

***APPLICATION TO ENVIRONMENT AUSTRALIA  
ON THE  
SHARK BAY SNAPPER MANAGED FISHERY***

*Against the Commonwealth Guidelines for the  
Ecologically Sustainable Management of Fisheries*

For Continued Listing on Section 303DB of the  
*Environment Protection and Biodiversity  
Conservation Act 1999*

DECEMBER 2002



**Department of Fisheries**  
Government of Western Australia



*Fish for the future*

**DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA  
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## TABLE OF CONTENTS

TABLE OF FIGURES .....	4
TABLES .....	5
<b>1. INTRODUCTION TO THE APPLICATION .....</b>	<b>6</b>
1.1 DESCRIPTION OF INFORMATION PROVIDED .....	6
1.2 OVERVIEW OF APPLICATION .....	7
<b>2. BACKGROUND INFORMATION .....</b>	<b>8</b>
2.1 DESCRIPTION OF THE FISHERY .....	8
2.2 BIOLOGY OF PINK SNAPPER.....	19
2.3 MAJOR ENVIRONMENTS .....	22
2.3.1 Physical Environment .....	22
2.3.1 Economic Environment .....	22
2.3.2 Social Environment.....	23
<b>3. METHODOLOGY .....</b>	<b>24</b>
3.1 SCOPE .....	24
3.2 OVERVIEW .....	24
3.3 ISSUE IDENTIFICATION (component trees) .....	25
3.4 RISK ASSESSMENT/PRIORITISATION PROCESS.....	26
3.5 COMPONENT REPORTS .....	27
<b>4. ASSESSMENT OF THE SHARK BAY SNAPPER MANAGEMENT REGIME AGAINST THE COMMONWEALTH (EA) GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES .....</b>	<b>29</b>
<b>GENERAL REQUIREMENTS OF THE EA GUIDELINES .....</b>	<b>29</b>
<b>PRINCIPLE 1 OF THE COMMONWEALTH GUIDELINES.....</b>	<b>32</b>
OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVEL OF TARGET SPECIES .....	32
OBJECTIVE 2. RECOVERY OF STOCKS .....	39
<b>PRINCIPLE 2 OF THE COMMONWEALTH GUIDELINES.....</b>	<b>39</b>
OBJECTIVE 1. BYCATCH .....	39
OBJECTIVE 2. PROTECTED/LISTED SPECIES.....	41
OBJECTIVE 3. GENERAL ECOSYSTEM.....	43
<b>5. PERFORMANCE REPORTS .....</b>	<b>47</b>
5.1 RETAINED SPECIES .....	47
COMPONENT TREE FOR RETAINED SPECIES OF THE SBS FISHERY .....	47
5.1.1 PRIMARY SPECIES.....	47
5.1.1.1 PINK SNAPPER.....	47
5.1.2 BY-PRODUCT SPECIES .....	54
5.2 NON-RETAINED.....	55
COMPONENT TREE FOR NON-RETAINED SPECIES .....	55
5.2.1 CAPTURED BY LINE.....	55
5.2.1.1. PROTECTED/LISTED SPECIES POTATO COD.....	55
5.2.1.2. PROTECTED/LISTED SHARK SPECIES .....	56
5.2.1.3. CATCHING BLUDGER TREVALLY .....	56

5.2.1.4 CATCHING NORTH-WEST BLOWFISH .....	56
<b>5.3 GENERAL ENVIRONMENT.....</b>	<b>58</b>
COMPONENT TREE FOR THE GENERAL ENVIRONMENT .....	58
<b>5.3.1 IMPACTS FROM REMOVAL OR DAMAGE TO ENVIRONMENT</b> 58	
5.3.1.1 REMOVAL OF ALL SPECIES (INCLUDING SNAPPER).....	58
5.3.1.1 TAKING ALL BY-PRODUCT SPECIES .....	59
<b>5.3.2 ADDITION OF MATERIAL TO the ENVIRONMENT.....</b>	<b>59</b>
5.3.2.1 TRANSLOCATION OF ORGANISMS ON VESSEL HULLS .....	59
5.3.2.2 TRANSLOCATION OF BAIT.....	59
5.3.2.3. DISCARDING DEBRIS FROM BAIT PACKAGING .....	60
5.3.2.4 DISCARDING LINES AND HOOKS .....	60
<b>5.3.3 DAMAGE TO HABITATS .....</b>	<b>61</b>
5.3.3.1 ANCHORING.....	61
<b>5.4 GOVERNANCE.....</b>	<b>62</b>
COMPONENT TREE FOR THE GOVERNANCE OF THE SHARK BAY SNAPPER FISHERY .....	62
<b>5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT .....</b>	<b>62</b>
5.4.1.1 MANAGEMENT EFFECTIVENESS (OUTCOMES) .....	62
5.4.1.2 MANAGEMENT ARRANGEMENTS.....	65
5.4.1.3 COMPLIANCE.....	69
5.4.1.4 ALLOCATION AMONG USERS .....	71
<b>5.4.2 DEPARTMENT OF FISHERIES - LEGAL ARRANGEMENTS .....</b>	<b>74</b>
5.4.2.1 OCS ARRANGEMENTS .....	74
<b>5.4.3 DEPARTMENT OF FISHERIES- CONSULTATION.....</b>	<b>77</b>
5.4.3.1 CONSULTATION.....	77
<b>5.4.4 DEPARTMENT OF FISHERIES- REPORTING .....</b>	<b>79</b>
5.4.4.1 ASSESSMENTS AND REVIEWS .....	79
<b>6. REFERENCES.....</b>	<b>83</b>
<b>Appendix 1 Attendees at Risk Assessment Workshop .....</b>	<b>84</b>
<b>Appendix 2 Acronyms .....</b>	<b>85</b>
<b>Appendix 3 Details of Consequence Tables.....</b>	<b>86</b>
<b>Appendix 4 Figures .....</b>	<b>88</b>
Appendix 4.1 Principal Fishing Areas for the Shark Bay Scallop Managed Fishery and Shark Bay Snapper Managed Fishery .....	88
Appendix 4.2 Principal Fishing Areas for the Shark Bay Prawn Managed Fishery and the Shark Bay Snapper Managed Fishery .....	89
<b>Appendix 5 Commercial Research Summary for the Snapper Fishery (1982 – 2002) .....</b>	<b>90</b>

## **TABLE OF FIGURES**

Figure 1. The Snapper fishery locality map.....	8
Figure 2. Snapper fishery major features.....	9
Figure 3. Features of Shark Bay. ....	10
Figure 4. Snapper fishery principal fishing areas and World Heritage Property boundaries.....	11
Figure 5. Annual catch (t) of snapper in the Snapper fishery since 1975.....	13
Figure 6. Catch per unit effort (CPUE) by year from 1988 to 2000 for the Snapper fishery. ....	16
Figure 7. Distributional range of pink snapper ( <i>Pagrus auratus</i> ) in Western Australian waters. ....	20
Figure 8. Summary of the ESD reporting framework processes. ....	25
Figure 9. Example of a component tree structure. ....	26
Figure 10. CPUE for the Snapper fishery, 1988-2000.....	35
Figure 11. Component tree for the retained species. ....	47
Figure 13. Component tree for non-retained species. ....	55
Figure 14. Component tree for the general environment.....	58
Figure 15. Component tree for governance. ....	62
Figure 16. Map of the Snapper fishery licence area detailing the WA State waters and Commonwealth waters.....	75

## **TABLES**

Table 1. National ESD reporting framework components.....	24
Table 2. Risk ranking definitions.....	27
Table 3. The National ESD reporting framework headings used in this report.....	28
Table 4. Summary of risk assessment outcomes for environmental issues related to the Snapper fishery. ....	44
Table 5. Catches in 2000 by the Snapper Fishery licensed boats, in the area between 23° S and 26° S, of species other than pink snapper (excluding mackerels).....	54

# 1. INTRODUCTION TO THE APPLICATION

## 1.1 DESCRIPTION OF INFORMATION PROVIDED

This is an application to Environment Australia (EA) to assess the Shark Bay Snapper Managed Fishery (Snapper fishery) against the Commonwealth guidelines for sustainable fisheries. The submission of a successful application against these guidelines is now needed to meet the requirements under Part 13A of the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC) to enable pink snapper (*Pagrus auratus*) and other relevant by-products of this fishery 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 2003.

