

Technical Memorandum

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Great Barrier Reef Marine Park Authority

Townsville, Queensland

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Fisheries Factors Affecting Marine Park Management

Wendy Craik



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GREAT BARRIER REEF MARINE PARK AUTHORITY

TECHNICAL MEMORANDUM GBRMPA-TM-2

FISHERIES FACTORS AFFECTING MARINE PARK MANAGEMENT

WENDY CRAIK

SUMMARY

Fisheries factors affecting management of marine parks in general, and the Great Barrier Reef Marine Park in particular, have been surveyed. Existing and potential commercial, recreational and subsistence fisheries have been considered in terms of their aims, and the conflicts they generate. Regulation, in terms of both the possible strategies and their effects and existing legislation is considered, and finally, possible implications of these matters for the Authority are suggested.

Keywords: Great Barrier Reef Marine Park Authority, reef fisheries, management, regulation, marine parks.

Technical Memoranda are of a preliminary nature, representing the views of the author and do not necessarily represent the views of the Great Barrier Reef Marine Park Authority.

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Postal Address: The Chairman, Great Barrier Reef Marine  
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## 1. INTRODUCTION

Managing marine fish involves particular difficulties which are not found in the management of terrestrial animals. In a general way, fishing can be equated with terrestrial "hunting" whereas cattle production for instance can be equated with "farming" and its potentially superior efficiency. The regions and boundaries established for management of marine areas are obviously artificial, and may be recognised, frequently only with difficulty, by fishermen but not at all by the fish. The continuous nature of water and the consequent immigration and emigration of organisms in and out of areas, coupled with the uncertainty of the size of area required to be self-sustaining makes fish management in marine parks a difficult task, based frequently on educated guesses, particularly in the absence of much information on the organisms involved.

## 2. EXISTING FISHERIES

Several kinds of fisheries can be identified:

- commercial
- recreational
  - . line
  - . spear

- subsistence
- miscellaneous
  - . coral collection
  - . aquarium fish collection
  - . mariculture

Existing commercial fisheries in the Great Barrier Reef Region include:

School Prawn	Trevally
Sand crab	Scallop
Mud crab	Barramundi
Spanish Mackerel	Marlin
Coral trout	Kingfish
Red emperor	Mullet
Snapper	Wrasse
	Whiting

and see attached map (Figure 1) (Rooney et al., 1978).

Although the marlin fishery is not a commercial fishery in the normal way, it generates and involves large amounts of money.

As is the case for the vast majority of Australian fisheries, mainly inshore resources are exploited and according to the Australian Fishing Council Working Group on the 200 mile zone (AFCWG), there is limited scope for further development other than by Australians,



particularly in scallop and prawn fisheries where some degree of management already exists. In demersal fisheries near large population centres, some form of control may need to be introduced. In contrast, pelagic fisheries, e.g. Spanish mackerel, tend to be relatively under-exploited (AFCWG, 1977).

Foreign fishing activity in the Great Barrier Reef area mainly involves Taiwanese boats fishing for clams (AFCWG, 1977). By February 1977, 22 Taiwanese fish boats had been apprehended with an estimated 406,000 clams (Aust. Fish., 1977). Recently, increased trawling activity by Taiwanese pair trawlers has been reported and some Japanese longlining is believed to occur (AFCWG, 1977).

As far as future development of resources is concerned, some potential for demersal trawl resources off the east coast of Queensland is believed to exist, but the types of fish and the kinds of bottom may limit it. Potential resources for skipjack tuna, northern bluefin tuna, yellowfin tuna, sharks, squid, billfish, lightfish and lanternfish are unknown, but may be at least moderate for some fisheries in some areas of the Great Barrier Reef Region (AFCWG, 1977).

The amateur fishery in the Great Barrier Reef area is involved in catching many of the same species caught by the commercial fisheries, although areas, quantities and methods obviously vary. Amateur fishing, through logistic considerations is obviously more concentrated near large population centres, but presumably there is potential for expansion to the outer reefs and the northern end of the reef.

Subsistence fishing for dugong, turtles and reef fish is undertaken by indigenous people around Lockhart (Chase, 1978), the Torres Strait Islands and Palm Islands (Goeden, 1975).

