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Department of
Fisheries

ESD REPORT
SERIES No. 8

Marine Aquarium Fish Managed Fishery



Ecologically
Sustainable Development
Catching Sustainability
FRDC – Subprogram



Australian Government
Fisheries Research and
Development Corporation



Fish for the future

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Preface

The following report formed the basis of an application by the Western Australian Department of Fisheries to the Australian Government Department of the Environment and Heritage (DEH) (now known as the Department of Environment, Water, Heritage and the Arts) to assess the Marine Aquarium Fish Managed Fishery (MAF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*.

A successful application against these guidelines was needed to meet the requirements under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC) to enable those species that were caught and classified as Marine Aquarium fish to remain on the section 303DB list of species exempt from export regulations (previously Schedule 4 of the *Wildlife Protection (Regulation of Exports and Imports) Act, 1982*) past December 2004.

The application was submitted to DEH in 2004. Information presented in the following report relates to the MAF at the time of submission of the application (i.e. to the end of 2003), not to the time of publication.

1.0 Introduction

Ecologically Sustainable Development (ESD) is the concept that seeks to integrate short and long-term economic, social and environmental effects in all decision-making. The Western Australian Government is committed to the concepts of ESD and these principles are implicitly contained in the objectives of the Fisheries Resources Management Act 1994 (FRMA). More recently, the Minister for Fisheries released a “Policy for the Implementation of Ecologically Sustainable Development for Fisheries and Aquaculture within Western Australia” (Fletcher 2002) to articulate, in a practical manner, how the Department of Fisheries can demonstrate to both the government and the broader community that these requirements are being achieved.

A major element of this policy was the requirement for reporting on the progress of each commercial fishery against the major ESD objectives by the end of 2003. This document forms part of this process being the ESD report for the Marine Aquarium Fish Managed Fishery

The reporting framework used to generate these ESD reports is the National ESD Framework for Fisheries (see Fletcher *et al.*, 2002 or www.fisheries-esd.com for details). This framework operates by identifying the relevant issues for a fishery within 3 main categories of Ecological wellbeing, Human wellbeing and Ability to achieve completing a risk assessment on each of the identified issues and then providing suitably detailed reports on their status.

Due to recent changes in the Australian Government’s environmental legislation administered by the Department of Environment and Heritage (DEH), all export fisheries are now required to have an assessment on their environmental sustainability. As a consequence, the initial series of assessments for fisheries has concentrated on the environmental and governance components of ESD of this fishery. The social and economic elements of ESD will be covered in the next phase of assessments.

The reporting of performance for each fishery is the responsibility of the Department in conjunction with the relevant Management Advisory group and/or associated stakeholders. Consequently, the completion of this report has involved a substantial level of consultation and input from many groups including a public comment period.

This material has also been used as the basis to submit an application to Environment Australia to meet the requirements of the Commonwealth’s Guidelines for the Ecologically Sustainable Management of Fisheries. A copy of the application section of this submission is located in Appendix 8. These ESD reports provide a comprehensive overview of the information pertaining to each fishery. A major element of which is the explicit determination of the operational objectives, performance measures and indicators that will be used to assess performance of the fishery. Most importantly these reports include appropriately detailed justifications for the levels chosen and the methods used. Therefore, the annual State of the Fisheries reports on the evaluation of performance of this fishery against these sets of “agreed” objectives/performance measures (i.e. the full justifications will not be presented in the SoF reports). This is summarised in Figure 1.1.

As stated in the Department’s ESD policy, it is expected that the ESD report, and therefore the objectives and performance measures, will be reviewed every 5 years to ensure that they remain relevant and appropriate with current scientific protocols, social attitudes and prevailing environmental conditions. This will coincide with the next assessment cycle under the EPBC. The material presented here relates to the time of the application, not time of publication.

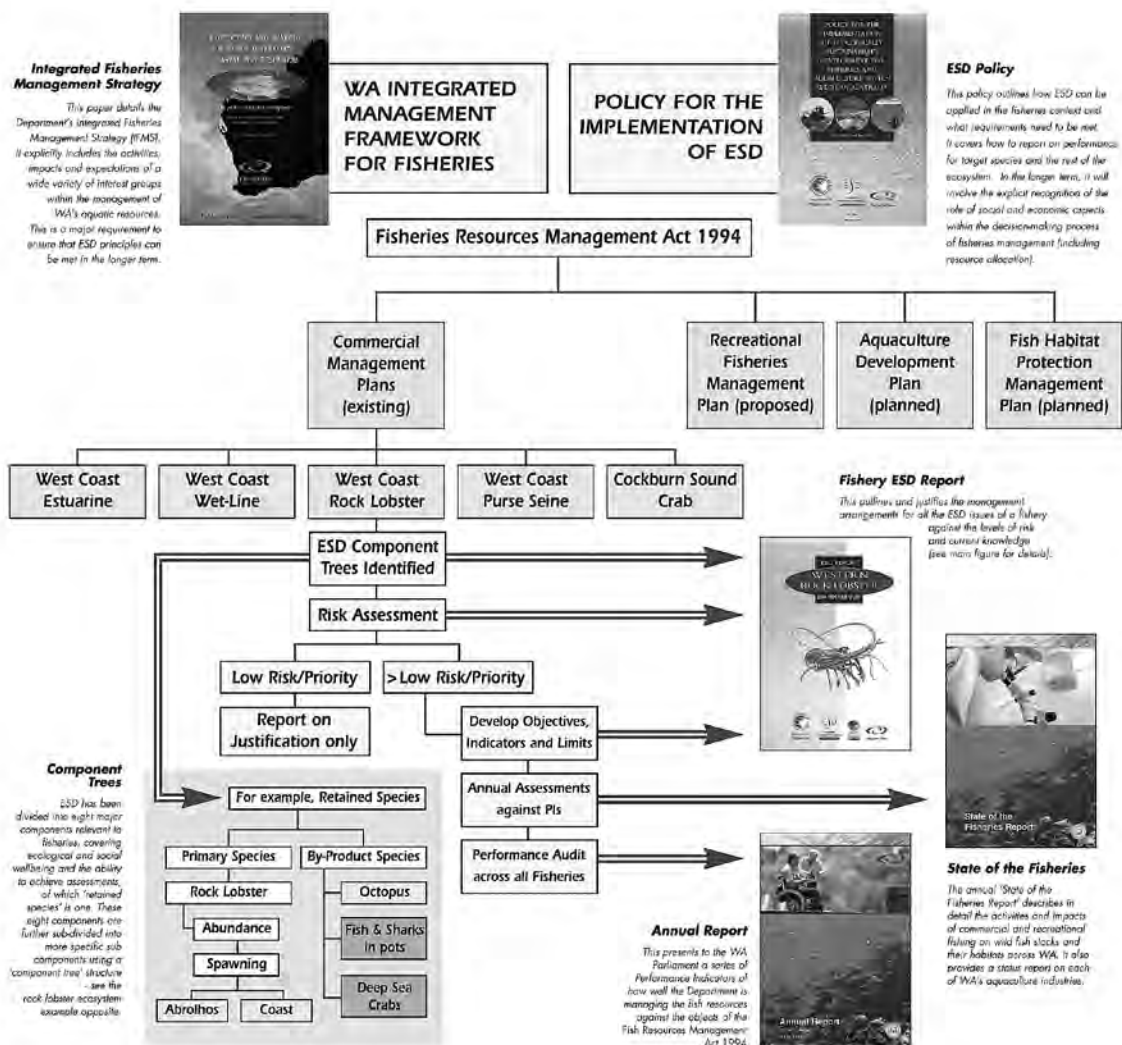


Figure 1.1 Summary of process for completing ESD reports and their relationship with the Annual Report and State of Fisheries Reports. (Example shown is for the West Coast Bioregion and the Western Rock Lobster fishery.)

2.0 Overview

The Marine Aquarium Fish Managed Fishery (MAF) targets more than 250 species of finfish under the management plan, and also takes coral, live rock, invertebrates, seagrass and algae. Reported catches from licensees for 2002/03 was 130,408 aquarium fish, 7,632 invertebrates, 4,637 kg hard coral and 6049 kg soft corals, living rock and algae (see section 5). The value of this fishery is uncertain. In 2003 the total number of licences was 13, with no more licences to be issued to the fishery.

The *Fish Resources Management Act 1994* (FRMA) provides the legislative framework to implement the management arrangements for this fishery. The specific management plan for the Fishery, the *Marine Aquarium Fish Management Plan 1995*, is currently under review. It is intended that the fishery will be operating under a new management plan by 2005. Since the fishery is undergoing changes to its management plan, most of this ESD report is based on the current management plan.

The maintenance of the marine aquarium species stocks, as well as the successful continuation of the fishery, has been achieved through the combination of:

- the suite of management arrangements in place;
- the small number of fishers, the physiological constraints of diving, a large area of fishable water and relatively low number of fish taken from a wide variety of species; and
- protection for species needing special conservation or more vulnerable to over-exploitation, as per 'protected fish' listing under Schedule 2 of the FRMA, which includes humphead maori wrasse, coral of the order *Scleractinia* (in certain areas), leafy seadragon and potato cod.

It should be noted that due to the small size of this fishery and the very low risks to the stocks involved, this fishery does not attract a high priority in relation to research on the targeted species.

The MAF, being a relatively small-scale fishery has minimal impacts on the broader ecosystem. The fishery is able to operate over the whole of the WA coast, however there is only a limited amount of this area that is targeted by the fishermen and their impacts are considered negligible.

Consequently, the management regime for the MAF should meet the *Guidelines for the Ecologically Sustainable Management of Fisheries*. Detailed justification for this conclusion is documented within this ESD report.

3.0 Background on the MAF Fishery

3.1. DESCRIPTION OF THE FISHERY

3.1.1 Location of The Fishery

3.1.1.1 License Area



Figure 3.1 Map of the Marine Aquarium Fishery

The MAF licence area extends into Commonwealth waters, spanning the coastline from the Northern Territory border to the South Australian border (Figure 3.1). However, in practice, the fishery currently operates only in WA state waters. The effort is spread over a total gazetted length of coast of 20,781 km. During the last two years the Fishery has been active in waters from Esperance to Broome with popular areas being Perth to Busselton, Karratha to Port Headland, the Gascoyne Region and around Albany (Figure 3.2).

Licensees are not permitted to operate within the Ningaloo Marine Park or in any waters closed to fishing (e.g. Rowley Shoals, Reef Observation Areas, Sanctuary Zones). The Fishery is permitted to operate in general purpose zones of other marine parks, such as Jurien Bay and Montebello Islands Marine Park. However, licensees must obtain written approval from the Department of Environment and Conservation (DEC) prior to collecting within any marine park reserves. Recently, a Section 43 Order, which prohibits fishing, was placed on Cleaverville Reef to prohibit the take of coral and associated organisms (i.e. live rock).

3.1.2 Number of Licensees

There are 13 licenses in the fishery, all except one are fully transferable and in most years nearly all licenses are used. Some licensees have endorsements to take specimens other than finfish. These include:

- 5 licensees permitted to take a combined maximum quota of 7,500 kg of coral,
- 3 licensees permitted to take 500 kg each of live rock and sand,
- 3 licensees permitted to take invertebrates, and
- 2 licensees permitted to take seagrass and algae.

The *Marine Aquarium Fish Management Plan 1995*, determines that the licensee or nominated operator must not work with more than two nominated divers at any one time and no more than two authorised vessels may be used in the fishing operation (that is, a ‘mother boat’ and an ‘auxiliary boat’). An authorised boat (whether a ‘mother’ or ‘auxiliary’ boat) must not be replaced by a vessel greater than eight (8) metres in length.

3.1.3 Description of Gear

3.1.3.1 General

Clause 12 of the *Marine Aquarium Fish Management Plan 1995*, determines that fish may be taken by hand held nets only. The MAF is primarily a dive-based fishery that uses hand held nets to capture the specimens. Fishing operations are heavily weather dependent due to the small vessels used and the potentially hazardous conditions (waves, swell etc) encountered. In addition to these constraints, there are human constraints (i.e. physiological effects of decompression) that limit the amount of effort exerted in the fishery, the depth of water and the offshore extent where collections can occur.

3.1.3.2 Operating Description

As the fishery is primarily dive based, commercial divers use self-contained underwater breathing apparatus (SCUBA) or surface air from a Hookah apparatus. Depending on the location, collection is usually done on day trips. Fish are mostly collected in buckets that remain attached to a drop line until fishing is completed. During hauling, buckets are held on the drop lines a few metres below the water surface for a period to allow for gradual decompression of the captured fish. Once fish are brought on to the boat, they are sorted and stored in small containers (usually 15 or 20 litre buckets).

For air transport, fish are placed into double plastic bags that are separated by newspaper, the bags are topped up with pure oxygen and placed in foam boxes. Road transport often uses large aerated tanks to transfer fish to the holding facility.

Fish are handled very carefully during all stages of the harvesting operation to minimise the mortality of the specimens. Those fish that are damaged have a reduced commercial value, therefore every effort is made to minimise potential injury to the fish by the handling procedure or by other captive fish. Licensees sort fish according to species and size to reduce both inter and intra-specific conflict.

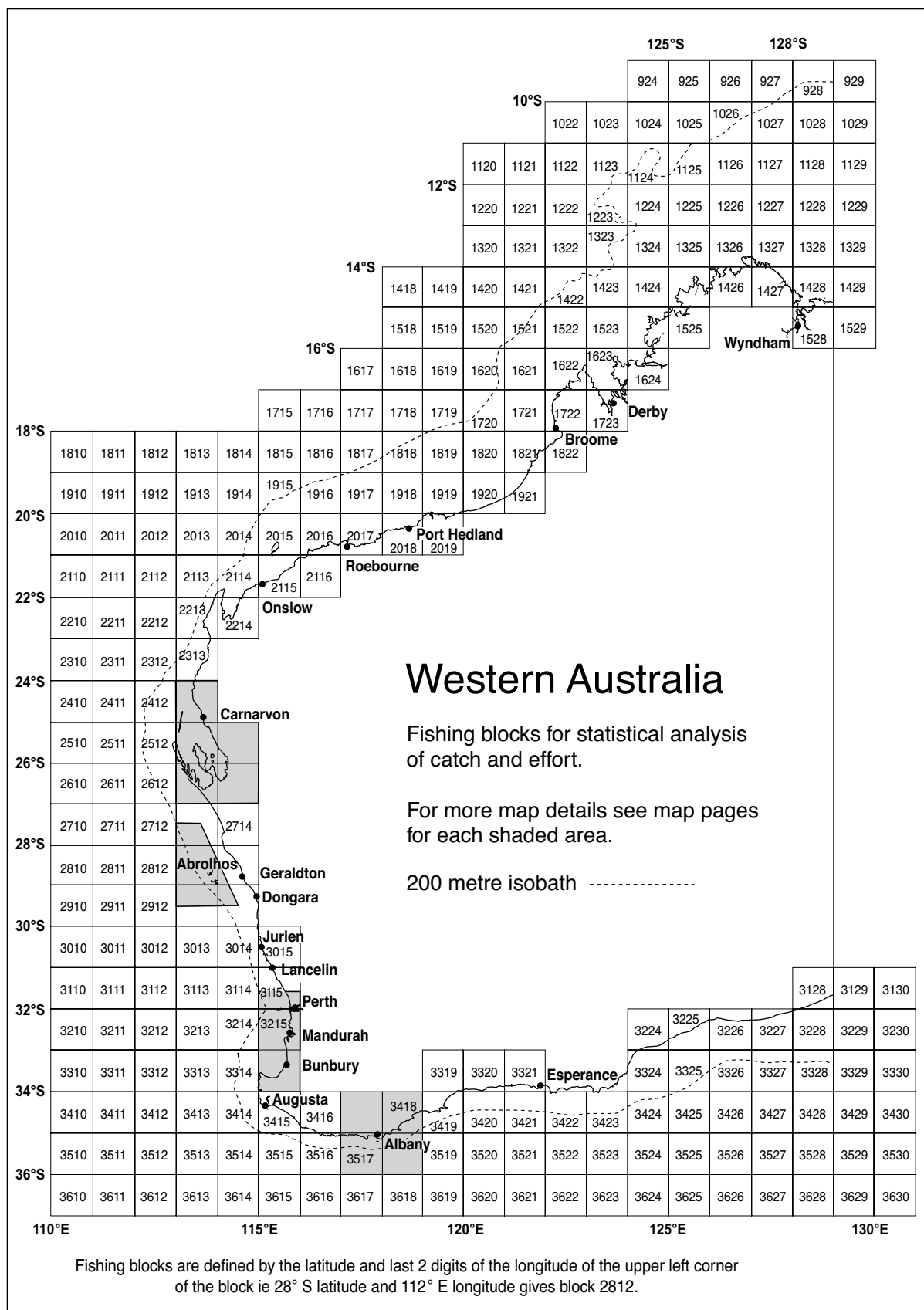


Figure 3.2 Fishing blocks for statistical analysis of catch and effort.

3.1.4 Taxa Caught

3.1.4.1 Target

Table 3.1 Main taxa targeted - total catches per block from 1976 to 2003. Listed taxa/blocks are those for which catches summed from 1976 to 2003 were >1000 individuals.

Common Name	Family	Block	Total Catch (No.individuals)
Hardyheads	Atherinidae	20180	788879
Cardinalfishes	Apogonidae & Dinolestidae	31150	59829
Herring/sprats/sardine	Clupeidae	20170	35690
Goatfish	Mullidae	96010	34042
Black-axil Chromis	Pomacentridae	35170	17914
Gobys	Gobiesocidae	24131	17235
Yellowtail Trumpeter	Terapontidae	35170	13837
Milkfish	Chanidae	31150	12286
Ogilby's Hardyhead	Atherinidae	32150	11950
Striped Catfish	Plotosidae	96000	10731
Striped Butterfish	Scatophagidae	21140	9578
Margined Coralfish	Chaetodontidae	31150	5752
Yellowtail Demoiselle	Pomacentridae	24131	5352
Scribbled Angelfish	Pomacanthidae	32150	5337
Green Chromis	Pomacentridae	24131	4699
Boxfish, White-barred	Ostraciidae	96030	4302
Shark, Port Jackson	Heterodontidae	96030	4194
Old Wife	Enoplosidae	96030	4020
Shadow Goby	Gobiidae	31150	3642
Clark's Anemonefish	Pomacentridae	31150	3591
Yellow-headed Hulafish	Plesiopidae	96010	3591
Black-headed Puller	Pomacentridae	96030	3520
Western Australian Seahorse	Syngnathidae	96030	3272
Red Anemonefish	Pomacentridae	32150	3107
Black-finned Threadfin	Polynemidae	20160	3000
Blue-lined Hulafish	Plesiopidae	96010	2831
Sweep, Footballer	Kyphosidae	96030	2698
Blue-tail Mullet	Mugilidae	20160	2478
Gobbleguts	Apogonidae	96000	2091
Neon Damsel	Pomacentridae	32150	2022
Moonlighter	Kyphosidae	96030	1512
Shaw's Cowfish	Ostraciidae	96010	1467
Common Seadragon	Syngnathidae	96030	1427
Cleanerfish	Labridae	96021	1136
Red-striped Cardinalfish	Apogonidae	96010	1068
Boxfish, Western Smooth	Ostraciidae	96010	771
Short-snouted Seahorse	Syngnathidae	96030	284
Spiny Seahorse	Syngnathidae	20170	4
Spiny Seahorse	Syngnathidae	20160	1
Spotted Seahorse	Syngnathidae	20160	1

The MAF is a multi-species fishery that targets over 250 species of fish. Marine aquarium fish cover any marine fish in the Class Osteichthyes (all bony fishes) and Class Chondrichthyes (all cartilaginous fishes). The take of these taxa of fish are managed under the current management plan for the fishery. Those taxa of fish which had over 1000 individuals caught between 1976 and 2003 are listed in Table 3.1.

Due to the listing of the Syngnathidae family under the EPBC Act, all captures of Syngnathids are also listed in Table 3.1 whether or not over 1000 individuals have been caught for each species.

Although the current management plan for the MAF only governs the take of fish species, several licensees within the fishery also have endorsements on their commercial fishing licences (CFLs), or an exemption, to take coral, live rock/sand, invertebrates, seagrass and algae. These endorsements are:

Coral:

Five licensees are permitted to take a combined maximum annual quota of 7,500 kg.

Live Rock:

Three licensees are permitted to take 500 kg each of live rock and sand per year.

Invertebrates:

Three licensees are permitted to take invertebrates. Two of these licensees may take any invertebrates that are not subject to regulatory notices. Notice Number 366 of the Fisheries Act 1905 prohibits the take by licensed professional fisherman of Echinodea, Asteroidea, Holothuroidea and some other classes. Therefore, these two licensees have an exemption to take 250 animals each of the above classes annually. The other licensee is restricted to taking two species of sea urchins, three species of sea cucumbers and terrestrial hermit crabs.

Four licensees are permitted to take tropical rock lobsters although they are not targeted.

Seagrass and Algae:

Two licensees are permitted to take seagrass and algae.

It is proposed that under the new management plan each licensee within the MAF will have an annual quota for coral, live rock/sand, invertebrates and possibly seagrass and algae. Incorporation of the take of these under the management plan will simplify the arrangements within the fishery and improve the ability to conduct compliance checks. Furthermore, the Department plans to liaise with the WA Museum and other relevant authorities to finalise the range of species that can be sustainably harvested by the fishery.

3.1.5 Bait Usage

No bait is used in this fishery.

3.2 HISTORY OF THE FISHERY

3.2.1 Management History

The MAF in WA dates back to the 1960's with early commercial operators working on permits or conditions on their commercial fishing licences. In 1986, the number of commercial licences was limited to 20. The fishery was reviewed again in 1991. This review resulted in an increase of licences from 20 to 25 in 1994. In accordance with Fisheries Management Paper No. 63 'Management of the marine aquarium fish fishery' (Department of Fisheries 1994), performance criteria had to be met by each licensee to retain their licence. The number of licences in the Fishery declined to the current 13. The total number of licences has been capped at 13 with no more licences to be issued. Subsequently, the only means of access to the fishery is by purchasing an existing licence.

3.2.2 Catch and Effort in the MAF

As an ornamental Fishery, collectors can earn a high return from the capture of very small quantities of individuals. Therefore, the catches are small in comparison to the more common, food-fish fisheries. Statutory (compulsory) monthly catch and effort summaries are compiled by fishers and reported in the Department's catch and effort statistics (CAES) system. Fishers report catch (kg or numbers) by species or species group. Catch location is reported in a 60 nautical mile (nm) grid (block) system (Figure 3.2), however negotiations are underway to change the grid to a 10 nm scale, and it is envisaged that reporting will be undertaken at this scale by the end of 2004.

Effort in the fishery has stabilised over the past three years (Table 3.2) with nearly all licensees reporting some level of activity. Effort was fairly concentrated with 85% of total effort across the fishery, taking place in six 'blocks' from 2001 to 2003 (Table 3.3). Due to the small number and transferability of the licences, effort could shift rapidly through licence transfers. For example, if an Albany based licence were transferred to a Broome resident, the associated effort could shift north.

Given that the specimens are collected for a live market, licensees are restricted in terms of the quantities that they can safely handle and transport (for example, by boat to shore, by vehicle to the holding facility and then on to the retailer) without impacting on the quality of the product. The size of the holding facility and access to regular freight and infrastructure services (such as airports, particularly in the remote northern locations of WA) restricts the levels of effort that can be expended in the Fishery at any given time. Further details on the catch are provided in section 5.1.

Table 3.2 Total fishing effort (days of fishing per block) and distribution of effort, 1999 to 2003.

	1999	2000	2001	2002	2003
No. of days	689	555	931	914	942
No. of licensees reporting effort	14	12	13	12	11
No. of blocks containing 95% of effort (total blocks fished)	9 (18)	14 (20)	14 (20)	10 (20)	7 (17)

Table 3.3 Average distribution of annual effort by block, 2001 to 2003. For location of blocks see Figure 3.2 and Appendix 1.

Block	Average annual effort (days)	% of total effort
20160	325	35.0
31150	119	12.8
21140	110	11.9
20170	90	9.7
22140	75	8.1
96030	71	7.6
24131	37	4.0
32150	16	1.7
34180	15	1.6
24130	12	1.3
20150	9	0.9
96010	8	0.9
96000	6	0.7
33150	6	0.6
33140	4	0.4
20180	4	0.4
30150	3	0.4
19190	3	0.3
21150	2	0.3
23130	2	0.3
31140	2	0.2
33210	2	0.2
97011	1	0.1
34150	1	0.1
33220	1	0.1
35180	1	0.1
34190	1	0.1
35170	1	0.1
34220	1	0.1
18220	1	0.1
27140	<1	<0.1
20190	<1	<0.1
TOTAL	929	100

3.3 RECREATIONAL FISHERY

There is no documented recreational fishery. However, if the public wishes to collect specimens for their own private aquarium they are permitted to do so but are restricted to normal bag limits and size limits, where applicable. There is a complete ban on the recreational take of coral and totally protected fish such as leafy sea dragons in WA.

3.3.1 Traditional Involvement in the Fishery

There is very limited information on this issue. However, it is believed that traditional involvement within this fishery is of minor significance. An aboriginal aquaculture group (Kimberley Aboriginal Aquaculture Corporation) are currently trialing the aquaculture of several marine aquarium fish species.

3.4 MAJOR ENVIRONMENTS

3.4.1 Physical Environment

The coastal environment of Western Australia is a vast area which, including the offshore islands, spans a length of approximately 20,870 km. At the southern end of the MAF, the coastline borders the Southern Ocean at latitudes of 32-34°S. At the northern end of the MAF the coastline is on the Timor Sea from 12-15°S, whilst the remainder borders the Indian Ocean. The waters range from temperate to tropical. A wide variety of conditions exist along this coastline, which includes large areas of shallow soft seabed, which form an ideal habitat for seagrasses (Kirkman and Walker, 1989). Coral reefs extend for over 3,000 kilometers along the western coast of Australia. A wide variety of reefs are found, ranging from open ocean atolls to fringing and barrier reefs. Reef degradation from sedimentation, run-off, nutrient enrichment, coastal development, and increasing population and visitor numbers to the area are all potential threats to the WA coastline.

The Leeuwin Current is a warm-water current of tropical origin that flows southwards along the Western Australian coast, most strongly in autumn and winter. The Current maintains much higher sea temperatures than occur off the west coasts of Southern Africa and South America at similar latitudes. It has two effects on WA coastal waters - it transports tropical marine larvae from more northern latitudes and it also raises winter water temperatures to enable many of these organisms to survive in the temperate waters found in the south western areas of the state.

3.4.2 Economic Environment

The MAF is part of a global multi-million dollar aquarium fish industry, worth an estimated US\$200-330 million annually (Wabnitz *et al*, 2003). The major export markets are the United States, the European Union (EU) and, to a lesser extent, Japan. It is unclear precisely how much the MAF in Australia is worth because details of the domestic market, which is larger than the export market, are difficult to obtain (J. Potter (MAF licensee), pers. comm. 2003).

3.4.3 Social Environment

Under clauses 9 and 10 of the *Marine Aquarium Fish Management Plan 1995*, a licensee (or his nominated operator) can fish with 2 nominated divers, thus allowing up to 3 persons to fish under a single licence at any one time. While most licensees dive alone, a full complement of divers is sometimes used, which affects the rate of supply of aquarium fish to markets and the level of employment that the industry generates in regional centres.

By providing specimens for aquariums, the marine aquarium industry contributes to a greater public awareness of marine ecosystems. Aquariums can be an educational tool and are used in a variety of public and private places to convey information about marine ecosystems.

3.5 CURRENT AND PROPOSED MANAGEMENT ARRANGEMENTS

3.5.1 Summary of Current Management Strategies and Justification

The current Management Plan commenced on 30 September 1995. The MAF is a limited entry fishery with 13 Managed Fishery Licence (MFL) holders operating on a State-wide basis. Licensees are permitted to take species of the Classes Chondrichthyes and Osteichthyes (i.e., cartilaginous and bony fishes, respectively) for marine aquarium purposes using hand-held nets.