The information provided in this application covers all the elements specified in the *Guidelines for the Ecologically Sustainable Management of Fisheries* (located on the EA website [www.ea.gov.au/coasts/fisheries/assessment/guidelines.html](http://www.ea.gov.au/coasts/fisheries/assessment/guidelines.html)) along with other information (at a variety of levels of complexity) considered relevant to those who wish to gain an understanding of the management of this fishery. The application includes:

- Comprehensive background information on the biology of pink snapper, the history of the Snapper fishery in Shark Bay and a description of the management arrangements, which provides the context for assessing this application (see Section 2 for details).
- A description of the National Ecological Sustainable Development (ESD) reporting framework and methodology used to generate the information presented in the application (see Section 3 for details).
- Specific supporting statements relevant to each of the criteria within the Commonwealth Guidelines. These criteria include the “General Requirements”, which covers many of the governance aspects related to the management of the Snapper fishery, plus each of the objectives listed under “Principle 1” (target species issues) and “Principle 2” (broader ecosystem issues) of the Guidelines (see Section 4).
- Section 4 also has, where appropriate, specific links and reference to the detailed ESD component reports contained in Section 5. Referral to this additional information is facilitated by the incorporation of appropriately placed hyperlinks (electronic version only).
- At the end of Section 4 there is an [OVERVIEW TABLE](#) that for each issue, outlines which EA Guidelines are relevant; if there is an operational objective, the availability of suitable data for the indicators, whether the current performance against the limit/measure chosen is acceptable, and a summary of what (if any) future actions are required.
- Section 5 includes a comprehensive account of the risk assessment outcomes and current performance of the Snapper fishery, presented in the ESD format, covering each of the environmental and governance issues relevant to this application for the Snapper fishery. These reports cover each of the issues in a comprehensive manner and include either; the explicit objectives, indicators,

performance measures, current and future management responses and justification for each major component; or a full justification for why specific management of this issue within the Snapper fishery is not required.

## **1.2 OVERVIEW OF APPLICATION**

The pink snapper (*Pagrus auratus*) is the major species targeted by this fishery. In 2000, the Snapper fishery landed 488 tonnes of snapper from the oceanic stock, which had a value of around \$2.24 million. In addition, a further \$0.46 million of other scalefish were caught by operators in the Snapper fishery in 2000. Since the inception of the fishery in the late 1980s, it has been managed using a mix of input and output controls. In 2001, new management arrangements were introduced into this fishery and now the fishery is quota-managed on a year-round basis.

The *Fisheries Resources Management Act, 1994* (FRMA) provides the legislative framework to implement the management arrangements for this fishery. The FRMA and the specific management plan for the Snapper fishery, adheres to arrangements established under relevant Australian laws with reference to international agreements as documented in Section 5.4.2.

The maintenance of the snapper stocks as well as the successful continuation of the fishery has been achieved through the combination of:

- past research projects to improve the relevancy and accuracy of information on the biology of *Pagrus auratus* and improve the management for the fishery;
- the sophisticated suite of management arrangements in place;
- the proactive management used in the Snapper fishery; and
- will be sustained in the future by research and the continued application of effective, proactive management.

While this fishery has minimal wider ecosystem interactions it has still taken steps to minimise the wider ecosystem impacts it does have. The fishery operates over only 1% of the total license area, has minimal contact with the seabottom substrate and includes permanent closures in the inner gulfs of Shark Bay to protect separate stocks and other species taken by other fisheries operating in the Snapper fishery licence area.

Consequently, the management regime for the Snapper fishery should meet the *Guidelines for the Ecologically Sustainable Management of Fisheries*. Detailed justification for this conclusion is documented within the remainder of this application.

## 2. BACKGROUND INFORMATION

### 2.1 DESCRIPTION OF THE FISHERY

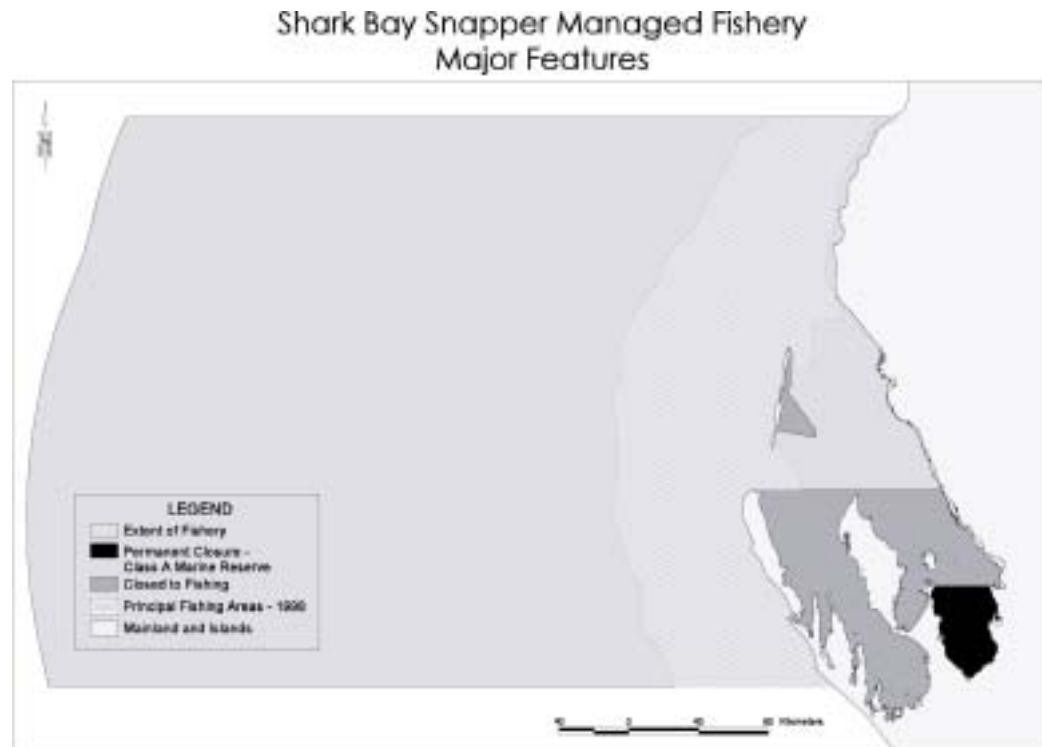
The Snapper fishery is a line based fishery that operates in the waters of Shark Bay and the Indian Ocean between latitudes 23°34'S and 26°30'S (Figure 1). There is an area within Shark Bay that has been closed to fishing by this fishery since the 1960's, which is inshore of Bernier and Dorre Islands and south of Cape Inscription (Figure 2).



**Figure 1. The Snapper fishery locality map.**

Within this overall area, only a relatively small portion of the licence area forms the functional fishery due to fishers targeting the higher yield fishing grounds (Figure 2).

Most of the peak season fishing (from May through August) takes place within a 10 km radius of Koks Island at the northern tip of Bernier Island and in a 5 km radius of Cape Inscription (Figure 3). However, there are also numerous patches over the latitudinal range of the fishery that have harder bottom substrates where snapper aggregations occur, and hence are targeted to a lesser degree as part of the commercial fishery. The off-peak season fishing is more dispersed than that conducted during the peak season.



**Figure 2. Snapper fishery major features.**

In 1991, Shark Bay was placed on the World Heritage list. All the waters of the Shark Bay World Heritage Property lie within the bounds of the licence area for the Snapper fishery but closures in the inner gulfs limit the area of activity of the operators in the fishery. Furthermore, a substantial amount of the catch comes from areas outside (beyond Bernier and Dorre Islands) the Shark Bay World Heritage Property (Figure 4). In conclusion, less than 10% of the Shark Bay World Heritage Property is actually fished by the Snapper fishery. In addition to the Snapper fishery operating within this area, the Shark Bay Prawn Managed fishery and the Shark Bay Scallop Managed fishery are also located in the area. Appendix 4 shows the overlap of fishing area between the Snapper fishery and the Shark Bay Prawn Managed fishery and the Shark Bay Scallop Managed fishery.

