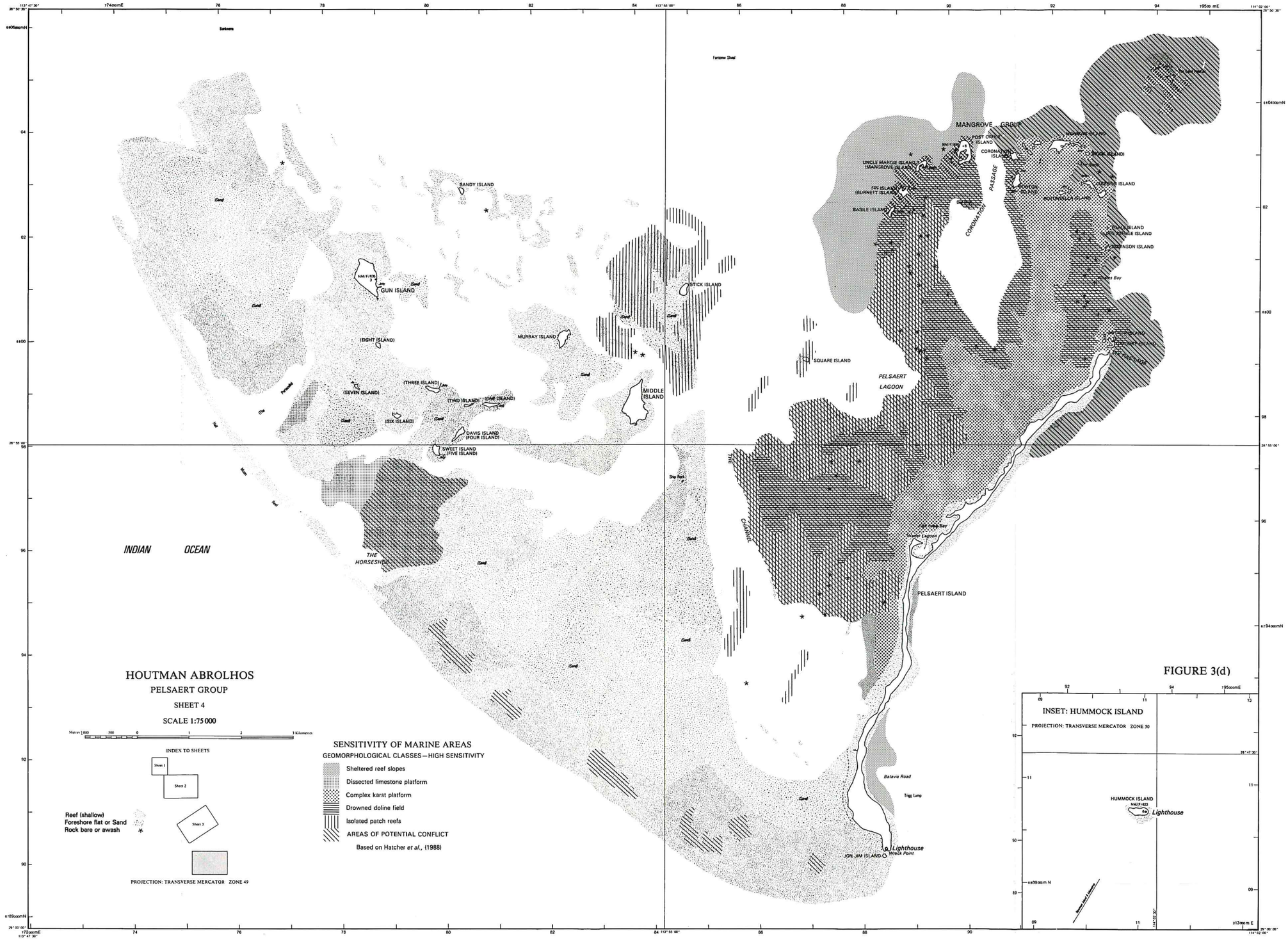
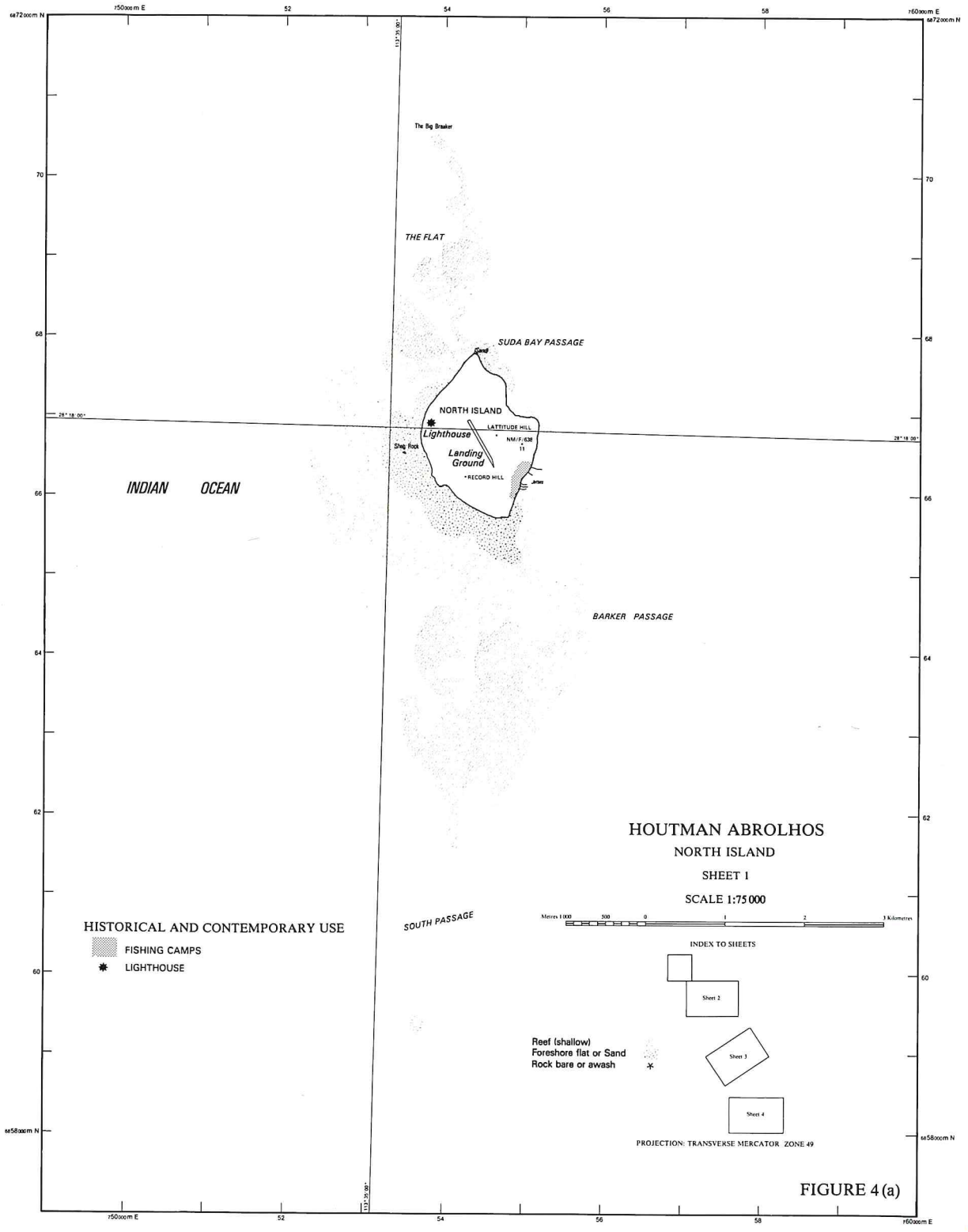