The licensee or nominated operator must not work with more than two nominated divers at any one time and no more than two authorised vessels may be used in the fishing operation (i.e., a 'mother boat' and an 'auxiliary boat'). An authorised boat (whether a mother or auxiliary boat) must not be replaced by a vessel greater than eight metres in length. Fish are only allowed to be collected by hand held nets. All MFL's except one are fully transferable.

Some MFL holders are also endorsed to take various invertebrate species for marine aquarium purposes via a condition on their individual CFL. Similarly, some MFL holders have small quantities of coral and 'live' rock quota endorsed on their CFL's.

While the Department recognises that the existing management arrangements may not be optimal in terms of efficient administration, equity and enforcement, there are no concerns with respect to sustainability given the limited entry status of the Fishery, the scale of the operations, the wide range of species targeted, the refugia available for these species and the highly selective nature of the Fishery.

Furthermore, the licensees have formed a formal industry association through the Western Australian Fishing Industry Council (WAFIC). A Code of Practice has been drafted by the Association, which advocates responsible fishing practices above and beyond what is legislated (see Appendix 6). The Code will formalise common practices such as not collecting breeding pairs, not repeatedly collecting from the same discrete area and not operating in popular locations during tourist seasons. While the Code itself will not be legislated, it is possible that some of the fishing practices outlined in the code will be incorporated into the revised management plan or be placed as a condition on the MFL.

Outside of the MAF, several public aquariums have been issued with an exemption to collect and hold aquarium specimens for purposes such as educational and community awareness programmes and tourism. For example, Coral World, trading as the Aquarium of Western Australia, has an exemption to collect a variety of aquarium fish, invertebrates, live rock and coral. The Department is considering the development of a specific 'public aquarium licence' for these ventures.

3.5.2 Legislation and Policies Affecting the Fishery

Marine Aquarium Fish Management Plan 1995 (the Plan);

Fish Resources Management Regulations 1995 (FRMR);

Fish Resources Management Act 1994 (FRMA);

Environment Protection and Biodiversity Conservation Act 1999 (EPBC)

Provides the export controls; and

Notice No. 366, Notice No. 387, Order No. 7 of 2001 (West Australian Government Gazette).

3.5.3 Proposed Future Management Arrangements

The Management Plan is currently under review. The following proposed changes are expected to be in place during 2005.

Some MFL holders are endorsed to take various invertebrate species for marine aquarium purposes via a condition on their individual CFL. These conditions are somewhat inequitable and the Department is currently considering providing all MFL's holders with access to 'invertebrates' for marine aquarium purposes (with specific limitations on selected species and combined total quotas). Similarly, some MFL holders have small quantities of coral and 'live' rock quota endorsed on their CFL's. It is the Department's intention that all MFL holders will have access to coral, 'live' rock and 'live' sand quota for marine aquarium purposes. The Department will liaise with staff of the WA Museum and other relevant agencies to compile a report identifying any species (or groups of species) that may be vulnerable to exploitation and, depending on the outcomes of that report, may introduce 'quotas' for particular species.

There is a nominal annual quota of 750 syngnathids imposed on the MAF by DEH. The Department intends to allocate part of the quota to each licensee and establish 'species-specific' catch quotas (especially for those primarily targeted), to replace the current 'blanket' syngnathid quota. Management arrangements that are consistent with recent listing by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) will also be included.

As part of the review the Department is also looking to increase the spatial resolution of the catch and effort data provided by MFL holders in the MAF. Monthly catch and effort data supplied by MFL holders, which are entered into the Department's CAES System, is currently reported in a sixty-nautical mile (nm) grid system. While this spatial scale is suitable for larger scale commercial fisheries (such as rock lobster or wetline fishing) it does not provide a suitable level of detail for smaller scale commercial operations such as the MAF. It is likely that a ten nm grid system will be adopted although the CAES system and grid maps will need to be modified before this can be implemented.

Formal notification by the licensee to the Department of the intention to fish was identified at a recent Compliance Risk Assessment Workshop as a means of being able to better utilise limited compliance resources. It is intended that this measure be adopted within the Fishery to assist in targeting compliance effort and enable the Department to gain a better understanding of the frequency, location and duration of fishing operations. It is expected this will be introduced via an amendment to the Management Plan during 2005.

3.6 RESEARCH STRATEGY

3.6.1 Recent/Current Research

This is presently restricted to the collection and analysis of the MAF's monthly catch and effort levels, as monitored through CAES records. Information on the biology of captured species has been obtained from published studies, including those completed by local universities or the WA Museum.

3.6.2 Proposed Future Research

It is anticipated that the newly formed Industry Association will be proactive in securing funding to undertake research into the main species collected.

3.7 BIOLOGY OF SPECIES

3.7.1 Aquarium Fish Species

The most abundant finfish taxa in recent MAF catches (i.e. > 2000 individuals per taxon taken between 2000 to 2003) are described below.

Atherinids are small (typically <10cm), pelagic fish that typically form schools. *Atherinomorus ogilbyi* inhabits shallow coastal and estuarine waters of Northern Australia, usually in schools. It occurs in WA, Qld and NSW. Maximum length is 17 cm (Allen 1997).

Apogonids are typically small (<10cm), demersal fish. They are mouth-brooders, producing pelagic larvae (Neira and Bruce 1998). There are approximately 91 species of apogonids in Australia, mainly occurring in tropical areas.

Gobiesocids are small (<5 cm), demersal fish that attach to substrate via a sucking disc. They produce demersal eggs and pelagic larvae. They feed on small invertebrates. There are approximately 15 tropical species and numerous temperate species (Leis and Carson-Ewart 2000).

Clupeids are small or medium sized (<20 cm) pelagic species that typically form large, dense schools. Most clupeids feed on plankton. Clupeids are a major prey item for piscivorous fish and birds. There are numerous tropical and temperate species in Australia (Leis and Carson-Ewart 2000). They produce pelagic eggs and larvae.

Mugilids are medium to large sized, schooling fish. Most mugilids are demersal feeders, consuming detritus and vegetation. There are numerous tropical and temperate species in Australia (Leis and Carson-Ewart 2000). They produce pelagic eggs and larvae. Some of the larger mugilid species (mainly *Mugil cephalus* and *Aldrichetta forsteri*) are targeted by commercial fishers in Western Australia. *Valamugil buechanani* is a tropical species occurring in coastal and estuarine waters throughout the Indo-west Pacific. Maximum length is 40 cm (Allen 1997). This species is not targeted by other commercial fishers in Western Australia.

Ambassis vachellii is a tropical species occurring in estuarine waters throughout the east Indian Ocean and Indo-Australian Archipelago. It forms pelagic schools. Maximum length is 7 cm (Allen 1997).

Amniataba caudavittatus is a demersal species occurring in estuarine waters across western (from Cape Leeuwin northwards) and northern Australia and southern New Guinea. Maximum length is 28 cm (Allen 1997, Wise *et al.* 1994). Individuals are caught and occasionally retained by recreational fishers.

Pomacentrids are typically small (<10cm), producing demersal eggs and pelagic larvae. *Chromis atripectoralis* is a tropical species that forms large aggregations above coral reefs throughout the Indo-central Pacific. Maximum length is 10 cm (Allen 1997). *Neopomacentrus azysron* inhabits coral reefs throughout the Indo-west Pacific. Maximum length is 9 cm (Allen 1997).

Chanos chanos is a tropical species occurring in coastal and offshore waters of the Indo-west Pacific. In Australia, it occurs in WA (from Shark Bay northwards), NT, Qld and NSW. Maximum length is 180 cm. It is targeted by commercial fishers in some regions, but is not targeted by commercial fishers in WA (Allen 1997, Hutchins and Swainston 1986).

Selenotoca multifasciata is a tropical species occurring in estuarine and freshwater waters of the Indo-Australian Archipelago. Maximum length is 28 cm (Allen 1997).

Plotosus lineatus inhabits coastal waters throughout the Indo-central Pacific, often in the vicinity of coral reefs. Maximum length is 32 cm. Eggs and larvae are demersal (Allen 1997, Neira *et al.* 1998).

3.7.2 Corals

This fishery collects small quantities of numerous species of soft and hard corals. The difficulties associated with accurate coral identification results in the majority of the catch being reported at family level or as ‘unspecified coral’. However, the fishers concentrate on coral species that survive and acclimatise in aquariums.

Of the soft corals identified, species from the family Alcyoniidae are the most commonly collected. This family forms the vast majority of octocoral coverage throughout the world, except in the Atlantic. These octocorals are known for their thick and encrusting forms and leathery skin. Many grow very large but can also form large colonial and/or clonal aggregations of individual colonies.

There are many more families of hard coral collected. Of the corals identified, the most commonly collected families during 2003 by volume in decreasing order were: Euphyllidae, Caryophylliidae, Dendrophylliidae, Trachyphylliidae and Acroporidae.

3.7.3 Invertebrates

The most commonly collected invertebrates are anemones, sea urchins, sea cucumbers, starfish and shrimp. Similar to the coral species, most are only reported to family level due to the lack of standard taxonomy for marine invertebrates.

3.7.4 Live Rock/Sand

Live rock is usually either a limestone based rock or dead coral that has live marine organisms growing on or in it. Typical inhabitants of live rock are anemones, tunicates, bryozoa, octocorals, sponges, echinoids, molluscs, tube worms, and calcareous algae. Live rock is often targeted for its cover of encrusting red algal species such as coralline algae. Live sand is marine sand containing live organisms including bacteria.

3.7.5 Syngnathids

Some species of syngnathids are vulnerable to overfishing because they reproduce relatively slowly, have low rates of dispersal and are highly habitat dependent. In addition, the distribution and biology of many syngnathids is poorly understood. However, there is no evidence of decline for any syngnathid species retained by the MAF (Pogonowski *et al.* 2002).

There is an annual limit of 750 syngnathids imposed on the MAF by DEH. No leafy seadragons are permitted to be taken. At least six species of syngnathids are retained by the MAF, although only four are generally targeted. Since 1999 the following species have been recorded:

- *Hippocampus angustus/elongatus* (catch reported as *H. angustus* but catches are probably mainly *H. elongatus*, with minor quantities of *H. angustus*, as *H. angustus* is not recorded south of Shark Bay where most captures in the fishery occur)
- *Phyllopteryx taeniolatus*
- *Hippocampus breviceps*

- *Stigmatopora argus*
- *Filicampus tigris*
- *Haliichthys taeniophorus*

The syngnathid species primarily taken are widely distributed within WA waters and occur in both shallow and deep waters in both urban and remote locations.

The **western spiny seahorse** (*Hippocampus angustus*) is endemic to WA and has a recorded distributional range from Shark Bay to the Dampier Archipelago. The species has been trawled to depths of 31 metres but is also found in shallows. It is generally found in association with seagrass beds. There is no evidence of declines for this species. The species is often misidentified as *H. hystrix* or *H. elongatus* (Pogonoski *et al.* 2002).

The **common weedy seadragon** (*Phyllopteryx taeniolatus*) is endemic to Australia and occurs from Port Stephens (NSW) through to Geraldton (WA), including Tasmania. The species is usually found in kelp reefs with edges of sand to depths of 50 metres. Individuals are often found washed up on the shore following storm events. Longevity in aquaria is at least 4-5 years, but lifespan in the wild is unknown. This species breeds early summer and generally only produces one brood per season. There is no evidence of declines for this species (Pogonoski *et al.* 2002).

The **short-snouted seahorse** (*Hippocampus breviceps*) occurs in South Australia and Tasmania but it's occurrence in WA is uncertain. The presence of this species in MAF catches requires validation. This species is usually found in association with seaweed and algal communities and occurs to depths of 20 metres. Individuals are rarely seen because of their good camouflage and small size. Longevity in aquaria is at least 3 years, but lifespan in the wild is unknown. This species breeds on a monthly cycle over the summer months. There is no evidence of declines for this species (Pogonoski *et al.* 2002).

The **spotted pipefish** (*Stigmatopora argus*) is endemic to southern Australia, occurring from Sydney (NSW) to Shark Bay (WA), including Tasmania (Gomon *et al.* 1994). The species is usually found in shallow seagrass beds and weedy areas on rocky reefs and they are thought to have a life span of approximately 12 months (Duque-Portugal 1989). They are abundant but are rarely seen because of good camouflage.

The **tiger pipefish** (*Filicampus tigris*) is endemic to southern Australia, occurring from southern Queensland to Shark Bay (WA) mostly at depths of 2-25 m (Gomon *et al.* 1994). This species is rarely taken by the MAF.

The **ribboned pipefish** (*Haliichthys taeniophorus*) occurring across northern Australia from Shark Bay (WA) to northern Queensland and also in the Indo-Pacific (Gomon *et al.* 1994). It is mainly known from trawl grounds. This species is rarely taken by the MAF.

4.0 Outline of Reporting Process

4.1 SCOPE

This ESD report is based upon the ESD report for the MAF. The ESD report was generated by assessing “**the contribution of the MAF to ESD**”. This assessment examined the benefits and the costs of the MAF across the major components of ESD. In doing so, it will eventually provide a report on the performance of the fishery for each of the relevant ecological, economic, social and governance issues associated with this fishery. Given the timeframes involved, only the criteria required for the “Guidelines for the Ecologically Sustainable Management of Fisheries”, which cover mainly the environmental elements of ESD (outlined below in Table 4.1) were generated for this ESD report.

Table 4.1 Main National ESD Reporting Framework Components.

Note: Only those ESD components in **bold*** are reported in this application.

National ESD Framework – ESD COMPONENTS
Contribution to Ecological Wellbeing
Retained Species*
Non-Retained Species*
General Ecosystem*
Contribution to Human Wellbeing
Indigenous Community Issues
Community Issues
National Social and economic Issues
Ability to Achieve
Governance*
Impact of the environment on the fishery

4.2 OVERVIEW

There were four steps involved in completing the ESD report for the MAF. It was based upon using the National ESD Reporting Framework, which is outlined in detail in the WA ESD policy paper (Fletcher, 2002) and in the “*How to Guide*” (Fletcher *et al.*, 2002) located on the website (www.fisheries-esd.com):

1. The issues that needed to be addressed for the MAF were determined at a stakeholder workshop. This process was facilitated by adapting the set of “Generic ESD Component Trees” into a set of trees specific to the MAF.
2. A risk assessment/prioritisation process was also completed at the workshop which objectively determined, which of these identified issues was of sufficient significance to warrant specific management actions and hence a report on performance. The justifications for assigning low priority or low risk were, however, also recorded.
3. An assessment of the performance for each of the issues of sufficient risk to require specific management actions was completed using a standard set of report headings where operational objectives, indicators and performance measures, management responses etc. were specified.
4. An overview assessment of the fishery was completed including an action plan for activities that will need to be undertaken to enable acceptable levels of performance to continue or, where necessary, improve the performance of the fishery.

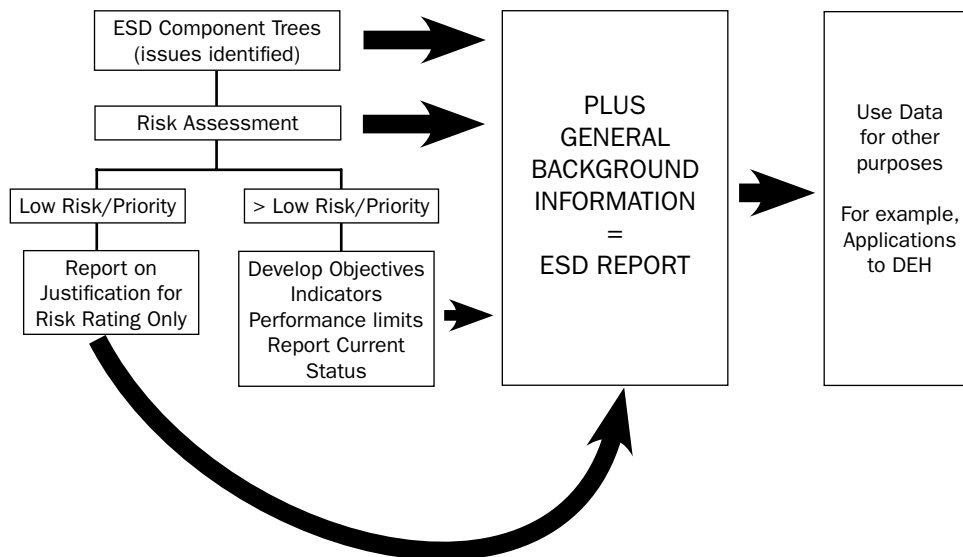


Figure 4.1 Summary of the ESD reporting framework processes.

4.3 ISSUE IDENTIFICATION (COMPONENT TREES)

The National ESD Reporting Framework has eight major components, which fall into three categories of the “contributions to ecological wellbeing”, “contributions to human wellbeing” and the “ability to achieve the objectives” (Table 4.1). Each of the major components is broken down into more specific sub-components for which operational objectives can ultimately be developed.

To maximise the consistency of the approach amongst different fisheries, common issues within each of the components were identified by the SCFA and ESD reference groups within each of the major component areas and arranged into a series of “generic” component trees (See Fletcher (2002) and the www.fisheries-esd.com web site for a full description). These generic trees were used as the starting point for identifying the issues. These trees were subsequently adapted into trees specific to the MAF by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (Figure 4.1). This process was conducted at a workshop attended by a variety of stakeholder groups in March 2004.

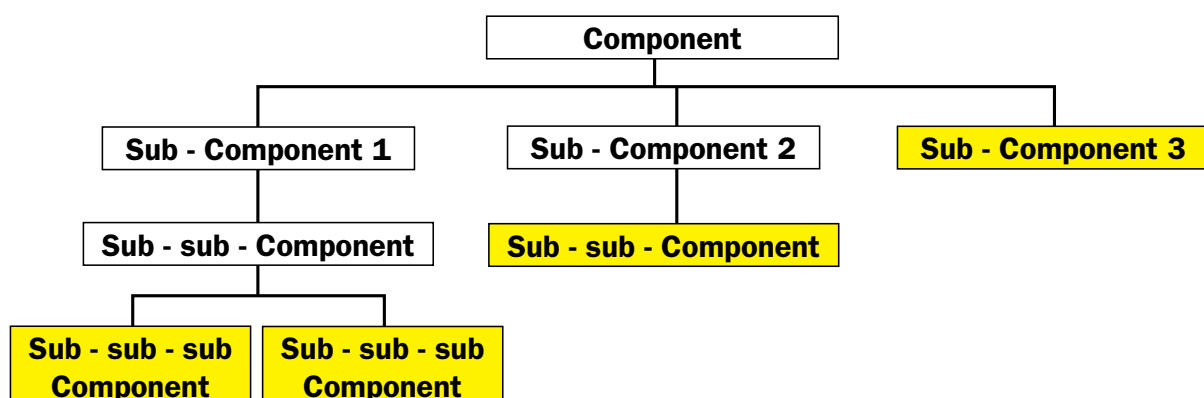


Figure 4.2 Example of a component tree structure.

4.4 RISK ASSESSMENT/PRIORITISATION PROCESS

After the components/issues were identified, a process to prioritise each of these needs was completed using a formal risk assessment process. The risk assessment framework that was applied at the internal workshop was consistent with the Australian Standard AS/NZS 4360:1999 Risk Management, concentrating on the risk assessment components. The general Risk Assessment process is well documented but in summary, it considers the range of potential consequences of an issue/activity and how likely those consequences are to occur. The combination of the level of consequence and the likelihood is used to produce an estimated level of risk associated with the particular hazardous event/issue in question.

The researchers made an estimate of the consequence level for each issue. This level was from 0-5, with 0 being negligible and 5 being catastrophic/irreversible.

The level of consequence was determined at the appropriate scale for the issue. Thus for target species the consequence of the MAF was based at the population not at the individual level. Obviously catching one fish is always catastrophic for the individual but not always for the population. Similarly, when assessing possible ecosystem impacts this was done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or individuals of non-target species.

The likelihood of a consequence occurring was assigned to one of six levels from remote to likely. In doing so, again it was considered the likelihood of the “hazardous” event (consequence) actually occurring based upon collective wisdom, which included an understanding of the scale of impact required.

From these two figures (consequence and likelihood), the overall risk value, which is the mathematical product of the consequence and likelihood levels ($\text{Risk} = \text{Consequence} \times \text{Likelihood}$), was calculated. Finally, each issue was assigned a Risk Ranking within one of five categories: High, Moderate, Acceptable, Low and Negligible based on the risk value (Table 4.2).

Table 4.2 Risk ranking definitions.

RISK	Rank	Likely Management Response	Reporting
Negligible	0	Nil	Short Justification Only
Low	1	None Specific	Full Justification needed
Moderate	2	Specific Management Needed	Full Performance Report
High	3	Possible increases to management activities needed	Full Performance Report
Extreme	4	Likely additional management activities needed	Full Performance Report

In general, only the issues of sufficient risk (Moderate, High and Extreme), i.e. those that require specific management actions, need to have a full performance reports completed. Nonetheless, the rationale for classifying issues as low risk or even negligible were also documented and formed part of the ESD report. This allows all stakeholders and interested parties to see why issues were accorded these ratings.

It is important to note that the Risk Assessment involves the completion of reports that contain the completed justifications for the scores generated. Thus, the scores determined within the meeting by themselves are insufficient.

4.5 COMPONENT REPORTS

Only the issues of sufficient risk or priority that require specific management actions have a full performance report completed (which form section 5 of this ESD report). Nonetheless, the rationale for classifying issues as low risk/priority were also documented and forms part of the report so that stakeholders can see where all the identified issues have finished.

For each of the lowest level sub-components (assessed as being of sufficient risk/priority to address), a detailed assessment of performance is generated. The SCFA Working Group in conjunction with the ESD Reference Group agreed upon a set of 10 standard headings each of which need to be addressed (Table 4.3). Added to this list a further heading, “**Rationale for Inclusion**”, has been added. This specific heading allows the issues raised within the risk assessment process to be explicitly recorded. A full description of each of these headings is located in the WA ESD policy (Fletcher, 2002), which is available on the WA Fisheries website.

Table 4.3 The National ESD reporting framework headings used in this report.

1.	Rationale for Inclusion
2.	Operational Objective (+ justification)
3.	Indicator
4.	Performance Measure (+ justification)
5.	Data Requirements
6.	Data Availability
7.	Evaluation
8.	Robustness
9.	Fisheries Management Response -Current -Future -Actions if Performance limit is exceeded
10.	Comments and Actions
11.	External Drivers

The completion of these component reports was initiated after the development of the component trees in March 2004. Progress towards completing these reports was subsequently made by a variety of Departmental staff. The draft ESD report was sent to DEH and stakeholders including industry members and industry groups for review. This final ESD report was generated after the review process.

4.6 APPLICATION TO MEET EPBC REQUIREMENTS

The material generated by the ESD reporting process, which is contained with the risk assessment and performance reports was used to meet the requirements of the Commonwealth Environment Protection and Biodiversity Conservation Act (1999). This involved submitting an application that addressed each of the criteria of the Commonwealth guidelines for the assessment of sustainable fisheries. This information is provided in Appendix 8.

4.7 OVERVIEW TABLE

The following table provides a summary of the material present in this report.

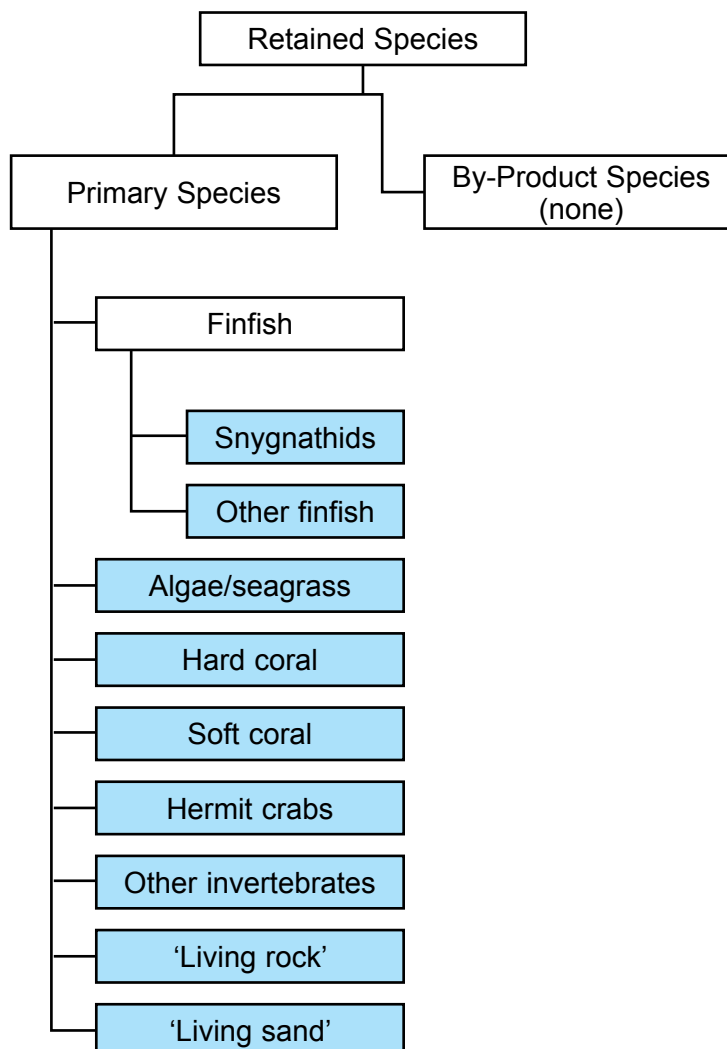
Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	DEH Guidelines Covered	Actions
RETAINED SPECIES (Component Tree)						1.1	
5.1.1.1 Syngnathids	No – Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data, improve species identification data
5.1.1.2 Other finfish	Group A, No – Negligible Risk Group B, No – Low Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data, improve species identification data
5.1.1.3 Seagrass/Algae	No – Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data
5.1.1.4 Hard coral	No – Low Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data
5.1.1.5 Soft coral	No – Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data
5.1.1.6 Hermit crabs	No – Low Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data
5.1.1.7 Other invertebrates	No – Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	DEH Guidelines Covered	Actions
5.1.1.8 Living rock	No – Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data
5.1.1.9 Living sand	No – Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Undertake a management review – improve spatial resolution of catch and effort data
NON-RETAINED SPECIES (Component Tree)	N/A	N/A	N/A	N/A	N/A	2.1 and 2.2	
GENERAL ENVIRONMENT (Component Tree)						2.3	
5.3.1.1 Trophic interactions	No – Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment.
5.3.1.2 Benthic biota (non-target elements)	No – Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment.
5.3.1.3 Anchoring	No – Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment.
5.3.2.1 Translocation by Vessel Hulls	No – Low Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment.
5.3.3.1 Exhaust fumes	No – Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment.
5.3.3.2 Oil discharge	No – Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment.

5.0 Performance Reports

5.1 RETAINED SPECIES

COMPONENT TREE FOR THE RETAINED SPECIES



A blue box indicates that the issue was considered a low or negligible risk, with no specific management required, and only a justification is presented.

5.1.1 Primary Species

5.1.1.1 Syngnathids Rationale for Inclusion

Small numbers of seahorses and pipefish are retained by the fishery. All species in the family Syngnathidae are listed as protected species under Commonwealth legislation (EPBC). It is an offence to kill, injure, take, trade, keep or move a member of a listed species without a permit (EPBC). Permits have been issued to licensees in the MAF.

ERA Risk Rating: Impact on breeding stocks (C0 L6 NEGLIGIBLE)

In general, some species of syngnathids may be vulnerable to overfishing because they reproduce relatively slowly, have low rates of dispersal and are highly habitat dependent. The distribution and biology of many syngnathids is poorly understood.

The MAF catches various species of shallow water syngnathids. However, the impact of the MAF on these syngnathids is likely to be minimal because low numbers of each species are caught per year (Table 5.1). No other commercial fishery targets these populations of syngnathids because the MAF operates in shallow water and other fisheries operate in deeper waters.