Whilst there are currently 65 licences in the managed fishery, 41 of these are attached to Shark Bay prawn and scallop trawlers. At the commencement of the managed fishery (in the mid 1980s) these trawl licences were allowed to catch one tonne of snapper by line in this region. Following the recent amendment to the snapper management plan (2000), each of these trawlers was allocated transferable quota units that had an initial value of one tonne. Since this time, there has been some

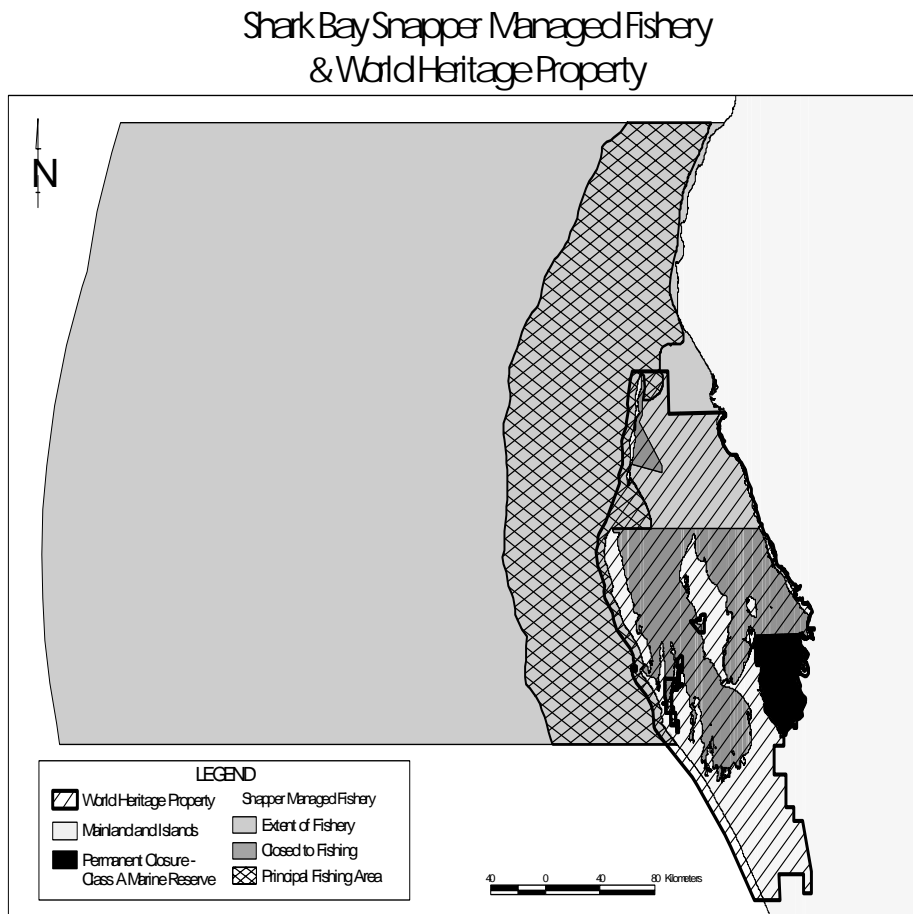
aggregation of these units and this is likely to continue, reducing the number of relevant licences but maintaining the total number of quota units.



**Figure 3. Features of Shark Bay.**

The peak season catch in 2000 (prior to the current quota arrangements) was 393 tonnes and the off-peak catch was 95 tonnes. As a result, catches of snapper from the oceanic stock in 2000 were slightly higher than the previous year, at 488 tonnes compared with 450 tonnes in 1999.

Commencing in 2001 the whole year's catch has been subject to transferable units of entitlement (quota). The value of the pink snapper taken by the fishery in 2000 was \$2.24 million, while other scalefish species added a further \$0.45 million.



**Figure 4. Snapper fishery principal fishing areas and World Heritage Property boundaries.**

### ***Fishing Operations***

The target species for this fishery is pink snapper (*Pagrus auratus*) and the main fishing method used is mechanised handline. Apart from the trawlers, the snapper boats are a mostly a mixture of ex-rock lobster boats and purpose-built hand line vessels. In the peak season, when a large part of the fleet consists of boats from other ports, crew of the visiting boats generally live on-board. In the off-season, crews are generally residents of Carnarvon or Denham and live ashore (Figure 3).

The gear used by the dedicated snapper boats consists of a number of mechanically powered winches each with one “hand-line”. The bottom of the line is weighted and a number of short (~40cm) leaders each with one hook attached are clipped to the line with shark clips. The average number of hooks per line is normally 15; however,

when a large school is being fished, the fishers will clip on more hooks per line. The preferred bait is pilchards, cut in small pieces, but other clupeoid fish, squid and cuttlefish are used when pilchards are not available.

During the peak season, when catch rates are high, most of the fishing trips are around one day duration. This maximises the freshness of the fish reaching the factories and eventually the consumers. In the off-season, the economies of boat operation make multi-day trips necessary to be profitable because of the lower catch rates.

Snapper are mostly found around patches of hard bottom. In the peak season, they form spawning aggregations on inshore patches whilst in the off-season they are dispersed in smaller schools on patches over the continental shelf and upper slope. Each dedicated snapper fisher has the location of a number of these patches recorded on their global positioning systems (GPS). Boats are generally anchored so that they remain over a patch while the crew fish with the lines. There are usually many hours each day when the snapper are not biting and most of the crew may rest at these times while one continues to fish. When the fish come back on the bite, all lines are fished until enough are caught for the trip or the snapper go off the bite again.

When fish are caught, they are landed onto a foam mattress to prevent bruising. They are unclipped from the line and spiked in the hind-brain from the right side of the head to kill them instantly. As well as being humane, this improves the eating quality of the fish. The dead fish are placed in an ice-slurry to rapidly cool them to around zero degrees Celsius, and then packed upright in plastic bins with some ice on top to keep them cold. The fish are separated from the ice by a layer of plastic, which prevents the flesh from being burnt during transport to shore and trucking to the factory.

### ***History***

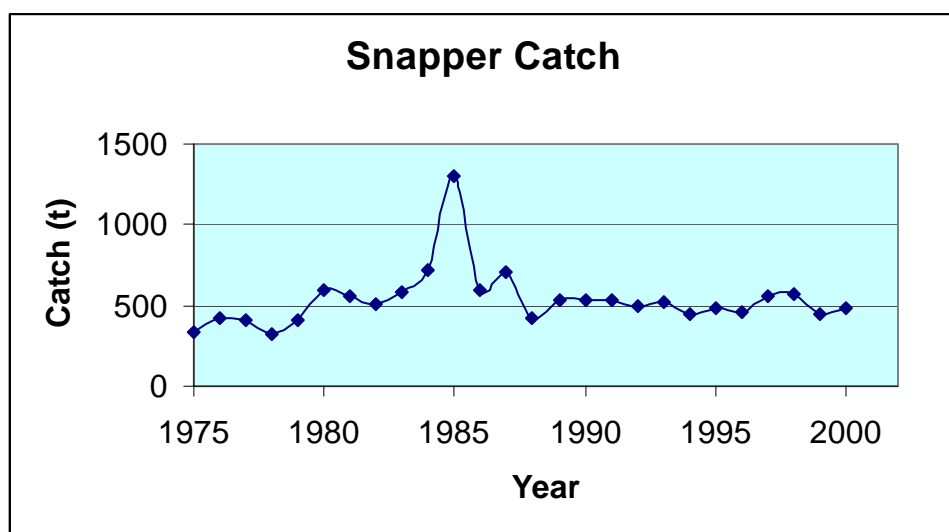
Pink snapper have been fished commercially in the Shark Bay region since the turn of the twentieth century. However, data on catches are only available from the 1950s onwards. During the 1950s a fleet of mainly rock lobster vessels travelled to the Shark Bay region each winter to take advantage of the spawning aggregations. There was also a small contingent of locally-based fishing vessels.

During this time, fishers used hand-lines as the sole means of taking pink snapper. The vessels would drift, in convoy, over the spawning aggregation and once a vessel had moved over the fishing ground it would steam back to the end of the queue and wait its turn. This method of fishing ensured that all vessels had the opportunity to fish all viable patches. However, given the nature of the operation it also meant that each vessel spent less than four hours a day physically fishing.