Although mariculture is not intensively undertaken in Australia, it offers possibilities on a small scale for localised areas. In the Great Barrier Reef area, oyster farming on Palm Island (Bryson, 1977) and pearl culture in the northern region of the Reef (Haysom and McPherson, 1978) are undertaken. However problems which maricultural activities can generate include:

- the production of organic effluents from hatcheries;



- sedimentation from raft culture;
- introduction of toxic chemicals;
- physical alteration of the environment;
- the introduction of exotics and parasites  
(Ray, 1976);
- the fencing off of areas, interfering with  
free passage, recreational fishing and  
boating (Rooney et al., 1978).

### 3. AIMS OF THE FISHERIES

The aim of the commercial fisherman is obviously to maximise his catch, particularly in the short term but also over as long a period as he intends to fish. However, in the absence of any regulation (licence limitation, catch quotas, etc.) the amount of fishing increases beyond the points of maximum sustained economic yield and maximum sustained biological yield and tends to stabilise, at a lower catch, around a point where costs and value are about equal (Crutchfield, 1959).

Likewise, commercial enterprises such as coral, shell and aquarium fish collection are obviously designed to maximise profit, and, although individuals may regulate their own collecting to ensure future income, the absence of any limitation on the number of people involved in such activities may, in an expanding fishery

result in "overfishing".

Maricultural activities are designed to farm fast growing, easily raised, economically profitable organisms, and while such enterprises are unlikely to result in overfishing, unless badly managed, mariculture presents its own set of problems, discussed earlier.

The aim of the recreational line fisherman is less clear, but studies conducted elsewhere suggest that such factors as water quality, natural beauty and privacy are more important to a fisherman than the size and number of fish caught (Moeller and Engelken, 1972). However, logistic factors tend to concentrate amateur fishermen in more accessible areas than commercial fishermen, and there will probably be less inclination for the amateur fisherman, particularly in the absence of any regulation, to spread his effort.

Spear-fishing also tends to be concentrated in more accessible areas and in the presence of frequent spear fishing may result in "shyness" of larger species (Goeden, 1972 cited in Goeden, 1975) and rapid depletion of resources, because the target can be more readily pursued by a spear fisherman than a line fisherman (Ray, 1976).

Personal and family food requirements are the objective of subsistence fishing, but realistic mechanisms are required to limit the fishery to traditional levels (in effort and equipment) (Robinson, 1976).

#### 4. CONFLICT BETWEEN USERS

Frequently conflict is generated between and within commercial and amateur fishermen and tourist groups, the latter category of people having the ability to cause inadvertent habitat destruction by walking, anchoring and removal of "souvenirs" (Goeden, 1975; Ruello and Henry, 1977). This conflict has been heightened by increased mobility of both amateur fishermen and tourists.

The differing aims and interests of each group mean that commercial fishermen may feel their livelihood threatened by amateur fishermen and both commercial and amateur fishermen may see the other group as responsible for the death of large numbers of young fish by retention of undersized fish, netting practices, etc. Amateur fishermen may feel that trawl and seine nets destroy bottom areas and organisms (Ruello and Henry, 1977). According to Ruello and Henry, much of the conflict between commercial and amateur fishermen is due to ignorance and envy and very little of it is based on fact.

## 5. REGULATION OF FISHING IN MARINE PARKS

In order to maintain sustainable yields of fished stocks, to resolve user conflicts and to fulfill the obligations of marine park management i.e. to permit reasonable use of the area without undue destruction, regulations have to be introduced.

Regulations can take a variety of main forms: licence limitation, size limitations, sex limitations, catch quotas, seasonal or areas restrictions or gear restrictions.

Licence limitation restricts the number of people entering a fishery and, given information on effort and catch, may be a satisfactory means of regulating a fishery, in that theoretically, the total amount of effort relative to catch can be limited. Size limits on species taken may permit successful breeding to occur, but may also have deleterious effects on population structure, if a larger total number of organisms is caught to obtain a sufficient number of an acceptable size. Minimum size limits may be deleterious for polygynous hermaphroditic organisms. Sex limitations may also increase breeding success, but may also increase mortality. Bag limits have the effect of narrowing the gap between good

and bad fishermen. The U.S.A. Sport Fishing Institute in 1964 reported that 66% of the nation's fishermen catch less than one third of all the fish caught and half of these fishermen catch no fish (Moeller and Engelken, 1972).