An annual limit of 750 syngnathids is imposed on the MAF by the Department of Environment and Heritage. No leafy seadragons (*Phycodurus eques*) are permitted to be taken. There is no evidence of declines for any syngnathid species retained by the MAF (Pogonowski *et al.* 2002).

At least six species of syngnathids have been reported by the MAF in the past, although only four are generally targeted. *Hippocampus angustus* is endemic to Western Australian waters and has been recorded from Shark Bay to the Dampier Archipelago (Pogonowski *et al.* 2002). The other syngnathid species reported by the MAF (see Table 5.1) each have a relatively wide distribution, encompassing the waters of WA and at least 1 other Australian state (Pogonowski *et al.* 2002). Hence, the total area in which syngnathids are captured by the MAF is very low relative to the total distribution of each species (Table 5.2).

Table 5.1 Annual MAF catch (no. of individuals) of Syngnathids, 1999-2003.

Taxa	1999	2000	2001	2002	2003
<i>Filicampus tigris</i>	3				
<i>Haliichthys taeniophorus</i>	1				
<i>Hippocampus angustus/elongatus</i> *	178	329	330	456	110
<i>Hippocampus breviceps</i>	64	62	56	18	
<i>Phyllopteryx taeniolatus</i>	136	223	325	332	215
<i>Stigmatopora argus</i>	78	24	1	21	50
<i>Syngnathidae, unspecified</i>			29	6	8
TOTAL	460	638	741	833	383

*catch reported as *H. angustus* but catches are probably mainly *H. elongatus*, with minor quantities of *H. angustus*.

Therefore, the fishery is ‘**likely**’ to have a ‘**negligible**’ impact on breeding populations of syngnathids. This results in a risk rating of **NEGLIGIBLE**.

Whilst there is uncertainty about the correct identification of some retained syngnathid species, due to the very low catch levels, this uncertainty does not represent a risk to the sustainability of any individual species. However, it is recognised that the standard of reporting by the MAF could be improved. A stakeholder workshop will be held during 2004/05 to address taxonomic uncertainties and other issues in the MAF.

Under the current DEH management arrangements there is nothing to prevent 750 of one species of syngnathid being taken. The management plan review process will investigate the potential to develop species-specific quotas for syngnathids, and the allocation of individual quotas to licensees.

Table 5.2 Total Syngnathid catches (no. of individuals) by block in 2002 and 2003.

Block 9600 = Cockburn Sound, 9603 = King George Sound. For locations of other blocks, see Figure 3.2.

Block	Annual catch	
	2002	2003
9603	298	203
3115	195	108
9600	96	38
3215	109	4
2413	60	
3418	33	
3015	31	
3315		16
2017		10
3518	6	
3419	5	
2016		4
TOTAL	833	383

5.1.1.2 Other Finfish

Rationale for Inclusion:

Small numbers of numerous marine finfish species are retained by the fishery.

ERA Risk Rating: Impact on breeding stocks:

Group A (C0 L6 NEGLIGIBLE) Group B (C1 L4 LOW)

From 2000 to 2003, the total annual catch (no. of individuals) of finfish (excluding syngnathids) by the MAF was 109757, 165657, 104907 and 130025, respectively. While there are currently no quotas on the total catch of finfish by the MAF, the total finfish catch is effectively limited by restrictions on the number of licensees (13 in total) and the physiological constraints of diver-based collection methods.

The vast majority of finfish species that are retained by the MAF are not targeted by other commercial fisheries in Western Australia. From 2000 to 2003, the MAF retained finfish from 117 families, comprising at least 541 species/taxa. However, not all taxa were reported each year – between 321 and 331 taxa were reported in any single year. The number of retained individuals of each taxa was generally very low, i.e. <2000 individuals per year (Table 5.3).

In this report, finfish taxa are divided into 2 groups, according to the average annual catch level. Group A contains those taxa that have an average annual catch of <2000 individuals per year. Group B contains those taxa that have an average annual catch of >2000 individuals per year.

Group A Finfish. This group includes 97 % of taxa caught by the fishery (Tables 5.3, 5.4). Much of the catch is taken around Roebourne (blocks 2016 and 2017) and the around Perth metropolitan area (block 3115), although the total catch is spread across a very wide area, comprising 34 MAF reporting blocks (Table 5.5). The finfish species taken by the MAF tend to be small (<10 cm in length) and abundant, with biological characteristics (high fecundity, planktonic larval dispersal, early age-at-maturity, etc) that minimise the risk of overfishing. Annual catches of <2000 individuals per species are likely to be negligible compared with total stock abundance and also negligible compared with rates of natural mortality (e.g. due to predation).

Therefore, the fishery is ‘likely’ to have a ‘negligible’ impact on breeding populations of Group A finfish. This results in a risk rating of **NEGLIGIBLE**.

Table 5.3 Average annual catches (no. of individuals) of finfish taxa reported by the MAF, from 2000 to 2003 (excluding syngnathids).

Group	Average annual catch	Number of taxa in this category
A	0-50	427
A	50-100	37
A	100-500	50
A	500-1000	9
A	1000-1500	3
A	1500-2000	0
B	> 2000	15

Table 5.4 Average annual catch (no. of individuals) per taxa of Group A finfish*, from 2000 to 2003.

(Group A taxa had an average annual catch of <2000 individuals. ‘Other’ is the summed catch of the remaining 427 taxa that had average annual catches of <50 individuals per year)

Taxa	Catch	Taxa	Catch	Taxa	Catch
<i>Periophthalmus argentilineatus</i>	1200	<i>Gerres oyena</i>	205	<i>Parma mccullochi</i>	90
Pomacentridae	1066	<i>Cryptocentrus obliquus</i>	202	<i>Sillago sihama</i>	89
Mullidae	1035	<i>Istigobius ornatus</i>	201	<i>Paraplesiops meleagris</i>	88
<i>Yongeichthys nebulosus</i>	989	<i>Liza vaigiensis</i>	190	<i>Amphiprion frenatus</i>	86
<i>Polydactylus nigripinnis</i>	800	<i>Amphiprion rubrocinctus</i>	187	<i>Sphyrna barracuda</i>	84
<i>Heterodontus portusjacksoni</i>	757	<i>Lutjanus russelli</i>	186	Gobiidae	82
<i>Apogon rueppellii</i>	615	<i>Halichoeres brownfieldi</i>	184	<i>Istiblennius meleagris</i>	82
<i>Glossogobius biocellatus</i>	603	<i>Rhabdosargus sarba</i>	172	<i>Halichoeres melanochir</i>	80
<i>Lutjanus argentimaculatus</i>	573	<i>Epinephelus coioides</i>	172	<i>Anoplocapros robustus</i>	79
<i>Amphiprion clarkii</i>	554	<i>Apogon victoriae</i>	158	<i>Apogon angustatus</i>	78
<i>Chelmon marginalis</i>	538	<i>Taeniura lymma</i>	153	<i>Siphonognathus radiatus</i>	77
<i>Monodactylus argenteus</i>	509	<i>Dasyatis kuhlii</i>	151	<i>Acentrogobius gracilis</i>	76
<i>Mugil cephalus</i>	496	<i>Pomacentrus milleri</i>	149	<i>Bathygobius fuscus</i>	75
<i>Anoplocapros lenticularis</i>	465	<i>Petroscirtes breviceps</i>	142	<i>Pseudochromis fuscus</i>	75
<i>Neopomacentrus filamentosus</i>	460	<i>Aracana aurita</i>	141	<i>Arothron reticularis</i>	73
Chaetodontidae/Pomacanthidae	457	<i>Neatypus obliquus</i>	141	Orectolobidae	72
<i>Trachinops noarlungae</i>	455	<i>Parupeneus signatus</i>	139	<i>Chelmonops curiosus</i>	71
<i>Chaetodon aureofasciatus</i>	455	Labridae	139	<i>Bodianus frenchii</i>	70
Blenniidae	448	<i>Chromis viridis</i>	136	<i>Thyrsites atun</i>	68
Sillaginidae	395	<i>Microcanthus strigatus</i>	129	<i>Cirripectes filamentosus</i>	65
<i>Coris auricularis</i>	392	<i>Pterois volitans</i>	125	<i>Arius graeffei</i>	64
<i>Lactoria cornuta</i>	360	<i>Pempheris analis</i>	123	<i>Aptychotrema vincentiana</i>	61
<i>Terapon jarbua</i>	350	<i>Scorpaenopsis venosa</i>	122	<i>Halophryne ocellatus</i>	59
Carangidae	340	<i>Labroides dimidiatus</i>	117	Plotosidae	58
<i>Chromis klunzingeri</i>	309	Hemiramphidae	111	<i>Salarias fasciatus</i>	55
<i>Pomacentrus pavo</i>	300	<i>Amblygobius phalaena</i>	109	<i>Congrogadus subducens</i>	54
<i>Enoplosus armatus</i>	296	<i>Parachaetodon ocellatus</i>	106	<i>Istigobius decoratus</i>	54
<i>Pomacentrus coelestis</i>	284	<i>Abudefduf vaigiensis</i>	104	Belonidae	53
<i>Ecsenius yaeyamensis</i>	249	<i>Valenciennea muralis</i>	101	Ariidae	52
<i>Trachinops brauni</i>	242	<i>Chaetodon assarius</i>	97	<i>Apogon endekataenia</i>	52
<i>Thalassoma lunare</i>	239	<i>Pterapogon mirifica</i>	97	<i>Acanthurus triostegus</i>	52
<i>Chaetodontoplus duboulayi</i>	220	<i>Acanthurus grammoptilus</i>	93	<i>Sargocentron rubrum</i>	51
<i>Tilodon sexfasciatus</i>	205	<i>Pempheris klunzingeri</i>	91	<i>Pempheris multiradiatus</i>	50
				Other (includes 427 taxa)	3454

Table 5.5 Total catch (no. of individuals) of Group A and Group B finfish by block, summed from 2000 to 2003.

Block 9600 = Cockburn Sound, 9601 = Geographe Bay, 9603 = King George Sound, 97011 = Abrolhos Islands. For locations of other blocks, see Figure 3.2.

Block	Group A	Group B
1919	9	
2015	92	8
2016	14037	43178
2017	3846	34827
2018	210	21007
2019	317	343
2114	1223	259
2214	516	41
2313	31	146
2413	511	141
2714	13	
3014	2	
3015	92	1
3114	47	
3115	3479	407
3215	861	109
3314	103	
3315	138	
3320	2	
3321	61	
3322	29	
3414	5	
3415	54	
3418	235	
3419	10	
3420	23	
3422	12	
3517	99	
3518	10	
9600	186	75
9601	261	
9603	529	
97011	8	

Group B Finfish. From 2000 to 2003, only 15 finfish taxa had average annual catches of >2000 per year (Table 5.6). Five of these taxa (apogonids, atherinids, clupeids, mugilids and gobioides) may represent >1 species, and so catches of individual species within these taxa may not actually exceed 2000 individuals per year. None of these 15 taxa are listed as threatened (Pogonowski *et al.* 2002).

Group B taxa share biological characteristics that minimise the risk of overfishing. All are relatively abundant species that have a wide distribution. The abundances of these taxa are high, partly because they occur in a range of habitat types and have broad diets (either omnivorous or planktivorous), and so are not strongly affected by food or habitat limitations. Most of these taxa have an early age-at-maturity, are highly fecund and produce pelagic eggs and/or larvae, which allows dispersal over long distances and promotes recruitment across a broad area.

From 2000 to 2003, group B taxa were mainly caught in the region from Port Hedland to Roebourne (MAF blocks 2016, 2017, 2018) (Table 5.5). Nearly all of these fish were taken by a single licensee, for the purpose of supplying live food.

The current MAF Management Plan does not refer to the taking of fish for live food. However, the Management Plan is under review and it is anticipated that the new Plan will restrict the taking of fish for live food within the MAF.

Group B taxa are common prey items for larger piscivores (fish and birds). Therefore, despite the relatively high catches (compared to other finfish caught by the MAF) and the localised distribution of catches, the quantities of these taxa taken by the MAF are likely to be minor relative to natural mortality due to predation. Assuming an average body weight of 20 g per fish, average annual MAF catches of Group B taxa are estimated to range from 42 to 482 kg per taxa. The risk of localised depletion is low because rates of population growth by these species are relatively rapid and can sustain moderate levels of fishing. Also, annual population replenishment of these species occurs via recruitment of planktonic larvae, independent of local population abundance. The total area in which these taxa are captured by the MAF is very small relative to the total distribution of each species, and so the impact of the MAF on the total breeding stock of each species is likely to be low or negligible.

Therefore, it is possible that the fishery could have a minor, but detectable, impact on breeding populations of Group B finfish. This results in a risk rating of **LOW**.

Table 5.6 Average annual catch (no. of individuals) of Group B finfish* by the MAF, from 2000 to 2003.

(*Group B taxa had an average annual catch of >2000 individuals per year).

Family	Taxa/species	Common Name	Average Catch
Apogonidae/Dinolestidae	Unspecified	Cardinalfish	24084
Atherinidae	Unspecified	Hardyheads	20470
	<i>Atherinomorus ogilbyi</i>	Ogilby's Hardyhead	7113
Clupeidae	Unspecified	Herring/sardine	8923
Mugilidae	Unspecified	Mullet	7626
	<i>Valamugil buehneri</i>	Blue-tail mullet	3519
Gobiesocidae	Unspecified	Clingfish	4551
Pomacentridae	<i>Chromis atripectoralis</i>	Black-axil chromis	4514
	<i>Chromis cinerascens</i>	Green chromis	2482
	<i>Neopomacentrus azysron</i>	Yellowtail demoiselle	2100
Teraponidae	<i>Amniataba caudavittatus</i>	Yellowtail grunter	3644
Chandidae	<i>Chanos chanos</i>	Milkfish	3072
Chanidae	<i>Ambassis vachellii</i>	Telkara Perchlet	3000
Plotosidae	<i>Plotosus lineatus</i>	Striped catfish	2943
Scatophagidae	<i>Selenotoca multifasciata</i>	Striped butterflyfish	2500

A very high diversity of finfish species in the catch has resulted in uncertainty about the correct identification of some retained species. Due to the very low catch levels, this uncertainty does not represent a risk to the sustainability of any individual species. However, it is recognised that the standard of reporting by the MAF could be improved. A stakeholder workshop will be held during 2004/05 to address taxonomic uncertainties, the taking of fish for live food and other issues in the MAF.

5.1.1.3 Seagrass/Algae

Rationale for Inclusion:

Licence endorsements can be issued to MAF licensees to collect algae and seagrass. Two algae and two seagrass licence endorsements currently exist (as of June 2004). The fishery currently collects small quantities of algae and very small quantities of seagrass.

ERA Risk Rating: Impact on breeding stocks (C0 L6 NEGLIGIBLE)

From 1998 to 2000, no algae were collected by the MAF. In 2001, 2002 and 2003, 810 kg, 2138 kg and 5081 kg (wet weight), respectively, of algae was collected. The type of algae is mainly reported as ‘unspecified’ but collections are known to include red and green algae.

Exact quantities of seagrass collected by the MAF are unclear because previous catches have been recorded by Department of Fisheries under the category of ‘unspecified species’. However, quantities collected to date are considered to be insignificant. Since 2002, only 1 licensee has collected seagrass, at a rate of approximately 0.5-1 kg per month (M. Cliff, Dept of Fisheries, pers. comm.). Seagrasses have low survival rates in aquaria and so the catch is likely to remain at an insignificant level in future.

The total area in which algae was collected by the MAF is very low relative to the probable total distribution of each species (Table 5.7). The impact of the fishery on individual algal species is likely to be negligible because the catch of each species is extremely low, relative to the likely abundance of each species across its entire distribution. Also, the amount of algae collected is likely to be negligible compared with natural losses due to herbivory and storm damage. Hence, the level of impact by the MAF on the population of each seagrass and algal species is likely to be undetectable.

Therefore, the fishery is ‘likely’ to have a ‘negligible’ impact on populations of algae and seagrass. This results in a risk rating of **NEGLIGIBLE**.

Table 5.7 Annual MAF harvest (kg) of algae by block in 2002 and 2003. For locations of blocks, see Figure 3.2.

Block	Annual catch (kg)	
	2002	2003
2016	-	103
2114	2082	4962
2214	3	16
3115	53	-
TOTAL	2138	5081

Standard MAF licences do not include an endorsement to collect algae or seagrass. The MAF Management Plan is currently under review. It is anticipated that the new Plan will simplify licence arrangements by including the current CFL endorsements on the Managed Fishery Licence and will specify quotas for algae and seagrass.

There is uncertainty about the correct identification of algal species in the catch. There are also inconsistencies in the reporting of harvest levels – algae has variously been reported as kilograms or pieces. Due to the relatively low quantities of retained algae, these uncertainties are unlikely to represent a risk to the sustainability of any species. However, it is recognised that the standard of reporting by the MAF could be improved.

Catches by the MAF are reported by 60 x 60 nm ‘blocks’. The Department of Fisheries is currently negotiating with licensees to develop a finer spatial scale for reporting.

A stakeholder workshop will be held during 2004/05 to address the above issues in the MAF.

5.1.1.4 Hard Coral

Rationale for Inclusion:

Licence endorsements can be issued to MAF licensees to collect hard coral. Five permits currently exist (as of June 2004). The fishery collects small quantities of numerous species of hard coral.

ERA Risk Rating: Impact on breeding stocks (C1 L5 LOW)

From the mid-1980s, the Department of Fisheries permitted five licensees to each collect up to 2,000 kg of hard coral, with an annual total fishery maximum of 10,000 kg. This maximum was recently reduced, through non-renewal of a licence, to 8,000 kg. MAF licensees have proposed that the total allowable catch be redistributed among all licensees in the fishery. This proposal is supported by the Department of Fisheries. Under this proposal, the 4 current licensees with existing coral-collecting permits would be allocated 1,000 kg per year and the remaining 9 licensees without coral-collecting permits being would be allocated 500 kg per year. This equates to a total maximum annual allowable take of 8,500 kg. No other commercial or recreational fishery in Western Australia is permitted to retain hard coral.

Collections of hard coral have variously been reported as kilograms or pieces. It is estimated that 5 pieces = approximately 1 kg (M. Cliff, Dept. of Fisheries, pers. comm.). Based on this estimate, total annual catches of 2066 kg, 2309 kg and 2197 kg were reported in 1999, 2000 and 2001, respectively. In 2002 and 2003, total annual catches of hard coral by the MAF were approximately 4700 kg (Table 5.8).

Since 2001, some hard coral catches have been reported by species. From 2001 to 2003, 21 individual species were named in collections. However, the vast majority of the catch was only reported at family level (15 families) or as 'unspecified hard coral' (Table 5.8).

Most of the hard coral collection by the MAF occurs in block 2016 (Tables 5.9, 5.10). From 2001 to 2003, the catch within block 2016 comprised at least 30 taxa. Over this 3-year period, the total catch of Caryophylliidae was 1125 kg, while catches of other taxa were much lower and ranged from 1 to 575 kg per taxa (Table 5.10).

Table 5.8 Annual MAF catches (kg) of hard coral, 2001 to 2003.

Family	Annual catch (kg)		
	2001	2002	2003
Acroporidae	22	201	345
Agariciidae		2	7
Anthemiphylliidae	33	296	222
Caryophylliidae	16	721	449
Dendrophylliidae	67	352	459
Euphyllidae	57	489	855
Fungiidae	18	89	94
Merulinidae	2	5	2
Mussidae	28	169	68
Oculinidae		7	14
Pectiniidae			3
Pocilloporidae	7	5	58
Poritidae	60	404	151
Siderastreidae		3	
Trachyphylliidae		75	276
Hard coral, unspecified	1887	1931	1634
Grand Total	2197	4748	4637

Table 5.9 Annual MAF catches (kg) of hard coral by block, 2002 and 2003.

See Figure 3.2 for location of blocks.

Block	Annual catch (kg)	
	2002	2003
2016	3836	3832
2017	130	126
2114	149	118
2214	217	249
2413	150	34
3115	267	279
Grand Total	4748	4637

There is a small risk of localised depletion of some hard coral species in block 2016. The impact of the current catch rate is likely to be greatest for slow growing species. Presently, there is considerable uncertainty about the correct identification of hard coral species in the reported catch. Whilst there are uncertainties about the quantity of hard coral collected because of inconsistencies in reported catch units (kg versus pieces), the risks to any one species is very small because the area over which each species is targeted by the MAF represent much less than 1% of the total distribution of these species groups. Moreover, the damage to these groups from the storms that frequent these locations are likely to result in damage that is many orders of magnitude larger than results from these collections. Therefore, the impact of the MAF on the standing stocks of each hard coral species is likely to be low to negligible.

It has been, nonetheless, recognised that the standard of reporting by the MAF should be improved. Taxonomic uncertainties need to be resolved. Also, the Department of Fisheries is currently negotiating with licensees to develop a finer spatial scale for reporting. Catches by the MAF are currently reported by 60 x 60 nm 'blocks'.

Therefore, the fishery may have a minor, but detectable, impact on populations of some hard coral species. This results in a risk rating of **LOW**.

Table 5.10 Annual MAF catch (kg) of hard coral in block 2016.

Family	Species	2001	2002	2003
Acroporidae	<i>Acropora tizardi</i>		3	
	Unspecified	4	98	235
	<i>Astreopora gracilis</i>			6
Agariciidae	Unspecified		2	
	<i>Pavona decussata</i>			4
Anthemiphylliidae	<i>Caulastrea tumida</i>			5
	Unspecified	33	261	145
	<i>Favites abdita</i>			2
	<i>Moseleya latistellata</i>		18	7
Caryophylliidae	Unspecified	16	719	389
Dendrophylliidae	Unspecified	51	91	93
	<i>Duncanopsammia axifuga</i>		226	192
Euphyllidae	<i>Catalaphyllia jardinei</i>	15	88	222
	<i>Euphyllia ancora</i>		104	209
	<i>Euphyllia glabrescens</i>	42	250	283
Fungiidae	Unspecified	18	71	72
	<i>Polyphyllia talpina</i>		17	21
Merulinidae	Unspecified	2	5	2
Mussidae	Unspecified	28	169	57
	<i>Scolymia australis</i>			2
Oculinidae	Unspecified		7	11
Pectiniidae	<i>Pectinia lactuca</i>			3
Pocilloporidae	<i>Pocillopora damicornis</i>			42
	<i>Pocillopora eydouxi</i>			2
	Unspecified	7	3	5
Poritidae	<i>Goniopora columna</i>	8	88	1
	<i>Porites attenuata</i>			1
	Unspecified	52	312	128
Trachyphylliidae	<i>Trachyphyllia geoffroyi</i>		30	243
	Unspecified		45	28
Hard coral	Unspecified	103	1230	1422
TOTAL		379	3836	3832

Standard MAF licenses do not include an endorsement to collect hard coral, although the taking of hard corals by MAF licensees currently occurs via an endorsement on their CFL. The MAF Management Plan is currently under review. It is anticipated that the new Plan will simplify licence arrangements by amalgamating current licenses and will specify quotas for hard coral.

A stakeholder workshop will be held during 2004/05 to address the above issues in the MAF. Experts in hard coral taxonomy will be invited to the workshop.

5.1.1.5 Soft Coral

Rationale for Inclusion:

Licence endorsements can be issued to MAF licensees to collect soft coral. The fishery collects small quantities of various species of soft coral (Alcyonacea).

ERA Risk Rating: Impact on breeding stocks (C0 L6 NEGLIGIBLE)

Until 2001, no soft coral collections were reported by the MAF. From 2001 to 2003, the catch was reported at family level (2 families) or as ‘unspecified soft coral’ (Table 5.11). Collections of soft coral have variously been reported as kilograms or pieces.

Table 5.11 Annual MAF catch (kg) of soft coral by block, 2001 to 2003.

For location of blocks, see Figure 3.2.

Family	Block	Annual catch (kg)		
		2001	2002	2003
Alcyoniidae	2016	28	693	513
	2017	-	-	20
	2114	4	34	15
	2214	7	48	74
	2413	-	290	-
Nephtheidae	2016	-	-	11
Soft coral, unspecified	2016	-	-	253
	2114	53	12	10
	2214	20	19	22
	2413	6	-	-
TOTAL		118	1096	918

The total area within which soft corals are collected by the MAF is very small relative to the likely total distribution of each species (Table 5.11). The impact of the fishery on individual soft coral species is likely to be negligible because the catch of each species is extremely low, relative to the likely abundance of each species across its entire distribution. Also, the amount of soft coral collected is likely to be small compared with natural losses due to storm damage and predation. No other commercial or recreational fishery in Western Australia is permitted to retain soft coral. Therefore, the fishery is ‘**likely**’ to have a ‘**negligible**’ impact on populations of soft corals. This results in a risk rating of **NEGLIGIBLE**.

Standard MAF licenses do not include an endorsement to collect soft coral, although the taking of soft corals by MAF licensees currently occurs via an endorsement of their CFL. The MAF Management Plan is currently under review. It is anticipated that the new Plan will simplify licence arrangements by amalgamating current licenses and will specify quotas for soft coral.

There is uncertainty about the correct identification of soft coral species in the reported catch. There are also uncertainties about the quantity of soft coral collected because of inconsistencies in reported catch units (kg versus pieces). Due to the relatively low quantities of retained soft corals, these uncertainties are unlikely to represent a risk to the sustainability of any species. However, it is recognised that the standard of reporting by the MAF could be improved.

Catches by the MAF are currently reported by 60 x 60 nm ‘blocks’. The Department of Fisheries is currently negotiating with licensees to develop a finer spatial scale for reporting.

A stakeholder workshop will be held during 2004/05 to address the above issues in the MAF. Experts in soft coral taxonomy will be invited to the workshop.

5.1.1.6 Hermit Crabs

Rationale for Inclusion:

Three MAF licensees are currently allowed to collect hermit crabs. The fishery collects terrestrial hermit crabs (*Coenobita variabilis*) and small numbers of shallow-water hermit crabs.

ERA Risk Rating: Impact on breeding stocks (C1 L3 LOW)

Collections of both *C. variabilis* and shallow-water hermit crabs by the MAF mainly occur in a single area (block 2016) located between Onslow and Port Hedland (Table 5.12). In 2002 and 2003, catches (number of crabs) of *C. variabilis* were 70,055 and 62,935, respectively, and catches of shallow-water hermit crabs were 14,018 and 32,076, respectively.

Two fishers outside the MAF also have permits for taking *C. variabilis*. Only 1 of these permits has been active in recent years. Collections by this permit holder usually occur in different areas (around Broome) to those of the MAF (Table 5.12).

In previous years, catches of both *C. variabilis* and shallow-water hermit crabs were lower. In 1999, 2000 and 2001, the total catches (number of crabs) of *C. variabilis* were 13415, 11633 and 24070, respectively. The total catches of shallow-water hermit crabs were 311, 1088 and 0, respectively.

Collections of shallow-water hermit crabs are not reported by species and the catch may include numerous species. Most shallow-water hermit crabs in Australia belong to the family Diogenidae, which contains a large number of species (Jones and Morgan 1994).

Table 5.12 Annual MAF catch (number of individuals) of hermit crabs by block, 2002 and 2003.

For location of blocks, see Figure 3.2.

Taxa	Block	Annual catch (number of crabs)			
		MAF		Non-MAF	
		2002	2003	2002	2003
<i>Coenobita variabilis</i>	1722	-	-	59800	32900
	1821	-	-	-	14900
	1822	1200	-	-	-
	1921	-	-	8000	-
	2016	67855	62935	-	-
	2115	1000	-	-	-
TOTAL		70055	62935	67800	47800
Hermit crabs, other	2016	12047	28103	-	-
	2214	1891	3273	-	-
	3115	-	400	-	-
	2017	-	300	-	-
	2114	80	-	-	-
TOTAL		14018	32076	0	0

Coenobita variabilis is distributed across northern Australia, from Exmouth Gulf to northern Queensland (Jones and Morgan 1994). Individuals occur in the intertidal zone and up to 100 m from the shoreline. They are common in mangroves, but also occur in sandy and rocky areas. Adults live out of water, but females require water in which to lay their eggs. Eggs and larvae are planktonic. Juveniles recruit to land. Maximum carapace length is 40 mm.

