
FORESTRY AND FISHING

FORESTRY

Forests are an important national resource, renewable over time and providing a wide range of indispensable products and benefits to the community.

The cover of forest vegetation protects the soil from water and wind erosion, reduces flash flooding and siltation of water storages, and maintains the quality of water. Forests provide habitat for a variety of native animals and plants, many of which depend on specific forest environments for survival.

Native and plantation forests contribute substantially to the Australian economy, especially to employment in rural areas. Forests also represent ecosystems of value for education, scientific research, tourism, recreation and other purposes. Not all forests are necessarily suitable for all types of uses at the same time. Yet careful management will ensure that the forests provide multiple benefits in the long-term, for the Australian community.

Forestry in the States and Territories

In the Commonwealth framework, State governments are primarily responsible for land management. Each State has a forest authority responsible for the management and control of publicly-owned forests, in accordance with Forestry Acts and Regulations. The Office of the ACT Administration, housed within the Department of the Arts, Sport, the Environment, Tourism and Territories, is responsible for the management and control of forests in the Australian Capital Territory. Forestry in the Northern Territory is the responsibility of the Northern Territory Conservation Commission. In Victoria and Western Australia the former independent forest services have been amalgamated with conservation and land management authorities.

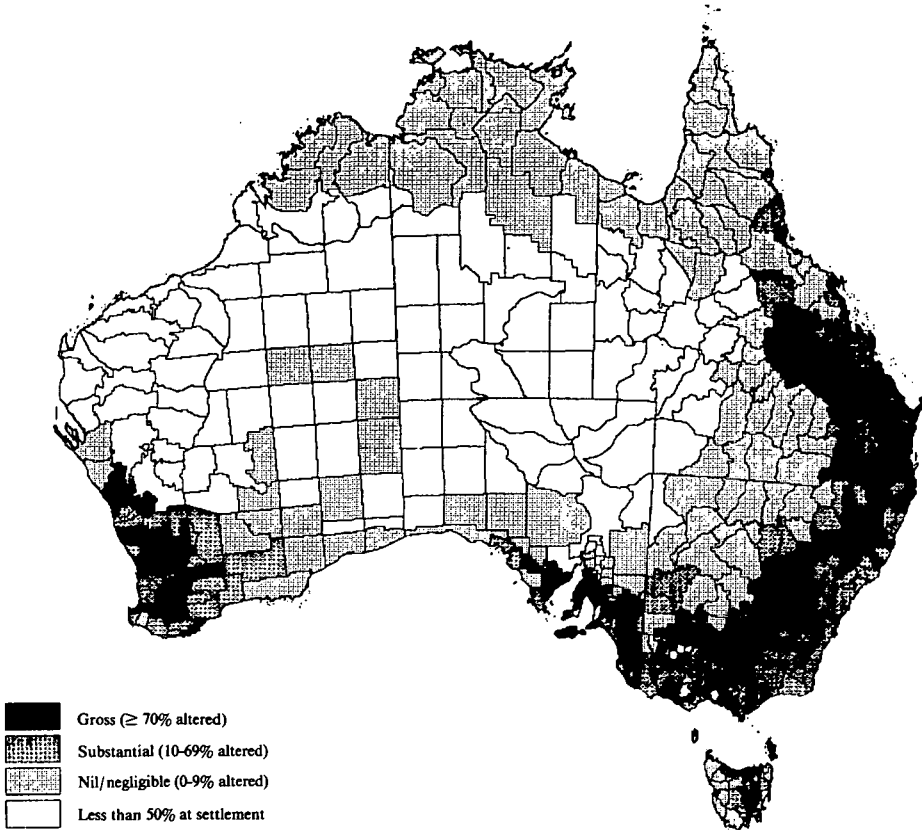
Commonwealth forestry administration

The Department of Primary Industries and Energy is responsible for forestry matters at the national level. Its primary responsibilities are the administration of a control on the export of unprocessed timber; liaison with State, national and international organisations concerned with forestry; and provision of the Secretariat for the Australian Forestry Council.

Existing forest estate

Native forest is defined as land dominated by trees with an existing or potential mature height of twenty metres or more, including native stands of cypress pine in commercial use regardless of height. The total area of native forest was estimated at 40.8 million hectares as at 30 June 1988.

**DISTURBANCE TO AUSTRALIAN FORESTS AND WOODLANDS
SINCE EUROPEAN SETTLEMENT**



This map, produced by CSIRO using the Australian Resources Information System (Cocks et al., 1987) shows the extent to which Australian natural forests and woodlands have been disturbed (usually meaning cleared) since European settlement.

For this map, forests and woodlands are defined as including:

- tree communities with at least 10 per cent projected foliage cover;
- tall (>2 m) Eucalypt shrub communities with at least 10 per cent projected foliage cover (e.g. Mallee);
- mangroves.

Two factors, original vegetation and recent land cover, have been combined to estimate the changes to forests and woodlands since European settlement (Wells et al., 1984).

The percentages shown on this map are conservative, i.e. at least these percentages of the original forests and woodlands have been disturbed. Estimates of the percentage of forests and woodlands disturbed in each State are:

New South Wales, 49%; Victoria, 68%; Queensland, 35%; South Australia, 40%; Western Australia, 31%; Tasmania, 36%; Northern Territory, 0%; Australian Capital Territory, 60%.

Sources:

Cocks, K.D., Walker, P.A. and Parvey, C.A. *Evolution of a Continental Scale Geographic Information System*. Submitted to the International Journal of Geographic Information Systems

Wells, K.F., Wood, N.H. and Laut, P. (1984) *Loss of Forests and Woodlands in Australia: A Summary by State, Based on Rural Local Government Areas*. CSIRO Division of Water and Land Research Technical Memorandum 84/4.

Of the 40.8 million hectares, 29.9 million hectares are in public ownership. The bulk of the 11.0 million hectares of private native forest are not actively managed for wood. Of the 29.9 million hectares of public forests, 5.3 million hectares have national park status and 12.3 million hectares are Crown forests, vacant or occupied under lease on which wood harvesting is carried out under government control but are not reserved and actively managed for wood production.

Of the 12.3 million hectares of State forests, 0.6 million hectares are special reserves managed for other than wood production purposes and on 4.4 million hectares, wood harvesting is restricted partly because of management priorities for other values and partly due to present economic inaccessibility. This leaves 7.3 million hectares or about 18 per cent of a total 40.8 million hectares actively managed for wood production.

**NATIVE FOREST AREAS: BY FOREST TYPE AND OWNERSHIP: BY STATE
AT 30 JUNE 1988
(' 000 hectares)**

<i>Item</i>	<i>NSW</i>	<i>Vic.</i>	<i>Qld</i>	<i>WA</i>	<i>SA</i>	<i>Tas.</i>	<i>NT</i>	<i>ACT</i>	<i>Total</i>
CLASSIFIED BY FOREST TYPE GROUPS									
Forest type									
Rainforest	265	13	1,237	—	—	499	38	—	2,052
Eucalypt productivity									
Class I (a)	1,207	527	205	178	—	442	—	—	2,559
Eucalypt productivity									
Class II (a)	3,659	4,255	1,290	2,477	—	1,903	—	51	13,635
Eucalypt productivity									
Class III (a)	8,009	455	3,300	—	—	—	—	—	11,764
Tropical eucalypt and paperbark (b)	—	—	4,078	—	—	—	2,450	—	6,528
Cypress pine	1,819	7	1,686	—	—	—	778	—	4,290
Total	14,959	5,257	11,796	2,655	—	2,844	3,266	51	40,828
CLASSIFIED BY OWNERSHIP									
Ownership category									
<i>Public</i>	9,759	4,652	10,304	2,153	—	2,177	839	51	29,935
— Category 1	3,222	2,688	3,182	1,863	—	1,391	0	0	12,346
— Category 2	4,390	447	6,412	52	—	461	524	9	12,295
— Category 3	2,147	1,517	710	238	—	325	315	42	5,294
<i>Private</i>	5,200	605	1,492	502	—	667	2,427	—	10,893
Total	14,959	5,257	11,796	2,655	—	2,844	3,266	51	40,828

(a) Eucalypt forests are grouped into productivity classes in descending order of productivity. No specific indexes of productivity have been developed for these classes and there can be some overlap, especially between states, in the relative productivity levels used to assign particular forest types to productivity classes. (b) Includes tropical eucalypt and paperbark not in commercial use.

NOTE: Public 1: Forest land managed for multiple use including wood production. Public 2: Crown land either vacant or occupied under lease on which wood harvesting is carried out under government control but is not reserved and managed for that purpose. Public 3: Land on which wood production is excluded (National Parks etc.).

For more details on Australian native forests see *Year Book* No. 61.

Plantations

Tree plantations of a few coniferous species now provide a large part of Australian-grown wood supplies. The large scale establishment of these plantations was commenced by State Forest Services early this century, and in the case of South Australia, last century, to overcome the shortage of native coniferous timber. In an eleven year period covered by the *Softwood Forestry Agreements Acts 1967, 1972 and 1976*, the Commonwealth provided financial assistance to the States in the order of \$55 million for an extended program of softwood plantation development. A further Act in 1978 provided funds for a five year period to 30 June 1981 for the maintenance of the area of plantations established previously with Commonwealth funds.