Seasonal or area restrictions are designed to permit restocking of depleted areas from "core" areas or "habitat reserves", which are maintained in an "unfished" state. In one of the few reported studies of the effects of area closure, tagging studies of spiny lobster (*Panulirus argus*) at Fort Jefferson National Monument showed that recruitment occurred into the commercially fished area from the closed area (Robinson, 1976). Another value of "unfished areas" is that if a measure of catch and effort can be obtained, the rate of recovery of fished areas may be assessed. Rotational closures however, may result in a "pulse" harvesting of fish stocks, which may or may not be a more satisfactory manner of fishing from a sustained yield point of view.

Gear restrictions can be used to reduce fishing effort and success, limit habitat disturbance and reduce the likelihood of behavioural changes in organisms. The effect of diver disturbance on spiny lobsters at Fort



Jefferson National Monument was shown to result in their scattering, making it more difficult for them to breed, feed, etc., that is, changing the population dynamics of the species (Robinson, 1976). Spearfishing has similar effects.

Rooney et al., point out the problems of policing fishing restrictions in marine parks and reserves and suggest that regulations may not be enforceable without support from the industry and fishermen. The U.S. experience is that although fishing has been traditionally regarded as acceptable in parks, the introduction of regulations was met favourably when it was accompanied by an interpretive program; advance public education is required (Robinson, 1976).

#### 6. EXISTING REGULATION OF FISHERIES IN THE GREAT BARRIER REEF REGION

Existing Queensland and Commonwealth legislation concerned with fisheries and fishing on the Great Barrier Reef region is summarised in Appendix 1. Commercial fishing matters are regulated by both Federal and Queensland legislation, while amateur fishing is regulated largely by Queensland legislation.

The most recent development in regulation and control of fisheries in the area is the extension of the Australian fishing zone to 200 miles, which means that Australia controls fisheries out to 200 miles, but where Australian fishermen cannot exploit available fishing stocks, foreign fishermen must be permitted to fish these stocks.

The AFCWG Report suggests that any possible expansion of fishing in the Great Barrier Reef Region can be adequately handled by Australian fishermen and that entry of foreign fishermen in this area should not be considered. However, the resources of some of the pelagic species are relatively unknown and if they are shown to be economically exploitable and are unable to be fished by the Australian industry because the most feasible methods (e.g. pole and bait) are too labour intensive, some consideration may have to be given to the entry of foreign fishermen. Jurisdiction over the extended Australian fishing zone was discussed at the June 1978 Premiers' Conference and it was agreed that joint Commonwealth/State authorities would be established for offshore fishing which would, by agreement between the Commonwealth and the States, manage specified fisheries from the low-water mark out. By agreement, some fisheries

outside the territorial sea could be allocated to the State concerned.

7. IMPLICATIONS OF FISHERIES MATTERS FOR THE  
GREAT BARRIER REEF MARINE PARK AUTHORITY.

200 Mile Fishing Zone:

- possibility of foreign vessels legally fishing Great Barrier Reef Region;
- surveillance for foreign vessels illegally fishing in Great Barrier Reef Region;
- involvement in joint offshore fishing authority for region;
- possible involvement with Queensland in management of fisheries outside territorial area;
- in the future: boundaries and fishery responsibility with respect to Papua New Guinea;
- effect of foreign fishing on reef populations.

Fisheries:

- evaluating relationship between commercial and recreational fishing on reef fish stocks, e.g. will regulations on recreational fishing have no effect if commercial fishing continues unchanged;

- consideration of effects of existing and potential commercial fisheries on reef region and reef populations, for example, demersal trawl fishery, reef fish fishery;
- degree of involvement and management of existing and potential commercial fisheries, especially reef fish, beche-de-mer, trochus fisheries, maricultural projects;
- enforcement of regulations e.g. closed areas
- assessment of effects of regulations and degree of flexibility so can be altered in view of new information;
- type of regulations to be introduced; particularly on near-shore reefs; benefits and feasibility of various kinds of regulations;
- kinds of regulations to be introduced for subsistence fisheries to maintain "traditional" catch and effort levels;
- kinds of regulations for coral, shell and aquarium fish collecting e.g. licence limitation and catch limits and effects on "rare" species.