INDIAN OCEAN
MANGROVE GROUP
POST OFFICE ISLAND
CORONATION ISLAND
UNCLE MARGIE ISLAND (MANGROVE ISLAND)
FIN ISLAND (BURNETT ISLAND)
BASILE ISLAND
CORONATION PASSAGE
BOOM ISLAND
PATTERSON ISLAND
ROBINSON ISLAND
SQUARE ISLAND
PELSAERT LAGOON
PELSAERT ISLAND
SANDY ISLAND
GUN ISLAND
STICK ISLAND
MURRAY ISLAND
(EIGHT ISLAND)
(SEVEN ISLAND)
(THREE ISLAND)
(TWO ISLAND)
(ONE ISLAND)
MIDDLE ISLAND
(SIX ISLAND)
DAVIS ISLAND (FOUR ISLAND)
SWEET ISLAND (FIVE ISLAND)
THE HORSESHOE
CHANNEL
Batavia Road
Trigg Lump
JOHN JIM ISLAND
Lighthouse
Wreck Point
Ship Rock
Sandbank
Reef
HOUTMAN ABROLHOS
PELSAERT GROUP
SHEET 4
SCALE 1:75 000
Metres 1,000 500 0 1 2 3 Kilometres
INDEX TO SHEETS
Sheet 1
Sheet 2
Sheet 3
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
PROJECTION: TRANSVERSE MERCATOR ZONE 49
SENSITIVITY OF MARINE AREAS
GEOMORPHOLOGICAL CLASSES – HIGH SENSITIVITY
Sheltered reef slopes
Dissected limestone platform
Complex karst platform
Drowned doline field
Isolated patch reefs
AREAS OF POTENTIAL CONFLICT
Based on Hatcher et al., (1988)
INSET: HUMMOCK ISLAND
PROJECTION: TRANSVERSE MERCATOR ZONE 50
HUMMOCK ISLAND
Lighthouse