Privately owned coniferous plantations amount to almost one-third the area under State ownership. New coniferous plantations (including replanting) are currently being established at the rate of 34,000 hectares per annum. A detailed account of the history and development of coniferous plantations and of the characteristics of individual species is included in *Year Book* No. 59.

Hardwood plantations are receiving increasing attention as a means of providing a secure resource base for the industry.

The Commonwealth has taken action to encourage native hardwood plantations through the establishment of the National Afforestation Program (NAP) in 1987-88, with funding of \$15 million over three years, to assist in the establishment of native hardwood plantations. NAP projects have created over 10,000 hectares of new eucalypt forests, and led to a doubling in the rate of planting prior to the NAP.

An increased interest in the establishment of eucalypt plantations is evident, particularly in Tasmania. The current annual rate of such plantations is about 5,000 hectares. The following table shows total area of plantations in Australia classified by species.

PLANTATION AREAS CLASSIFIED BY SPECIES, 31 MARCH 1988
(hectares)

Species group	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
Coniferous—									
Pinus radiata	222,814	199,373	3,264	51,905	88,622	68,380	—	13,940	648,298
Pinus elliotii	n.a.	—	88,255	290	—	—	—	—	88,545
Pinus pinaster	n.a.	—	—	28,671	3,324	—	—	—	31,995
Pinus caribaea	n.a.	—	43,865	—	—	—	2,470	—	46,335
Araucaria	1,582	—	44,593	—	—	—	—	—	46,175
Other	13,971	4,200	6,523	808	370	334	1,801	514	28,521
Total	238,367	203,573	186,500	81,674	92,316	68,714	4,271	14,454	889,869
Broadleaved—									
Eucalyptus	1,238	14,617	1,298	10,388	1,200	18,057	—	—	46,798
Populus	1,835	215	—	—	—	—	—	—	2,050
Other	34	16	496	—	—	2,696	—	—	3,242
Total	3,107	14,848	1,794	10,388	1,200	20,753	—	—	52,090
Total	241,474	218,421	188,294	92,062	93,516	89,467	4,271	14,454	941,959

(a) Native broadleaved species on public land are not identified separately from native forest areas. Other coniferous includes pinus elliotii, pinus pinaster, pinus caribaea. (b) Since 31 March 1986, plantations on aboriginal land have been transferred to private ownership and publicly owned plantations are no longer managed for wood production. (c) Does not include APM resource, which is in process of liquidation.

Source: State and Territory forest services.

Australian Forestry Council

The Commonwealth and the State Governments formed the Australian Forestry Council in 1964 to coordinate the development of the nation's forest resource in the general interest of the community. Membership of the Council comprises the State and Northern Territory Ministers responsible for forestry and the Commonwealth Minister for Primary Industries and Energy. The New Zealand Minister for Forestry has observer status on Council. The Council is serviced by a Standing Committee and specialist subcommittees.

The Australian Forestry Council's current terms of reference are to:

- promote the management of Australian forests for the benefit of the people of Australia;
- advance the welfare and development of the industries based upon these forests;
- facilitate the exchange of information between parties interested in all the uses and the protection of the forests;
- facilitate consultation and coordination between the Commonwealth, State and Territory Governments on forestry matters, especially matters having interstate or national implications;
- formulate and recommend national forest policy for Australia;
- coordinate research into all aspects of forestry including the uses of forests and forest products;
- consider matters submitted to the Council by its Standing Committee.

The Council's National Forests Strategy, which outlines important basic principles and goals associated with the management of Australia's forests as well as providing a framework for the general development of programs and ongoing administration, was tabled in Federal Parliament in November 1986.

In recognition of the need to prepare shorter term statements of forestry management objectives, in 1989 the Council authorised the publication of a Public Land Fire Management statement. Its Standing Committee prepared a position paper on Australian Bushfire Research in 1987 and supported the publication of Australian Fire Research in progress Register No. 1.

Research

Commonwealth Scientific and Industrial Research Organisation—CSIRO

CSIRO research on forests is mainly undertaken in the Division of Forestry and Forest Products which was formed on 1 January 1988, integrating research on land use and the production and processing of wood. The research is of two main types: longer-term strategic research that will help shape the future of the industry, and collaborative and contract research with individual companies and States. The aims of the Division are to:

- enhance understanding of the ecology and the basis for sustained productivity of forests;
- develop strategies and techniques for management of forests for multiple uses including wood production, water supply and ecosystem conservation;
- develop technologies for increasing the profitability of forest-based industries through efficient use of wood resources and development of new products.

The Division has major laboratories in Melbourne and Canberra, and smaller research groups in Brisbane, Hobart, Mt Gambier and Perth. Work is organised in eight programs, and is normally undertaken in collaboration with State forest services, private companies or universities.

Australian Bureau of Agricultural and Resource Economics—ABARE

ABARE research is aimed at enhancing the efficiency at forest based industries through analysis of the institutional framework, policies and practices, and the evaluation of alternative arrangements.

Education

The Australian National University and the University of Melbourne offer undergraduate courses leading to a Bachelor of Science degree in Forestry. Most States provide for sub-professional forestry training.

Each year, the Department of Primary Industries and Energy makes available postgraduate awards for full-time research, leading to the degree of Master and/or Ph.D at an Australian university. The Department also administers an award funded from a private bequest for postgraduate study at Oxford University for one year.

Timber and Timber Products

The selected details shown below have been compiled from the annual census of manufacturing establishments.

The woodchip export industry uses timber which is unsuitable for sawmilling and is not required by the Australian pulp, paper and reconstituted board industries. Before the advent of the woodchip export industry much of this material was left standing in the forest after logging, where it inhibited regeneration. After several cycles of selective logging since European settlement, many forests contained large volumes of over-mature and defective timber for which there was no market. The woodchip export industry, by making it economic to remove this poor quality timber, has enabled degraded forests to be regenerated into faster growing, more productive ones. Considerable quantities of sawmill waste material, which would otherwise be burnt, are also chipped for local pulpwood-using industries and for export.

About 4.5 million tonnes of woodchips worth \$260 million were exported from Australia in 1986. Over 95 per cent of Australia's woodchip exports go to Japan where they are used to produce high quality printing and writing papers. The remainder goes to Korea and Taiwan.

MANUFACTURING ESTABLISHMENTS (a)—SUMMARY OF OPERATIONS, 1987-88

1983 ASIC (b) code	Industry description	Establish- ments at 30 June	Employment at 30 June (c)	Wages and salaries (d)	Turnover
		No.	'000	\$m	\$m
2531	Log sawmilling	604	11.3	201.3	820.0
2533	Veneers and manufactured boards of wood	72	5.3	125.7	763.1
2537	Hardwood wood chips	12	0.8	26.0	329.8

(a) All manufacturing establishments owned by multi-establishment enterprises and single establishment enterprises with four or more persons employed. (b) Australian Standard Industrial Classification. (c) Includes working proprietors. (d) Excludes the drawings of working proprietors.

TIMBER AND SELECTED TIMBER PRODUCTS (a)

Item		1984-85	1985-86	1986-87	1987-88
Undressed sawn timber—					
Recovered from sawn logs—					
Australian grown—					
Broadleaved	'000 cu m	1,932	n.a.	2,009	n.a.
Coniferous	"	1,055	n.a.	1,056	n.a.
Total	"	2,987	n.a.	3,065	n.a.
Woodchips (green weight)—					
Hardwood (broad leaved)	'000 tonnes	4,817	n.a.	5,287	n.a.
Plywood—					
Commercial – (surface measure)	'000 sq m	5,774	n.a.	6,706	n.a.
(1 mm basis)	"	55,379	n.a.	69,542	n.a.
Waterproof – (surface measure)	"	1,846	n.a.	1,171	n.a.
(1 mm basis)	"	15,446	n.a.	12,132	n.a.
Particle board (resin bonded)	'000 cu m	685	731	705	728
Wood pulp—					
Mechanical	"	351,446	361,356	371,089	414,297
Other	"	n.p.	516,892	534,629	580,192
Paper—					
Newsprint	tonne	354,453	362,954	386,320	401,066
Printing	"	143,927	172,539	184,504	194,191
Tissue and sanitary papers	"	116,289	125,592	133,402	n.p.
Wrapping (incl. kraft)	"	335,882	338,220	362,439	n.p.
Writing and duplicating (b)	"	83,127	82,495	77,756	72,588
Other paper (incl. blotting)	"	38,279	40,886	65,067	n.p.
Paperboard (incl. strawboard)	"	475,060	472,609	497,425	557,249

(a) Excludes production of small single establishment enterprises with fewer than four persons employed and establishments engaged in non-manufacturing activities but which may carry on, in a minor way, some manufacturing. (b) Includes cartridge.

FISHING

Source and basis of statistics

Statistics presented in this section are obtained from the Australian Bureau of Agricultural and Resource Economics (ABARE) and the Australian Fisheries Service, Department of Primary Industries and Energy. The Australian Bureau of Statistics (ABS) has reduced its involvement in the collection of fisheries statistics. The ABS no longer publishes statistics on the Australian fishing industry.