In 1959, trap fishing for pink snapper was first introduced and used extensively in the fishery until 1987. The traps altered traditional fishing patterns and initially caused conflict between line and trap fishers. Traps quickly became the principle method of capture although some fishers continued to hand-line whilst their traps were soaking. However, drift fishing with hand-lines whilst trapping proved difficult given the logistical problems associated with drifting between trap buoys and lines.

The major difference between the two primary methods was that traps allowed the fisher to target the aggregations more effectively. Consequently, the fisher with the greatest knowledge of where the aggregations occurred caught the most snapper. This situation differed from the original hand-lining method, which gave all fishers a reasonable chance of drifting over an aggregation. Furthermore, the trap fisher could fish the aggregation patch for an extended period. Consequently, the storage capacity of the vessel became the limiting factor as to how long a vessel may stay at sea and continue fishing.

When the limited –entry fishery began in 1987, only those boats, which had used traps in the past, could continue to use them. The trap endorsements were not transferable and in the end only 4 of the trap boats remained. Unfortunately, the pink snapper tended to sustain significant scale and skin damage as a result of trap capture. Market prices reflected this decline in quality and traps were subsequently replaced by hand-lines. Only one of the boats using traps continued past this time until around 1991.



**Figure 5. Annual catch (t) of snapper in the Snapper fishery since 1975.**

Pink snapper catches peaked at around 600 tonnes in 1959 and again in 1960. The catch then declined over the following decade until interest was revived in the late 1970's. In 1986, the collective pink snapper catch in the Shark Bay region reached at an all-time high of 1 300 tonnes (Figure 5). At this time, the issue of stock over-exploitation was raised and a Ministerial Working Group was appointed to consider management options for the fishery.

Following the increase in catch and effort in the Snapper fishery in the early 1980s culminating in the peak 1300 tonne catch in 1985, a limited entry fishery was proposed and a closed season in July was implemented in 1986. Although the limited entry fishery was not legislated for another year, fishers who did not meet the entry criteria tended not to work the fishery in 1986.

Increases in fishing efficiency occurred quickly, which negated the benefits of the temporal closure in July. A minimum size limit of 38 centimetres total length was also introduced to the fishery at this time.

The Shark Bay Snapper Limited Entry Fishery was officially declared in 1987, following the finalisation of the Offshore Constitutional Settlement (OCS) between the State and the Commonwealth, which gave WA control of line and trap fishing in Commonwealth waters. The waters of the Fishery were considered to be those of the outer bay and ocean lying between 23°34'S and 26°30'S. However, pink snapper stocks in the inner gulfs of Shark Bay could only be fished by licensees in the Shark Bay Beach Seine and Mesh Net Managed Fishery (this arrangement continues currently).

The level of access to the Snapper fishery at this time was determined based on the following selection criteria. Firstly, those fishers who had taken at least eight tonnes of pink snapper per annum over four of the five years included in the period 1980 to 1984 were given an 'A' class level of access. Those fishers who had taken four tonnes of pink snapper per year and four tonnes of other species over two of the four years included in the period 1982 to 1985 were given a 'B' class level of access to the Snapper fishery. 'A' class entitlement holders were permitted to fish the core fishing zones whereas 'B' class holders were restricted to fishing the outer perimeters.

A total of 13 'A' class and 14 'B' class access entitlements were initially distributed. However, following an appeals process a further 5 'B' class entitlements and 16 supplementary access endorsements were granted. These original class licences (A and B) only had area restrictions attached to them and it wasn't until 1989 that catch restrictions were also attached to the licences.

In 1988, research advice suggested that the collective catch of pink snapper was still too high. Consequently, industry agreed to trial a split season fishing year, with the peak season being quota managed. In 1988, as a trial of the quota system that began in 1989 catch restrictions were placed on the licences. An 'A' class entitlement attracted a quota allocation of 20 units whereas a 'B' class entitlement carried 10 units. The rules governing the purchase and transfer of licenses was designed to reduce the number of vessels in the Snapper fishery over the long-term. This heralded a shift from strictly input control management to a management regime based on a combination of input and output controls. The peak season at this time ran over the period 1 June to 15 August.

Along with an increase in the minimum legal size from 38 centimetres to 41 centimetres, researchers were satisfied that the quota measures had reduced the commercial catch to sustainable levels. The new length restriction was determined based on the average length at which pink snapper in the Shark Bay area become sexually mature.

Considering the success of the split season trial it was decided that an individually transferable quota (ITQ) system be introduced on a permanent basis. Consequently, in 1989, licensees were required to nominate whether they would fish the peak season under quota or the off-peak season without quota restrictions. The peak season was also extended to cover the period 16 May to 15 August.

Vessels choosing to fish the off-peak were limited to five lines and five hooks per line with most operators choosing to retrieve their lines with hydraulic winches.

In 1991, a quota carry-over system of 500 kilograms was introduced and standard containers were required to weigh the catch during the peak season (so that individual quota could be tallied).

In 1993, the peak season was further extended to cover the period from 1 May to 31 August. At this time fishers were also given the option to fish during both the peak and off-peak seasons. This measure was introduced to increase the scope of marketing flexibility for fishers. However, if a fisher chose to fish for pink snapper on a year round basis the license would forfeit ten units of quota during the peak season.

In 1994, the *Shark Bay Snapper Management Plan 1994* was introduced. The principal tools used under these management arrangements were seasonal quota and size limits but there were also a range of other controls employed in the Snapper fishery as summarised below.

By this time there were 13 'A' class endorsements, 11 'B' class entitlement holders, five supplementary licence holders and 41 trawl vessels entitled to take one unit of pink snapper during the peak season. An 'A' class entitlement provided 20 quota units, a 'B' class holder was given a base quota of ten units and supplementary licensees attracted a unit holding of four. Additional non-transferable units were distributed at the beginning of each year to compensate fishers who had a history of large catches.

Quota restrictions applied to those fishing the peak season, which coincided with the pink snapper spawning period. The official peak season ran from 1 May through to 31 August. Fishers fishing in the off-season did not have any quota restrictions, but were restricted to a maximum of five hand-lines or five drop-lines with five hooks per line.

Licensees were required to nominate the period they wanted to fish at the beginning of each year. However, fishers retained the option to fish both the peak and off-peak season provided they surrendered ten quota units during the peak. Fishing both the peak and off-peak seasons provided greater marketing flexibility but with the advances in fish finding technology fishers also found it easier to locate resident pink snapper populations during the off-peak season. This had the potential to offset the benefit of quota managed peak season.

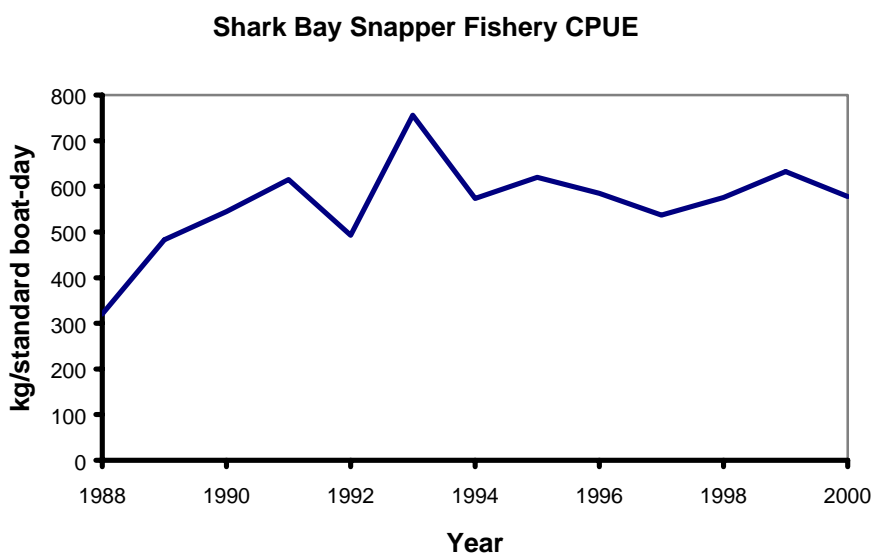
The total allowable catch (TAC) for the peak season was set at around 550 tonnes, with physical catches generally ranging between 500 and 530 tonnes. This equated to one unit being worth approximately one tonne of pink snapper.