FIGURE 3(d)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6658000m N
The Big Breaker
THE FLAT
SUDA BAY PASSAGE
NORTH ISLAND
Lighthouse
LATTITUDE HILL
NM/F/638
11
Landing Ground
RECORD HILL
Shag Rock
INDIAN OCEAN
BARKER PASSAGE
SOUTH PASSAGE
HISTORICAL AND CONTEMPORARY USE
FISHING CAMPS
LIGHTHOUSE
HOUTMAN ABROLHOS
NORTH ISLAND
SHEET 1
SCALE 1:75 000
Metres 1000 500 0 1 2 3 Kilometres
INDEX TO SHEETS
Sheet 2
Sheet 3
Sheet 4
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 4 (a)

INDIAN OCEAN

EAST WALLABI ISLAND
Well
Well
Landing Ground
FLAG HILL 15
Jetty
EAGLE HILL
Fish Point
Turtle Bay
Recruit Bay
Blowfish Point
The Reef
Shag Bay
Old Guano Jetty
Pelican Point
PELICAN ISLAND
TURNSTONE ISLAND
Gage Roads
Anchorage
PIGEON ISLAND
Pigeon Island
SEAGULL ISLAND
'Fort'
Fireplaces
Cairn/Well
'Fort'
Fireplace
Well
OYSTERCATCHER ISLAND
Slaughter Point
LUMLEY ISLAND
LITTLE PIGEON ISLAND
Jetty
PASSAGE
Reef
WEST WALLABI ISLAND
Well
Harvey Bay
Tartler Bay
TARTLER ISLAND
Rocky Bay
Sand
Corner Cairn
MANGROVE ISLAND
Snake Flat
Shag Rock
Sand
Cairn
Eagle Point
West Reef
Evening Reef
Shelter Reef
PASSAGE
HARTLEY ISLAND
SANDY ISLAND
LAGOON ISLAND
SMALL ISLET
LONG ISLAND
PASSAGE
SANDY ISLAND
GOSS
THE LAGOON
THREE SISTERS
DICK ISLAND (GOSS ISLAND)
TRAITORS ISLAND
SEAL ISLAND
Hadda Wreck Site
BEACON ISLAND
HALL ISLAND
SAVILLE-KENT ISLAND
DAKIN ISLAND
Mowing Reef
Inside site
Batavia Wreck Site
main site
FAR ISLAND
EASTERN ISLAND
North East Reef
(Crazy Corner)
Nicou Reef

HISTORICAL AND CONTEMPORARY USE

- FISHING CAMPS
- GUANO MINED AREA
- GUANO MINING RAIL/TRAM LINES
- IMPORTANT HISTORIC SITE
- WRECK SITE—MAIN
- WRECK SITE—ASSOCIATED WRECKAGE