Australian fisheries production statistics are generally in terms of the form in which the products are taken from the water. For example, the statistics of fish production published in this chapter are in terms of 'estimated live weights' which are calculated from landed weights by using conversion factors for each species in each State. These conversion factors allow for the fact that the quantities of fish reported are frequently in a gutted, headed and gutted, or otherwise reduced condition. Crustaceans are reported on an 'estimated live weight' basis and molluscs (edible) on a 'gross (in-shell) weight' basis. The figures for pearl shell and trochus shell refer to the actual quantities of dry shell for sale and exclude the weight of the animal.

For more details of employment and boats and equipment for general fisheries and particulars of the whaling industry see earlier *Year Books*.

Fisheries Resources and their Commercial Exploitation

Over 3,000 species of marine and freshwater fish occur in and around Australia and at least an equal number of crustacean and mollusc species. Despite this, less than 100 of these are commercially exploited. Australia's major commercially exploited species are prawns, rock lobster, abalone, tuna, other fin fish, scallops, oysters and pearls. Australian fishing operators concentrate their efforts on estuarine, coastal, pelagic (surface) species and demersal (bottom living) species that occur on the continental shelf.

Fin fish

Off north Australia, barramundi (*Lates calcarifer*) constitutes the most important estuarine and coastal species, while in the south-east and south-west regions, mullet (mainly *Mugil cephalus*), bream (*Acanthopagrus* spp.), Australian salmon (*Arripus trutta*) and Australian herring (*Arripus georgianus*) are important catch components.

Major pelagic fisheries are southern bluefin tuna (*Thunnus maccoyii*) off southern Australia, jack mackerel (*Trachurus declivis*), snoek (*Leionura atun*), pilchards (*Sardinops neopilchardus*) and anchovies (*Engraulis australis*) off south-east Australia and Spanish mackerel (*Scomberomorus commersoni*) off north Australia. A long line fishery for yellow fin tuna (*Thunnus albacares*), big eye tuna (*Thunnus obesus*) and other tunas has developed substantially in recent years off the east coast of Australia.

A large multispecies demersal fishery that targets on flathead (*Neoplatycephalus* and *Platycephalus* spp.), morwong (*Nemadactylus* spp.), redfish (*Centroberyx affinis*), gemfish (*Rexea solandri*), orange roughy (*Hoplostethus atlanticus*), trevally (*Pseudocaranx dentex*) and blue grenadier (*Macruronus novaezelandiae*), exists off south-east Australia. Demersal inshore snapper (*Chrysophrys auratus*) fisheries exist off south-west and south-east Australia; in the latter region, stocks of whiting (*Sillaginidae*) are also fished. In the northern tropical region, reef fish such as cods (*Epinephelus* spp.) are exploited. A large demersal fishery for school and gummy sharks (*Galeorhinus australis* and *Mustelus antarcticus*, respectively) is centred in Bass Strait.

Crustaceans

Prawns (*Penaeus* and *Metapenaeus* spp.) provide the most valuable fishery in Australia and are taken in estuarine, coastal and offshore waters of all States except Tasmania. The largest prawn fishery, the northern prawn fishery, is located in northern Australia from Cape York (Queensland) to Cape Londonderry (Western Australia). The western and southern rock lobsters (*Panulirus longipes cygnus* and *Jasus novaezelandiae*), also a valuable resource, are taken on rocky reefs around the southern half of Australia. Deep water fisheries are developing off the north-west shelf for prawns, scampi and lobsters, and off Western Australia where prawns, scampi, lobsters, crabs, squid and fin fish are taken. Bay lobsters (*Thenus* spp. and *Ibacus* spp.) are taken incidentally to prawn trawling operations. Crabs (*Scylla* spp. and *Portunus* spp.) are taken mainly in Queensland, New South Wales and Western Australia. Tropical rock lobsters are taken in the Torres Strait fishery along with prawns and fin fish.

Molluscs (edible)

Naturally-occurring oysters are harvested in all States; in New South Wales and Queensland the Sydney rock oyster (*Crassostrea commercialis*) is cultured commercially. The introduction of the Pacific oyster (*Crassostrea gigas*) to Tasmania, Victoria, and South Australia has proven successful. Production is planned to increase significantly and presently accounts for over 12 per cent of total oyster production. Following a serious decline in catches in the scallop (*Pecten meridionalis*) fishery based on stocks in Port Phillip Bay in Victoria, new offshore beds were located in southern New South Wales, eastern Victoria, northern Tasmania and south-west Western Australia. However, substantial fluctuations in abundance have resulted in erratic production from year to year. Fisheries

based on the saucer scallop (*Amusium balloti*) are centred on Hervey Bay, Queensland and in Shark Bay, Western Australia. An important abalone (*Haliotis* spp.) fishery exists in south-east Australia with Tasmania, Victoria and South Australia providing the bulk of the catch. There is also a small abalone fishery in south-west Western Australia. Mussels (*Mytilus planulatus*) are harvested in Victoria, Western Australia and New South Wales. Small quantities of cephalopods, mainly squid, were produced in many localities. Feasibility fishing located promising squid resources (*Nototodarus gouldi*) in the south-east. Squid (*Loligo* spp.) form an important component to the trawl catch in the Arafura Sea.

Pearl shell and trochus shell

The shell of the Australian species of pearl oyster (*Pinctada maxima*) is taken from various localities in the tropical waters of Australia, between Broome in Western Australia and Cairns in Queensland, for the manufacture of buttons, knife handles, etc. Live pearl shell is used for pearl culture, *Pinctada maxima* being capable of producing pearls which are the largest in the world and which command top market prices. Trochus shell is found mainly on coral reefs off the Queensland coast, although small quantities occur in Western Australia.

Aquaculture

Australia has enjoyed a relatively long history of success in the farming of the Sydney rock oyster. Pearl culture operations and goldfish farming are well established. The production of juveniles of several species of fin fish, molluscs and crustaceans has been undertaken for some years, initially for restocking wild populations and subsequently for grow-out operations. As in many other developed countries, there has been a surge of interest and investment in many types of aquatic farms over the last decade. Notable successes are the salmonid industry in Tasmania, consisting of about 25 farms, and commercial cultivation of the Pacific oyster, blue mussel and rainbow trout.

Developmental work is active in a number of areas such as barramundi, freshwater crayfish (yabbies and marron), prawns, mussels and algae. Research is continuing into the hatchery rearing of species such as abalone, scallops, giant clams, flat and pearl oysters.

Whales

Whales are now a protected species in the Australian Fishing Zone (AFZ).

Foreign fishing

Establishment of the 200 nautical mile AFZ in 1979 covering a total of 8.9 million square kilometres, brought portions of oceanic tuna stocks, and demersal and pelagic fish stocks previously exploited by foreign fishing vessels, under Australian control.

Australia has an international obligation under the Law of the Sea Convention, to allow foreign nations access to resources within the Australian Fishing Zone, that are surplus to domestic fisheries requirements and where such access does not conflict with Australian management and development objectives.

Licensed vessels from Japan, Korea, Thailand and Taiwan are currently permitted to operate in Australian waters either under bilateral agreements or joint venture arrangements with foreign Governments or fishing companies/organisations.

Foreign fishing operations by Taiwan and Thai interests in the demersal trawl fishery off the north and north-west coast take a wide range of tropical demersal fish species, including threadfin bream (*Nemipteridae*), tropical snappers (*Lutjanidae*), emperors (*Lethrinidae*), goatfish (*Mullidae*) and hair tails (*Trichuiridae*). Following the introduction of controls on the length of gillnets which can be used, foreign pelagic gillnet operations have ceased. Japan is permitted, under agreement, to long line, principally for tunas, off certain areas of Australia. There is also an agreement with the Republic of Korea to allow squid jigging in a designated area off Tasmania, Victoria and South Australia.

Fisheries Administration and Research

The Commonwealth Parliament has enacted a number of laws dealing with fisheries in Australian waters beyond territorial limits. The fisheries laws of the States and the Northern Territory apply to all kinds of fishing within the territorial sea and inland waters. These laws require the licensing of persons and boats in the commercial fisheries and provide a range of other regulatory powers. The Commonwealth laws relating to fishing are outlined below.

Fisheries Act 1952

This Act applies to commercial fishing for swimming species, by Australians in waters extending from 3 to 200 nautical miles seaward of the territorial sea baseline of Australia and external territories excluding the territorial sea of another country, and by foreign boats in the 200 nautical mile AFZ. The AFZ comprises waters which extend 200 nautical miles seaward of Australia's territorial sea baselines but does not include waters within exclusive fishing zones of adjacent countries or waters adjacent to Australia's Antarctic Territory.

This Act, together with the following two Acts, requires the holding of licences and empowers the Minister to prohibit fishing activities as necessary for the conservation of resources and the management of the fisheries. The Fisheries Act authorises the publication of management plans having the force of law in relation to particular fisheries.