Given that the vast majority of the catch by the MAF is taken from a single block (2016), there is a small potential for localised depletion. Whilst the catches for *C. variabilis* are higher than for shallow-water hermit crabs, the risks to these stocks are very low given the often very high densities of this group that can be found within suitable intertidal areas.

Total catches of shallow-water crabs may include several species, and so catches of individual shallow-water crab species are likely to be considerably lower than catches of *C. variabilis*.

The total area in which *C. variabilis* is collected by the MAF and the non-MAF permit holder is small relative to the total distribution of the species. Hence the catch of this species is low, relative to the likely abundance of the species across its entire distribution. Also, recruitment of planktonic larvae, which can be dispersed long distances, is likely to ensure replenishment of fished populations and minimise the risk of localised extinction. The supply of new recruits can occur from unfished populations throughout northern WA.

Similarly, the impact of the fishery on the breeding stocks of shallow-water hermit crabs is likely to be low because the catch of each species is small, relative to the likely abundance of each species across its entire distribution. Also, recruitment of planktonic larvae is likely to ensure replenishment of fished populations and minimise the risk of localised depletion.

Therefore, it is ‘**unlikely**’ that even a ‘**minor**’ impact on populations of hermit crabs will result from the MAF. This results in a risk rating of **LOW**.

5.1.1.7 Other Invertebrates

Rationale for Inclusion:

The fishery by way of an endorsement on their commercial fishing licence catches small quantities of numerous invertebrate species.

ERA Risk Rating: Impact on breeding stocks (C0 L6 NEGLIGIBLE)

From 2001 to 2003, 24 taxa of ‘other invertebrates’ (excluding hard and soft corals and hermit crabs) were collected by the MAF (Table 5.13). This catch was distributed across 11 MAF blocks (Table 5.14). The composition of the catch was variable across years. In 2002 and 2003, anemones (various species) were the most abundant component of the catch. The total area in which ‘other invertebrates’ are collected by the MAF is small relative to the total distribution of each species. Hence, catches are low relative to the likely abundance of each species across its entire distribution.

The life history characteristics of most invertebrate species (high rate of natural mortality, rapid growth, early age at maturity, medium-high fecundity) result in a low vulnerability to overfishing. Also, a pelagic larval phase allows each species to disperse widely and would facilitate annual recruitment to each area of the fishery, irrespective of local population abundance. This minimises the risk of localised depletions.

Therefore, the impact of the MAF on populations of ‘other invertebrates’ is ‘**likely**’ to be ‘**negligible**’. This results in a risk rating of **NEGLIGIBLE**.

Table 5.13 Annual MAF catches (number of individuals) of 'other invertebrates', 2001 to 2003.

Family	Species	Common Name	2001	2002	2003
Crustacea	Unspecified	Unspecified	3150		
	Unspecified	Shrimp	128	69	91
Palinuridae	<i>Panulirus ornatus</i>	Ornate rock lobster	1		1
Porcellanidae	Unspecified	Porcelain crabs		9	5
Stenopodidae	<i>Stenopus hispidus</i>	Banded coral shrimp	156	149	168
Order Echinoidea	Unspecified	Sea urchin	6	227	644
Order Asteroidea	Unspecified	Starfish	101	425	197
Comasteridae	Unspecified	Basketstar-Crinoids		51	
Holothuriidae	<i>Holothuria edulis</i>	Burnt sausage cucumber		6	183
	<i>Holothuria leucospilota</i>	Black cucumber			40
	Unspecified	Sea cucumber		25	170
Nudibranchia	Unspecified	Nudibranchs	24		31
Octopodidae	Unspecified	Octopus		15	32
Serpulidae	Unspecified	Tubeworms			8
Actinodiscidae	<i>Discosoma</i> spp.	Coral-like anemone			383
Zoanthidae	Unspecified	Zoanthid anemones			86
Order Actiniaria	Unspecified	Anemone	782	2967	2585
Stichodactylidae	<i>Entacmea quadricolor</i>	Anemone	145	436	2901
	Stichodactylidae	Carpet anemones		16	86
Order Corallimorpharia	Unspecified	Coral-like anemones			2
Order Pennatulacea	Unspecified	Seapens	3		6
Protoptilidae	<i>Distichoptilum gracile</i>	Seapen			6
Virgulariidae	Unspecified	Seapens			6
Order Scyphozoa	Unspecified	Jellyfish	1		

Table 5.14 Annual MAF catches (number of individuals) of 'other invertebrates' by block, 2001 to 2003.

Block 9600 = Cockburn Sound, 9601 = Geographe Bay. For location of other blocks, see Figure 3.2.

Block	2001	2002	2003
2016	85	1773	4708
2017	3150	30	659
2114	555	417	1193
2214	145	283	549
2313	39		240
2413	299	1240	38
3114	21		
3115	175	648	235
3215	10		
9600	9	4	10
9601	9		
TOTAL	4497	4395	7632

Standard MAF licenses do not include an endorsement to collect invertebrates, although the taking of invertebrates by MAF licensees currently occurs by way of an endorsement on their commercial fishing licence. The MAF Management Plan is currently under review. It is anticipated that the new Plan will specify quotas for invertebrates.

There is considerable uncertainty about the correct identification of ‘other invertebrate’ species in the reported catch. Due to the low catch levels, these uncertainties are unlikely to represent a risk to the sustainability of any species. However, it is recognised that the standard of reporting by the MAF could be improved.

Catches by the MAF are currently reported by 60 x 60 nm ‘blocks’. The Department of Fisheries is currently negotiating with licensees to develop a finer spatial scale for reporting. A stakeholder workshop will be held during 2004/05 to address the above issues in the MAF. Experts in invertebrate taxonomy will be invited to the workshop.

5.1.1.8 Living Rock

Rationale for Inclusion:

The fishery collects small quantities of ‘live rock’. Three endorsements to take 500 kg each currently exist (as of May 2004) for MAF licensees to collect ‘live rock’.

ERA Risk Rating: Impact on environment (C0 L6 NEGLIGIBLE)

‘Live rock’ is defined as rock and dead coral with live marine organisms growing on and/or in it. It is collected as substrate for aquariums. From 2001 to 2003, collections of ‘live rock’ ranged between 0 and 2089 kg per block. Collections were made in 8 blocks.

Table 5.15 Annual MAF collections (kg) of ‘live rock’ by block.

For locations of blocks, see Figure 3.2.

Block	2001	2002	2003
2015	78		
2016	63	1032	2089
2017	560		20
2018	1		
2114	3		
2413	325	240	
3115	70	328	421
3322	10		
TOTAL	1110	1600	2530

The Department of Fisheries proposes to implement a quota that will allow each license some units of live rock per year. The impact of this collection level by the MAF on populations of rock-dwelling organisms or other associated organisms is considered to be **NEGLIGIBLE**. Impacts on the general environment would probably be undetectable.

5.1.1.9 Living Sand

Rationale for Inclusion:

The fishery collects very small quantities of ‘live sand’.

ERA Risk Rating: Impact on environment (C0 L6 NEGLIGIBLE)

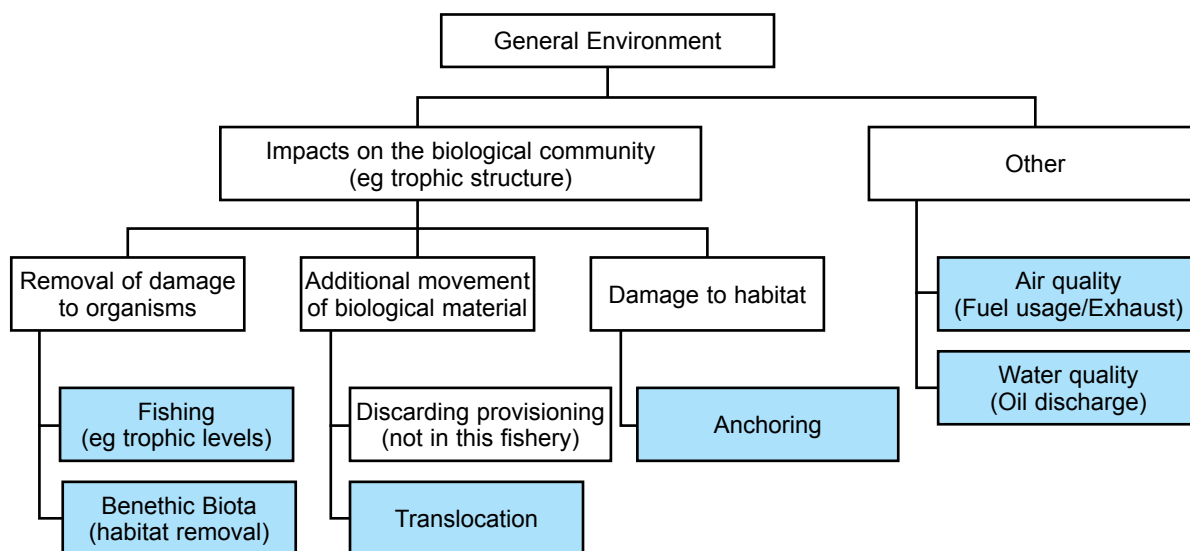
‘Live sand’ is defined as marine sand containing live organisms. It is collected as substrate for aquariums. In 2002 and 2003, 100 kg and 50 kg, respectively, of live sand were collected by the MAF. A single licensee in block 2413 made collections.

The Department of Fisheries proposes to implement a quota that will allow each license some units of live sand per year. The impact of this collection level by the MAF on populations of sand-dwelling organisms or other associated organisms is considered to be **NEGLIGIBLE**. Impacts on the general environment would probably be undetectable.

5.2 NON RETAINED SPECIES

There are no non-retained species for this fishery.

5.3 GENERAL ENVIRONMENT COMPONENT TREE FOR THE GENERAL ENVIRONMENT



A blue box indicates that the issue was considered a low risk, with no specific management required, and only a justification is presented.

5.3.1 Removal of/Damage to Organisms

5.3.1.1 Trophic Interactions

Rationale for Inclusion:

The assessment of potential indirect ecosystem impacts that could result from the removal of target species by a fishery should always be assessed. Finfish and small invertebrates comprise major components of the MAF catch.

Most of the finfish species in the MAF catch are small-sized (<10 cm in length). Many are planktivorous. Many are prey to piscivorous birds and larger fish. Most of the invertebrates in the MAF catch are also small-sized. Most consume plankton or detritus. There is no evidence that any finfish or invertebrate species play a ‘keystone’ role in the ecosystem. Therefore, the majority of the species within these 2

groups are similar in their trophic function and it is appropriate to consider the impact of total finfish and total invertebrate removals by the fishery.

ERA Risk Rating: Impact on the environment (C0 L6 NEGLIGIBLE)

From 2000 and 2003, total finfish catches averaged between 0 and 1144 kg per block per year (assuming an average body weight of 20 g per fish). It is not possible to estimate the total weight of invertebrates taken by the fishery each year. However, the invertebrates that are collected by the fishery are all small-sized and so the total numbers of individuals probably amount to a relatively small total biomass per region. This level of biomass removal by the fishery is likely to be negligible compared with natural rates of mortality (especially due to predation) that act on populations of small fish and invertebrates in each region. Impacts to trophic dynamics in each region would probably be undetectable.

Therefore, it is ‘**likely**’ that the trophic impact of removals by the fishery is ‘**negligible**’. This results in a risk rating of **NEGLIGIBLE**.

Although the trophic impact of total removals by this fishery was rated as **NEGLIGIBLE**, the Department of Fisheries recognises that an assessment of trophic impacts by fisheries at a regional level, rather than at the individual fishery level, would be beneficial. Consequently, the Department will investigate the development of research to identify any detectable regional changes in the structure of coastal fish communities over the last 40 years.

5.3.1.2 Benthic Biota (non-target elements)

Rationale for Inclusion:

Apart from the impact on the habitat associated with the collection of the specific target species (see above) the fishery may have some impact on the surrounding benthic habitats.

ERA Risk Rating: Impact on the environment (C0 L6 NEGLIGIBLE)

There is likely to be very insignificant impacts on the surrounding habitats from the activities of the MAF. This may occur from the removal of non-target benthos accidentally whilst collecting specimens. The scale of this is likely to be much lower than for the target groups and occur across a wider range of species and hence will result in negligible impact.

5.3.1.3 Anchoring

Rationale for Inclusion:

Small vessels, which use anchors, are used in the fishery.

ERA Risk Rating: Impact on general environment (C0 L6 NEGLIGIBLE)

There are 13 licensees operating in the fishery, all except one use relatively small (<12 m) licensed fishing vessels. The fishery extends the entire length of the Western Australian coastline and some collection activities (e.g. collection of hermit crabs and wading in shallow water) are not undertaken from a vessel.

Therefore, the impact of anchoring by the fishery over this area is ‘**likely**’ to be ‘**negligible**’. This results in a risk rating of **NEGLIGIBLE**.

5.3.2 Addition/Movement of Biological Material

5.3.2.1 Translocation by Vessel Hulls Rationale for Inclusion:

Vessels used in the fishery travel between regions and could potentially be a vector for exotic species and diseases.

ERA Risk Rating: Impact on the environment (C4 L1 LOW)

Thirteen licensees operate in the fishery, which extends along the entire length of the Western Australian coastline. The hulls of vessels moving between regions could provide an opportunity for translocation of organisms. However, licensees typically operate within a small region and do not travel between regions. Also, the Leeuwin Current flows along the length of the WA coastline, transporting biological material and resulting in a high level of connectivity between regions. Therefore, vessels in the fishery are unlikely to translocate organisms beyond the range of dispersal that would occur through natural processes. Vessels operating in the fishery do not use ballast water. Therefore, although the impact of translocation of exotic pests or diseases could be ‘major’, the likelihood of this event is ‘remote’. This results in a risk rating of **LOW**.

5.3.3 Other Environmental Impacts

5.3.3.1 Exhaust Fumes Rationale for Inclusion:

Vessels in the fishery produce exhaust fumes.

ERA Risk Rating: Impact on general environment (C0 L6 NEGLIGIBLE)

There are 13 licensees operating in the fishery, all except one use relatively small (<12 m) licensed fishing vessels. The fishery extends the entire length of the Western Australian coastline and some collection activities (e.g. collection of hermit crab) are not undertaken from a vessel.

Therefore, the impact of exhaust fumes released by the fishery over this area is ‘likely’ to be ‘negligible’. This results in a risk rating of **NEGLIGIBLE**.

5.3.3.2 Oil Discharge Rationale for Inclusion:

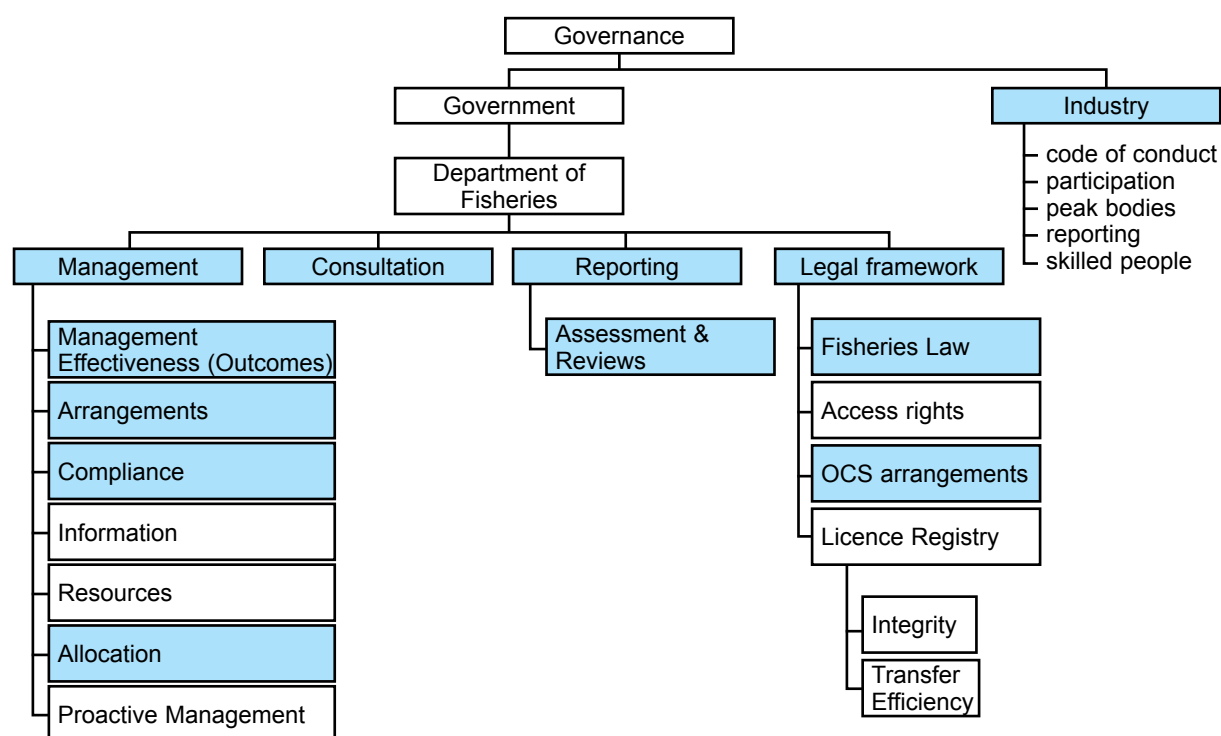
The fishery uses small vessels, which use oil.

ERA Risk Rating: Impact on general environment (C0 L6 NEGLIGIBLE)

There is a risk of oil spills from vessels used in the fishery. However, there are only 13 licensees operating in the fishery, all except one use relatively small (<12 m) licensed fishing vessels. The fishery extends the entire length of the Western Australian coastline and some collection activities (e.g. collection of hermit crab) are not undertaken from a vessel.

Therefore, the risk to the environment of oil being released by a small number of small vessels over this large area is ‘likely’ to be ‘negligible’. This results in a risk rating of **NEGLIGIBLE**.

5.4 GOVERNANCE COMPONENT TREE FOR THE GOVERNANCE OF THE MARINE AQUARIUM MANAGED FISHERY



NB - Generic components have been removed from the tree and only the blue boxes will be reported in this ESD report.

5.4.1 Department of Fisheries – Management

5.4.1.1 Management Effectiveness (Outcomes)

Rationale for Inclusion:

The effectiveness of management arrangements in the MAF are ultimately measured by assessing the outcomes of various strategies employed to manage this fishery. Effort has been controlled through input controls since the inception of the management plan in 1995. This plan restricts the number of licence holders who can commercially fish for aquarium fish and imposes gear restrictions.

The expected outcome in this fishery is that licensees are able to comfortably catch their targeted species. Any reduction in the ability of the licensees to target the MAF species that cannot be readily explained (e.g. natural recruitment variability, negative market forces) may reflect a reduction in management effectiveness and raise concerns about the ongoing sustainability of the commercial fishery. Due to the high number of species taken in this fishery, minimal biological and ecological research has been carried out on the MAF. The Department of Fisheries Research Division has many years of catch and effort data for the fishery.

Operational Objective

The effort used to comfortably catch the targeted species is maintained within an acceptable range as predicted from historical data (except for the Syngnathid species, which has a blanket restriction of only 750 specimens that are allowed to be harvested in any given year).

Justification:

If effective management arrangements are operational in the fishery, then the level of effort used to collect the targeted species should be maintained. In the event commercial fishermen were unable to catch a significant proportion of the targeted species, or this took a substantially different period of time than normal, then the reason/s would need to be identified and explained. For example, it may be that unfavourable weather conditions reduced the number of days able to be fished and hence the ability of the licensees to get a reasonable amount of the targeted species would have to be justified – or the reason may stem from changes to the market price and hence the incentive to fish.

Indicator

The level of effort to collect the targeted species of MAF.

Performance Measure

The number of days fished in relation to catch.

It has been suggested that the number of hours searched (as opposed to the number of days fished) would give a better representation of the effort and consequently the performance/efficiency of the licensees.

Justification:

The possibility of establishing a new way of measuring effort through hours searched for fish rather than days fishing is one which the Department of Fisheries is assessing. It is considered that this gives a better representation of effort because the number of hours it takes to find the fish the licensees are targeting in one day is a much better representation than just giving the fact that they went fishing for one day. It should also be noted that the MAF licencees often target species that are commercially valuable on an opportunistic basis rather than individual species.

Data Requirements for Indicator

The following data are required for this indicator:

Data Requirement	Data Availability
Historical catch levels	Yes – records available and accessible
Level of fishing effort	Yes – available as number of fisher days
Commercial catch	Yes – available through CAESS data
Impacts from other resource users	Yes (for some other interactive fisheries) - Information is available through CAESS data (see Appendix 7 for information regarding trawl activity on Syngnathid family in the Shark Bay Area). There are no real estimates of recreational catch but it is considered that it would be minimal
Environmental impacts	No – there is no real understanding of impact of environmental conditions on stock abundance

Evaluation**Commercial catch**

Reported catches from MAF licensees (from the State of the Fisheries Report)

Species	2000/01		2001/02	
	Quantity	Weight (kg)	Quantity	Weight (kg)
Aquarium Fish	193,608		167,871	
Invertebrates	5,126		5,112	
Corals		2,393		3,007
Soft corals, live rock/sand, algae				9,994

Fishing effort

The fishing effort in 2001, 2002 and 2003 was 931, 914 and 942 fisher days respectively. It is assumed that the MAF is currently meeting its performance measure because the industry has not indicated that extra effort is required to take the required catch and the number of fisher days over the past three years is relatively stable.

Robustness

LOW – Relevant base line studies not have been carried out on the MAF.

Fisheries Management Response

Current

The current management arrangements are listed in Section 5.4.1.2. In addition, the Department of Environment and Heritage has set by Declaration a nominal amount of 750 individuals of Syngnathid species to be taken.

Future

The Management Plan is in the process of being amended. It is proposed that each licensee will have an annual quota for coral, live rock and invertebrates. The range of species allowed to be taken will be finalised after liaison with the WA Museum and other relevant authorities.

In WA up to six species of syngnathid are known to have been taken in the past, although only four are generally targeted. Under the current DEH management arrangements there is nothing to prevent 750 of one species of syngnathid being taken. The management plan review process will investigate the potential to develop species-specific quotas for syngnathids, and the allocation of individual quotas to licensees, to meet the total allowable quota of 750 individuals.

The Department will incorporate the new CITES agreement and decisions into it's management arrangements. This will place a minimum size limit of 10 cm length on the harvest of syngnathids.

The Department supports potential future developments in aquaculture, which potentially will ultimately result in a decrease of wild caught species, and assist in satisfying public perceptions/concerns about wild caught aquarium fish and syngnathids in particular.

The Department intends to negotiate with the newly formed Industry Association to consider an 'industry-contribution-to-research' fee to accommodate data collection and analysis. It is also hoped that the Association may be proactive in terms of securing funding/resources for universities, etc to undertake further research into the species collected in the MAF, given the lack of consolidated funds within the Department to undertake research on this minor fishery.

The Department has identified that a finer scale of reporting in terms of the harvest area would be

beneficial in collecting more information on the distribution of syngnathids and the primary finfish species targeted within the MAF. The current catch and effort return forms provide for a 60 x 60 nautical mile (nm) grid system which does not provide a suitable level of detail for smaller scale commercial operations such as the MAF. Consequently, the Department is in the process of negotiating with the Association to impose a smaller grid system of possibly 10 nm.

At a recent internal Risk Assessment Workshop, several compliance ‘loopholes’ in the existing management arrangements were identified. Once feasible solutions are finalised, they will be incorporated into the Management Plan to improve enforcement rigour within the Fishery.

Actions if Performance Limit is Exceeded: If the effort required to catch the target species were outside the historical values then a review of the causes would be undertaken. This review would examine why the catch levels were not met. If this variation is not explained by changes in the market conditions or environmental variations or a peculiarity of industry dynamics and behaviour, then strategies that offer further protection for those species will be considered. These strategies include reductions in total effort expended in the fishery through a reduction in the number of days fished, area or seasonal closures, species restrictions and quota reductions for coral and live rock.

For the Syngnathid family, harvesting of greater than 750 specimens requires the Department to prepare a report to DEH indicating why the take was exceeded. In 2002, 833 syngnathids were taken and as a result a report was submitted to DEH (Appendix 5).

Comments and Actions

A change to the way in which effort is reported, from ‘number of fisher days’ to ‘numbers of hours searched’, as mentioned above, should provide a better representation of effort and monitor performance within the fishery. Areas within the fishery that have experienced a decreased abundance of targeted species due to fishing effort may then be more easily identified.

External Driver Checklist

- Diving conditions vary between years which may affect catch rates and hence the level of effort required.
- The direct impact of recreational fishermen and other fishing activities (for example, trawling and other line fish fishing) is unknown.
- Market capacity/demand may affect the take of MAF targeted species and it is forecast that some of the popular marine aquarium species will be supplied by the aquaculture industry. This may reduce the level of effort or shift it to other species.

5.4.1.2 Management Arrangements

Rationale for Inclusion:

In Western Australia, a number of instruments are used to articulate the management arrangements for fisheries. The FRMA has elements that affect all fisheries. The FRMA provides for the creation of Management Plans, Orders (Notices), Regulations, Ministerial Policy Guidelines (MPG) and Policy Statements.

The Act sets out the objects for the sustainable management of fish resources in Western Australia and provides the framework for developing and implementing management plans for each of the State’s fisheries. *The Marine Aquarium Fish Management Plan 1995* is effectively a set of rules for the

fishery and includes, amongst other things, clauses concerning gear restrictions and license restrictions. Management arrangements for the commercial take of aquarium fish and other species (ie. coral, live rock, invertebrates and marine plants) are provided for through both a Managed Fishery Licence and a Commercial Fishing Licence.

The Marine Aquarium Fish Managed Fishery has recently established a formal Industry Association called the Aquarium Specimen Collectors Association of W.A. Inc. Current membership consists of 9 of the 13 licensees and a further 2 have indicated that they will be joining shortly. The formation of this Association indicates the level of long-term commitment to the Industry that is exhibited by the licensees. The terms of reference for the Association (as outlined in their Constitution) are:

- To unite all members for the common benefit of the Fishery
- To present the views of members to communicate with Government
- To promote efforts within the industry for the solving of common problems
- To act as adviser to, or intermediary between, Government and Industry
- To appoint or nominate representatives to various bodies.

One of the Association's key projects is to revise and formalise a Code of Practice (see Appendix 6) for the licensees. This newly formed association should create a better overall communication base and provide a 'professional' lobby group for the industry.

Operational Objective

To have an effective and understandable plan of management for this fishery.

The Department, in consultation with the recently formed Industry Association and other stakeholders, will periodically review *The Marine Aquarium Fish Management Plan 1995*, related legislation and regulations to ensure the management framework remains relevant and aligned with the management objectives.

Justification:

Management arrangements ultimately enable the sustainable exploitation of a natural resource where the potential to harvest the resource could exceed the ability of the resource to replenish itself. The development of rules can restrict the potential to harvest (effort) to an appropriate level, and management arrangements can define processes within which access to the resource can be allocated to competing user groups (including natural ecosystems).

Indicator

The extent to which the FRMA, FRMR, Management Plans, and other management arrangements allow for the timely setting of appropriate effort levels and resource allocation in the fishery.

The extent to which the *Marine Aquarium Fish Management Plan 1995* and supporting documentation addresses each of the issues and has appropriate objectives, indicators and performance measures along with planned management responses.

Performance Measure

The Management Plan should be 100% effective.

Evaluation

Each year an Annual General Meeting is organised by the Department to allow the MAF industry and Department to discuss any issues. As a result, a review is done on an annual basis. In addition, any major problems with management arrangements that arise outside of this timeframe can be raised by anyone (industry or the Department) at any time and they will be addressed.

The performance of the management arrangements is evaluated on two levels – the micro level (i.e., the relevance of individual clauses and the role they play) and the macro level (i.e., the relevance of *The Marine Aquarium Fish Management Plan 1995* as a whole and the role it plays).