### ***Impacts on Assessment Techniques***

Prior to 1986, there had been a large turnover of fishers, resulting in a significant number of inexperienced fishers entering the fishery. From 1986 onwards, the Snapper fishery consisted of experienced snapper fishers and the reduction in fishing time with the July closure stimulated a search for more efficient fishing methods. Changes that have increased fishing time and/or efficiency include:

- a change from gutted to whole fish which gave the crew more fishing time as less time was needed to handle the catch;
- changes in hook types and bait;
- the phasing out of hand-powered winches to the use of mechanical winches;
- increases in the number of crew to fish the maximum permitted five lines per boat; and
- extra staff onshore were employed for unloading so that the crew could spend more time fishing.

When it became clear that there was still more than enough fishing capacity in the fleet to overfish the stock, a change was made from fishing effort controls in the peak season to individual quotas in 1988. The methods used in the Snapper fishery stabilised following a few years of dramatically increasing efficiency. Because of these various changes, comparisons of catch per unit effort pre and post 1988 when individual quotas were introduced would be misleading and they are only presented from 1988.



**Figure 6. Catch per unit effort (CPUE) by year from 1988 to 2000 for the Snapper fishery.**

Units are kg whole weight of pink snapper per standard boat day. As catchability varies markedly throughout the year, peaking in June and July, the CPUE for line fishing in June and July is used as the index of abundance.

### ***Management Objectives and Issues***

The Minister and the Department of Fisheries have a statutory obligation under section 3 of the *Fisheries Resources Management Act, 1994* (FRMA) to conserve, develop and share fish resources of the State for the benefit of present and future generations. These objectives are further amplified through the vision and mission statements and objectives as specified in various Strategic and Business plans for the Department.

The Shark Bay Snapper Managed Fishery Working Group, which first met in 1995, was formed to discuss all the issues pertaining to fishing in the Shire of Shark Bay

incorporating commercial and recreational aspects to establish regulations and guidelines for sustainable resource sharing with in Shark Bay. The group adopted three guiding principles to develop the revised management arrangement for this fishery, and these still apply to the Department's management approach:

1. The maintenance of pink snapper stocks at sustainable levels for the present and future benefit of industry and the community.
2. That any proposed management arrangement for the Snapper fishery should be applied equally to all unit holders in the Snapper fishery.
3. That any proposed management arrangements should be simple and easy to understand, thus resulting in administration efficiencies and cost effective management for both industry and the Department.

### ***Current Management Arrangements***

The Shark Bay Snapper Managed Fishery has been in operation since the late 1980s, and has been managed using a mix of input and output controls. Following a lengthy consultation period, new management arrangements were introduced at the beginning of 2001 under the provisions of the Shark Bay Snapper Fishery Management Plan Amendment 2000. The Snapper fishery is now quota-managed on a year-round basis (whereas before only the peak season was quota managed), and a minimum holding of 100 quota units applies. Although the units are transferable, a number of governing policies and principles exist.

The amendment simplifies the complex management and administrative arrangements previously in place while providing more flexibility for both industry and the Department of Fisheries.

The current management plan for the Snapper fishery is a formal statutory document that provides the framework for the management measures for the fishery. Management of the fishery is based on quota management, gear controls and minimum legal size.

*Quota management.* Since the beginning of 2001 the Snapper fishery began operating under an annualised quota system within a TAC of 563.75 tonnes of pink snapper. Licensees' entitlement of pink snapper may be taken at any time of the year. Strict controls exist regarding the notification of landing snapper, weighing of the catch and transporting of catch. Masters of the snapper vessels must notify the Department of Fisheries immediately before or upon landing of any snapper. Any snapper landed must be accurately weighed within 240 minutes of being landed. Prior to the fish being moved once on shore the weight must be recorded and entered into a Catch and Disposal Record (CDR) book, and a copy that information must be provided to the Department of Fisheries within 24 hours of the landing.

A minimum unit holding principle is also embodied within the management plan for this fishery. The aim of the minimum unit holding requirement is to set a maximum number of participants in the Snapper fishery, each with a significant level of commitment to this fishery, which improve compliance effectiveness. The minimum number of units is 100 units, where one unit currently equates to 110 kg of snapper. Therefore the minimum unit holding of 100 unites equates to 11 tonnes. Although

prawn and scallop licencees have a minimum of 10 units (1.1 tonnes of snapper). In total, there are 5125 units of entitlement in the Snapper fishery.

*Gear Restrictions.* The only permitted means of taking pink snapper is by line and hook.

*Minimum Legal Size.* There is a minimum size of 41 cm total length for snapper that applies across both the commercial and recreational sectors. At a length of 41 cm, it is estimated that approximately 90% of pink snapper have had the opportunity to spawn at least once before being available for capture.

*Spatial Closures.* Commercial snapper fishing by the Shark Bay Snapper licensees is not permitted within the eastern and western inner gulfs of Shark Bay and in an area adjacent to the eastern side of Bernier and Dorre islands (Figure 2).

*Additional Management –“Wetline” fishery.* The additional governing legislation/fishing authority relevant to the Snapper fishery is the open access Western Australian Fishing Boat Licence (FBL). These “wetline” licences continue to have access within the waters of the snapper fishery to target species other than pink snapper. In effect, the two types of fishing rights co-exist within the same area. Of the other non-snapper species, mackerel will come under formal management in the near future; however, the remaining species (e.g. Black snapper, baldchin, cods etc) will continue to be available to holders of FBLs until all scalefish species are formally managed.

This ‘open access’ FBL issue is also currently under consideration through a separate management review, the Wetline Review. The extent of this type of fishing activity, the associated mortality of pink snapper caused by these vessels on return to the water is the subject of on-going discussions with industry and consideration by the Department of Fisheries.

The level of interaction between the Shark Bay prawn and scallop trawl fleets and the snapper stocks is also under examination by the Department of Fisheries. Issues relate mainly to the separate inner gulf pink snapper stocks, which are not the subject in this document.

### ***Compliance***

Pink snapper are a valuable commodity and coupled with their biological characteristics (see below) require a strong Government commitment to ensure compliance with the management arrangements. The compliance activities undertaken by the Department of Fisheries used to uphold the integrity of the management arrangements for the Snapper fishery cover three main areas of:

- The potential for non-reporting, under-reporting or false reporting of catch landed by commercial operators.
- Over runs on quota and non-compliance with minimum sizes.
- Unlicensed commercial activities.

These result in the following compliance activities:

- Inspections of commercial catches at the point of landing.
- Catch inspections at processing factories.
- At sea inspections of snapper boats and non-snapper boats.
- Monitoring of snapper quota system to detect unlawful “over quota” take.
- Random checks of Snapper fishery and other commercial fishing boats to check unlawful take and landing of pink snapper.

Inspections of snapper boats at the point of landing carried out by Fisheries Officers in Denham and Carnarvon enable checks of the size of snapper taken and the quantities landed. Licence checks are also conducted during these inspections. Notification requirements are contained in the management plan to ensure adequate notice of snapper landings are provided to the Department of Fisheries. The quota management system is also maintained to track the take and landing of snapper throughout the season.

### ***Markets and the Commercial Sector***

Domestically pink snapper are sold both whole and in fillet form, with a major market in recent years being the Sydney Fish Market. For the export market, pink snapper are primarily sold as whole fish and are exported to Japan, Taiwan, Italy and the USA.

The demand for pink snapper has varied between years and during periods when the price per kilo has been relatively low, the quota has often not been taken (eg the mid 1990s).

### ***Research***

Detailed research on the oceanic stock caught by the Snapper fishery was undertaken during the 1980s and provides the scientific knowledge base for management. A new FRDC funded project, which commenced in July 2000 will utilise data collected since the 1980s to assess and model the snapper stock. In addition, sampling of the catch will be undertaken every second or third year to provide up-to-date age composition data. The periodicity of this catch sampling will remain under review to ensure that it is adequate for input to the model to provide adequate scientific advice. Until the results from this research become available, monitoring of the fishery will continue to be undertaken annually using catch and effort statistics (CAES) data. Appendix 5 provides a summary of the research, which has been conducted for the Snapper fishery since 1982.