Continental Shelf (Living Natural Resources) Act 1968

This Act regulates the searching for and taking, from the continental shelf of Australia and the external territories, of living sedentary species by Australians and foreigners. Sedentary species are those that, at the harvestable stage, are either immobile on or beneath the seabed or are unable to move except in constant physical contact with the seabed. The continental shelf is the seabed beyond the territorial sea and adjacent to permanently exposed land masses, extending to a depth of 200 metres or, beyond that depth, to where the exploitation of the seabed is possible.

Torres Strait Fisheries Act 1984

This Act gives effect in Australian law to the fisheries elements of the Torres Strait Treaty. The Act applies in the area of Australian jurisdiction in the Torres Strait Protected Zone and areas outside but near that zone proclaimed in respect of particular fisheries which Australia and Papua New Guinea have agreed to manage jointly under the Treaty, or which are referred to in the Treaty.

Foreign Fishing Boats Levy Act 1981; Fisheries Agreements (Payments) Act 1981

These Acts facilitate the imposition and collection of access fees for foreign boats fishing in the AFZ.

Fisheries Levy Act 1984

This Act imposes a levy on prescribed classes of licences under the *Fisheries Act 1952* or the *Torres Strait Fisheries Act 1984* or on units of fishing capacity created by management plans under the first of those Acts. Levies are applied to recover costs of management and administration.

Administration

Australian fisheries are administered by the authority having jurisdiction over the waters concerned. In inland waters and in waters within territorial limits, administration is the responsibility of the State or Territory fisheries authority. In proclaimed waters, and on the continental shelf beyond territorial limits, administration is the responsibility of the Commonwealth Government which, by agreement, has delegated to State Fisheries Authorities the necessary authorities for day-to-day administration of the Acts.

The Commonwealth and all State and Northern Territory parliaments have enacted amendments to fishery laws for the purpose of implementing the fisheries elements of the Offshore Constitutional Settlement (OCS) adopted by the Premiers' Conference in 1979. Those amendments, which came into force on 14 February 1983, authorise the Commonwealth and one or more States to enter into a formal legal arrangement to apply a single law (Commonwealth or State) to the management of a particular fishery from low water mark and to vest executive power under that law in:

- (i) a joint authority, the membership of which would comprise the Commonwealth and the relevant State or States;
- (ii) a State alone; or
- (iii) the Commonwealth alone.

OCS arrangements are now in force between the Commonwealth and the Northern Territory and all States except New South Wales. OCS arrangements simply rationalise jurisdiction and do not specify new rules for management of the fisheries concerned.

The administration of the fisheries is directed to a number of objectives. The two most important are conservation and management of the living resources of the AFZ to ensure that they are not endangered by over exploitation; and achievement of the optimum utilisation of the living resources by the Australian fishing industry and foreign interests. Consistent with these objectives a number of controls have been introduced to prevent the depletion of the more heavily fished species and to ensure the optimum utilisation of resources. These controls take the form of individual transferable catch quotas, seasonal and area closures, gear limitations, minimum size requirements and limited access rights as well as outright prohibitions on the taking of certain species.

Formal management arrangements have been implemented or are being developed for all Australian fisheries which are now under Commonwealth control. The aim is to conserve the resource while promoting development and improving the economic performance of the industry. Special emphasis is being placed on the development of Australia's under-utilised species and the discovery of new resources. The Government has encouraged the fishing industry to participate more fully in fisheries management. Extensive consultations between government officials, scientific agencies, industry associations and recreational fishermen have become strong features of the decision making process.

Research

The main aim of fisheries research in Australia is to provide a background of biological, technical and economic information which will provide guidance for the efficient and rational utilisation of fisheries resources. To this end much of the research already undertaken has been directed at formulating recommendations for management of various fisheries. Research work, including feasibility fishing projects involving foreign fishing vessels, is also carried out and is expected to lead to the development of new fisheries, the expansion of under-exploited fisheries, greater economy in operations and the use of more efficient equipment and methods.

The Fisheries Development Trust Account (established under the *Fishing Industry Act 1956*) and the Fishing Industry Research and Development Trust Fund (established under the *Fishing Industry Research and Development Act 1987*) are available to support, financially, projects for the development and management of the fisheries and fishing industry which are consistent with the purposes of those Acts. The former was established with the proceeds of the sale of the assets of the Australian Whaling Commission and is replenished from Consolidated Revenue as necessary. The latter is a matching fund into which is paid each year an appropriation from Commonwealth Government Revenue equal to amounts collected from the fishing industry by the State Fisheries Authorities and paid into appropriate State research accounts for the same purpose.

Organisations in Australia at present engaged in research into fisheries matters are:

- (i) CSIRO division of Fisheries Research, which has its headquarters and main laboratory at Hobart, Tasmania, and regional laboratories in Western Australia and Queensland (fisheries science)
- (ii) CSIRO Division of Oceanography, which has its headquarters and laboratory at Hobart, Tasmania;
- (iii) CSIRO Division of Food Research, conducts research into handling, storage, processing and transportation of fish at its laboratory in Hobart, Tasmania;
- (iv) The Australian Fisheries Service, Department of Primary Industries and Energy, Canberra;
- (v) Bureau of Rural Resources, Department of Primary Industries and Energy, Canberra;
- (vi) Australian Bureau of Agricultural and Resource Economics, Department of Primary Industries and Energy, Canberra (economic and marketing research);
- (vii) State fisheries departments. Research vessels are operated by New South Wales, Victoria, Queensland, Western Australia, South Australia and Tasmania;
- (viii) Great Barrier Reef Marine Park Authority (GBRMPA) located in Townsville and Canberra;
- (ix) Universities; and
- (x) private fishing companies (surveys of fisheries resources, research into handling, processing and marketing).

Boats and Equipment Used in Fisheries

Fish, crustaceans and molluscs

The boats used for the estuarine fisheries are mostly small vessels propelled by diesel or petrol engines of low power. The offshore vessels range up to 40 metres in length and are almost invariably powered by diesel engines. Most of them have either insulated holds and carry ice, or are equipped with dry or brine refrigeration. Some rock lobster vessels are fitted with wells in which the catch is kept alive.

The following are the types of equipment most commonly used in the main fisheries: *mullet*—beach seine, gillnet; *shark (edible)*—long-lines, gillnet; *Australian salmon*—beach seine; *snoek*—trolling lines; *flathead*—Danish seine, otter trawl; *snapper*—long-lines, traps, gillnet, handline; *morwong*—Danish seine, otter trawl, traps; *whiting*—handline, otter trawl, Danish seine, beach seine, gillnet; *garfish*—beach seine; *Spanish mackerel*—trolling lines; *tuna*—pole and live-bait, purse seine, trolling lines (lampara nets and purse seines are used for taking live bait for tuna); *prawns*—otter trawl, beam trawl, beach seine net; *rock lobster*—pots, traps; *scallops*—dredge, otter trawl; *abalone*—diving using hookah gear; *pilchards, anchovies, jack mackerel and stripped tuna*—purse seine; *pearl shell oysters*—diving; *squid*—jigging, otter trawl; *crabs*—traps, otter trawl; *barramundi*—gillnet; and *orange roughy*—otter trawl.

Ketch-rigged luggers about 15 metres long which carry crews of eight to fourteen members are used for pearl shell fishing in northern Australia.

Production, Processing and Domestic Marketing of Fisheries Products

Value of fisheries production

The following table shows the gross value of the Australian commercial fishing industry. As the value of materials used in the course of production is not available, it is not possible to show a comparison of net values. Gross value of production is the value placed on recorded production at the wholesale price realised in the principal markets. In general, the 'principal markets' are the metropolitan markets in each State, although, in cases where commodities are consumed locally or where they become raw material for a secondary industry, these points are presumed to be the principal markets. Gross value includes marketing costs which were estimated at \$18.8 million for Australia for the year 1979-80. Details on marketing costs are not available for 1980-81 and subsequent years.

FISHERIES: GROSS VALUE OF PRODUCTION

(\$ million)

1970-71	73	1979-80	299
1971-72	86	(a)1980-81	330
1972-73	93	(a)1981-82	344
1973-74	100	(a)1982-83	423
1974-75	100	(a)1983-84	449
1975-76	135	(a)1984-85	524
1976-77	194	(a)1985-86	595
1977-78	218	(a)1986-87	735
1978-79	265	(a)1987-88	909

(a) Estimates provided by the Australian Bureau of Agricultural and Resource Economics and the Australian Fisheries Service.

NOTE: Figures exclude on-edible production, but may include the value of production of fishmeat and petfood.

SELECTED MAJOR FISHERIES CATEGORIES: GROSS VALUE (a)

(\$ million)

	1985-86 \$ million	1986-87 \$ million	1987-88(b) \$ million
Prawns	190.0	220.0	246
Rock lobster	166.0	186.0	252
Tuna (c)	16.5	43.7	66
Shark	12.0	15.0	20
Other fin fish (d)	90.0	122.0	162
Fish n.e.i. (e)	6.0	7.8	8
Abalone	59.7	84.0	96
Scallops	24.4	25.1	20
Oysters	30.0	31.2	38
Total	594.6	734.8	909

(a) Excludes non edible products. (b) Estimated by the Australian Bureau of Agricultural and Resource Economics. (c) Excludes sashimi production prior to 1986-87. (d) For human consumption. (e) Not for human consumption.