The current performance is assessed against each of the following key principles, under the collective management arrangements:

1. **An explicit description of the management unit** – the management unit is explicitly described in the “Declaration of the MAF ” section of *The Marine Aquarium Fish Management Plan 1995*.
2. **The issues addressed by the Marine Aquarium Fish Management Plan 1995** – the issues that need to be addressed by the Plan have been examined thoroughly and are documented within the ESD component trees and their reports.
3. **Description of the stock/s, their habitat/s and the fishing activities** – the MAF and fishing activities are described in section 2.
4. **Clear operational (measurable) objectives and their associated performance measures and indicators** – these are located in section 5 (component reports) for each of the major issues.
5. **Clearly defined rules, including what actions are to be taken if performance measures are triggered** – for each of these major issues, the management actions that will be taken if performance limits are exceeded are now articulated in section 5 (Component Reports).
6. **Economic and social characteristics of the groups involved in the Fishery** – a brief description of the economic and social characteristics is located in section 2.
7. **Management and regulatory details for the implementation of the actual management arrangements** – the regulations relating to the MAF are located in both the Marine Aquarium Fish Management Plan 1995 and the FRMR and orders.
8. **The reporting and assessment arrangements** – these arrangements are documented in Section 5.4.4 and include annual reporting against current agreed performance limits and targets and a five yearly review of these arrangements and assumptions.
9. **How and when reviews of the management arrangements will occur (including consultation mechanisms)** – the FRMA clearly sets out how the process for the review of any Management Plan must occur. Changes resulting from a Plan review were implemented in 2001.
10. **A synopsis of how each of the ESD issues are being addressed** – a synopsis of ESD issues has been compiled within the Overview Table of this report.

Robustness High

The management arrangements for the MAF are comprehensive and are performing relatively well. The fact that the management arrangements are contained within enforceable legislation provides a high degree of stability with respect to how the MAF is managed. This said, the processes for achieving the changes to the management arrangements are well understood by the majority of stakeholders and the system is flexible enough so that the management process can respond to external stimuli. It has been identified that a few loopholes may exist and these need to be addressed by the Department of Fisheries.

Fisheries Management Response

Management has successfully administered the *Marine Aquarium Fish Management Plan 1995* and related legislation to achieve and pursue the stated objectives.

Comments and Actions

The MAF is managed in a dynamic and consultative manner but fishermen are often resistant to change. While most fishermen have a very high level of confidence in the Department's research activities, members of industry can sometimes be sceptical of research findings. Individual fishermen's views can understandably be greatly influenced by their own experiences and observations while fishing, and these sometimes give them a contrary view of the state of the MAF, particularly when they are aware that minimal research has been conducted on the MAF. Nonetheless, there is generally a very good relationship between fishermen and the Departmental research scientists and most will accept the advice of the researchers. It is anticipated that the newly formed Industry Association will be proactive in securing funding to undertake research into the main species collected.

External Driver Check List

Unquantified environmental factors (e.g. climatic changes, ocean currents) may impact on the size of the exploitable biomass despite management arrangements. Similarly, the direct impact of recreational fishermen and other fishing activities (e.g., trawling and line fishing) are also unknown. Further research is required to provide a reasonably accurate estimate of stock biomass so that appropriate management arrangements can be developed to respond to any potential future changes.

The impact from increased general human interaction (e.g., boating and diving activities) may also impact on MAF targeted species but is unquantified at this stage.

5.4.1.3 Compliance

Rationale for Inclusion:

Effective compliance is vital to achieve the management objectives of any fishery. The Department has very few resources available for enforcement and compliance monitoring programs in the MAF.

Operational Objective

To have sufficiently high levels of compliance with the FRMA, FRMR, the *Marine Aquarium Fish Management Plan 1995*, licence conditions (endorsements) and notices whilst ensuring the sustainability of the target stock.

Justification:

The activities of the participants in the MAF need to be sufficiently consistent with the management framework and legislation to make it likely that the expected outcomes and objectives of the fishery will be achieved.

Indicators

The level of compliance with the legislation, including the estimated level of boundary infringements.
The level of compliance with any conditions of a licence.

The degree of understanding and acceptance of the rules governing the operation of the MAF by the licensees and the broader fishing community.

Performance Measures

These are currently under development by the Department (and in consultation with Industry) following completion of a compliance risk assessment workshop. Performance measures may include that no fishing occurs in closed areas (such as marine parks) and that quota are not exceeded.

Data Collection Requirements and Processes

- Random inspections of boats and catch on landing.
- Number and type of breaches and enforcement responses (for example, warning versus prosecution).
- Monitoring of closed areas.
- Ongoing collection of data on illegal activities.
- Comparative data on the relative effectiveness of certain compliance techniques.

Evaluation

A risk assessment workshop was conducted in March 2003 to identify problems associated with compliance within the MAF. It concluded that despite Fisheries Officers encountering or being informed of numerous situations where license holders have been in breach of the management plan, infringements and prosecutions are difficult to achieve given deficiencies in the provisions of the Management Plan. Further workshops need to be held and the issues addressed are considered to be ongoing.

Robustness Medium

The catch and effort returns are mandatory each month and if they are not submitted the licensees are prosecuted, there is a high (generally 100%) compliance rate for catch and effort returns in the MAF.

There were only 3 inspections carried out on the MAF in 2002.

Fisheries Management Response

Despite the relatively low levels of compliance work being done in the MAF, the Regional Services division of the Department continues to gather intelligence on suspected breaches within the fishery. Compliance staff will continue to conduct routine inspections.

Furthermore, compliance staff will continue to be employed in an educational role in addition to an enforcement role to raise the awareness of the legislative requirements relating to the MAF.

Comments and Actions

The Department will continue to provide a compliance service, within budgetary and resourcing constraints, to the MAF. It is expected that continuing compliance risk assessments will enable the Department to better direct resources to further increase the effectiveness of the limited compliance activities. The Management Plan will be amended to tighten up on the identified compliance 'loopholes'.

MAF fishing activities occur over a large part of the State and currently there is no requirement for fishers to notify the Department that they intend to fish. It has been suggested by the Department that MAF licensees should have to nominate the area/s that they intend to operate which will assist compliance officers with their inspections.

External Driver Checklist

- Changes to technology that may facilitate an increase in the level of non-compliance.
- Changes to non-Fisheries legislation (National Competition Policy) may impact upon the Department's ability to restrict activities in a way that assist compliance.

5.4.1.4 Allocation Among Users

Rationale for Inclusion:

Within the broad context of ESD, the issue of how fish resources can be best shared between competing users requires consideration. In WA, the Integrated Fisheries Management Review Committee was established to develop a strategy to integrate the management and sustainable use of fish resources. The report produced by the Committee in November 2002 proposes an alternative management framework and a set of guiding principles for allocating fish stocks to ensure optimal benefits are realised for the WA community.

The Department of Fisheries recognises that the integrated fisheries management approach applies to the MAF. In addition to the commercial fishery there is also likely to be a small recreational fishery for marine aquarium fish in W.A. There are also non-extractive interests (Department of Conservation and Land Management, dive operations, etc) in the resource and its related ecosystem, which also need to be considered within the management process.

Operational Objective

To ensure that allocation decisions aim to maximise the overall benefit to the Western Australian community from the use of fish stocks and take into account the economic, social, cultural and environmental factors.

Indicator

The level of resource sharing conflict between users and the level of participation of interested groups in any focused resource sharing process.

Performance Measure

To be determined as part of the integrated fisheries management process on broad scale resource sharing.

Data Requirements for Indicator

In order to ensure satisfactory allocation among user groups the following data is required: It should also be noted that cost is another major factor when considering various management options. For example, a TAC, which incorporated a recreational 'allocation' may satisfy sustainability issues, but would be prohibitively expensive in terms of the management/administration of the recreational 'quota'.

Data Requirement	Data Availability
Breeding stock abundance estimates	Yes– available for some species.
Estimate of recreational catch	NO- There has been no data related to the MAF targeted species in relation to recreational fishers, however it is considered minimal
Estimate of projected growth of recreational Marine Aquarium fishing	Unknown
Impacts from other commercial fishermen	Some catch data from other commercial fishermen (e.g. pipe fishes recorded from trawl fisheries).

The Department is currently awaiting the outcomes of the integrated fisheries management review process in terms of processes that need to be used for resource allocation mechanisms among user groups and timeframes etc.

Evaluation

There is no method currently in use to evaluate recreational harvesting within the MAF.

Robustness Medium

At present, whilst there is no specific allocation made to the recreational sector their current level of catch is considered negligible and therefore sustainable. However, ‘catch and release’ of unwanted species may be having an additional impact on stocks. For the same reason, it is also important to gain some understanding of the quantities of MAF targeted species being caught but not retained by other commercial fishing activities (e.g., trawling in both State and Commonwealth vessels). It should also be noted that increased recreational catch would prompt a reassessment of current management arrangements (for both recreational and commercial sectors).

Fisheries Management Response

It is expected that some further direction in relation to resource sharing will be given once the Minister finalises his determinations on the new framework following the review of the Integrated Fisheries Management Review Committee’s report.

External Driver Checklist

Resource sharing issues being raised with the Minister independently of the Integrated Fisheries Management Review Committee recommended process.

5.4.1.5 Consultation (Including Communication)

Rationale for Inclusion:

The FRMA has certain requirements with regard to consultation that must be undertaken in the course of managing fisheries. The management of the MAF is based around a robust consultation and communication process.

There are sections in the FRMA that relate to the development of a management plan (Section 64) and to the amendment of a management plan (Section 65). Given that the MAF already has a management plan, Section 65 is the most relevant.

This states that:

Section 65. Procedure before amending management plan

(1) A management plan must specify an advisory committee or advisory committees or a person or persons who are to be consulted before the plan is amended or revoked.

(2) Before amending or revoking a management plan the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan.

(3) Despite subsection (2), the Minister may amend a management plan without consulting in accordance with that subsection if, in the Ministers opinion, the amendment is –

(a) required urgently; or

(b) of a minor nature

(4) If –

(a) the Minister amends a management plan; and

(b) the amendment is made without consultation because it is, in the Minister's opinion, required urgently, the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan as soon as practicable after the plan has been amended.

The particular group, which must be consulted for the MAF, is designated in the management plan as 'all licensees'. There is no formal Ministerial Advisory Committee (MAC), however in addition to the licensees the Department also consults with the newly formed Association and the WA Fishing Industry Council. Meetings held with the MAF typically involve discussions about management, research and compliance issues in the fishery and provide a forum for Industry to raise concerns and/or ask questions of the Department concerning management arrangements.

Operational Objective

To administer a consultation process that is in accordance with the requirements of the FRMA and allows for the best possible advice from all relevant stakeholders to be provided to the decision maker (Minister/CEO) in a timely manner.

Indicators

The Minister (or the Department on his behalf) conforms to the consultation requirements of the FRMA and the level to which licensees consider that they are adequately and appropriately consulted.

Performance Measures

- Proper consultation procedures have been followed in any amendment of the management plan.
- Industry meetings held annually.

Data Requirements

The views of Industry collected from stakeholders at each annual meeting. When an amendment is proposed, documentation of the formal consultation procedures is needed.

Evaluation

Consultation on management of the MAF fishery is conducted in an open, accountable and inclusive environment where all sectors of the industry and the Department (i.e., management, compliance and research) collectively identify and discuss appropriate courses of action.

Decision makers are provided with advice based on this consultation and reasons are provided for decisions that vary from consultation-based advice.

Robustness High

The consultation process is extremely well understood with relatively high levels of participation from licensees.

Fisheries Management Response

The Department is attempting to improve communication links with Industry in the MAF through regular correspondence and encouraging communication with a newly appointed dedicated half time fisheries management officer.

Comments and Actions

The Department will continue to provide a commercial fisheries management officer who coordinates and further develops the consultation process for the MAF.

External Driver Check List

Despite the aforementioned consultation processes that are in place, disaffected parties may still seek to use political avenues to further their cause.

5.4.2 Department of Fisheries- Reporting

5.4.2.1 Assessments and Reviews

Rationale for Inclusion:

It is important that the outcomes of the fisheries management processes administered by the Department for the MAF are available for review by external parties. It is also important that the community is sufficiently informed on the status of the MAF, given that it is utilising a community resource.

The reports that are currently developed annually include: the State of the Fisheries Report, the Annual Report to the Auditor, the ESD report, and this ESD report to DEH. There is a longer-term plan to have the entire system of management audited by the WA Environmental Protection Authority (EPA).

Operational Objective

To continue to report on an annual basis to Parliament and the community on the status of all fisheries including the MAF and to prepare a framework for reporting on ESD requirements for all Western Australian fisheries.

Indicators

The extent to which external bodies with knowledge on the management of fisheries resources have access to relevant material and the level of acceptance within the community.

Performance Measure

General acceptance of the management system by the community.

Data Requirements

The majority of data required to generate reports is already collected in the course of pursuing resource management objectives. The Department conducts an annual survey of the community with respect to the community's opinion on the status of the State's fisheries and their attitudes to the performance of the Department.

Evaluation

The Department has implemented more than one process to report on the performance of this fishery and in doing so has acted to ensure that the community has access to this information. In addition to this base level reporting, continual development of the management process will see the MAF undergo regular independent audits ensuring that the evaluation of the management arrangements in this fishery is robust.

The Department has been the recipient of a number of awards for excellence for its standard of reporting - Premiers Awards in 1998, 1999 for Public Service excellence, Category Awards in Annual Reporting in 1998, 1999, 2000; Lonnie Awards in 2000, 2001 and 2002.

Current reporting arrangements for this fishery include:

State of Fisheries. There is annual reporting on the performance of the fishery against the agreed objectives within the "State of the Fisheries Report". This document is available in hard copy format but is also available from the Department's web site in PDF format.

Annual Report. A summary of this report is presented within the Department's Annual Report and is used in some of the Performance Indicators that are reviewed annually by the OAG.

ESD Report Series. Following completion of this ESD report the Department will publish it as part of the ESD Report Series which will be available from the website.

Reports to industry. Each year, the status of the resource and effectiveness of current management are presented to industry at an annual meeting.

Robustness High

Fisheries Management Response

Current

For many years the Department has produced substantial and high quality documents that report on the operation of the Department and the status of its fisheries - these reports are the Annual Report and the State of the Fisheries.

Future

The Department is working with the EPA to prepare a framework for reporting on ESD for all Western Australian fisheries. It is proposed that this framework will be linked to a regular audit cycle involving the EPA and periodic reporting to the OAG. The Department is working to combine the processes for reporting to the States and the Commonwealth and believes that this can best be achieved by using a Bilateral Agreement with DEH under the EPBC.

Comments and Actions

The assessment and review processes already established together with proposed external review processes should ensure that there are many opportunities for the appropriateness of the management regime and the results it produces to be reviewed.

External Driver Check List

The assessments provided by independent review bodies and the community.

5.4.3 Department of Fisheries – Legal Framework

5.4.3.1 OCS Arrangements

The licence area for the MAF extends into Commonwealth waters and OSC arrangements would apply. However, in practise all fishing for marine aquarium target species currently occurs within state waters. Therefore the OCS arrangements are not required.

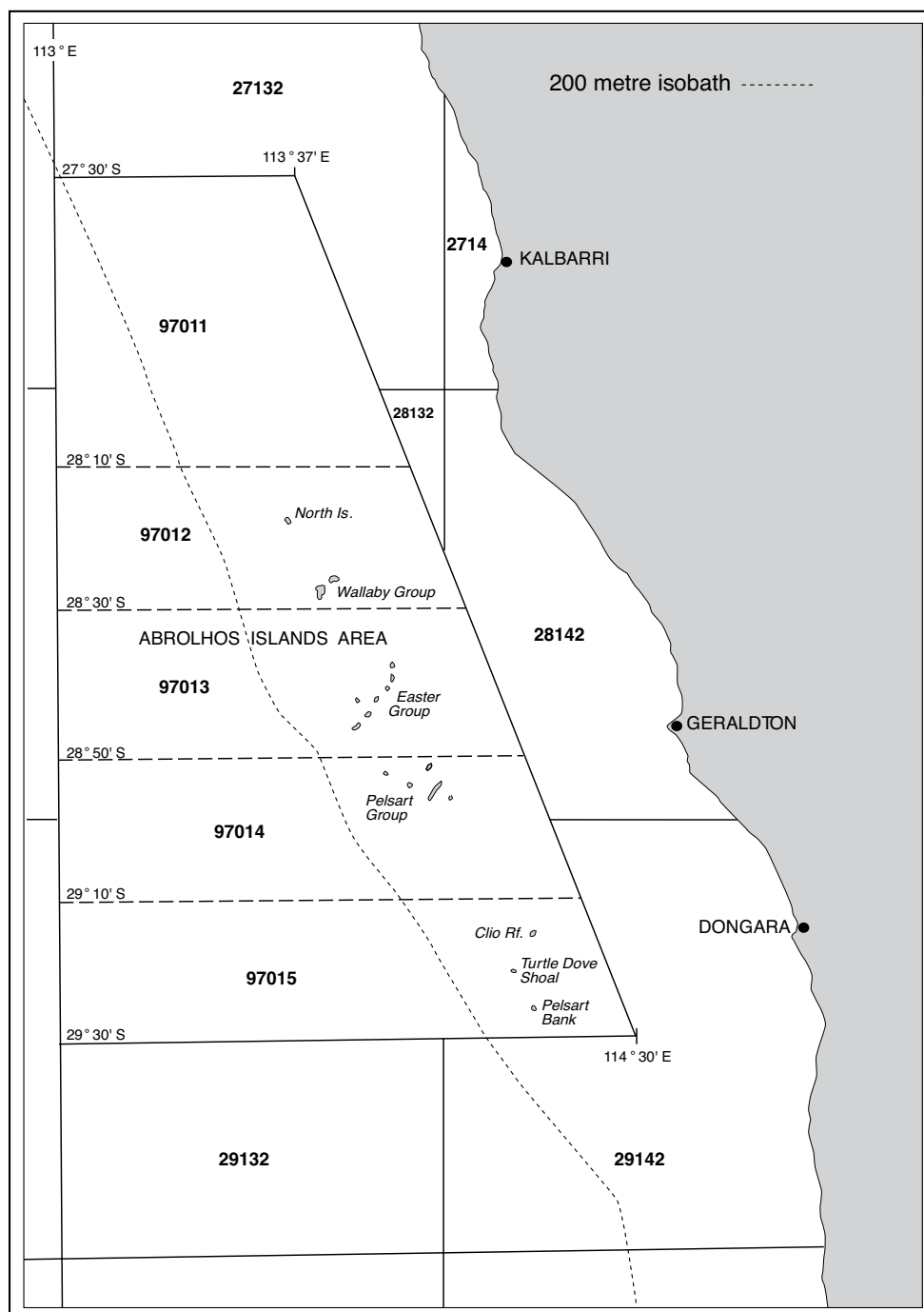
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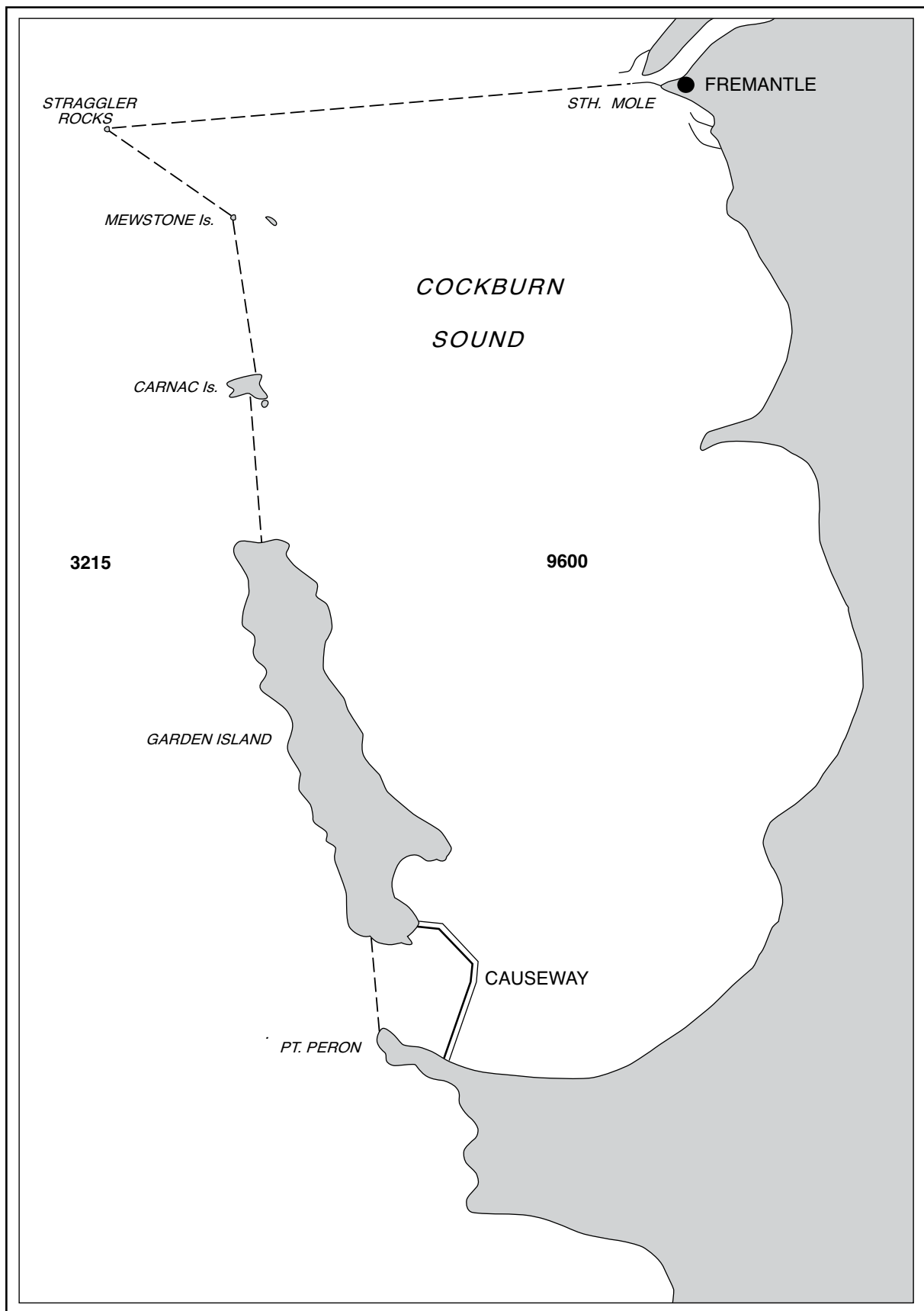
7.0 Appendices

APPENDIX 1 DETAILED FISHING BLOCK AREAS FOR THE MARINE AQUARIUM MANAGED FISHERY FOR THE ABROLHOS ISLANDS, COCKBURN SOUND, GEOGRAPHE BAY, KING GEORGE SOUND AND PRINCESS ROYAL HARBOUR, AND SHARK BAY.