## **2.2 BIOLOGY OF PINK SNAPPER**

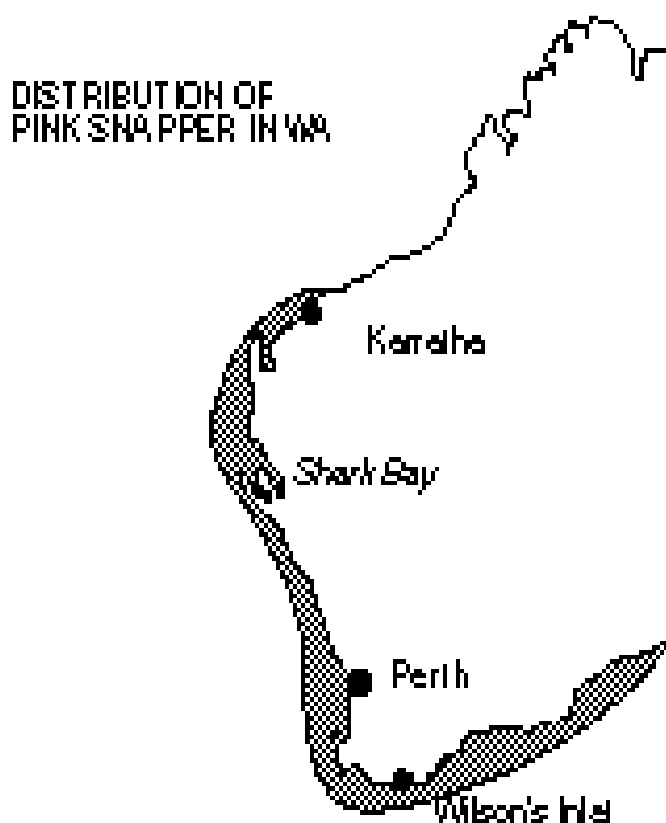
### ***Distribution and Stock Structure***

In Western Australia, pink snapper are found from the South Australian border through to Barrow Island in the northwest (Figure 7). The species is found along the continental shelf as well as in marine embayments and estuaries. Pink snapper are

demersal or bottom-dwelling and can occur to depths of up to 200m. Depth-distribution appears to be a function of individual size/age, with juvenile pink snapper tending to be more abundant in shallow waters, whereas larger individuals seem to prefer deeper waters with a rocky substrate.

Research has shown that there are three (3) distinct stocks of pink snapper within the Shark Bay region (e.g. Edmonds et al., 1995). The three populations have significant differences in their genetics, which implies no inter-breeding. There are two populations within the inner gulfs of Shark Bay and one that inhabits the rest of the bay and outer ocean adjacent to it. Each population appears to have evolved to a different set of optimal environmental conditions (for example, salinity concentration and range). New evidence indicates that the snapper population inhabiting the Denham Sound part of the outer bay has only limited mixing with the ocean stock (M. Moran<sup>1</sup>, pers. comm.). As a result, Denham sound is treated as a distinct inner bay stock for management purposes.

Tagging studies have shown that pink snapper within the inner gulfs are highly site-attached whereas those living in the mouth of the bay and outer ocean may travel up to 300 kilometres.



**Figure 7. Distributional range of pink snapper (*Pagrus auratus*) in Western Australian waters.**

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<sup>1</sup> Mike Moran, Department of Fisheries – Research Division.

## ***Life History***

### *Age & Growth*

Pink snapper are a relatively long-lived species with a moderate rate of growth. Individuals may reach 35 years of age but generally recruit to the Snapper fishery (that is, when they reach the minimum size limit of 41 cm in total length) at around four (4) years old.

Growth rates and maximum sizes vary throughout the distributional range of the species, so while pink snapper can grow to a length of around 100 centimetres and 16 kilograms in weight, oceanic stock pink snapper in the Shark Bay region rarely exceed 85 centimetres.

### *Reproduction and Recruitment*

Shark Bay pink snapper tend to spawn over the winter months from late May through till August. During this time, sexually mature individuals move inshore to form large spawning aggregations. Even though the stock is effectively from a wide area, they are temporarily concentrated therefore the fishing pressure on the stocks is increased. These spawning aggregations form the basis of the peak fishing season and make pink snapper particularly vulnerable to localised depletion due to overfishing and recruitment overfishing.

Female pink snapper may spawn over a million eggs per season. The eggs are released in discrete batches throughout the spawning period, which is referred to as serial spawning. The courting process between males and females is not fully understood, although the males are believed to use their large fleshy nose bumps to encourage females to release their eggs. Like most fish species, the larger and/or older females in the population produce eggs disproportionately, in terms of both quantity and quality, than their younger counterparts.

Once fertilised, eggs drift for a couple of days before hatching and are greatly influenced by the prevailing currents. Some larvae will settle in the vicinity of the spawning grounds whereas others will be dispersed further afield. The seasonal variability of the currents results in variability in the precise locality and level of larval settlement each year.

Good larval recruitment years, which imply a high larval survival rate, generally result in good recruitment into the fishery four or more years later. Strong larval recruitments can usually be tracked as pulses of recruits to the commercial fishery. In the Shark Bay region, whilst there are variations in the recruitment levels amongst years, these variations are not as pronounced as seen in some locations (eg Victoria, New Zealand) where the relative recruitment levels can vary by approximately 20 times amongst years (Francis, 1993).

### *Diet*

Pink snapper are opportunistic carnivores, consuming a wide variety of mainly benthic organisms depending on availability. The range of foods includes: fish, crustaceans, molluscs and other invertebrates.

## **2.3 MAJOR ENVIRONMENTS**

### **2.3.1 PHYSICAL ENVIRONMENT**

Shark Bay has a semi-arid to arid climate with hot, generally dry summers and mild winters. The waters of Shark Bay cover an area of 13, 000 km<sup>2</sup>. It is for the most part a shallow embayment with an average depth of around 9 m and a maximum of 29 m. The large seagrass beds in the bay influence the hydrology of the area, slowing water currents as they pass over the beds and allowing increased deposition of suspended sediments. This has led to the development of large sedimentary banks. The restrictions on water flow imposed by these seagrass beds has resulted in an unusual hydrologic structure in Shark Bay characterised by salinoclines and three major water types – namely oceanic (salinity 35-40 ppt), metahaline (40-56 ppt) and hypersaline (56-70 ppt). This distinct salinity pattern influences the distribution of marine flora and fauna (including pink snapper) within the bay, leading to three biotic zones.

The managed Snapper fishery occurs on deeper patches of hard bottom around the entrances to Shark Bay and in the adjacent ocean. Underwater video work has shown that the habitat is dominated by sponges, soft corals and gorgonians. Fishing does not normally occur over the seagrass or hard coral areas as part of the managed Snapper fishery. However, wetline fishers in the region may target coral areas for other reef species such as baldchin groper (*Choerodon rubescens*).

### **2.3.1 ECONOMIC ENVIRONMENT**

In recent years, the Japanese demand for snapper has been declining and efforts have been made to explore other overseas and Eastern States markets. The value of the Snapper fishery contributes significantly to the Gascoyne regional economy and economy of WA in general.

The fishery has an annual value to fishers in excess of \$2 million depending on variable catch levels and composition (noting by-product species), market price and exchange rate. In 1999 the value of the snapper catch at approximately \$4.60/kg was estimated at \$2.06 million. In 2000, the value of the pink snapper taken by this fishery was \$2.24 million. In addition, the value for other species caught by the fishery in 1999 totalled \$0.6 million and \$0.45 million in 2000.

### **2.3.2 SOCIAL ENVIRONMENT**

The fishery has had considerable impact on regional WA. In 2000, seven boats fished both peak and off-peak seasons (about nine months) with an average crew of three. This rose during the peak season (four months) to a total of 13 boats with an average crew of five. The fishery also provides significant employment for fish processing and transport staff in this region.

### 3. METHODOLOGY

#### 3.1 SCOPE

This application is based upon the ESD report for the Snapper fishery. The ESD report was generated by assessing “**the contribution of the Snapper fishery to ESD**”. This assessment examined the benefits and the costs of the Snapper fishery across the major components of ESD (see Table 1). 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 1) were generated for this application.