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APPENDIX I

LEGISLATION

QUEENSLAND

Fisheries Act. 1957-1974

- . Incorporating
  - Pearl Shell and Beche-de-Mer Fishery Act 1881 and amendments to 1931;
  - The Fish and Oyster Act, 1914 and amendments to 1955;
  - The Whaling Act, 1936.
- . Current management of fish (as defined by the Act), oysters, pearl shell, trochus, green snail, shell grit, coral and other marine products, in force in Queensland Territorial waters under the authority and provisions of the Fisheries Act, 1957-1974 include:
  - Whaling
    - . total management of licensing and conditions, species taking, treating, use of vessels, scientific taking, remuneration of crews, forfeitures, powers of inspection;
  - Pearling
    - . total management of licensing and conditions

of personnel, vessels, grounds, unlicensed disturbing, diseases, qualifications, remuneration of crews, vessel surveys, health of divers, dealing in pearls, powers of inspection;

- Oystering

. total management of licensing and conditions, personnel, vessels, grounds, culture, catchment, maturing, sale, offences, preferential rights, disturbances, powers of inspection;

- Mangrove Areas

. destruction of mangroves, removals under authority, inspections;

- General Fisheries

. regulating fishery, closed waters, reserves, description of type of fishing equipment, illegal equipment, fish sizes, confiscations and forfeitures, regulating the use of explosives and noxious substances, pollution, licensing, removal of coral, shell grit, pearl shell, trochus, beche-de-mer.

. Specifically legislation includes:

- describing the sizes of all nets for  
the taking of fish (including prawns  
and scallops);
- the minimum sizes at which fish may be  
taken, by any means;
- licensing of personnel and vessels involved  
in taking fish for sale;
- prohibition on the use of a spear or spear  
gun to take fish commercially (described  
as an illegal apparatus);
- prohibiting the taking of fish by jaggging  
or foul hooking;
- prohibition on taking of protected species
  - . Clams
  - . Turtles
  - . Helmet Shells
  - . Triton Shells
  - . Dolphins and related mammals
  - . Dugong
- areas where the taking of fish or marine  
product is prohibited
  - . areas at Heron and Wistari Reefs;
  - . the use of shell dredges i.e.  
specification of dredge size,  
areas where the use of a dredge  
is prohibited, licensing;

- . regulations managing, the removal of coral, shell grit, oysters, and pearling;
- . minimum size at which pearl shell, trochus shell and green snail may be taken.

. Fisheries Act 1976

Extend controls along lines of previous Act

- establishes a special research fund;
- creates marine parks;
- controls the introduction of potentially dangerous exotic fish;
- limits permits for sale of fish by amateur fishermen;
- provides State licenses for all fishermen landing fish in Queensland;
- licenses processing vessels or establishments;
- extends tenure over oyster leases;
- bans spearing of fish using SCUBA;
- increases penalties for offences.

Research and Scientific Projects

- . The activities of research and scientific workers on reef areas are currently managed by the provisions of permits setting out



conditions on activity.

Navigation (Survey and Equipment of Fishing Vessels)  
Regulations, 1960.

. These regulations, made in pursuance of the Queensland Marine Act, provide that all sea going fishing vessels (as defined) of 9.14 metres and over in length shall be subject to survey by a surveyor at least once in every period of twelve calendar months,

- no vessel requiring a certificate under these regulations shall be employed as a fishing vessel unless a valid certificate of seaworthiness is held.

Navigation (Manning of Fishing Vessels) Regulations, 1974

. These regulations, made in pursuance of the Queensland Marine Act, provide that for all power driven fishing vessels of 15 metres in length or over which goes to sea from any port, or plies in any port, shall be provided with duly certified persons either for the master and engine driver as the case may be.

COMMONWEALTH

Fisheries Act, 1952 and Fisheries Act Amendment Bill 1978

. Licensing

- all persons engaging in fishing for trade or manufacturing purposes, required to be licensed

- . includes pro-amateurs.