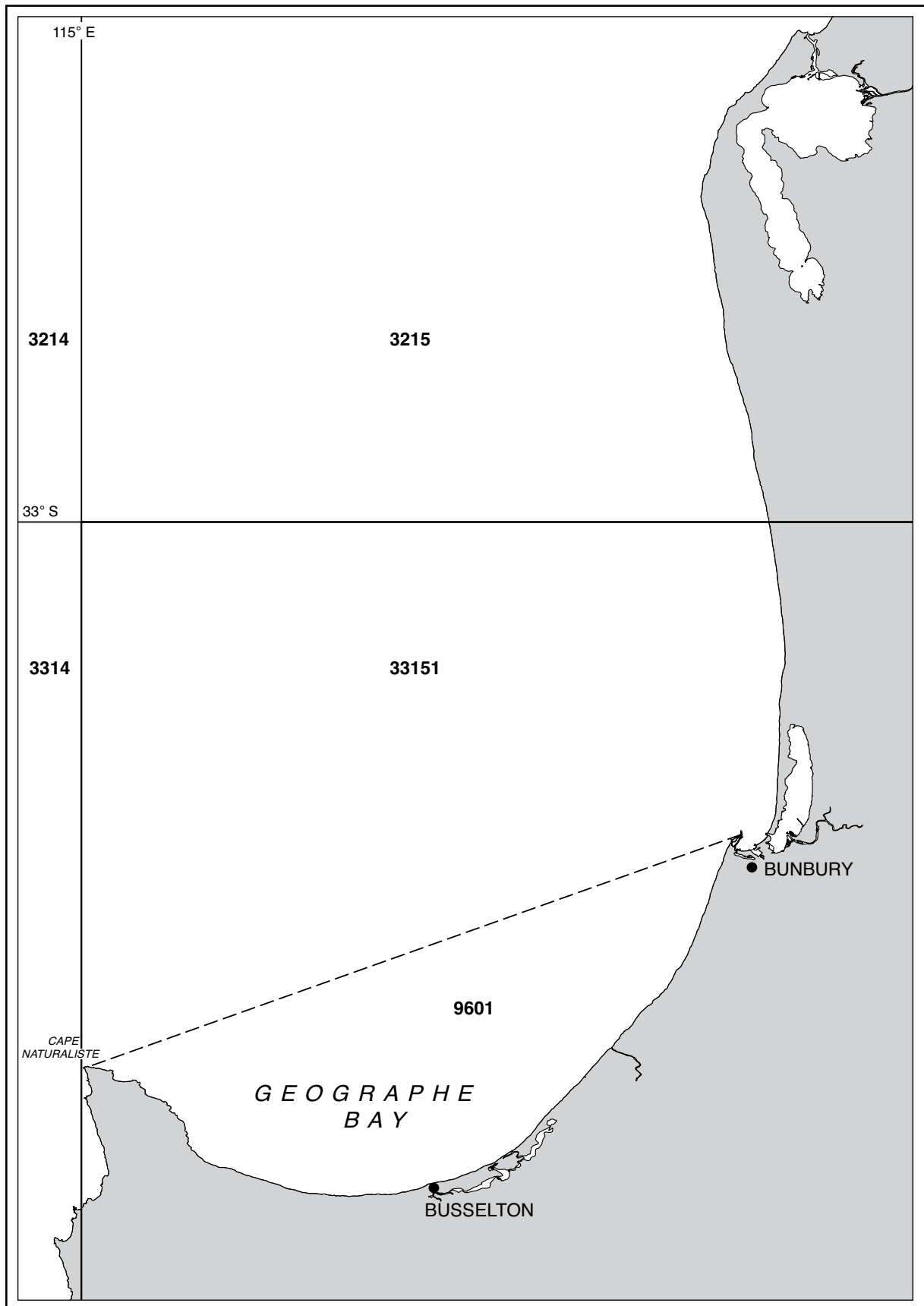
Abrolhos



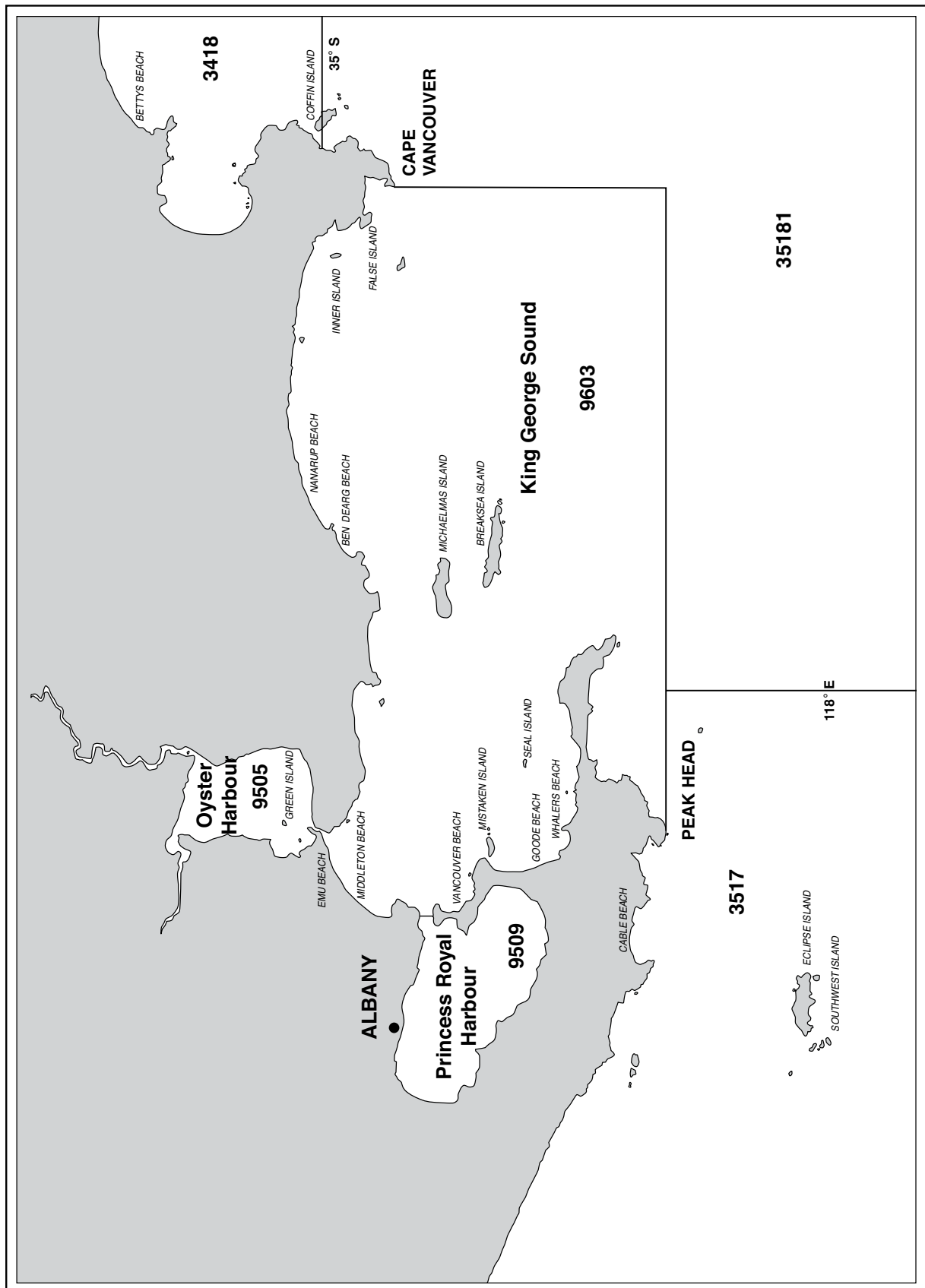
Cockburn Sound



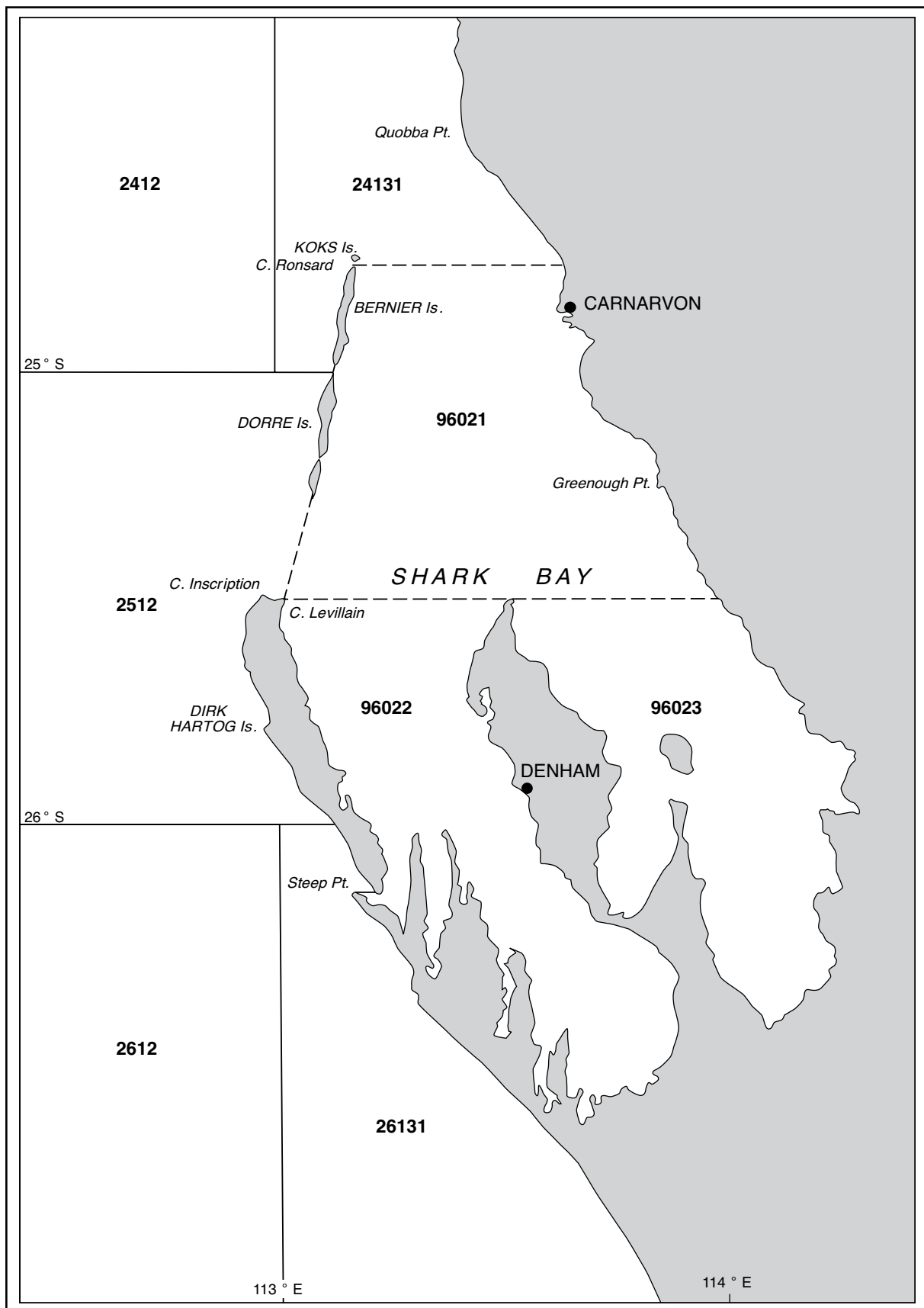
Geographe Bay



King George Sound and Princess Royal Harbour



Shark Bay



APPENDIX 2 ACRONYMS

CAES	Catch and Effort Statistics
CAESS	Catch and Effort Statistics System
CFL	Western Australia Commercial Fishing Licence
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPUE	Catch per unit effort
DEH	Department of Environment and Heritage
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act, 1999
ESD	Ecologically Sustainable Development
FBL	Western Australia Fishing Boat Licence
FRDC	Fisheries Research and Development Corporation
FRMA	Fisheries Resources Management Act, 1994
FRMR	Fisheries Resources Management Regulations, 1995
GBRMP	Great Barrier Reef Marine Park
GPS	Geographical Positioning Systems
MAC	Ministerial Advisory Committee
MAF	Marine Aquarium Fish Managed Fishery
MFL	Western Australia Managed Fishing Licence
MPG	Ministerial Policy Guidelines
OAG	Office of the Auditor General
OCS	Offshore Constitutional Settlement
RFAC	Recreational Fishing Advisory Committee
SCFA	Standing Committee for Fisheries and Aquaculture
WA	Western Australia
WAFIC	Western Australia Fishing Industry Council

APPENDIX 3 DETAILS OF CONSEQUENCE TABLES

Level	Ecological
Negligible	<p>General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability.</p> <p>Target Stock/Non-retained: undetectable for this population.</p> <p>Byproduct/Other Non-Retained: Area where fishing occurs is negligible compared to where the relevant stock of these species reside (< 1%).</p> <p>Protected Species: Relatively few are impacted.</p> <p>Ecosystem: Interactions may be occurring but it is unlikely that there would be any change outside of natural variation.</p> <p>Habitat: Affecting < 1% of area of original habitat area.</p> <p>No Recovery Time Needed</p>
Minor	<p>Target/Non-Retained: Possibly detectable but little impact on population size but none on their dynamics.</p> <p>By-Product/Other non-retained: Take in this fishery is small (< 10% of total) compared to total take by all fisheries and these species are covered explicitly elsewhere.</p> <p>Take and area of capture by this fishery is small compared to known area of distribution (< 20%).</p> <p>Protected Species: Some are impacted but there is no impact on stock.</p> <p><i>Ecosystem: Captured species do not play a keystone role – only minor changes in relative abundance of other constituents.</i></p> <p>Habitat: Possibly localised affects < 5% of total habitat area.</p> <p>Rapid recovery would occur if stopped - measured in days to months.</p>
Moderate	<p>Target/Non Retained: Full exploitation rate where long term recruitment/dynamics not adversely impacted.</p> <p>Byproduct: Relative area of, or susceptibility to capture is suspected to be less than 50% and species do not have vulnerable life history traits.</p> <p>Protected Species: Levels of impact are at the maximum acceptable level.</p> <p>Ecosystem: measurable changes to the ecosystem components without there being a major change in function. (no loss of components).</p> <p>Habitat: 5-30 % of habitat area is affected.</p> <p>or, if occurring over wider area, level of impact to habitat not major</p> <p>Recovery probably measured in months – years if activity stopped</p>

Severe	<p>Target/Non Retained: Affecting recruitment levels of stocks/ or their capacity to increase.</p> <p>By-Product:Other Non-Retained: No information is available on the relative area or susceptibility to capture or on the vulnerability of life history traits of this type of species.</p> <p>Relative levels of capture/susceptibility greater than 50% and species should be examined explicitly.</p> <p>Protected Species: Same as target species</p> <p>Ecosystem: Ecosystem function altered measurably and some function or components are missing/declining/increasing outside of historical range &/or allowed/facilitated new species to appear.</p> <p>Habitat: 30- 60 % of habitat is affected/removed.</p> <p>Recovery measured in years if stopped</p>
Major	<p>Target/Non Retained: Likely to cause local extinctions.</p> <p>By-Product:Other non-retained:N/A.</p> <p>Protected Species: same as target species.</p> <p>Ecosystem: A major change to ecosystem structure and function (different dynamics now occur with different species/groups now the major targets of capture).</p> <p>Habitat: 60 - 90% affected.</p> <p>Recovery period measured in years to decades if stopped.</p>
Catastrophic	<p>Target/NonRetained:Local extinctions are imminent/immediate.</p> <p>By-Product/Other Non-retained N/A.</p> <p>Protected Species: same as target.</p> <p>Ecosystem: Total collapse of ecosystem processes.</p> <p>Habitat: > 90% affected in a major way/removed.</p> <p>Long-term recovery period will be greater than decades or never, even if stopped</p>

APPENDIX 4 LETTER OF JUSTIFICATION FOR TAKING OVER 750 SYNGNATHID SPECIMENS & STATUS REPORT

Your Ref:

Our Ref: 593/98-12 Enquiries: H. Greif (08) 9482 7306

Ms A McDonald
Environment Australia Department of Environment and Heritage
GPO Box 787
CANBERRA ACT 2601

Dear Ms McDonald

Further to your letter of 1 October, please accept the following advice in regard to the commercial collection of syngnathids in Western Australia (WA) (with respect to the conditions of the Commonwealth Declaration of Controlled Specimens (provided for under Section 10A of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982*) (the Declaration)). That is:

Syngnathids are not harvested in Commonwealth waters off the WA coast.

Syngnathids are harvested in accordance with the provisions of the *Marine Aquarium Fish Management Plan 1995*.

See below for further details.

Licensees make reasonable efforts to ensure that non-egg bearing adults are not taken. It should also be noted that licensees in the Marine Aquarium Fish Managed Fishery have recently formed a formal Association under the banner of the WA Fishing Industry Council. The Association intends on revising the existing Code of Practice and adopting it formally. The take of non-egg bearing adults will be included in the Code of Practice. The formation of the Association indicates the level of long-term commitment to the industry that is exhibited by licensees.

The leafy seadragon (*Phycodurus eques*) is a totally protected fish under the provisions of Section 46 of the *Fish Resources Management Act 1994*, Regulation 10 and Schedule 2 of the of the *Fish Resources Management Regulations 1995*.

Under the provisions of the *Marine Aquarium Fish Management Plan 1994* licensees are only permitted to use hand held nets.

Any post-capture/pre-sale mortalities are recorded on the mandatory monthly catch and effort returns that are submitted to the Department. No mortalities were recorded over the 2002 period.

See below for further details.

See enclosed report.

Syngnathids are prepared and shipped in accordance with Guideline 51 of the *International Air Transport Association Live Animal Regulations*.

Annual quota of syngnathids Over the 2002 period a total of 833 individual syngnathids were harvested from WA waters for marine aquarium purposes (see enclosed report for specific details). This figure is over the nominal 750 individuals set by the Declaration and was previously earmarked in the covering letter accompanying the Department's October 2002 report. Under such

circumstances the Department is required to demonstrate to Environment Australia that this 'excess' take of syngnathids is sustainable.

As also noted in the covering letter accompanying the Department's October 2002 report the sustainable take of syngnathids is currently being assessed as part of the ecological sustainability report required under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* for the Marine Aquarium Fish Managed Fishery. In any event, the Department does not consider this level of harvest unsustainable particularly given the spread of species (and their distributional ranges and their cryptic behaviours) and collection sites.

As noted in previous correspondences, the Department would prefer to have a species-specific annual 'quota' rather than a blanket 'syngnathid' quota. This would ensure that species, which *may* be more vulnerable to over-fishing or species for which biological data is poor, are not 'lumped together' with other more robust/well known species.

Under the current Declaration there is nothing to prevent 750 of one species of syngnathid being taken. Consequently, while the overall syngnathid 'quota' was exceeded by 83 individuals during the 2002 period, given that the total take was spread over four + species, I do not consider it necessary to 'demonstrate' sustainability unless the take of a single species exceeded the 750 'quota'. To do so based on the current collective syngnathid quota would not achieve anything.

I do note however, that there has been a relative increase in the numbers of western spiny seahorse (*Hippocampus angustus*), common weedy seadragon (*Phyllopteryx taeniolatus*) and spotted pipefish (*Stigmatopora argus*) collected in the 2002 period. That is, from 330 in 2001 to 456 in 2002, from 325 in 2001 to 332 in 2002, and from 1 in 2001 to 21 in 2002 respectively. I do not consider these increases unsustainable for the reasons described previously. However, please note that I will advise licensees of this increase and remind them of the requirements of the Declaration. Please also note that there was a reduction in the collection of the short-snouted seahorse (*Hippocampus breviceps*) from 56 in 2001 to 18 in 2002.

Resource Assessment Forms Information on size, sex and reproductive status has been collected sporadically by some operator's on the Resource Assessment Forms. However, as noted in the Department's October 2002 report, this data has very limited value without a specific project and support funding to co-ordinate the data collection and analysis.

Please note that the Department also intends to negotiate with the newly formed Association to consider an 'industry-contribution-to-research' 'fee' to accommodate such data collection and analysis. It is also hoped that the Association may be proactive in terms of securing funding/resources for universities etc to undertake further research into the species collected in the Marine Aquarium Fish Managed Fishery, given the severe lack of consolidated funds within the Department to undertake research on such a minor fishery.

Other issues The Department has identified that a finer scale of reporting in terms of the take area would be beneficial in collecting more targeted information on the distribution of syngnathids and the primary finfish species targeted within the Marine Aquarium Fish Managed Fishery.

The current catch and effort return forms, which are entered into the Department's Catch and Effort Statistical (CAES) System, provide for a 60 nautical mile (nm) grid system. While this gross scale is suitable for larger scale commercial fisheries (such as the rock lobster or wetline fishing) it does not provide a suitable level of detail for smaller scale commercial operations such as the Marine Aquarium Fish Managed Fishery.

Consequently, the Department is in the process of negotiating with the newly formed Association to introduce a smaller grid system. Ideally, the Department would like to introduce a ten (10) nm grid system to complement that negotiated with licensees in the Specimen Shell Managed Fishery.

Please also note that earlier this year, an internal Risk Assessment Workshop was undertaken by the Department's compliance personnel to identify and risk rank potential 'loopholes' in the existing management arrangements and to identify feasible solutions to improve the enforcement rigour within the Fishery. Once these outcomes/recommendations are finalised it is intended that they also be incorporated in the Plan.

I trust the above information will suffice. However, should you have any further queries, please do not hesitate to contact me on telephone (08) 9482 7306 and email hgreif@fish.wa.gov.au.

Yours sincerely

Heidi Greif
Commercial Policy Officer

29 October 2003

Status report for collection of syngnathids in Western Australia

October 2003

1.0 Management overview

The catch of syngnathids is a small component of the Marine Aquarium Fish Managed Fishery (the Fishery), which is managed under the legislative provisions of the *Marine Aquarium Fish Management Plan 1995*. The Fishery targets over 200 species in varying quantities.

There are 14 licences in the Fishery, with the licensees ranging from the ‘hobbyist’ to the vertically integrated businessman. Licensees in the Fishery are only permitted to collect specimens by hand or using hand held nets. Operationally, licensees are restricted by weather and physical dive limitations. Licensees are also restricted in the number of ‘crew’ that may participate in the collections.

The Fishery is a Statewide Fishery although there are a number of areas along the coast that are protected from commercial fishing. For example, sanctuary zones of Marine Parks and Marine Nature Reserves and the entire State and Commonwealth portions of the Ningaloo Marine Park (implemented through the Department of Conservation and Land Management) as well as some Fish Habitat Protection Areas and the area between Point Maud and Tantabiddi Well (implemented through the Department of Fisheries).

Under the provisions of Regulation 64 of the *Fish Resources Management Regulations 1995*, licensees are required to submit monthly catch and effort returns detailing the number of species taken and the locations of take. The State’s waters are divided into grid squares of 60 x 60 nautical miles for the purposes of recording take location. Certain areas such as Shark Bay and the Houtman Abrolhos Islands are divided up into smaller areas. The returns are recorded in the Department’s Catch and Effort Statistical System.

2.0 Commercial catch and effort

The syngnathid catches reported by licensees in the Fishery over the period from 1994 to 2002 are shown in Table 1 below. It is difficult to extract the effort data relating specifically to the take of syngnathids because licensees rarely set out to specifically target syngnathids. More often than not syngnathids are taken on an opportunistic basis during other marine aquarium fish collecting activities. However, the total number of fisher days recorded by licensees in the Fishery as a whole over the 2002 calendar year period was 910 days. The number of operators reporting syngnathid catches over the 2002 period was 7.

The catch distribution for 2002 is shown in Figure 1 and ranges from the Gascoyne region to the Southern region of WA. The spatial distribution of catches varies greatly from year to year depending on the operational requirements of each licensee.

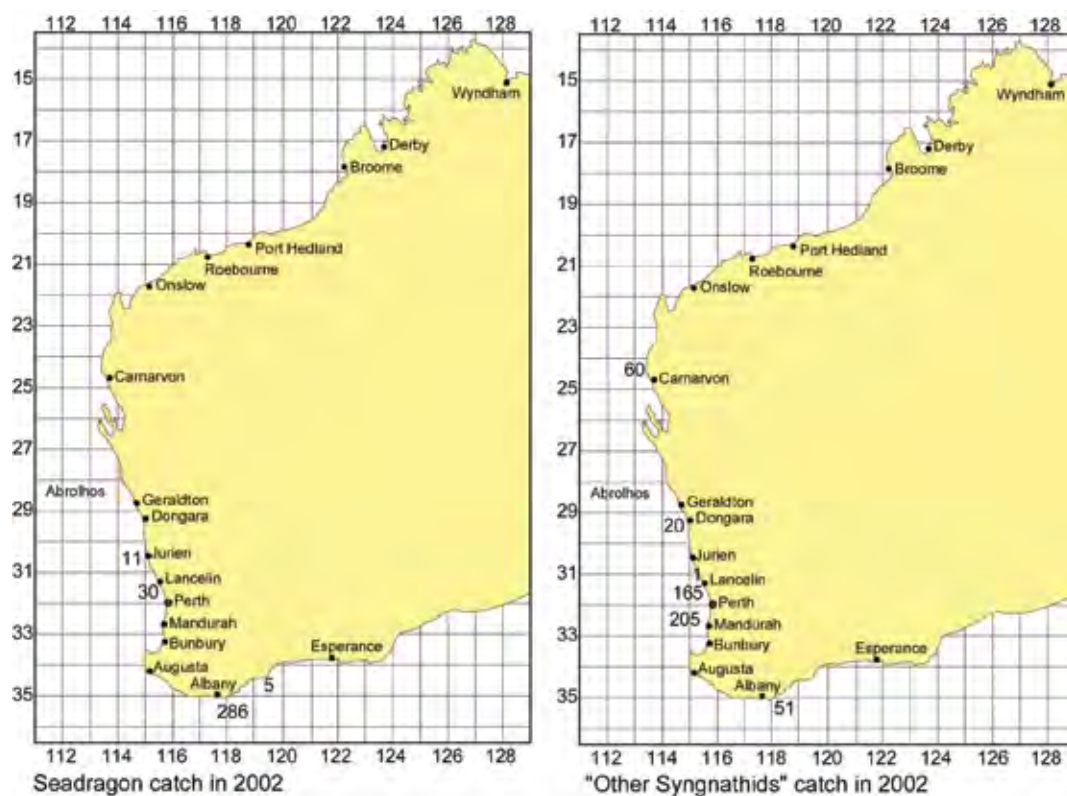


Figure 1 Distribution of Syngnathid catches (numbers) in 2002.

Common name	Scientific name	1994	1995	1996	1997	1998	1999	2000	2001	2002
Weedy seadragon	<i>Phyllopteryx taeniolatus</i>	50	24	22	99	123	136	223	325	332
WA spiny seahorse	<i>Hippocampus angustus</i>	290	364	192	378	358	178	329	330	456
Short snouted seahorse	<i>Hippocampus breviceps</i>		2		21	39	64	62	56	18
Spiny seahorse	<i>Hippocampus histrix</i>				1					
Spotted seahorse	<i>Hippocampus kuda</i>				1					
Tiger pipefish	<i>Filicampus tigris</i>						3			
Ribboned pipefish	<i>Haliichthys taeniophorus</i>						1			
Upside down pipefish	<i>Heraldia nocturna</i>									
Spotted pipefish	<i>Stigmatopora argus</i>						78	24	1	21
Other									29	6
Total		340	390	226	513	552	460	638	741	833

Table 1 Reported catches of syngnathids by licensees in the Marine Aquarium Fish Managed Fishery from 1994 to 2002

3.0 Catch by other sectors

The recreational take of syngnathids is unknown as there are no reporting requirements for recreational collections of syngnathids. Indications of the level of recreational fishing activity may be extrapolated from regional creel surveys conducted on the Lower West Coast (96/97), Gascoyne (98/99) and Pilbara (99/00) regions of Western Australia, which recorded no take of syngnathids. The National Recreational Fishing Survey (00/01), which recorded over 19,000 recreational fishing trips, did not report syngnathids being taken as part of the survey. However, it is likely that there are certain recreational groups, such as marine aquarium enthusiasts that do take syngnathids for marine aquarium purposes. Consequently, the Department intends to consider the introduction of a daily recreational bag limit for syngnathids.

There is also some unreported bycatch of syngnathids in other commercial fishing operations, but the size of the catch and the associated mortality rate is unknown. There is also no measure of illegal fishing activities in relation to syngnathids.

4.0 Biological characteristics of primary syngnathid species taken

Some operators have collected information relating to size, sex and reproductive status, sporadically on Resource Assessment Forms. However, as noted in the Department's October 2002 report, this data has very limited value without a specific project and support funding to co-ordinate the data collection and analysis.

Regardless, the following information indicates that the syngnathid species primarily taken are widely distributed within WA waters and occur in both shallow and deep waters in both urban and remote locations. It is estimated that 80% of populations occur in areas that receive little to no impact from fishing (based on the distributional ranges and the spatial catch and effort data). Consequently, the relatively small take of each species by licensees in the Marine Aquarium Fish Managed Fishery is highly unlikely to affect the sustainability of the wild populations.

The **western spiny seahorse** (*Hippocampus angustus*) is endemic to WA and has a distributional range from North West Cape through to Augusta. The species has been trawled to depths of 30 metres but is also found in shallows. It is generally found in association with seagrass beds. There is no evidence of decline for this species. The species is often misidentified as *H. hystrix* or *H. elongatus* (Pogonoski *et al.* 2002).

The **common weedy seadragon** (*Phyllopteryx taeniolatus*) is endemic to Australia and has a distributional range from the central coast of NSW through to WA's midwest coast (including Tasmania). The species is usually found in kelp reefs with edges of sand to depths of 50 metres. Individuals are often found washed up on the shore following storm events. Consequently, the natural mortality is considered higher than any other mortality source. Longevity in aquaria is at least 4 years, but lifespan in the wild is unknown. This species breeds early summer and generally only produces one brood per season. There is no evidence of decline for this species (Pogonoski *et al.* 2002).

The **short-snouted seahorse** (*Hippocampus breviceps*) has a distributional range from the central coast of NSW through to Lancelin on WA's midwest coast (including Tasmania). The species is usually found in association with seaweed and algal communities and occurs to depths of 20 metres. Individuals are rarely seen because of their good camouflage and small size. Longevity in aquaria is at least 3 years, but lifespan in the wild is unknown. This species breeds on a monthly cycle over the summer months. There is no evidence of decline for this species (Pogonoski *et al.* 2002).

The **spotted pipefish** (*Stigmatopora argus*) is endemic to Australia and has a distributional range from southern QLD through to WA's midwest coast (including Tasmania) (Gomon *et al.* 1994). The species is usually found in shallow seagrass beds and weedy areas on rocky reefs and they are thought to have a life span of approximately 12 months (Duque-Portugal 1989). They are abundant but are rarely seen because of good camouflage.

5.0 Stock assessment

A species-specific stock assessment is not feasible for the syngnathid 'fishery' given the comparatively low catches and the wide spatial scale of fishing and reporting. However, the Department recognises that an annual report such as this provides a general indication of the trends of take within the 'fishery'. The Department is also of the opinion that a species-specific catch 'quota' (especially for those primarily targeted) would be more beneficial than the current 'blanket' syngnathid 'quota'.

APPENDIX 5 DRAFT CODE OF PRACTICE MARINE AQUARIUM MANAGED FISHERY

DRAFT CODE OF PRACTICE

April 2004

For the Collection of Aquarium Fish, Living Rock, Live Sand and Coral

Purpose of the Code of Practice

The Aquarium Specimen Collectors Association of Western Australia Inc. (Association) developed this Code of Practice (Code) as an agreement between licensees of the Marine Aquarium Managed Fishery, for the purpose of:

- Establishing a voluntary set of standards or behaviour for responsible fishing and resource sharing.
- Demonstrating to other aquatic users of the licensees' commitment to ensuring the Fishery is, and continues to be managed in a sustainable way and
- Providing a valuable source of information to those wanting to know more about the Fishery and how it operates.

Licensees who have agreed to abide by the Code have provided their signatures at the end of this document. It is a voluntary agreement between licensees and adherence to the Code is a condition of membership in the Association. A breach of the Code is likely to result in:

- *Expulsion of that member from the Association*
- *Recommendation to the Executive Director of the Department of Fisheries WA, The association does not believe that member to be a fit and proper person to hold a licence in the Fishery.*

*The Department of Fisheries, The Marine Conservation Council, and Recfishwest have also endorsed this document. This code will remain in place until it is updated in 2006. ***** (endorsements still to come)******

Description of the Fishery

Licensees of the Fishery

The Marine Aquarium fishery in Western Australia dates back to the 1960's, with early commercial operators working on permits or conditions endorsed on their commercial fishing licences. In 1995 The Marine Aquarium Fish Managed Fishery was formed. It is a small commercial highly selective fishery with thirteen licensees permitted to take bony and cartilaginous fish for marine aquarium purposes. Five of the licensees are endorsed with a condition to take other marine organisms such as live rock, corals and invertebrates.