**Table 1. National ESD reporting framework components.**

Nb: *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\****

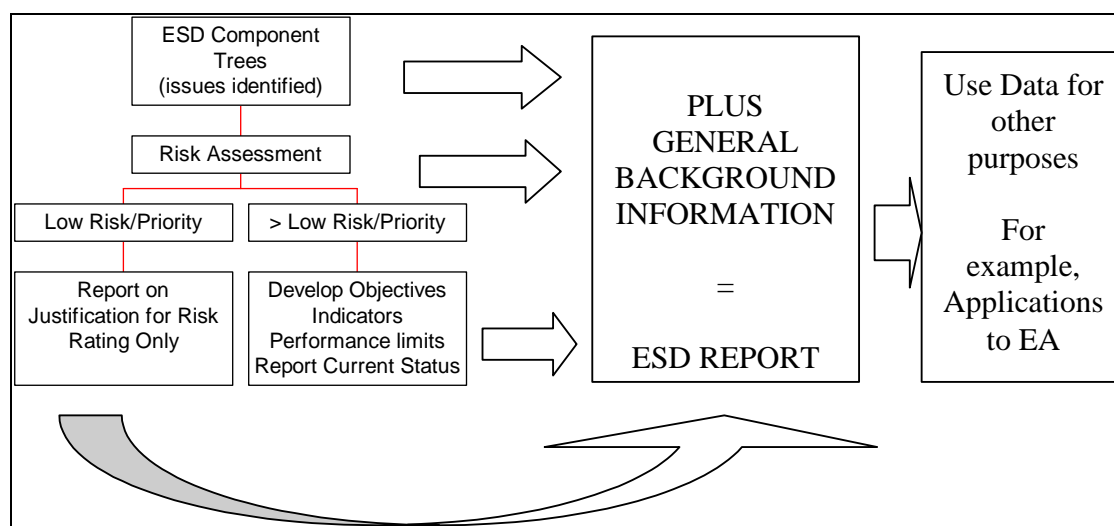
*Impact of the environment on the fishery*

#### 3.2 OVERVIEW

There were four steps involved in completing the ESD report for the Snapper fishery. 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 (<http://www.fisheries-esd.com/>):

- The issues that needed to be addressed for this fishery 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 Snapper fishery.
- A risk assessment/prioritisation process was completed that 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.

- 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.
- 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.

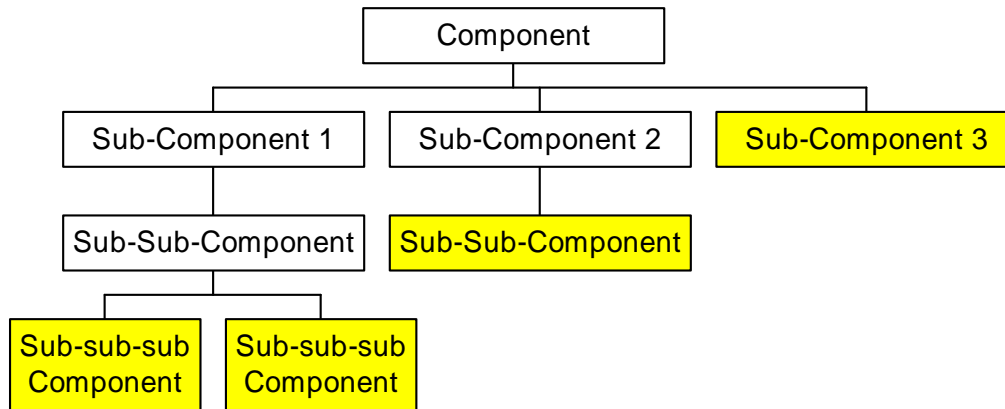


**Figure 8. Summary of the ESD reporting framework processes.**

### **3.3 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 1). Each of the major components is broken down into more specific sub-components for which ultimately operational objectives can be developed.

To maximize the consistency of the approach amongst different fisheries, common issues within each of the components were identified by the Standing Committee for Fisheries and Agriculture (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](http://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 Snapper fishery during an open consultative process involving all stakeholder groups. This was achieved by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (Figure 9).



**Figure 9. Example of a component tree structure.**

The trees for the Snapper fishery were developed at a meeting held in August 2001. The stakeholders present during this meeting covered the commercial industry, recreational fishers, environmental groups, local government, Environment Australia, Department of Environmental Protection, Department of Fisheries staff and an independent facilitator (full attendance list in Appendix 1).

### **3.4 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 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.

A realistic estimate of the consequence level for each issue was made by the group at the workshop. This level was from 0-5, with 0 being negligible and 5 being catastrophic/irreversible (see Appendix 2 for details of consequence tables). This assessment was based upon the combined judgement of the participants at the workshop, who collectively had considerable expertise in the areas examined.

The level of consequence was determined at the appropriate scale for the issue. Thus for target species the consequence of the Snapper fishery 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, the workshop group again considered the likelihood of the “hazardous” event (consequence) actually occurring based upon their 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 (Risk = Consequence x 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 (see Table 2).

**Table 2. Risk ranking definitions.**

<b>RISK</b>	<b>Rank</b>	<b>Likely Management Response</b>	<b>Reporting</b>
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 needed
Extreme	4	Likely additional management activities needed	Full Performance Report needed

In general, only the issues of sufficient risk (Moderate, High & Extreme), - 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. This process is summarized in Figure 8 (above).

**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.**

### **3.5 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 application). 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 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 3. The National ESD reporting framework headings used in this report.**

<ol style="list-style-type: none"><li>1. Rationale for Inclusion</li><li>2. Operational Objective (+ justification)</li><li>3. Indicator</li><li>4. Performance Measure (+ justification)</li><li>5. Data Requirements</li><li>6. Data Availability</li><li>7. Evaluation</li><li>8. Robustness</li><li>9. Fisheries Management Response<ul style="list-style-type: none"><li>-Current</li><li>-Future</li><li>-Actions if Performance limit is exceeded</li></ul></li><li>10. Comments and Action</li><li>11. External Drivers</li></ol>
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The completion of these component reports was initiated at the initial stakeholder workshop back in August 2001. Progress towards completing these reports was subsequently made by a variety of Departmental staff. Since the number of issues identified for this fishery was relatively few and their risks were relatively minor, a second full workshop was not held. Rather, the completed set of draft component reports was sent to all attendees of the initial workshop and any problems/concerns they had were communicated directly.

## **4. ASSESSMENT OF THE SHARK BAY SNAPPER MANAGEMENT REGIME AGAINST THE COMMONWEALTH (EA) GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES**

### **GENERAL REQUIREMENTS OF THE EA 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.

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](http://www.fish.wa.gov.au).

Finally, once completed, the full ESD Report for the Snapper 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 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. More specifically, the current management arrangements for the Snapper fishery were developed through formal consultation with the industry through the Shark Bay Snapper Working Group.

The ESD report for the Snapper fishery was developed through a consultative process that included a wide variety of stakeholders including members of the Shark Bay Snapper and prawn industry, government (Department of Fisheries, Conservation and Land Management), recreational/regional groups (Recfishwest, Shire of Shark Bay, Denham Professional Fishermen's Association, Denham Recreational fishing advisory committee), non-government environmental groups (Conservation Council of WA) and Environment Australia. As a result,

***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 application include:

- Department of Fisheries, WA;
- Department of Environment, WA;
- Department of Conservation and Land Management, WA;
- Western Australian Fishing Industry Council (WAFIC);
- Recfishwest;
- Conservation Council of WA;
- Shire of Shark Bay Council;
- Shark Bay Snapper industry; and
- Shark Bay Prawn industry.

***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 Snapper fishery. 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 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 and specifically the management plan for the Snapper fishery provides the legislative ability to control the level of harvest within this fishery. This is achieved through the use of a sophisticated and effective combination of input and output control measures based upon a quota system, minimum size limitations and gear restrictions.