HOUTMAN ABROLHOS

WALLABI GROUP

SHEET 2

SCALE 1:75 000

Metres 1 000 500 0 1 2 3 Kilometres

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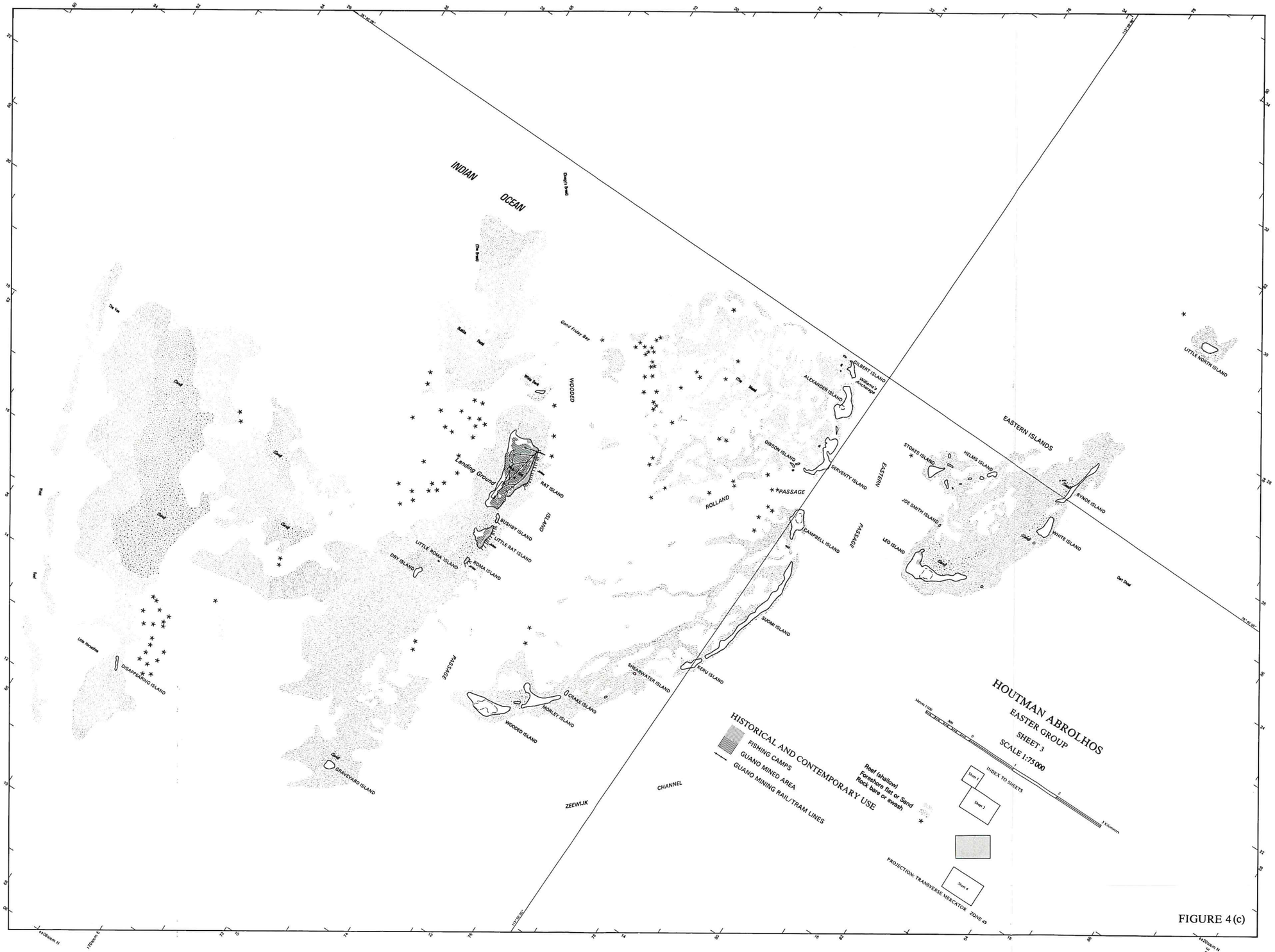
Sheet 4

Reef (shallow)
Foreshore flat or Sand
Rock bare or awash

PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 4(b)