Like the other Aquarium Fisheries in Australia, only hand held nets are used to capture fish. No chemicals, explosives or traps are permitted. The Fishery currently has Environment Australia approval and export clearance for syngnathids (sea horses and pipe fish) based on the non-destructive capture methods and sustainability of the fishery. Also the fishery is currently seeking Environment Australia approval for the remainder of specimens collected. The Aquarium Fisheries of Australia are widely recognised as the best in the world.

“When questioned about the sustainability of the aquarium trade I point to the Australian Aquarium Fisheries as the benchmark”

-Steve Robinson President Marine Dealers Association of North America

“The marine aquarium industry and coral reef conservation in Australia are models for the rest of the world,”
“Australia has never used chemicals to catch fish, and the collectors act as excellent stewards of the reefs they work” Paul Holthus, Marine Aquarium Council president

“Reefs, like forests, will only be protected in the long term if they are appreciated. Aquariums, both public and private are playing a crucial role in this. They are helping to create interest for the general public and it is not unreasonable to suppose that this interest, once embraced by a whole generation will result in an active desire to conserve.”

Dr J.E.N. Veron, Australian Institute of Marine Science.

The Market

The live organisms collected in the Fishery supply aquarium outlets, public oceanariums (eg AQWA), and a variety of businesses and individuals wanting to maintain a reef aquarium. Marine organisms captured in the Fishery supply Australian markets and international exports of marine aquarium fish only.

A large percentage of the fish sold as aquarium specimens in Australia are imported from countries such as Indonesia, Fiji, The Solomon Islands and Sri Lanka. Many of these specimens are caught using dubious means (ie cyanide poisoning), with high mortality rates both during collection and after importation into Australia.

Both West Australian and indeed Australian collected specimens are highly regarded internationally for the high quality and high rates of survival due to the collection methods used. These live aquarium specimens' command extreme prices on a per kg basis reflecting the low amount of kg's taken relative to other higher volume more mechanical fisheries. On a dollar per kg basis, ornamental fish are second only to pearls. Fish currently achieve prices averaging \$1 000.00 per kg, invertebrates \$1 000.00 per kg and corals \$100.00 per kg. Making the Fishery second in value on a per kg basis only to pearls.

Components of a Reef Aquarium

A modern reef aquarium consists of live sand, which is usually of coralline origin (broken down coral), collected from the ocean floor because it contains live micro-organisms which break down wastes produced by other life in the aquarium. “Living rock” is loose rock consisting of old dead corals dislodged from the reef by tropical storms and cyclones. It is normally collected from a wave swept reef area. The surface of living rock is covered in small plants and encrusting organisms. There are also many microorganisms living within the rock surface. These play an important role in the breakdown of wastes within the aquarium. Living rock also forms the basis of the reef construction and decoration within the tank.

Coral, fish and invertebrates are mainly selected for their aesthetic values, temperament and hardiness, but many of them play important roles in the aquarium ecosystem such as Grazing on algae's and breaking down detritus.

Utilising these organisms in such a way allows the aquarist to create a mini version of a real reef with its own ecosystem. This has seen great improvements in long-term survival and propagation of captive organisms. Collectors now not only take from the wild but also culture and grow a number of their specimens for sale.

Maintaining Resource Sustainability

There are several important factors that act to minimise the impact the collectors have on the marine

environment and ensure these activities continue to be sustainable. These are:

Number of Operators: There are 13 licensed operators in the Fishery who are licensed to operate over the entire of Western Australia's coastline. No other licences to operate in the Fishery will be made available in the future and the only way to obtain a licence is to buy an existing licence from a licensee seeking to leave the Fishery. In this way the total effort of the fishery is capped at a sustainable level.

Individual Quota: Collectors are allocated a certain amount of quota to take certain marine organisms depending on their licence conditions. The Department of Fisheries is responsible for determining and enforcing the quota levels for the Fishery. Currently 7500kg of live coral and 1500kg of live rock is distributed among 5 of the licensees. While these numbers may look large the reality is, an individual collector with maximum quota may only collect less than 6 kg each day. The equivalent amount of coral and rock equal to the total quota available for the entire fishery for a year would be represented on less than a 1-hectare site of medium to low-density coral reef or even one single coral head. Only a pinprick on a map of WA.

Market requirements: The market for aquarium specimens demands a vastly wide range of species, which minimises any possible effect or time, spent collecting on any one particular species. The market also requires specimens of a small range of sizes, shapes and only those in perfect condition, (this being a very small percentage of the available stocks), and at any one time the market for one individual species is limited. The key is to supply quality, diversity and variety.

Natural Abundance: The majority of species, of which there are over 150, sought by collectors are found in large numbers. There is also little or no competition from other commercial fisheries or the recreational sector to target these species.

Collection Methods: Collection in the fishery occurs with hand held nets so there are many physical limits on how much each collector can catch in a given time. This is particularly influenced by the need to catch and handle each specimen individually in order to keep it in good condition. Collectors are legally required to only use hand nets and hand tools. No chemicals, explosives or mechanical means are permitted. Hand held nets are an inefficient means of capture as the overwhelming majority of fish manage to escape capture by retreating within reef structures or out swimming the fisher. No unwanted by catch is produced with marine aquarium specimen collecting. Marine aquarium specimen collectors are completely discriminate in their fishing practices and should be recognised as such. Unlike almost all other fishing methods such as trawl fishing, net and line fishing, recreational included. All of which are almost completely indiscriminate.

Dive based fishery: As a dive based fishery, the actual physical constraints of human endurance and the physiological effects of decompression, limit the effort in the fishery. Additionally, optimal conditions of tide, swell, visibility and wind are required to successfully capture live fish. Thus the unusual nature of the fishery imposes limitations on the amount of effort that can be made.

Licensee Operational Rules

Fishing Practices and Operations

Licensees will conduct their operations to ensure a sustainable resource by:

1. Ensuring no damage is caused to a reef during collection operations

Good care will be taken to prevent damage to reef structures or organisms while collecting specimens.

1. *Careful placement and inspection of anchors whilst working within reef systems.*
2. *Divers to be instructed on minimising fin damage to corals whilst diving.*
3. *No attached corals or substrate to be removed or un attached to enable fish capture.*
4. *Removal of a specimen should be done by the most effective means to avoid any other disturbance.*

2. Ensuring overexploitation of any one area or reef doesn't occur.

The licensee is to vary where he works so that one area does not suffer from too much collection of any one species.

1. *The licensee will not remove more than 50% of any type of rock/coral/sessile invertebrate from one particular area and not return until new specimens have been given sufficient time to regrow.*
2. *The licensee will not exploit any one-reef system repetitively to collect localised fish populations. Capture rates (ie 5 fish per hour) from previous visits could be used as an assessment tool to monitor fish population depletions. A 50% reduction on capture rates to trigger the collector to rest the reef system until fish populations return.*

3. Ensuring the mortality rate is to be kept to an absolute minimum.

The licensee should implement efficient capture, handling, holding and transportation procedures to ensure that the mortality rate is kept to an absolute minimum.

1. *The licensee is to achieve consistent survival rates of all specimens from collection through to final sale of better than 95%.*
2. *Failing to consistently to achieve 95% survival is to be reported to the association.*
3. *All association members are to provide any information or assistance required to the licensee to improve knowledge and technics to an acceptable level of compliance.*

4. Using collection practices to encourage regrowth.

The licensee is to use and share knowledge with the other licensee's in the fishery, efficient means of collecting specimens in a way in which the targeted specimens will have the quickest recruitment / recovery after collection.

1. *No obviously active breeding specimens are to be collected. (i.e. Berried syngnathids, Breeding paired clownfish) Exceptions, Brood stock for aquaculture.*
2. *With all coral and invertebrate species where it is possible a portion of the specimen is to remain attached to the reef / substrate to continue growing.*
 - a. *Tip pruning s.p.s. corals.*
 - b. *Leaving a cutting attached to the reef for leather and other soft corals.*
 - c. *Not collecting the entire colony of colonising corals (i.e. coral morphs, anemones etc).*

5. Collecting only enough fish/coral/rock/sand for the immediate needs of the licensee.

No more specimens should be taken than the licensee knows can be safely transported and stored until sold.

1. *The licensee is to only collect specimens that he/she has.*

a. *A firm purchase order for or facilities to hold the specimens until sale.*

b. *Transport arrangements in place to send the specimens to holding facilities*

c. *The ability to comply to rule 3.1.*

6. Not collecting from reef systems, which have limited resources and may not cope with collection.

7. Supplying accurate records of identification and quantities of specimens to the Department of Fisheries

This will ensure the Department of Fisheries maintains accurate catch records from the fishery.

8. Staying up to date with regulations relating to the fishery.

Licensees have the responsibility of keeping abreast of all the laws and by laws enacted by various government bodies and local shire councils when it comes to gaining access to fishing grounds. Collectors should not cause environmental damage when gaining access or leaving.

9. Taking due care specimens will have the best chance of survival in the aquarium trade.

Licensees are to collect specimens suitable for the aquarium trade.

1. *Licensees are to keep a list of specimens considered not suitable for the general aquarium trade (attachment A).*

2. *Any specimens sold from attachment A Must be sold and marketed to all customers (retail and wholesale) by the collector with the corresponding warning.*

3. *Each licensee is to endeavour to supply specimens only to facilities with the appropriate husbandry abilities.*

Resource Sharing

Long-term sustainability is the key objective of resource management. Sustainability must take account of all users of the resource. We support resource-sharing methods that maintain sustainability of the resource by:

10. Leaving no obvious evidence of harvesting.

Collectors should aim to operate in such a manner that there is little or no obvious evidence of collection.

11. Keeping collection from reefs and locations frequented by other users to a minimum.

Many local dive and tour operators have particular locations that are very popular with their customers and thus important to the operator's business. Collectors are to avoid possible conflict by avoiding or minimise collecting from such locations. This includes reducing time spent on public boat ramps during peak recreational times.

12. Not portraying a negative image of the fishery.

Collectors are to be mindful of other aquatic users in the area and when interacting with other users should do so in a professional and cooperative manner. Where possible, collectors should take the time to explain the management of the fishery to interested members of the public. If a dispute occurs then we have a duty to behave in a non-aggressive and lawful manner.

13. Adopting the most efficient and sustainable methods of harvesting.

Pollution Control

Licensees have a responsibility to protect the marine environment by taking the following measures to manage pollution:

14. Fuelling operation should be carried out on land wherever possible.
15. Ensuring oil and other chemicals must never be discharged overboard.
16. Have secure bins and bags on board for waste and disposing of all rubbish back on land into secured bins.
17. Report any observed environmental damage to the appropriate authorities.

Compliance

It is paramount licensees act in accordance with the law to ensure sustainability of stocks and credibility of the fishery. Our industry will cooperate at all times with the Department of Fisheries to identify and prevent illegal fishing activities by:

18. Immediately notifying illegal fishing to the Department of Fisheries Regional Office concerned.
19. Reviewing their membership of the Association if a blatant illegal fishing act has taken place by an operator within the fishery.

Research

Fisheries research forms the basis of the knowledge required to make informed management decisions in our industry. Therefore, collectors should participate with research managers (and WA museum staff where necessary) in the collection of statistics to aid in the conservation and management of stocks.

We will:

20. Assist researchers where possible by offering assistance and advice with research projects.
21. Work with the WA Museum in the identification of species.
22. Work with the Department of Fisheries Research in streamlining identification of organisms.
23. Incorporate any appropriate research into best practice techniques to improve collection methods.
24. Endeavour to further knowledge and minimise wild collection of specimens suitable for captive culture.

Thank you for making the effort to read the Aquarium Specimen Collectors Association of WA Inc. Code Of Practice. Please inform Fisheries WA or the Aquarium Specimen Collectors Association of WA Inc. of any breaches to this code by members. Similarly of any undesirable activities conducted by non-commercial collectors should be addressed.

Contacts:

Fisheries WA, 168 St Georges terrace, WA 6000

Fish watch 1800 815 507

Aquarium Specimen Collectors Association of WA, Inc.

President: Steven Marns (08) 9307 6257

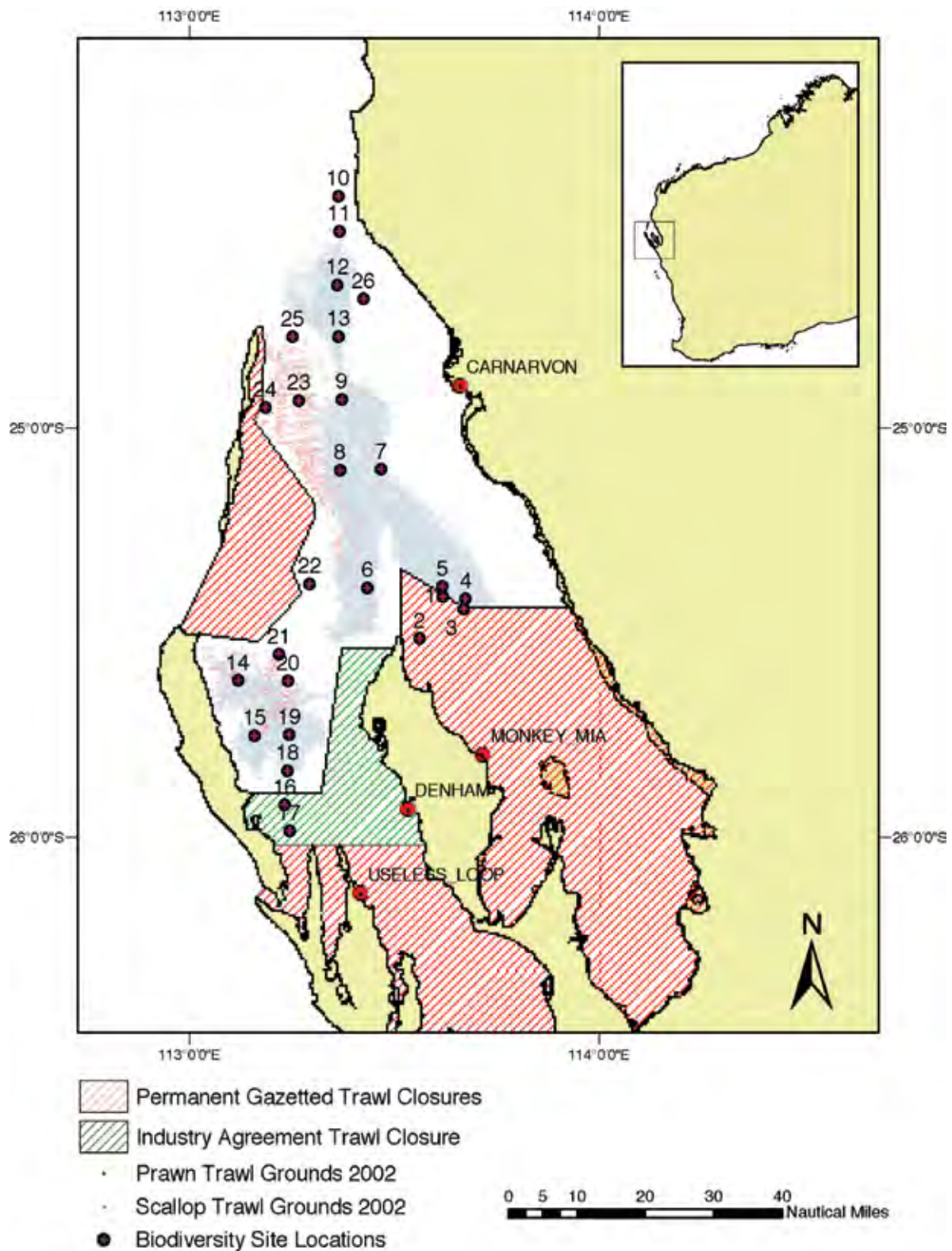
Vice president: Jonathon Potter (08) 9949 2272

Secretary: Peter Fullarton (08) 9305 9891

Attachment A.

Name	Warning
Black tip reef shark <i>Carcharias melanopterus</i>	Max size 2m, not suitable for home aquariums.

APPENDIX 6 INFORMATION REGARDING TRAWL ACTIVITY ON THE SYNGNATHID FAMILY IN THE SHARK BAY AREA



Map of the Shark Bay area detailing the locations where Syngnathids were taken during a fisheries trawl exercise. The numbers refer to the site numbers in the following table.

Syngnathids		SHARK BAY SITE NUMBERS														
SCIENTIFIC NAME	COMMON NAME	1	2	3	4	7	9	16	19	20	21	23	24	25	TOTAL	
<i>Filicampus tigris</i>	Pipefish, Tiger			4					1						5	
<i>Haliichthys taeniophorus</i>	Pipefish, Ribboned						1				2				3	
<i>Hippocampus angustus</i>	Seahorse, Western Spiny	2		1						2	1	4	1	2	13	
<i>Hippocampus biocellatus</i>	Seahorse, False-eyed			5	2	1						2			10	
<i>Trachyrhamphus bicoarctatus</i>	Pipefish, Short-tailed		1					1		2	1	3			8	
															39	

APPENDIX 7 MATERIALS SUPPLIED TO ENVIRONMENT AUSTRALIA AGAINST THEIR SPECIFIC GUIDELINES

SECTION 4. ASSESSMENT OF THE MARINE AQUARIUM FISHERY MANAGEMENT REGIME AGAINST THE AUSTRALIAN GOVERNMENT GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

GENERAL REQUIREMENTS OF THE GUIDELINES

The management arrangements must be:

Documented, publicly available and transparent;

As per the FRMA “the Executive Director is to cause a copy of every order, regulation and management plan in force under this Act:

- To be kept at the head office of the Department; and
- To be available for inspection free of charge by members of the public at that office during normal office hours.”

In addition to the legislative requirements, the current management regime, as documented in the formal set of management regulations, can be purchased by interested parties from the State Law Publisher and viewed on the their website www.slp.wa.gov.au/statutes/subsidiary.nsf/Fisheries.

Of more relevance is that any discussion papers and proposals for modifications to these management arrangements are distributed widely to stakeholder groups automatically and other interested individuals by request in hard copy format. Where appropriate, they are now also available from the Departmental web site www.fish.wa.gov.au.

Finally, once completed, the full ESD Report for the fishery will be made publicly available via publication and electronically from the Departmental website. This will provide increased transparency through explicitly stating objectives, indicators, performance measures, management arrangements for each issue and how the fishery is currently performing against these criteria. As a result, the Department of Fisheries is meeting the guideline.

Developed through a consultative process providing opportunity to all interested and affected parties, including the general public;

The Department of Fisheries is meeting this guideline through a variety of consultative processes. S64 and S65 of the FRMA define the requirement for procedures that must be undertaken before determining or amending all management plans.

Licensees from the MAF have recently established a formal Industry Association called the Aquarium Specimen Collectors Association of WA Inc. This Association should create a better overall communication base for the fishery and improve the image of the fishery. The terms of reference are described in Section 5.4.1.

The MAF is currently undergoing a review of its management plan, which will result in numerous changes to the current management regime and the development of a new management plan in 2005.

The Department of Fisheries will be consulting with stakeholders (including those listed under the guideline below), during the review and development of the new management plan.

In addition, a workshop was held to seek outside involvement in the development of this report for the MAF. This workshop included industry members, industry representative groups, scientific researchers, other state government agencies and non-government environmental groups. The information that was collected through the workshop has been incorporated into this report.

Ensure that a range of expertise and community interest are involved in individual fishery management committees and during the stock assessment process;

The range of expertise and community interests that have been involved in the process of determining management and reviewing stock assessments is extensive. The groups that have been involved in the generation and review of the information contained in this ESD report include:

Department of Fisheries, WA;
Department of Conservation and Land Management, WA;
Western Australian Fishing Industry Council (WAFIC);
Conservation Council of WA;
Marine and Coastal Community Network;
W.A. Museum; and
The Marine Aquarium Industry.

The organisations that were invited but did not attend the workshop included:

Department of Environment, WA;
DEH;
Recfishwest; and
Curtin University.

As a result the Department of Fisheries is meeting this objective. See Section 5.4.1.5 for more information.

Be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements are measured;

The Department of Fisheries is achieving this guideline through the ESD Component Reports. These reports (see Section 5 Performance Reports) contain the available objectives, indicators and performance measures for measuring the effectiveness of the management arrangements for the MAF. For some components, the objectives, indicators and performance measures are well established and the data are available to demonstrate levels of performance over time. For other components, the objectives, indicators and performance measures have only just been developed and/or the necessary data collection is only just being initiated. The status of this information and, where applicable, individual performance criteria, is documented within each of the individual component reports within the National ESD Reporting Framework in Section 5.1-5.4.

Be capable of controlling the level of harvest in the fishery using input and/or output controls;

The FRMA, commercial fishing licence and specifically the management plan for the MAF provides the legislative ability to control the level of harvest within this fishery. This is achieved through the use of effective input and output control measures based upon limited entry, gear restrictions and quotas.

In the case of the Syngnathid family an annual quota of 750 individuals is set by DEH and an annual report is provided to DEH outlining the past performance in the fishery.

These arrangements have been varied during the past 40 years to ensure that management remains appropriate to achieve the sustainability objectives for the fishery. As was previously discussed the current management plan for the fishery is under review. This review may result in changes to the current management arrangements in an attempt to improve the management regime for the fishery. As a result, the Department of Fisheries is meeting this guideline.

Contain the means of enforcing critical aspects of the management arrangements;

The Department of Fisheries employs operational staff to ensure compliance with the critical aspects of the management arrangements for the MAF. This includes at-sea patrols to ensure restrictions on gear and other operational rules are being adhered as well as inspections of catches at the point of landing and aquarium display centres.

Due to the limited resources available to this fishery, compliance checks are usually conducted in conjunction with other fisheries i.e. when other fisheries are operating in the same area. In 2002/03, of the 3 formal compliance checks for this fishery, none resulted in a breach.

The Department of Fisheries conducted a compliance risk assessment workshop in March 2003 to identify the compliance problems in the MAF. The objectives of the workshop were:

- To identify and assess the severity of the compliance risks associated with the fishery and provide justification for the rankings assigned;
- To identify current and future compliance activities that could be undertaken to obviate the risks identified; and
- To identify any policy, management or legislative deficiencies with the fishery that may impact on the effectiveness of any compliance activities.

The results from this workshop highlighted the difficulties with the current management plan for proficient compliance checks to be conducted within the fishery. The review of the management plan and development of the new management plan will address the problems and gaps for compliance within this fishery.

Nonetheless given the value of licences and the competitive nature of the industry, fishers themselves are also a source of information on illegal activities. A full summary of these compliance activities and their effectiveness is provided in Section 5.4.1.3. Through the combination of having employed operational staff as well as good dialog with the fishers, the Department is meeting this guideline.

Provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria;

The Department is meeting this guideline through the annual “State of the Fisheries” report and the five-year review of this document. DEH is set to review its stance on the Syngnathidae family at the end of October 2004 when the current declaration regarding the Syngnathidae family is reviewed. There is an annual review of the performance of the major aspects of the fishery through the completion of the “State of the Fisheries” report. This is updated and published each year including periodic reviews by the Office of the Auditor General (OAG). It forms an essential supplement to the Department’s Annual Report to the WA Parliament with the latest version located on the Departmental website www.fish.wa.gov.au.

The ESD Component Reports contain a comprehensive performance evaluation of the fishery based upon the framework described in the ESD policy (Fletcher, 2002). The reports include the development of objectives, indicators and performance measures for all aspects of this fishery and included status reports for those components that are not subject to annual assessment. The Department intends to complete and review externally this full assessment, including examination of the validity of the objectives and performance measures every five years.

Be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates; and

The Department of Fisheries is meeting this guideline through the development of this report. Capabilities for the assessment, monitoring and avoidance, remedying or mitigating any adverse impacts on the wider marine ecosystem are documented in the “General Environment” Section 5.3. This has been completed through a formal risk assessment analysis of the issues and, where necessary, the development of suitable monitoring programs. The risk assessment workshop was a critical part of the mechanisms to identify potential impacts of the MAF on the wider marine ecosystems. This process did not identify any issues that posed greater than a minor risk and hence there is currently no need to implement specific monitoring for such impacts.

Require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy.

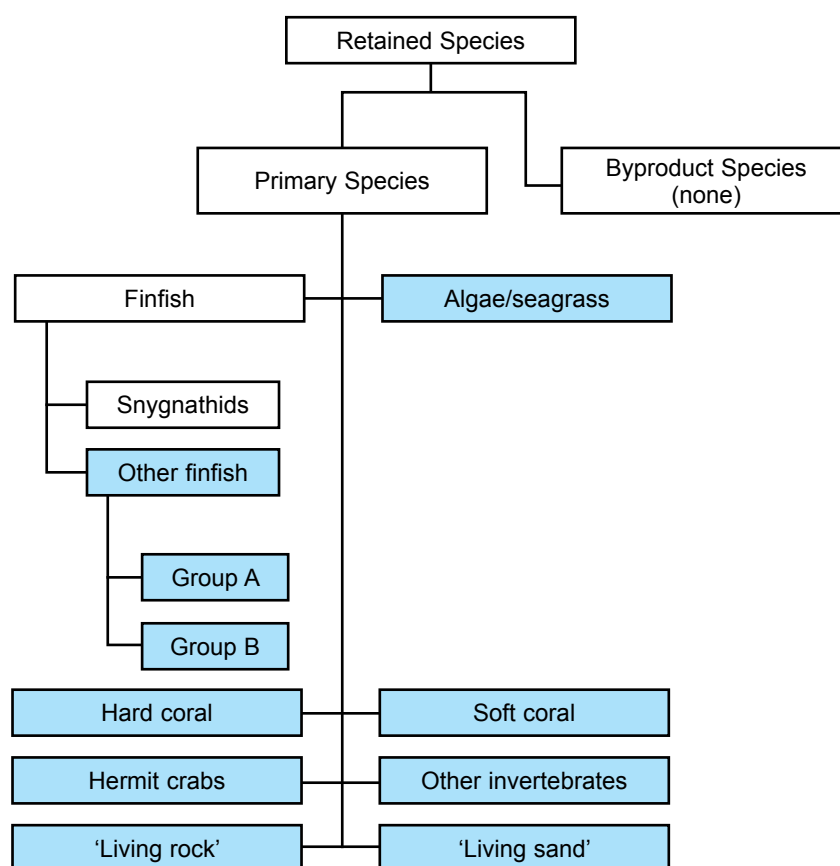
The management regime complies with all relevant threat abatement plans for species where there is an interaction and therefore is meeting this guideline. Details are provided in the “nonretained species” section of the ESD report (Section 5.2). In addition the management for all WA fisheries adhere to the relevant international agreements such as the *International Convention for the Prevention of Pollution from Ships* (MARPOL) and the *United National Convention on the Law of the Seas*. Furthermore, WA will incorporate the new agreement and decisions decided under CITES into its management of seahorses.

A risk assessment workshop was conducted in March 2003 to identify problems associated with compliance within the MAF. It concluded that despite Fisheries Officers encountering or being informed of numerous situations where license holders have been in breach of the management plan, infringements and prosecutions are difficult to achieve given deficiencies in the provisions of the Management Plan. Further workshops need to be held and the issues addressed are considered to be ongoing.

PRINCIPLE 1 OF THE GUIDELINES

OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVEL OF TARGET SPECIES

The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.



The component tree detailing the retained species within the MAF is shown above. The species retained in this fishery have been grouped into categories such as finfish, Living rock etc. For the finfish category this has further been split into Group A and B. Group A contains those taxa that have an average annual catch of <2000 individuals per year. Group B contains those taxa that have an average annual catch of >2000 individuals per year. Each of these groups were assessed with the appropriately detailed reports having been compiled (Section 5.1.1.1-5.1.1.9). The Risk Assessment classified all these groups of species as either **Negligible Risk or Low Risk** and therefore only a short justification is needed.

There are no byproduct species retained within the MAF because all captured specimens are individually targeted with a hand held net and in the event that a non-retained species is caught within a net it is released unharmed.