Processing of fish, crustaceans and molluscs

There is very little value added processing of fish products in Australia. Processing establishments vary in size, scope of operations and sophistication of technologies employed. The majority of establishments undertake only the most basic cleaning, filleting,

packing and freezing processes, but others have the capacity for significant product transformation.

Processing plants are located strategically throughout Australia close to fishing grounds.

Rock lobsters, prawns, abalone, tuna, scallops and some fin fish are frozen for export; tuna, snoek, Australian salmon and abalone are canned; small amounts of fish are smoked; and some molluscs are bottled. Hand labour is still used extensively in processing operations, but mechanisation is being progressively introduced.

Ice is used extensively for the chilling of fish taken in estuarine and inshore fisheries. Refrigeration is used particularly on vessels operating in the tuna and prawn fisheries to chill or freeze the catch. An increasing range of fish products, including fresh-chilled tuna, live rock lobster, abalone and sea urchin roe, are being air-freighted to export markets, particularly Japan.

Fish, crustaceans and molluscs intended for export are processed in establishments registered under the Export (Fish) Regulations. Edible fish for local consumption is mainly dispatched fresh-chilled to markets.

Pearls, pearl shell and trochus shell

PEARL CULTURE AND PEARL AND TROCHUS SHELL FISHING OPERATIONS (a)

(Source: Department of Primary Industries and Energy)

		1985	1986	1987
QUANTITY				
Pearl and Trochus shell fishing operations—				
Production of—				
Pearl shell (b)	tonnes	117	196	342
Trochus shell	tonnes	n.p.	n.p.	n.p.
Natural pearls	momme (c)	n.p.	n.p.	n.p.
Pearl culture operations—				
Live shell introduced	No.	173,577	145,626	96,637
	tonnes	56	51	47
Production—				
Round and baroque pearls	No.	54,040	25,850	3,822
	momme (c)	53,761	21,965	2,690
Half pearls	No.	185,083	112,617	60,780
Manufacturing shell	tonnes	53	19	10
VALUE (\$'000)				
Pearl and Trochus shell fishing operations—				
Production of—				
Live pearl shell		1,831	2,507	5,348
Pearl shell		248	82	384
Trochus shell		n.p.	n.p.	n.p.
Natural pearls		n.p.	n.p.	n.p.
Pearl culture operations—				
Production of—				
Round and baroque pearls		13,616	5,794	1,028
Half pearls		1,289	1,099	546
Manufacturing shell		117	38	48

(a) Figures refer to the fishing season commencing in the years shown. (b) Excludes manufacturing shell produced from pearl culture operations. (c) A pearl weight measurement equivalent to 3.769 grams.

Marketing of fisheries' products

Exports of fisheries products comes under Commonwealth jurisdiction, while domestic market activity comes under that of the corresponding State or Territory.

Although a substantial proportion of the Australian salmon, and to a lesser extent tuna catches are canned, the greater part of Australian fish production is marketed fresh-chilled.

Marketing arrangements for fresh fish vary. In New South Wales, fish marketing is the responsibility of the Fish Marketing Authority which operates the Metropolitan Fish markets. In other coastal centres of New South Wales, fishing cooperatives may become registered as local fish markets. In Queensland, fishermen must sell their catch to a licensed processor or a licensed commercial buyer. Exceptions exist for fish intended for interstate trade. In Victoria, Western Australia, South Australia and Tasmania, there is no restriction on market outlets. In Victoria, Western Australia and South Australia, most fish are sent to metropolitan wholesale fish markets for auctioning; small quantities are processed for sale locally, chiefly by cooperatives. Nearly all fresh fish in Tasmania is consigned direct to processors. The principal outlets for fish products in Australia are retail and catering establishments.

A high proportion of Australian seafood production is exported and domestic prices increasingly reflect the conditions on export markets. The Australian industry exports 40 per cent of total fish production, but depends on export markets for over 70 per cent of its revenue. The Australian fisheries export industry depends on a limited range of products sold on a few major markets, with Japan and the United States accounting for about 80 per cent of the value of our exports.

Australian fisheries supply domestic markets with fresh and frozen table fish, but do not produce sufficient to meet demand. Over 60 per cent of seafood consumed in Australia is imported, mostly in the form of fresh, chilled or frozen fish. Prawns and canned fish also are significant imported items.

BIBLIOGRAPHY

AUSTRALIAN BUREAU OF AGRICULTURAL AND RESOURCE ECONOMICS.
Quarterly Review of the Rural Economy (various issues)

PRIMARY INDUSTRIES AND ENERGY, DEPARTMENT OF, AUSTRALIAN
FISHERIES SERVICE *Australian Fisheries*.

THE GREAT BARRIER REEF MARINE PARK— CONSERVATION AND MANAGEMENT IN THE MARINE ENVIRONMENT

(This special article has been contributed by the Great Barrier Reef Marine Park Authority)

The Great Barrier Reef—world heritage site and marine park

Scattered over a distance of 2,300 kilometres, from the middle of Australia's eastern coast northwards to Papua New Guinea, lies the Great Barrier Reef. Not really a continuous barrier but a collection of about 3,400 separate coral reefs, shoals and other formations, it is the largest system of coral reefs in the world.

About 2,900 reefs, including 760 fringing reefs, lie within a formally defined area known as the Great Barrier Reef Region which has the tip of Cape York as its northern boundary (see Figure 1). With an area of about 350,000 square kilometres the Region is considerably larger than the combined areas of Victoria and Tasmania, although only approximately nine per cent (31,500 square kilometres) is composed of reefs. Within this Region there is great variety in structure and life form. There are some 300 reef islands or cays; 87 of them permanently vegetated. There are about 600 continental or high islands often with fringing reefs around their margins.

This range of reef and island structures is small compared with the diversity of Reef fauna. An estimated 1,500 species of fish and more than 300 species of hard, reef-building corals are known; more than 4,000 mollusc species and over 400 species of sponges have been collected. Six species of turtle and the dugong, an endangered herbivorous marine mammal, also occur in the Region; as do more than 240 species of birds.

Several Great Barrier Reef islands have middens or other sites of Aboriginal and Torres Strait Islander origin, as well as ruins and operating lighthouses of historical and cultural significance. There are also more than 30 known historic shipwrecks.

However, it was primarily for the unique combination of biological diversity and size that the Great Barrier Reef was selected and placed on the UNESCO World Heritage List in 1981¹.

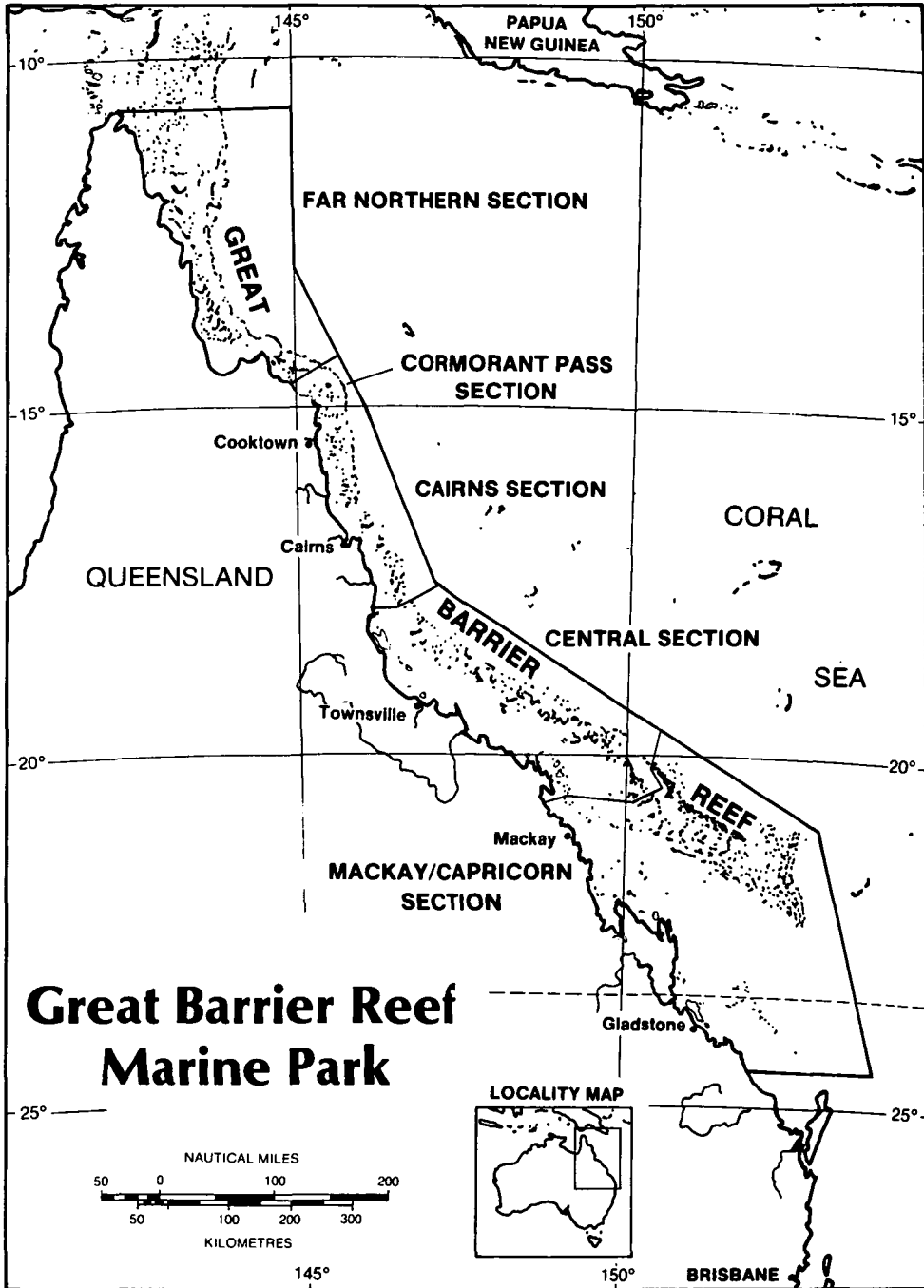
Australia had already taken action to protect the Reef when it established the Great Barrier Reef Marine Park in 1975. The Marine Park is a multiple-use management approach which aims to achieve reasonable use consistent with conservation. The *Great Barrier Reef Marine Park Act 1975* anticipated the 1981 World Conservation Strategy² and it may be unique in providing specifically for conservation and reasonable use, or sustainable development of a large area of recognised conservational significance.