INDIAN
OCEAN
Clerk's Island
The Isle
Good Friday Bay
White Reef
WOODED
ISLAND
Landing Ground
RAT ISLAND
BUSHBY ISLAND
LITTLE RAT ISLAND
LITTLE ROMA ISLAND
ROMA ISLAND
DRY ISLAND
PASSAGE
DISAPPEARING ISLAND
CRAKE ISLAND
MORLEY ISLAND
WOODED ISLAND
GRAVEYARD ISLAND
Little Horseshoe
The Ice
Shoal
Reef
Wreck
ZEEWIJK
CHANNEL
GILBERT ISLAND
Wallaroo's Anchorage
ALEXANDER ISLAND
The Nest
GIBSON ISLAND
SERVENTY ISLAND
EASTERN
PASSAGE
ROLLAND
PASSAGE
CAMPBELL ISLAND
SUOMI ISLAND
SHEARWATER ISLAND
KERU ISLAND
EASTERN ISLANDS
STOKES ISLAND
HELMS ISLAND
JOE SMITH ISLAND
LEO ISLAND
BYNOE ISLAND
WHITE ISLAND
Owl Shoal
LITTLE NORTH ISLAND
HOUTMAN ABROLHOS
EASTER GROUP
SHEET 3
SCALE 1:75 000
HISTORICAL AND CONTEMPORARY USE
FISHING CAMPS
GUANO MINED AREA
GUANO MINING RAIL/TRAM LINES
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
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PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 4 (c)

HOUTMAN ABROLHOS
PELSAERT GROUP
SHEET 4
SCALE 1:75 000

INDEX TO SHEETS

Reef (shallow)
Foreshore flat or Sand
Rock bare or awash

PROJECTION: TRANSVERSE MERCATOR ZONE 49

HISTORICAL AND CONTEMPORARY USE
- FISHING CAMPS
- LIGHTHOUSE
- GUANO MINED AREA
- GUANO MINING RAIL/TRAM LINES
- WRECK SITE—MAIN
- WRECK SITE—ASSOCIATED WRECKAGE
- IMPORTANT HISTORIC SITE

INDIAN OCEAN

Zeewijk Wreck Site (Main Anchor)
Zeewijk Survivors Campsite
Well
GUN ISLAND
SANDY ISLAND
STICK ISLAND
(EIGHT ISLAND)
MURRAY ISLAND
Zeewijk survivors used well
(SEVEN ISLAND)
(THREE ISLAND)
(TWO ISLAND)
(ONE ISLAND)
(SIX ISLAND)
DAVIS ISLAND (FOUR ISLAND)
SWEET ISLAND (FIVE ISLAND)
MIDDLE ISLAND
Cairn
Stone Tower
Zeewijk survivors used well
THE HORSESHOE
Ocean Queen Wreck Site
Ship Rock
CHANNEL
Windsor—boiler, hull, etc.
Windsor Wreck Site
Fantome Shoal
The Coral Patches
MANGROVE GROUP
POST OFFICE ISLAND
NEWMAN ISLAND
CORONATION ISLAND
INOOK ISLAND
The Nook
UNCLE MARGIE ISLAND (MANGROVE ISLAND)
FIN ISLAND (BURNETT ISLAND)
BASILE ISLAND
Dog Rock
PASSAGE
CORONATION
BURTON ISLAND
JACKSON ISLAND
ROTONDELLA ISLAND
FOALE ISLAND
IRIS REFUGE ISLAND
ROBINSON ISLAND
Whales Bay
ARTHUR ISLAND
GREGORY ISLAND
PIX PASSAGE
SQUARE ISLAND
PELSAERT LAGOON
Fish hook Bay
Wadal Lagoon
Ben Ledi Onshore Site
Ben Ledi Wreck Site
PELSAERT ISLAND
Phosphate Loading Jetty and Limestone Causeway (B.P.C.)
Stockpile Loading Bay
Batavia Road
Trigg Lump
19th Century Jetty
W.W. II Limestone Causeway (B.P.C.)
Gazes Camp
Well
Lighthouse
Wreck Point
JON JIM ISLAND

INSET: HUMMOCK ISLAND
PROJECTION: TRANSVERSE MERCATOR ZONE 50
HUMMOCK ISLAND
Lighthouse

FIGURE 4(d)