- all boats used to take, process or carry fish for trading or manufacturing purposes, to be licensed

- . includes boats owned by pro-amateurs

- pro-amateurs include part-time or recreational fishermen who sell any part of their catches

. Management

- power in legislation for Minister to make notices prohibiting the taking of fish

- . undersized

- . during a closed season

- . by a particular method or equipment

- . except by use of a boat with licence endorsed to take a specified kind of fish

- . this supported by controls on  
fishing gear quantities.
- notices presently in force prohibit taking
  - . berried rock lobsters (all waters)
  - . turtles (all waters)
  - . dugong (all waters)
  - . fish by means of a spear, between  
13°S and 28° 09'S and out beyond the  
eastern edge of the Great Barrier Reef.

Amendment:

- extends Australian jurisdiction over foreign  
fishermen out to 200 miles beyond low water  
mark.

Continental Shelf (Living Natural Resources) Act, 1968 and  
Continental Shelf (Living Natural Resources) Amendment Bill  
1978

. Licensing

- persons who search for and take living  
sedentary organisms in a controlled area  
of the continental shelf, for commercial  
purposes, to be licensed;
- persons who use ships to search for and  
take sedentary organisms in a controlled  
area for commercial purposes, required  
to hold licenses for such ships;

- persons who employ divers, trial divers, divers' tenders, to take sedentary organisms in a controlled area for commercial purposes, required to hold licences to employ
  - . must first hold licence to search for and take.
- . Controlled Area
  - Queensland Division of continental shelf is a controlled area for
    - . all corals, sea urchins, beche-de-mer, sedentary bi-valves and gastropod molluscs.
- . Management
  - Minister may by notice prohibit taking for any purpose, of sedentary organisms
    - . undersized
    - . in closed season
    - . by method
    - . more than bag limit, per person or ship, per unit of time
    - . except by persons or ships for which licenses are endorsed
    - . for removal alive except by written permission.

- Notices presently in force

- . minimum size for *Pinctada maxima* and *P. margaritifera*, other *Pinctada* spp., trochus, green snail.
- . prohibition on trawling or dredging for mother-of-pearl shell, trochus, green snail, beche-de-mer.

. Amendment

- now illegal for foreigners to take sedentary organisms e.g. giant clams from continental shelf for any purpose.

Whaling Act, 1960 and Whaling Amendment Bill 1978

- . applies to all cetaceans recorded in the southern hemisphere. N.B. one species of porpoise may occur but not yet specified.

. Licensing

- all factories or ships used to treat whales, to be licensed.
- all ships and aircraft used as whale catchers to be licensed.

. Management

- Minister may prohibit taking of whales
  - . undersized



- . in closed season
- . by specified methods
- . females accompanied by calves  
or suckling whales
- Notices presently in force
  - . complete prohibition on right,  
humpback and blue whales and females  
accompanied by calves or sucklings,
  - . minimum size for fin, sei and sperm  
whales,
  - . closed season for fin, sei and sperm  
whales from 1 November to 30 April.
- No notices in force at present on small  
whales.

. General

- no powers in present Act to provide full  
regulation of keeping whales alive for  
display but existing provisions may be  
applied to taking for that purpose.

. Amendment Bill

- allows management of whaling activities  
in 200 mile zone in accordance with  
International Whaling Convention.

From

. The Commercial Fishing Industry in the  
Capricorn/Bunker area by Fisheries Division,  
Department of Primary Industry, and Queensland  
Fisheries Service in co-operation with  
Queensland Commercial Fishermen's Assn.  
and Australian Fisheries

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Fish Methodology Workshop Participants:

Department of Environmental Studies

Frank Talbot

Macquarie University

Barry Russell

Hugh Sweatman

Lizard Island Research Station

Barry Goldman

James Cook University

Norm Milward

Greg Stroud

Australian National Parks and Wildlife  
Service

Gordon Anderson

Australian Underwater Federation

Peter Saenger

Department of Biological Sciences  
Sydney University

Peter Sale

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Division of Fisheries & Oceanography

CSIRO

Peter Young

Queensland Fisheries Services

Noel Haysom

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Wendy Craik

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7. Descriptors

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