The Marine Park overall conforms to Category VIII of the classification system for protected areas used by the International Union for the Conservation of Nature and Natural Resources (IUCN). It also meets the criteria for selection and management as a Biosphere Reserve (Category IX), although it has not been formally proposed or established as one.

The Great Barrier Reef Marine Park— history of establishment

The Region has long been used as a source of food and raw materials. The Great Barrier Reef or parts of it were explored and used by indigenous people for fishing, hunting and collecting many thousands of years ago.

Since the arrival of Europeans, the Reef has been used for commercial enterprises based on harvesting its natural resources: bêche de mer, turtles, scallops, prawns and pelagic and demersal fishes. The bêche de mer and trochus fisheries were particularly important



 Great Barrier Reef Marine Park Authority

FIGURE 1

NOTE: The Marine Park comprises about 98.5 per cent of the area of the Reef Region

and have at times involved considerable work forces. Records for 1881 show that some 250 tonnes of dried bêche de mer were exported. Today the bêche de mer fishery is non-existent and the trochus industry very small.

The Reef has also been a supplier of non-living resources. For example a number of cays, including Raine, North-West, Fairfax and Lady Elliott Islands, were mined for guano or phosphate rock in the second half of the nineteenth century. The operations were considerable. They involved substantial work forces (there were 112 people on North-West Island in 1897) and removed large quantities of topsoil and rock.

Before Federation in 1901, the Great Barrier Reef was administered by the Colony of Queensland. After Federation this arrangement continued largely unchanged, except that the new Federal Government was given the responsibility for fisheries beyond the 3 mile Territorial Sea and for navigation.

Up until the early 1970s, fishing and collecting were the major activities in the Great Barrier Reef. There was a small but growing tourist industry. Most activities were located close to the mainland and near population centres; few people had access to areas further offshore.

Serious conflict on and about the Reef and its management first arose in the 1960s when the people of Australia became aware of, and objected to, proposals to drill for oil and to mine limestone on the Reef. The ensuing controversy revealed that the Reef was treasured by many Australians for its uniqueness, biological diversity, beauty and grandeur³.

In 1973, the Commonwealth Parliament passed the Seas and Submerged Lands Act which established overtly Commonwealth jurisdiction over, and title to, the sea bed below low water mark outside State internal waters. This Act was challenged by some of the States but its constitutional validity was upheld by the High Court in 1975.

In the same year, the Commonwealth Parliament passed, with the support of all major political parties, the Great Barrier Reef Marine Park Act which provided for the 'establishment, control, care and development of a marine park in the Great Barrier Reef Region', and gave responsibility for the establishment of the Marine Park and the development of management strategies to the Great Barrier Reef Marine Park Authority.

The 1975 Act represented the culmination of efforts by many people, both within Australia and overseas, concerned about the long-term survival of the Reef in the face of the rapidly increasing development of reef-related industries. Of particular concern was the potential threat to the Reef from mining for limestone and other minerals and oil drilling. Other concerns included the need for environmental controls over expansion of commercial fishing, over the development of a major tourist industry and over impacts reaching the Reef from terrestrial activities⁴.

The Marine Park and the zoning system

The Great Barrier Reef Marine Park is not a National Park. While the prime objective is conservation, the Authority is also required to make provision for reasonable use of resources, for the enjoyment of the public, for research and for preservation. This is achieved in the first instance through zoning.

Through the use of zoning, conflicting activities are separated, areas are provided which are suitable for particular activities and some areas are protected from use. Levels of protection within the Park vary from almost complete absence of restriction on activity in 'General Use' zones to 'Preservation' zones in which almost no human activity is permitted. The only activities which are prohibited throughout the Park are oil exploration, mining (other than for approved research purposes), littering, spearfishing with scuba and the taking of large specimens of certain species of fish.

In the zoning plans which have been developed so far, there are three major categories of zones:

Preservation zones and Scientific Research zones	Equivalent to IUCN Category I, Scientific Reserve/Strict Nature Reserve. Only scientific research permitted.
Marine National Park zones (there are 3)	Equivalent to IUCN Category II, National Park. Major uses permitted are scientific, educational and recreational.
General Use zones (there are 2)	Equivalent to IUCN Categories IV, Managed Nature Reserve and VI, Resource Reserve. They aim to maintain sustainable use levels. Commercial and recreational fishing are generally permitted, although bottom trawling is prohibited in one of these zones.

The zones are fixed during the life of a zoning plan (generally five years). They are complemented by generally smaller areas which give special protection from time-to-time to animal breeding or nesting sites, to sites in General Use and other zones which are required to be protected to allow appreciation of nature free from fishing or collecting and to sites suitable for scientific research.

The pattern of zones within a plan as far as possible avoids any sudden transition from highly protected areas to areas of relatively little protection.

The first zoning plan for a section of the Marine Park (Capricornia) came into effect in 1981 and the initial zoning of the whole Park was completed in 1988.

The Marine Park is currently divided into four sections shown in the following table.

GREAT BARRIER REEF MARINE PARK MANAGEMENT SECTIONS

<i>Section</i>	<i>Area (km²)</i>	<i>Year proclaimed</i>	<i>Year plan began operation</i>
Cairns/Cormorant Pass	35,000	1981	1983
Far Northern	83,000	1983	1986
Townsville/Whitsunday	77,000	1984	1987
Mackay/Capricorn (<i>a</i>)	149,000	1984	1988

(*a*) Subsumed Capricornia Section, which had a zoning plan in operation from 1981 to 1988.

Information for planning and management— the role of research and public participation

The information on which zoning plans are based is obtained from technical literature, specialist reports and from submissions from interested persons and organisations, especially during programs specifically directed at encouraging community involvement.

Formal research provides information on the ecological characteristics of the Reef which need to be known as a reference point for the monitoring of the possible changes resulting from human activities. Similar information is also required to predict, at least in approximate terms, the type and scale of effect likely to result from individual or combined activities. The development of monitoring programs assists our understanding of reef processes and of the effects of management.



The Great Barrier Reef Aquarium.



Tourism in the Great Barrier Reef.



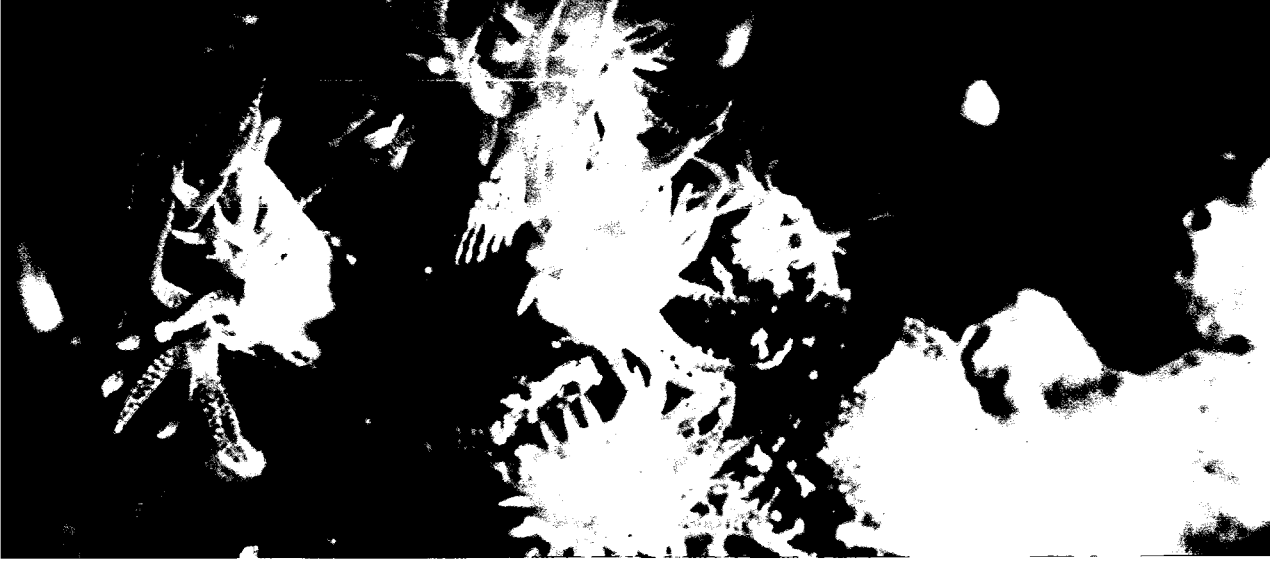
View North along Ribbon Reefs.