INDIAN OCEAN

EAST WALLABI ISLAND
Landing Ground
FLAG HILL 15
EAGLE HILL
Turtle Bay
Bluff Point
Blowfish Point
The Reef
Recruit Bay
Shag Bay
Pelican Point
TURNSTONE ISLAND
Sugar Reef
SEAGULL ISLAND
PIGEON ISLAND
PELICAN ISLAND
Shoal
LUMLEY ISLAND
LITTLE PIGEON ISLAND
OYSTERCATCHER ISLAND
Stingaree Point
WEST WALLABI ISLAND
Horseyard Bay
Tattler Bay
TATTLER ISLAND
Rocky Bay
MANGROVE ISLAND
Snake Flat
Sting Rock
Eagle Point
West Reef
Evening Reef
PASSAGE
Bar REEF
SHELTER ISLAND
SANDY ISLAND
HARTLEY ISLAND
SANDY ISLAND
LAGOON ISLAND
THE LAGOON
THREE SISTERS
DICK ISLAND (GOSS ISLAND)
SMALL ISLET
LONG ISLAND
BEACON ISLAND
GOSS PASSAGE
TRAITORS ISLAND
FAR ISLAND
EASTERN ISLAND
HOOK ISLAND
SOUTH PINNACLE ISLAND
DANGER ISLAND
RAT ISLAND
North-East Reef
(Deep Channel)
Reef

IMPORTANT RECREATION AREAS

- MOORING SITES
- DIVING SITES
- MAJOR AREAS/DESTINATIONS
- LAND SITES VISITED BY CHARTERS
- FISHING AREAS

HOUTMAN ABROLHOS

WALLABI GROUP

SHEET 2

SCALE 1:75 000

Metres 1 000 500 0 1 2 3 Kilometers

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Reef (shallow)
Foreshore flat or Sand
Rock bare or awash

PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 5 (a)