An assessment of the current performance of this fishery demonstrates that all the targeted species for the MAF are being maintained at acceptable levels. Thus, in summary:

- There is an annual limit of 750 syngnathids imposed on the MAF by DEH. In 2003 the fishery only retained a total of 383 individual seahorses, which was well within the overall limit. This take is likely to have minimal impact on these stocks as the total catch encompasses a number of different species which are not targeted by any other fishery as the MAF operates in shallow water while other fisheries operate in deeper waters.

- From 2000 to 2003, the total annual catch (no. of individuals) of other finfish by the fishery was 109,757; 165,657; 104,907; and 130,025, respectively. The total catches of finfish between 2000 and 2003 came from 117 families comprising of at least 541 species. Furthermore, not all taxa were reported each year and the number of retained individuals of each taxa was generally very low, i.e. <2000 individuals per year.
- From 1998 to 2000, no algae were collected by MAF. In 2001-2003 the catch of algae ranged from 810 kg to 5081 kg (wet weight). Since 2002 only 1 licensee has collected seagrass, at a rate of 0.5 – 1 kg per month.
- The annual maximum take of hard coral was recently reduced from 10,000 to 7,500 kg. In 2002 and 2003, total annual catches of hard coral by the whole MAF was approximately 4700 kg. With the development of a new management plan for the MAF, it has been proposed that the total allowable catch be redistributed among all licensees within the fishery. Even with the redistribution the maximum annual allowable take would be 8,500 kg.
- From 2001 to 2003, the catch of soft corals was reported at a family level (2 families) or as “unspecified” soft coral. The catch for 2001 through 2003 was only 118, 1096 and 918 kg, respectively.
- Three licensees are currently permitted to take hermit crabs. The take of hermit crabs include terrestrial as well as a small number of shallow-water hermit crabs. Between 2002 and 2003, the catch of the terrestrial hermit crabs were 70,055 and 62,935 individuals, respectively, and catches of shallow-water hermit crabs were 14,018 and 323,076 individuals respectively.
- Only small quantities of other invertebrates are collected by the MAF. From 2001 to 2003, 24 taxa of “other invertebrates” were collected by the MAF. The composition of the catch has been variable among the years. In 2002 and 2003, anemones (various species) were the most abundant.
- One licensee in the MAF collects live sand. Live sand is collected as a substrate for aquariums. In 2002 and 2003, only 100 kg and 50 kg, respectively, of live sand were collected by the MAF.

Consequently, it is considered that this fishery is meeting the requirement of Principle 1. The information relevant to this principle for these species is detailed below.

Information Requirements

1.1.1 There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.

Data collection for MAF is largely restricted to fishery dependent data collection systems which currently monitor the catch (species or taxa specific), effort and catch rates for the fishery. Fishers within the MAF provide monthly returns under the statutory catch and effort system (CAES). These returns contain information on catch (individuals caught and spatial area (60 x 60 nm grids)), and days and hours fished by month and year.

It is proposed that the resolution of the information provided by fishers will be increased as part of the revision to the management plan. It is expected that the spatial scale of the blocks will be reduced to 10 x 10 nm, at least in areas where there is relatively high activity levels.

The specific data requirements needed to assess performance for each of the relevant objectives are detailed in the relevant sections of the ESD report, which is in Section 5.1. Retained Species. These requirements are summarised as follows:

Monitoring Program	Information Collected	Robustness
CAES	Monthly summaries of catch and effort. Available since 1985.	Moderate

1.1.2 There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and/or reproductive capacity. Review should take place at regular intervals but at least every three years.

This guideline is discussed under 1.1.5.

1.1.3 The distribution and spatial structure of the stock(s) has been established and factored into management responses.

Most of the species of finfish collected by the MAF in both Group A and Group B have extremely large distributions (see section 2 for details).

There is only one syngnathid species, which the fishery catches that is endemic to WA. *Hippocampus angustus*, has only been recorded from Shark Bay to the Dampier Archipelago (Pogonowski *et al.* 2002). The other syngnathid species retained by the MAF have a relatively wide distribution, encompassing the waters of WA and at least 1 other Australian state or Territory (Pogonowski *et al.* 2002). Hence, the total area in which syngnathids are captured by the MAF is very low relative to the total distribution of each species. See section 5.1.1.1 for more information.

In addition, the MAF also collects seagrass and algae, hard and soft coral, live rock, live sand and hermit crabs all of which have extremely large distributions and include a range of species.

1.1.4 There are reliable estimates of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stocks. These estimates have been factored into stock assessments and target species catch levels.

Within the list of monitoring programs outlined below, the MAF data covering each of the sources of removal are outlined. Specific information on the take and risk to species is located in Section 5.1.1

There are no significant indigenous or recreational fishing activities for these species.

Sector	Catch Data Collected	Frequency
Commercial	Fishers monthly or trip summaries (CAES). Catch, effort and location.	Monthly.
Charter Boat	N/A	N/A
Recreational	N/A	N/A
Indigenous	N/A	N/A
Illegal	Estimated from compliance data.	Annually.

1.1.5 There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.

From 2000 to 2003, the MAF retained finfish from 117 families, comprising at least 541 species. However, not all taxa were reported each year – between 321 and 331 taxa were reported in any single year. The number of retained individuals of each taxa was generally very low, i.e. <2000 individuals per year (Table 5.3).

The finfish taxa are divided into 2 groups, according to the average annual catch level. Group A contains

those taxa that have an average annual catch of <2000 individuals per year. Group B contains those taxa that have an average annual catch of >2000 individuals per year.

Group A. This group includes 97 % of taxa caught by the fishery. The largest numbers are taken around Roebourne (blocks 2016, 2017) and around the Perth metropolitan area (block 3115). The total catch, however, is spread across a very wide area, comprising 34 MAF reporting blocks (Table 5.5).

The finfish species taken by the MAF tend to be small (<10 cm) and abundant, nearly all of which have biological characteristics (high fecundity, planktonic larvae dispersal, early age-at-maturity, etc) that minimise the risk of overfishing. Annual catches of <2000 individuals per species are likely to result in only negligible impacts on the total stock abundance and are also negligible compared with rates of natural mortality (e.g. due to predation). See Section 5.1.1.2 for more information.

Group B. From 2000 to 2003, only 15 finfish taxa had average annual catches of >2000 individuals per year (Table 5.6). Five of these taxa (apogonids, atherinids, clupeids, mugilids and gobiesocids) may represent >1 species, and so annual catches of any individual species within even these taxa may not actually exceed 2000 individuals per year. None of these 15 taxa are listed as threatened (Pogonowski *et al.* 2002).

The Group B taxa have biological characteristics that minimise the risk of overfishing. All are relatively abundant species that have a wide distribution. The abundances of these taxa are high, partly because they occur in a range of habitat types and have broad diets (either omnivorous or planktivorous), and so are not strongly affected by food or habitat limitations. Most of these taxa have an early age-at-maturity, are highly fecund and produce pelagic eggs and/or larvae, which allows dispersal over long distances and promotes recruitment across a broad area.

The risk of even localised depletion for these species is low because rates of population growth by these species are relatively rapid and they can sustain moderate levels of fishing. Also, annual population replenishment of these species occurs via recruitment of planktonic larvae which are independent of local population abundance. The total area in which these taxa are captured by the MAF is very small relative to the total distribution of each species, and so the impact of the MAF on the total breeding stock of each species is likely to be low. See Section

5.1.1.2 for more information.

Management Responses

1.1.6 There are reference points (target and/or limit) that trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.

Due to the small number of each of the individual finfish species taken, there are currently few specific triggers or reference points. As discussed above, the finfish taxa are divided into two groups according to the average annual catch level.

Group A contains those taxa that have an average annual catch of <2000 individuals per year. This group includes 97% of the taxa caught by the fishery (Table 5.2). Annual catches of <2000 individuals per species are likely to be negligible compared with the total stock abundance and also negligible compared with the rates of natural mortality (e.g. due to predation) and therefore no specific management actions beyond the current levels are required.

Group B From 2000 to 2003, most of the Group B taxa were taken for the purpose of supplying live

food. The current MAF Management Plan does not refer to the taking of fish for live food. With the Management Plan currently under review, the take of fish for live food will be prohibited within the MAF.

A specific level (for the total take of both Groups) that will trigger a review will be developed as part of the revision of the management plan. If the total catch of both groups exceeds the determined trigger level, this will result in the risk levels being re-examined and potentially individual limits for some species/groups may then need to be considered.

Syngnathids The take of syngnathids by this fishery is already controlled by an annual limit set by DEH. The annual limit set for the MAF by DEH is 750 syngnathids. This annual limit is not species dependent and made up of four to six species of syngnathids. If this limit is exceeded in any given year, the Department is required to prepare a report to DEH indicating why the take was exceeded. In 2002 833 syngnathids were taken and as a result a report was submitted to DEH (Appendix 5).

The review of the Management Plan is currently developing species-specific quotas, and it is envisaged that the total syngnathid quota (6 species) will be distributed among the licensees when the plan is implemented during 2005.

Other The take of algae, seagrass, coral, hermit crabs, other invertebrates and live rock and sand are managed by input controls in particular by specific licence endorsements that allow certain fishers the ability to take these groups of species. Currently, under the management their managed fishery licence does not cover plan the take of these groups of species and fishers wanting to take these groups must have a specific endorsement. It is anticipated that the new plan will include these groups of species, and quotas on the MAF licence.

While the take of hard coral is managed through a CFL endorsement, the Department has set an annual maximum amount, which is allowed to be taken. This maximum has recently been reduced, through non-renewal of a licence, from 10,000 kg to 7,500 kg. Additionally, the Department is investigating the redistribution of the total allowable catch of hard coral among all licensees in the fishery through the new management plan. Under this proposal, the 4 current licensees with 2000 kg coral quota would be reduced and allocated 1,000 kg per year and the remaining 9 licensees would be allocated 500 kg per year. If all these license options are exercised the Department would set a revised maximum limit of 8,500 kg.

With the development of the new management plan the take of all species will be reviewed and in particular, the take of coral will be investigated and reviewed by an expert panel. The coral expert panel will review the current take of coral by the MAF and develop a robust list of coral species, which the MAF should be allowed to take.

1.1.7 There are management strategies in place capable of controlling the level of take.

A full discussion of the main regulations and their justifications are located in Section 2.5. The following is a summary of the management arrangements for the fishery:

It is a limited entry fishery with 13 Managed Fishery Licence (MFL) holders operating on a State-wide basis. Licensees are permitted to take species of the Classes Chondrichthyes and Osteichthyes (that is, cartilaginous and bony fishes respectively) for marine aquarium purposes using hand-held nets.

The licensee or nominated operator must not work with more than two nominated divers at any one time and no more than two authorised vessels may be used in the fishing operation (that is, a 'mother boat' and an 'auxiliary boat'). An authorised boat (whether a 'mother' or 'auxiliary' boat) must not be

replaced by a vessel greater than eight (8) metres in length. Fish are only allowed to be collected by a net or nets held in the hand.

It should also be noted that MAF licensees have drafted a Code of Practice (Appendix 6), which advocates responsible fishing practices above and beyond what is legislated. The Code will formalise common practices such as not collecting breeding pairs, not repeatedly collecting from the same discrete area or not operating in popular locations during tourist season. While the Code itself will not be legislated the possibility of some of the fishing practices outlined in the code being incorporated into the revised management plan, or being placed as a condition on the MFL.

It is the Department's intention that following the management review, all MFL holders will have access to coral, 'live' rock and 'live' sand quota for marine aquarium purposes. The Department intends to compile a report identifying any species (or groups of species) that may be vulnerable to exploitation and then depending on the outcomes of that report introduce 'quotas' for those particular species. The preparation of this report will involve consultation and liaison with sygnathid expertise in agencies other than the Department of Fisheries.

As part of the review the Department is also looking to increase the spatial resolution of the catch and effort data provided by MFL holders in the MAF to improve the information available to monitor performance.

1.1.8 Fishing is conducted in a manner that does not threaten stocks of by-product species.

There are no by-product species taken by this fishery.

1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The MAF is currently managed through input and output controls including gear and effort restrictions, and licence endorsements with specific quotas. The relatively limited area where fishing occurs compared to the wide distribution of these species both in WA and across this geographic region, combined with the small number of operators in this fishery and the improvements to management outlined above make it highly likely that the objective of maintaining adequate stocks of these species will be met.

OBJECTIVE 2. RECOVERY OF STOCKS

Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.

Not applicable.

PRINCIPLE 2 OF THE GUIDELINES

OBJECTIVE 1. BYCATCH

The fishery is conducted in a manner that does not threaten bycatch species.

Because of the restrictions placed on the gear that can be used and the highly selective fishing methods that are employed there are no by catch associated with the Marine Aquarium Fishery.

Information Requirements

2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.

Not Applicable

Assessments

2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing.

Not Applicable

Management Responses

2.1.3 Measures are in place to avoid capture and mortality of bycatch species unless it is determined that the level is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.

Not Applicable

2.1.4 An indicator group of by-catch species is monitored.

Not applicable.

2.1.5 There are decision rules that trigger additional management measures when there is significant perturbation in the indicator species numbers.

Not applicable.

2.1.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Given that there are no known interactions of the MAF with non-retained species and the selective method of fishing used (diving, collection by hand only) in the fishery it is likely that the level of interaction will continue to be only minimal with only acceptable levels of impact occurring.

OBJECTIVE 2. PROTECTED/LISTED SPECIES

The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoid and minimises impacts on threatened ecological communities.

Information Requirements

2.2.1 Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities.

The MAF is allowed to take species from the Syngnathid family, which is listed under the EPBC Act. The annual limit is set by DEH at 750 syngnathids. No leafy sea dragons are permitted to be taken by this fishery. There is no evidence of decline for any syngnathid species retained by the MAF (Pogonowski *et al.*, 2002).

At least six species of syngnathids have been retained by the MAF in the past, although only four are generally targeted. *Hippocampus angustus* is endemic to Western Australian waters and has been recorded from Shark Bay to the Dampier Archipelago (Pogonowski *et al.* 2002). The other syngnathid

species retained by the MAF each have a relatively wide distribution, encompassing the waters of WA and at least 1 other Australian state (Pogonowski *et al.* 2002). Hence, the total area in which syngnathids are captured by the MAF is very low relative to the total distribution of each species.

There are no known interactions between the MAF and any other endangered, threatened, or protected species or threatened ecological communities. Due to the relatively selective method used in this fishery it is unlikely that the MAF has interactions with endangered, threatened or protected species. Furthermore, there is minimal chance for interactions through boat strikes because the boats are small and moving at relatively slow speeds which allow for most species (eg turtles, whales etc) to be avoided and/or species to move away from the boats.

Assessments

2.2.2 There is an assessment of the impact of the fishery on endangered, threatened or protected species.

There is a blanket restriction on the Syngnathid family that states that only 750 are allowed to be taken each year in the fishery and if this figure is exceeded justification needs to be given by the Department. In 2002, 833 syngnathids were taken which was over the allotted amount. The Department developed a report to outline the reason why this catch went over as well as the implications it would have on the species. This report is detailed below and a letter that was sent to Environment Australia by the Department of Fisheries Western Australia (see Appendix 5). Licensees were notified of their breach of the limit, and the Department intends to implement species specific quotas to licensees with a total syngnathid quota of 750.

The syngnathid species primarily taken are widely distributed within WA waters and occur in both shallow and deep waters in both urban and remote locations. It is estimated that 80% of populations occur in areas that receive little to no impact from fishing (based on the distributional ranges and the spatial catch and effort data). Consequently, the relatively small take of each species by licensees in the MAF is highly unlikely to have an unsustainable impact on the wild populations.

2.2.3 There is an assessment of the impact of the fishery on threatened ecological communities.

There are no threatened ecological communities associated with the MAF.

Management Responses

2.2.4 There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.

Current management arrangements prohibit the landing of the leafy seadragon (*Phycodurus eques*).

2.2.5 There are measures in place to avoid impact on threatened ecological communities.

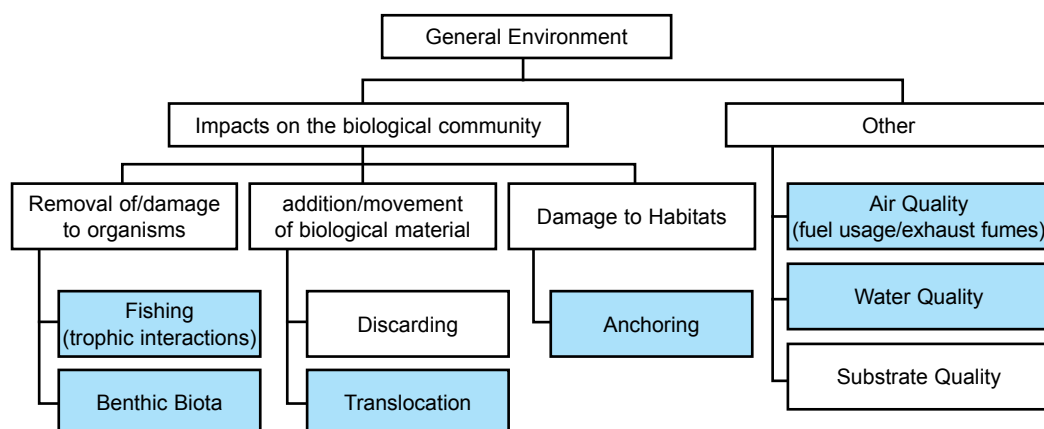
Not applicable given nature and size of operations.

2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Given the extremely low levels of interaction of this fishery with protected species, it is more than likely that the current situation of having only negligible impacts on these species will continue.

OBJECTIVE 3. GENERAL ECOSYSTEM

The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.



The issues that relate to the broader ecosystem identified for the MAF are shown below in the component tree. A formal risk assessment process subsequently assessed each of these issues with the information relating to each issue detailed in Section 5.3.

Of the issues identified for the MAF, all were considered of **NEGLIGIBLE or LOW risk** (trophic interactions, benthic biota, anchoring, translocation by vessel hulls and exhaust fumes). Consequently, the MAF's current performance is meeting Objective 3 and this acceptable performance is likely to at least continue or improve in the future.

Information Requirements

2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.

Appropriate levels of information have been obtained for most of the issues identified, which has allowed a sensible assessment of the level of risk to be made. This information includes data collected, which is directly related to the MAF -in terms of levels of catch and effort.

2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.

A formal risk assessment was completed (see Section 5.3 for details) on each of the identified issues relevant to the MAF (see component tree for issues). The identified issues were assessed and a summary of the outcomes is located in the Summary Table below. Complete justifications are located in the performance reports in Section 5.3.

Summary table of risk assessment outcomes for environmental issues related to the MAF.

ISSUES	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Removal of /damage to the environment:			5.3.1
Trophic interactions	Negligible	Most of the finfish species in the MAF catch are small-sized (<10 cm). Many are planktivorous. Many are prey to piscivorous birds and larger fish. Most of the invertebrate in the MAF catch are also small-sized. Most consume plankton or detritus. There is no evidence that any finfish or invertebrate species play a 'keystone' role in the ecosystem. Therefore, the majority of the species within these 2 groups are similar in their trophic function and it is appropriate to consider the impact of total finfish and total invertebrate removals by the fishery.	5.3.1.1
Benthic Biota (non target species)	Negligible	The fishery will not affect any group that is not targeted.	5.3.1.2
Anchoring	Negligible	There are 13 licencees operating in the fishery, all of whom use relatively small (<12 m) vessels. The fishery extends the entire length of the Western Australian coastline and some collection activities (e.g. collection of hermit crab) are not undertaken from a vessel.	5.3.1.3
Addition/Movement of Biological Material:			5.3.2
Translocation by Vessel Hulls	Low	There are 13 licencees operating in the fishery, all of whom use relatively small (<12 m) vessels. The fishery extends the entire length of the Western Australian coastline and some collection activities (e.g. collection of hermit crab) are not undertaken from a vessel.	5.3.2.1
Other Environmental Impacts:			5.3.3
Exhaust Fumes	Negligible	Same as above.	5.3.3.1
Oil Discharge	Negligible	Same as above.	5.3.3.2

Management Response

2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1.

None of the activities were identified as posing sufficient risk to warrant specific management attention. Reports are available in Section 5.3.

2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is initiated by ESD report of the precautionary approach.

Not applicable.

2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The risk assessment identified that under current management arrangements there have been minimal or negligible impacts from the MAF on the broader ecosystem. It is, therefore, highly likely that the fishery will continue to meet the objectives of having only acceptable levels of impact. If future studies indicate that further management is required for one or more of the various habitat types, then appropriate actions will be developed.

APPENDIX 8 APPROVAL AND RECOMMENDATIONS FROM DEH

The Hon Jon Ford MLC
Minister for Fisheries
11th Floor Dumas House
2 Havelock St
West Perth WA 6005

Dear Minister

I am writing to you as Delegate of the Minister for the Environment and Heritage in relation to the assessment of the *Western Australian Marine Aquarium Fish Managed Fishery* under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). In August 2004 the Department of Fisheries Western Australia (DFWA) submitted the document entitled *Final ESD report to the Australian Government Department of Environment and Heritage on the Marine Aquarium Fish Managed Fishery* for assessment under the EPBC Act.

The submission has been assessed for the purposes of the protected species provisions of Part 13 and the wildlife trade provisions of Part 13A of the EPBC Act.

I am pleased to advise that assessment of the fishery is now complete. The assessment report will be available on the Department of the Environment and Heritage (DEH) website at: <http://www.deh.gov.au/coasts/fisheries/wa/marine-aquarium/index.html>.

I am satisfied that the operation of the fishery is consistent with the objects of the wildlife trade provisions in Part 13A of the EPBC Act. I am also satisfied that it is unlikely to be detrimental to the survival or conservation status of any taxon to which the fishery operation relates, or threaten any relevant ecosystem. The fishery is relatively well managed and operates under an adaptable and precautionary regime capable of controlling, monitoring and enforcing the level of take from the fishery. Performance against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* is adequate, however there are a number of issues that need to be addressed to contain environmental risks in the longer term. Hence, I propose to declare the fishery an approved Wildlife Trade Operation (WTO), under Part 13A of the EPBC Act. This declaration would allow the export of product from the fishery for the next three years. I will make the declaration subject to the conditions at Attachment A.

I also propose to include product from this WTO fishery on the List of Exempt Native Specimens (LENS) so that exporters would not require EPBC Act export permits. Please note that the LENS listing excludes any species listed under the Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES). Exporters will be required to apply to DEH for a CITES export permit to export any CITES listed species including *Hippocampus* seahorses and hard coral.

The management regime aims to ensure that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. On balance, the fishery is being managed in an ecologically sustainable manner and is working to address existing problems and to minimise environmental risks.

While there are some environmental risks associated with this fishery, I believe that DFWA is committed to addressing these issues and is already taking proactive steps in some areas. Officers from our two departments have discussed key areas requiring ongoing and increased attention. I understand that they have agreed to a number of recommended actions, focusing on addressing key issues, to be implemented before the next Australian Government review of the fishery. The recommendations (Attachment B) have been an important factor in my decision to declare

the fishery a WTO and I look forward to receiving your confirmation that they will be implemented.

At this time, I am not satisfied that the management arrangements for the fishery require that all reasonable steps are taken to ensure that protected species are not injured or killed. I note that the fishery is in a developing stage and there is currently no restrictions on the harvest of species protected or listed under the EPBC Act. Consequently, there are also no mechanisms in place in the management regime for the fishery to explicitly prohibit the take of any EPBC Act listed threatened fish or to prohibit the take of listed marine species in Commonwealth waters. I understand that DFWA is aware that accreditation of the fishery under these components of Part 13 of the EPBC Act is not possible at this time, and has agreed that if operators wish to harvest listed marine species in Commonwealth waters in the future, a wildlife conservation plan will be negotiated between DBIRD and DEH and implemented. This arrangement has been included as a condition on the WTO declaration for this fishery. Accreditation will be granted for cetaceans, as the management arrangements in the fishery do not permit the harvest of cetaceans as listed under the EPBC Act.

I would like to thank you for the constructive way in which your officials have approached this assessment.

Yours sincerely

[Signed]

LARA MUSGRAVE

Delegate of the Minister for the Environment and Heritage

11th October 2005

Conditions on the approved wildlife trade declaration for the Western Australian Marine Aquarium Fish Managed Fishery

Relating to the harvesting of fish specimens that are, or are derived from, fish or invertebrates taken in the MAF.

1. Operation of the fishery will be carried out in accordance with the Western Australian Marine Aquarium Fish Management Plan 1995 and associated management regime in force under the Western Australian Fish Resources Management Act 1994 and the Western Australian Fish Resources Management Regulations 1995.
2. The Western Australian Department of Fisheries (DFWA) will advise DEH of any material change to the MAF's legislated management plan and/or arrangements that could affect the criteria on which EPBC decisions are based, within three months of that change being made.
3. The declaration covers the Western Australian Marine Aquarium Fish Managed Fishery only to the extent that the Western Australian Marine Aquarium Fish Managed Fishery relates to specimens that:
 - i. are not listed under Part 13 of the EPBC Act, or
 - ii. are listed marine species that are not taken in the Commonwealth marine area, or
 - iii. are listed marine species that are taken in the Commonwealth marine area according to the specifications of a wildlife conservation plan negotiated between DFWA and DEH.
4. Reports to be produced and presented to DEH annually, and to include:
 - i. information sufficient to allow assessment of the progress of DFWA in implementing the recommendations made in the Assessment of the Western Australian Marine Aquarium Fish Managed Fishery 2005;
 - ii. A description of the status of the fishery and catch and effort information;
 - iii. A statement of the performance of the fishery against objectives, performance indicators and measures once developed; and
 - iv. Research undertaken or completed relevant to the fishery.

Recommendations to DFWA on the ecologically sustainable management of the Western Australian Marine Aquarium Fish Managed Fishery

The Western Australian Marine Aquarium Fish Managed Fishery (MAF) is a relatively well-managed fishery with a range of management measures to promote the ecologically sustainable harvesting of species from the fishery including limited entry, gear restrictions and area restrictions that should enable the fishery to be ecologically sustainable in the short to medium term. Stocks are not currently overfished and the management arrangements provide the basis to ensure that fishing is conducted in a manner that will not lead to over-fishing.

While management is appropriately precautionary, issues that must be managed to ensure that their impacts are minimised include a lack of information on critical elements of species biology, potential for localised depletion of some species targeted in the fishery, lack of data validation for commercial catch data and current absence of strategies to address identified compliance risks. The fishery also targets seahorses listed under the *Convention on the International Trade in Endangered Species of Wild Flora and Fauna* (CITES) and syngnathids listed under Part 13 of the EPBC Act. Therefore special consideration is needed to ensure the ecological sustainability of these species and to ensure that international conventions are being adequately addressed.

The following recommendations aim to address these risks and uncertainties. DFWA should action these recommendations before the next review in 2008 within the timeframe specified in individual recommendations.

Recommendations

1. DFWA to advise DEH of any material change to the MAF's legislated management plan and/or arrangements that could affect the criteria on which EPBC Act decisions are based, within three months of that change being made.
2. The ESD Report, including all performance measures, responses and information requirements to be incorporated into the management regime and decision making process.
3. DFWA to consult with DEH prior to a change to the management arrangements for a CITES or EPBC Act listed species being implemented.
4. Within 18 months DFWA to develop and implement strategies to address identified compliance risks within the fishery.
5. DFWA to implement data validation mechanisms for CITES and EPBC Act listed species harvested in the fishery within 18 months.
6. Within 2 years DFWA to develop and implement a research strategy to gather further information on the stock status, biology and ecology of CITES and EPBC Act listed species. DEH notes that the research strategy will need to be implemented within the constraints of available resources.
7. Within 2 years DFWA to identify species at risk of localised and serial depletion and to implement management measures to mitigate these risks in the fishery.
8. Within 12 months DFWA to develop a timeline for the implementation of proposed changes to the Management Plan for the MAF, as outlined in the DFWA submission.
9. DFWA to provide a mechanism which allows fishers to record interactions with protected/listed species. DFWA to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.