Black/Hardy Reef.

Tourism in operation at an outer reef. A permit system ensures protection of the environment.

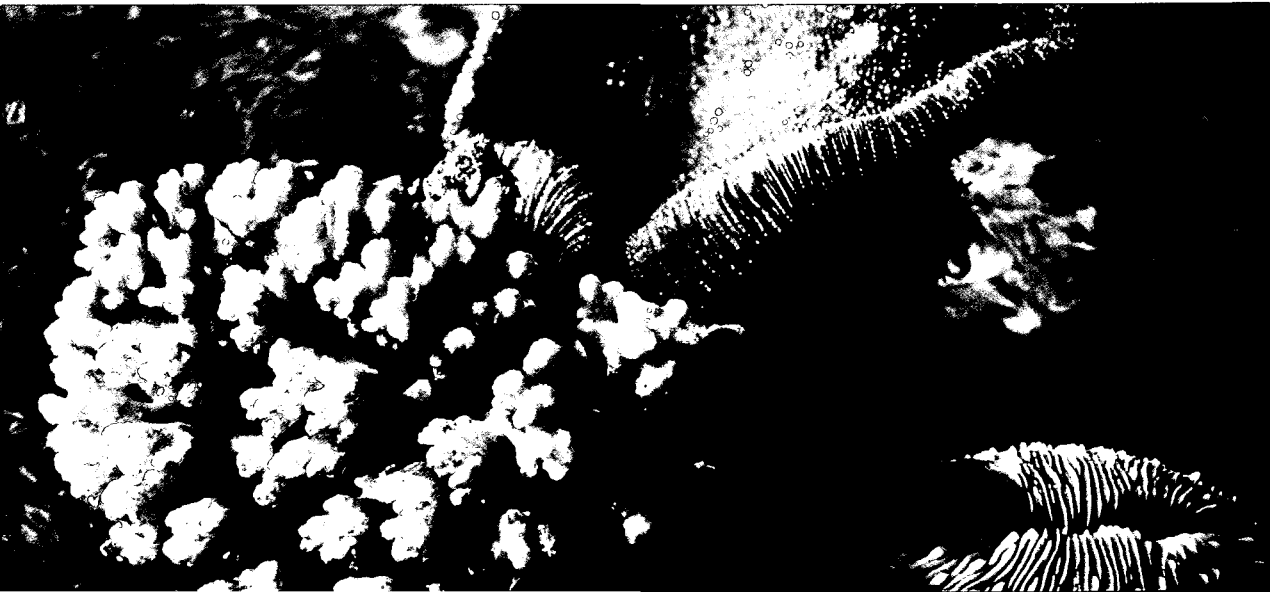


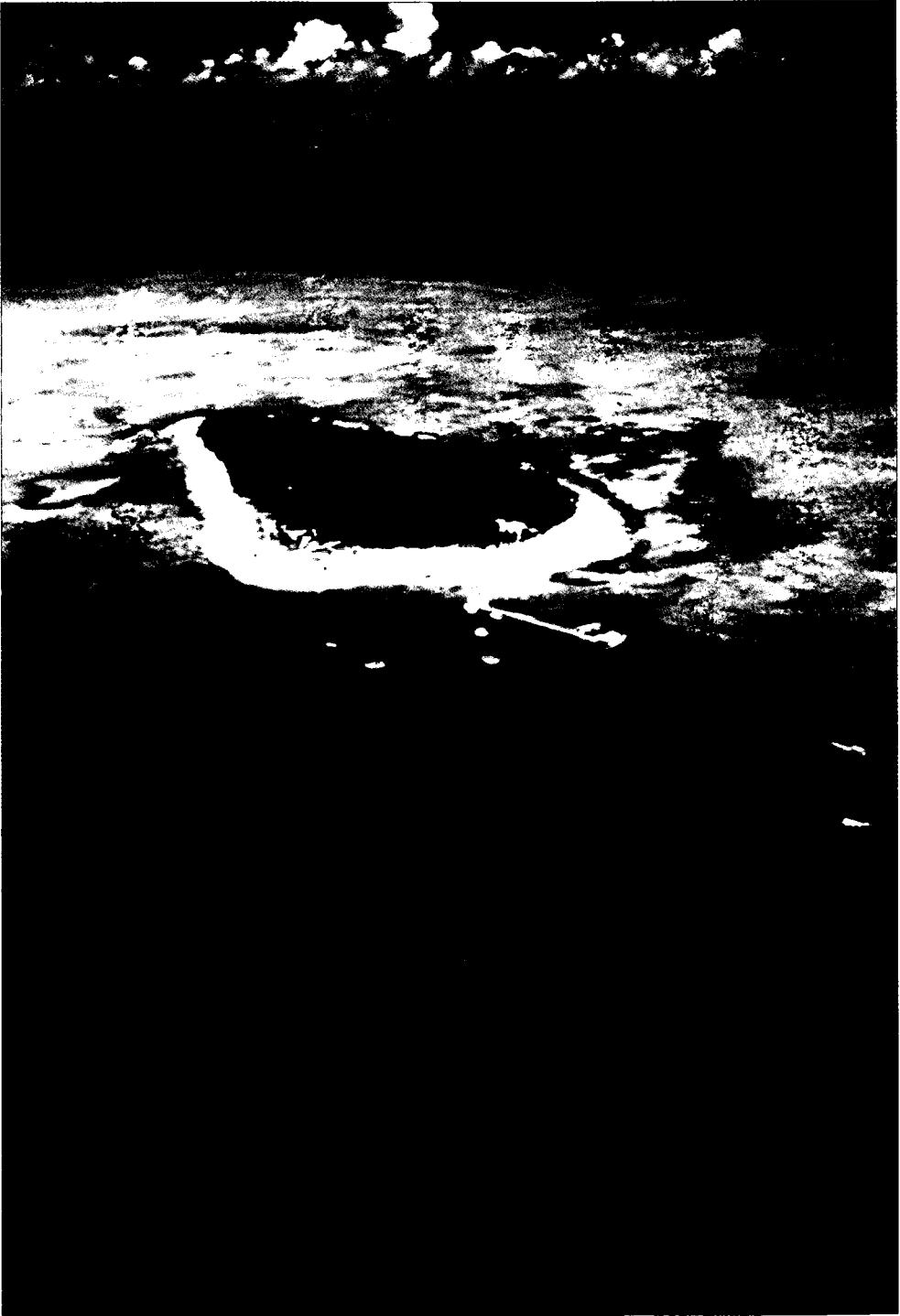


Living coral feeding at night — Great Barrier Reef.



Marine life, Great Barrier Reef.





Green Island

In recognition of the ever-increasing level of understanding of reef processes and the evolving new activities and industries in the Reef Region, zoning plans are publicly reviewed about every five years.

The second major source of information about the Reef is interested persons and organisations. As a statutory obligation, but particularly as a preferred mode of operation, the Authority actively involves the community in planning the Marine Park. It does so primarily through specifically designed public participation programs. These occur in at least two stages in the setting up of an operational Marine Park section: firstly, at a general information gathering phase when a section has been declared but not yet zoned, and secondly, when a proposed zoning plan has been drawn up for the section and is released for public review.

In the light of the representations received at the second stage the zoning plan is revised. When this revised plan has been the subject of subsequent ministerial and Commonwealth parliamentary review; it comes into effect on a specified date. Thereafter a continuing program of extension and community education takes place.

A third source of information is the permit system. Permits are required for many activities to proceed in the Marine Park including tourist facilities and programs, education and research programs, aircraft operations, discharge of waste, collecting, installation and operation of moorings and traditional hunting and fishing. This system allows intended activities to be identified; the potential impacts assessed; if approved, have conditions imposed, and effects monitored. Most permits require renewal after 12 months.

The permit system was instituted to encourage responsible behaviour in users, separate potentially conflicting uses, gather data for management and place reasonable limits on particular operations, consistent with sustainable use.

Marine park management

The Federal and Queensland governments have agreed that the day-to-day management of the Marine Park, using the framework of sections and zoning plans, should be undertaken by Queensland Government agencies, principally the National Parks and Wildlife Service, subject to the Authority.

The Queensland National Parks and Wildlife Service is already responsible for managing numerous island national parks within the outer boundaries of the Region, as well as State marine parks.

A recent restructuring of the Queensland National Parks and Wildlife Service has led to increasing emphasis on the regional management of sections of the Marine Park. Day-to-day management will be directed from regional offices at Cairns, Townsville and Rockhampton with a number of smaller sub-regional offices in appropriate coastal towns.