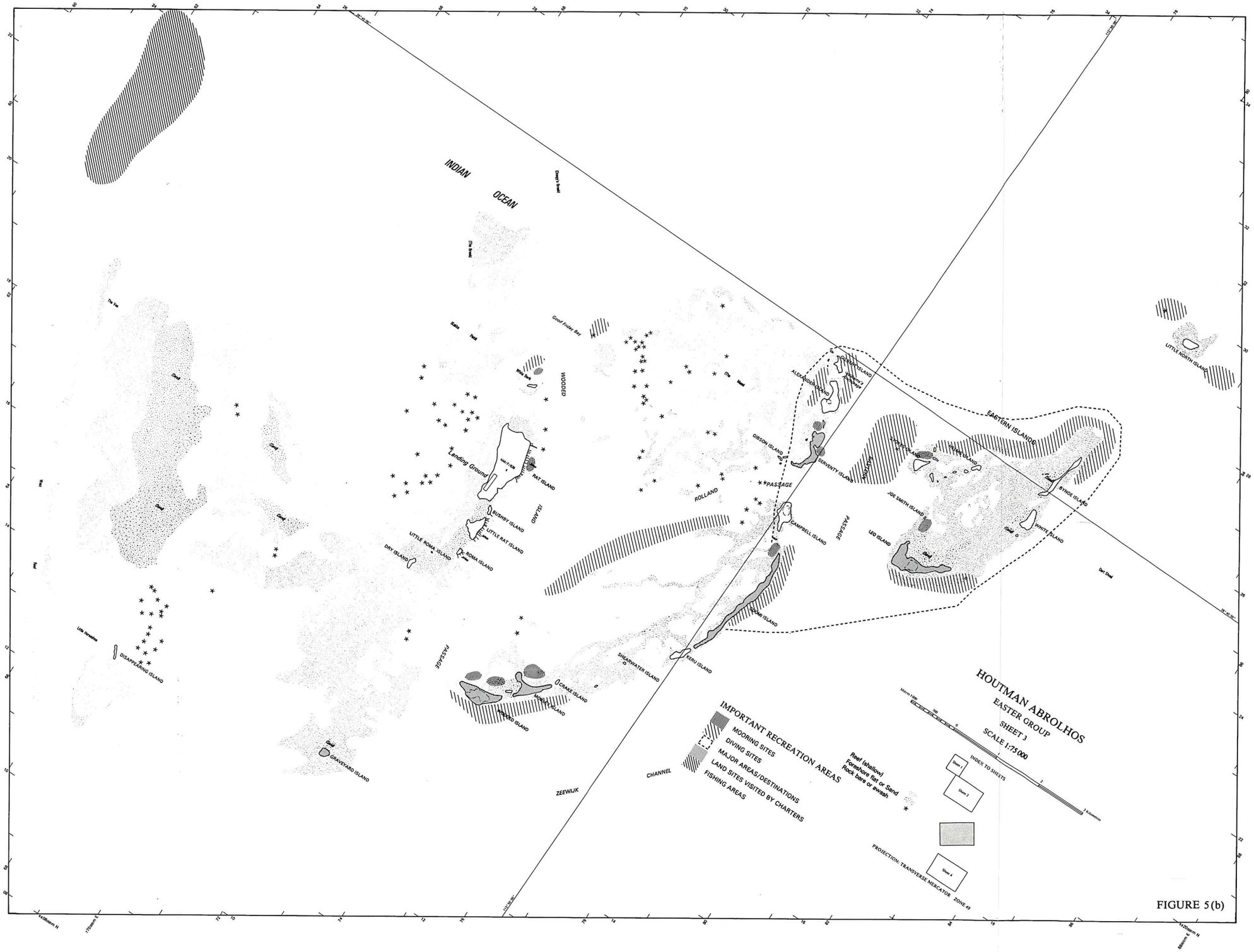
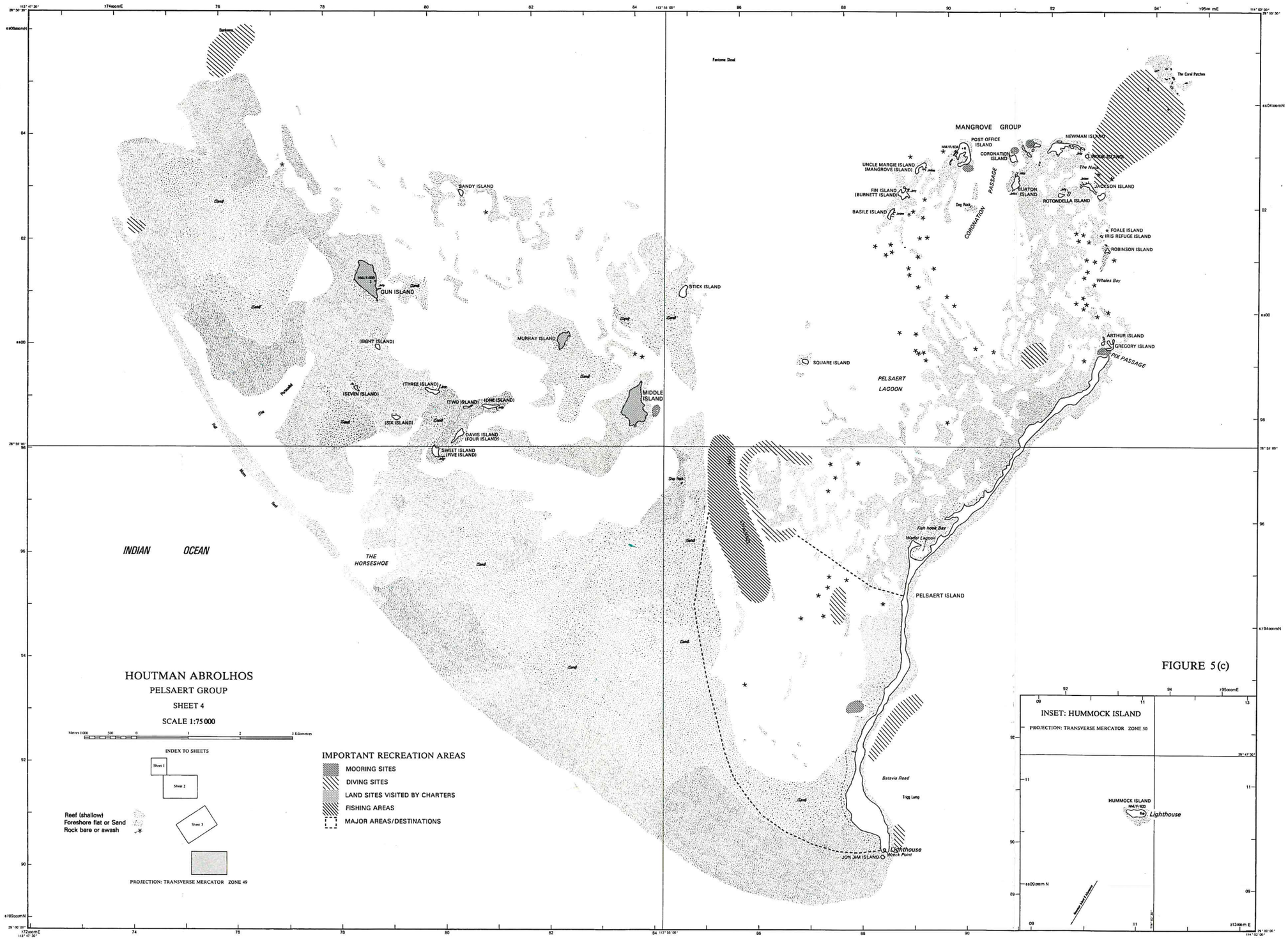