Under a Commonwealth-Queensland agreement, costs for management in the Great Barrier Reef Marine Park are shared. The purchase of accommodation, boats, equipment and other capital costs are met by the Commonwealth for the first three years or so. Replacement capital and running costs, which include rent, salaries, fuel and communications, are shared equally by the two governments.

Management by education is a major focus of the Authority. While there must be regulations and penalties, ultimate success in conserving the Great Barrier Reef depends upon genuine community understanding and acceptance of the need for self-regulation and adherence to the provisions of zoning and management plans. As well as tapping the tremendous store of Reef knowledge held by the community, public participation contributes to the acceptance of zoning and management plans.

The authority's education and information program produces materials and programs for community education and assists operators in the tourism industry with the development of visitor programs which are conservationally and educationally focused.

The Authority also operates a major aquarium housing a living coral reef in Townsville. The Great Barrier Reef Aquarium is enabling visitors to the Reef Region to gain a greater understanding and appreciation of the Reef and its management as a Marine Park. While the Aquarium provides a 'reef experience' in itself, it also encourages visitors to experience the 'real thing', with care for the environment brought about by greater understanding.

Management—modern reef-based industries

Today, the three major industries of the Great Barrier Reef, in terms of people employed and annual turnover, are tourism, recreational fishing and commercial fishing.

Tourism (encompassing the provision of accommodation, transport and recreational activities) is the fastest growing activity. The popularity of the Reef and adjacent coast region as a tourist destination increased forty-fold between 1940 and 1980 and continues to increase. In 1989, tourism to the Reef was estimated at 2.1 million visitor days a year. The Cairns area has seen rapid increases with organised tourism on reefs close to Cairns estimated to have grown by 30 per cent per annum between 1986 and 1989.

Tourism and recreation activities extend along most of the length of the Great Barrier Reef but have been focused in the Cairns, Townsville, Whitsunday Islands and Gladstone areas. The major activities are summarised in the following table.

MAJOR TOURISM AND RECREATION ACTIVITIES IN
THE GREAT BARRIER REEF MARINE PARK

<i>Structure/Activity</i>	<i>Began</i>	<i>Current number</i>
Island resorts	1932	27
Resort capacity (beds)	1932	5,300
Bareboat charters	1978	>130
Large catamarans	1980	30
Pontoons	1982	20
Floating hotels	1988	—
Private boat use	..	20,000

The Reef Region supports a number of significant recreational and commercial fisheries including prawn trawling, trolling, line fishing, crabbing, collection of aquarium fish, corals, shells, trochus and bêche de mer.

It is estimated that half the commercial Queensland fish catch is taken from within the Great Barrier Reef Region. Recreational fishing tends to concentrate on stocks close to the coast and takes a higher percentage of the catch than commercial fishing in these areas.

Management—problems and responses

One outcome of these activities has been increasing competition for the use of limited desirable sites, leading to increasing conflict between competitors for the same type of use, and competition for different types of use. For example, a large tourist pontoon is incompatible with commercial fishing or a small dive operation. Sites suitable for reef based tourist activities are usually determined by distance from a population centre, protection from the weather and quality of the reef in terms of coral cover and fish abundance.

Concern to prevent unacceptable ecological impact is paramount in the Authority's management of tourism development. The types of biophysical environmental impacts which may be associated with reef-based tourism operations include: discharge of waste, litter and fuel; physical damage to reefs from anchors, people snorkelling, diving and reef walking; disturbance of fauna (especially seabirds); and over-fishing or collecting. All of these may be managed to some extent by design, prohibition or limitation.

The permit system has an important role here. All tourist activities require a permit, and while the assessment and issuing of permits has become a large administrative burden, it does provide, through attached conditions, the means to control activities and limit effects. It has become a practice to specify conditions that relate to all aspects of an operation, including limits on the number of people allowed on a site and what they can do there.

It is considered that some uses of parts of the Reef have already reached levels that appear to exploit fully the productive capacity of the system e.g. bottom trawling for prawns. A decline in the average size of reef fish landed from charter boats indicates reef fishing is also affecting stocks⁵.

Run-off from islands and the mainland contains suspended solids, herbicides, pesticides, and nutrients. It is likely to have effects on the Reef but the magnitude of the effects, and whether these effects represent a real threat to the Reef, is not yet known. The Authority is funding a program to determine more precisely the origins and amounts of nutrients that enter the Marine Park.

The table below summarises management problems relating to major activities which occur within the Great Barrier Reef Marine Park, and how the Authority has attempted to contend with these problems or threats⁶.

Whilst the following represent some of the major problems that the Authority has had to contend with in recent times, there are many other problems that arise, some of which are inherent in being a bureaucracy, particularly one that has to deal with two levels of government—the Commonwealth and Queensland. A continuing problem for the Authority is to overcome the tendency of any bureaucracy to either over-regulate or to become complacent and allow industry to degrade the environment.

MANAGEMENT PROBLEMS AND RESPONSES

<i>Activity</i>	Commercial and recreational fishing and collecting
<i>Threats/Problems</i>	Stock depletion; destruction of habitat; competition with other uses; increasing levels of activity—recreational fishing is increasing at a rate of about 7 per cent per year; increasing costs; conflict between users; resistance to management.
<i>Management Response</i>	Identify and monitor available resources; attempt to maintain effect within the capacity of resource stocks; separate conflicting operations; ensure effective education and extension; carry out research on which to base management decisions, in cooperation with the fishing industry and agencies.
<i>Benefits</i>	Medium and long-term sustainable levels of activity identified; reduced conflict through separation of conflicting activities; cooperation in obtaining effective management; short-term disbenefits as regulation affects users who have not been affected before.
<i>Activity</i>	Private recreation (not fishing or collecting)
<i>Threats/Problems</i>	Scarcity of attractive, accessible sites; competition by both compatible and incompatible uses for suitable sites; overcrowding; loss of amenity; destruction of coral and other reef life.
<i>Management Response</i>	Separate incompatible activities; provide information to improve understanding and minimise impacts; limit site use to sustainable levels.
<i>Benefits</i>	Reduced competition and conflict; sustainable activity; increased enjoyment through improved information.

MANAGEMENT PROBLEMS AND RESPONSES—*continued*

Activity	Tourist programs and developments
Threats/Problems	Large volume use of accessible sites; competition with existing uses.
Management Response	Allocate sites on the basis of suitability; control impact through conditions on permits; education and information for operators and visitors to improve understanding and minimise impacts.
Benefits	Sustainable development; reputation for quality tourist experience in a protected natural environment.
Activity	Habitat preservation, scientific research
Threats/Problems	Increasing levels of use of the Great Barrier Reef; illegal entry; major degradation from accidental impacts (e.g. oil spills), incidental impacts (terrestrial run-off); need for minimally disturbed reference and research sites.
Management Response	Zone uses; set aside scientific research and preservation zones; enforce regulations; monitor environmental conditions, human use and the impact of use; support management-related research.
Benefits	Ecosystem maintenance through effective management.

The Great Barrier Reef Marine Park— towards 2000 AD

In some ways the Great Barrier Reef Marine Park is an experiment on a grand scale. Nevertheless, principles are being followed in its development which have often been successfully applied to regional planning in the terrestrial sphere. The Marine Park is now seen as a model for marine resource management and each year the Authority receives many requests for technical assistance from countries around the world.

There is, in the main, considerable public satisfaction about the role and actions of the Authority. A survey of users of the Capricornia Section after five years of operation found that 63–90 per cent agreed that zoning helped to protect the Reef, and 50–73 per cent agreed that the zoning plan was a wise use of public money⁷.

The successes achieved so far in managing the Great Barrier Reef Marine Park have been due largely to a range of legislative and administrative arrangements which have been accompanied by strong commitments to gathering the necessary information for planning, by consulting all user groups and with an extensive education and information program promoting 'wise use' to the Australian community. Maintaining this community support at a high level is essential for the Marine Park to succeed in attaining its fundamental objective—long term harmony between human activities and the conservation of the Great Barrier Reef.

REFERENCES

- ¹ *Nomination of the Great Barrier Reef by the Commonwealth of Australia for inclusion in the Worlds Heritage List.* Great Barrier Reef Marine Park Authority, 1981.
- ² *The World Conservation Strategy.* IUCN Gland, Switzerland, 1981
- ³ Kelleher G. *Marine Protected Areas.* Proceedings of Environment Institute of Australia's First Annual Conference. 19–20 November 1987. Sydney.
- ⁴ Wright, Judith. *The Coral Battleground.* Thomas Nelson (Australia) Melbourne, 1977.
- ⁵ Craik, W. 'Reef Fisheries' *Oceanus* 29(2):81, 1986.
- ⁶ Kelleher, G. et al. *Human Impact on the Great Barrier Reef.* Paper presented at the Australia–Mexico Conference on Tropical Marine Sciences, July 1987. Great Barrier Reef Marine Park Authority.
- ⁷ Environment, Science and Services. *A user based evaluation of the zoning plan and day-to-day management in the Capricornia Section of the Great Barrier Reef Marine Park.* GBRMPA, 1987.