INDIAN OCEAN
Diego Small
Pal
Good Fisher Bay
WOODED
Landing Ground
RAT ISLAND
BUSHBY ISLAND
LITTLE RAT ISLAND
ROLLAND
PASSAGE
CAMPBELL ISLAND
LITTLE ROMA ISLAND
ROMA ISLAND
DRY ISLAND
DISAPPEARING ISLAND
GRAVEYARD ISLAND
CRAGG ISLAND
SPOON ISLAND
TWIN ISLAND
SHEARWATER ISLAND
KERU ISLAND
ZEEWIJK
CHANNEL
ALEXANDER ISLAND
GIBSON ISLAND
SERVENTY ISLAND
EASTERN ISLANDS
JOE SMITH ISLAND
LED ISLAND
BYNOE ISLAND
WHITE ISLAND
LITTLE NORTH ISLAND
Dot Shelf
IMPORTANT RECREATION AREAS
MOORING SITES
DIVING SITES
MAJOR AREAS/DESTINATIONS
LAND SITES VISITED BY CHARTERS
FISHING AREAS
Reef (shallow)
Foreshore flat or Sand
Rock bare or awash
HOUTMAN ABROLHOS
EASTER GROUP
SHEET 3
SCALE 1:75 000
INDEX TO SHEETS
PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 5(b)



HOUTMAN ABROLHOS

PELSAERT GROUP

SHEET 4

SCALE 1:75 000

Metres 1 000 500 0 1 2 3 Kilometers

INDEX TO SHEETS

Sheet 1
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Reef (shallow)
Foreshore flat or Sand
Rock bare or awash

IMPORTANT RECREATION AREAS

- MOORING SITES
- DIVING SITES
- LAND SITES VISITED BY CHARTERS
- FISHING AREAS
- MAJOR AREAS/DESTINATIONS

PROJECTION: TRANSVERSE MERCATOR ZONE 49

FIGURE 5(c)

113° 30′ 00″

114° 00′ 00″

North Island

PASSAGE

SOUTH

GEELVINK

CHANNEL

East Wallabi Island

WALLABI GROUP

West Wallabi Island

28° 30′ 00″

28° 30′ 00″

CHANNEL

MIDDLE

Little North Island

EASTER GROUP

Suomi Island

Rat Island

CHANNEL

Hummock Island

ZEEWIJK

STATE TERRITORIAL WATERS BOUNDARY

MANGROVE GROUP

Post Office Island

Newman Island

Gun Island

Middle Island

PELSAERT GROUP

Pelsaert Island

ABROLHOS ISLANDS KEY RESOURCE MANAGEMENT AREA

PLANNING STRATEGY

BOUNDARY OF AQUATIC RESERVE

ABROLHOS ISLANDS NATIONAL PARK

MARINE PARKS

ISLANDS FOR THE PURPOSE OF THE FISHING INDUSTRY

(NOTE: ALL BOUNDARIES ARE DIAGRAMMATIC)

0 5 10 kilometres

JANUARY 1989

29° 00′ 00″

29° 00′ 00″

113° 30′ 00″

114° 00′ 00″