These arrangements have been varied during the past 40 years to ensure that management remains appropriate to achieve the sustainability objectives for the fishery. Thus there have been changes to the fishing season (closure for the month of July, changes in the maximum size limit etc), changes to the number of vessels allowed to operate, changes to gear requirements and, most notably, the introduction of a TAC and quotas. 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 Shark Bay Snapper fishery. 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 processing factories.

Given the value of licences, 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. 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](http://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.

***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 “non-retained species” section of the ESD report (Section 5.2).

## **PRINCIPLE 1 OF THE COMMONWEALTH 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.***

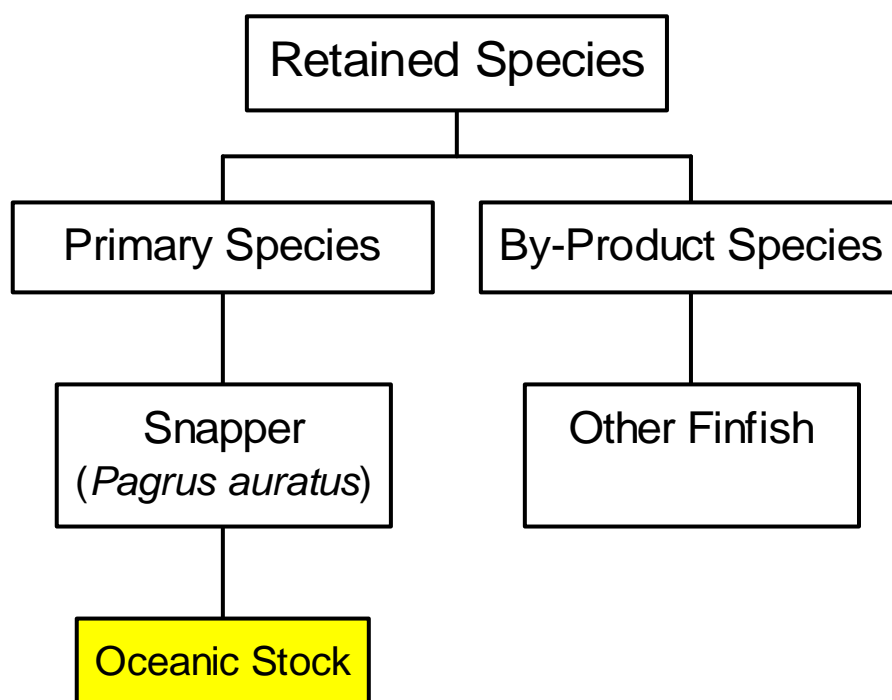
The component tree detailing the retained species within the Snapper fishery is shown below. The only target species in this fishery, the pink snapper (*Pagrus auratus*) was assessed with the appropriately detailed reports having been compiled (Section 5.1.1.1). The Risk Assessment classified this as a **MODERATE risk** and therefore warrants detailed attention.

The by-product species were all classified to be at **NEGLIGIBLE risk** from this fishery. Full justifications for not specifically assessing these components (i.e. Mulloway, Cod, Trevally etc) are located in Section 5.1.2. These decisions were largely related to the relatively small quantities taken by the Snapper fishery in comparison to other fisheries. Moreover, these species will be addressed in detail in the relevant fishery assessments (these will incorporate the level of catch by the Snapper fishery).

An assessment of the current performance of this fishery demonstrates that the oceanic stock of pink snapper is being maintained at acceptable levels. Thus, in summary:

- The catch of pink snapper has been kept below the estimated maximum sustainable yield of around 600 tonnes for the past 12 years with an average of approximately 500 tonnes.
- The catch rate for the past 10 years has been relatively stable, averaging around 595 kg/boat day, which is above the current limit reference of 500 kg/boat day for the Snapper fishery in June-July. The maintenance of the catch rate combined with a minimum legal size which allows 90% of the snapper stock to reach maturity prior to exploitation, guarantees that the breeding stock will be maintained at levels where subsequent recruitment is therefore not likely to be adversely affected.

- The level of capture of other by-product species by this fishery is relatively small and therefore does not have a significant impact on their dynamics.



Consequently, 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 are collected through a combination of fishery dependent and fishery independent systems to monitor the stock abundance within the fished areas.

The specific data requirements needed to assess performance for each of the relevant objectives are detailed in the relevant sections of the ESD reports in Section 5.1 Retained Species. Listed below are the current data collection systems in place.

The current FRDC project, which will finish in 2003, is aimed at developing an age-structured model from which the current TAC of 563.75 tonnes can be re-assessed. The work towards this model is progressing well, with a good record of age compositions of Shark Bay snapper from throughout the 1990s. Successful implementation of this model will provide a basis for managing the fishery in the coming years. Catch monitoring, to provide up-to-date age composition data, will be undertaken every second or third year.

Monitoring Program	Information Collected	Robustness
Catch and Disposal Record form	Provides on a daily basis the catch of snapper by the commercial fishery.	Moderate
CAES returns	Provided on a monthly basis by fishers the total catch of all species landed and effort- days fished.	Moderate
Size Frequency and Age frequency Information	Lengths and ages of a sub-sample of snapper landed by the fishery.	High

## Assessment

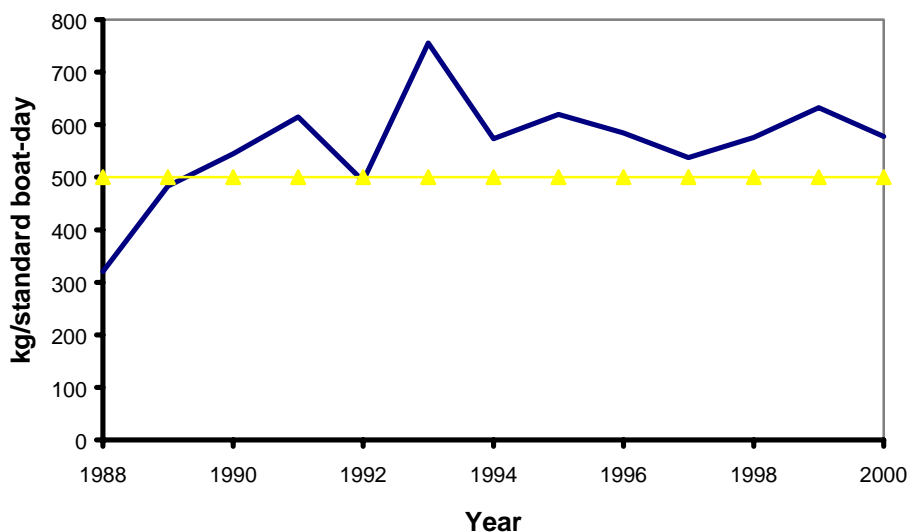
**1.1.2 There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and/or reproductive capacity. Review should take place at regular intervals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

The target species for the Snapper fishery, pink snapper, is classified as being close to fully exploited. A review of the performance for the Snapper fishery is conducted at least once a year. This review includes an assessment of the total catch by the fishery, the level of effort to take the catch, the distribution of effort, both spatially and temporally across the season and the calculated catch rates. In some years, information on the lengths and estimates of the age composition of the catch are sampled.

Full details of the current evaluation and a discussion of the robustness of the analyses used are located in 5.1.1.1. These assessments are then reported annually within the State of the Fisheries Report.

The on-going assessment of pink snapper, in relation to the acceptable catch rate, indicates that current levels are above the limit reference of 500 kg/boat (represented by yellow line on Figure 10) for the peak season between June-July (Figure 10). Although catchability of the snapper varies markedly throughout the year, the catch and catch rates peaks in June-July therefore this period is the most appropriate estimator of local abundance. If catches fell below this limit reference point of 500 kg/day, such a decline would represent a 20% drop below the 10-year average (539 kg/day) and would warrant a review and likely changes to the management arrangements unless it could be demonstrated that the drop was not due to a decline in the stocks.

Over the past 10 years catch rates have been relatively stable, averaging 593 kg/boat day. In 2000, the catch rate was very close to the 1990s average (593 kg/day) at 578 kg/day compared with 632 kg/day in 1999 (Figure 10).



**Figure 10. CPUE for the Snapper fishery, 1988-2000.**

CPUE by year from 1988 to 2000 for the Shark Bay Snapper Managed Fishery. Units are kg whole weight of pink snapper per standard boat day. As catchability varies markedly throughout the year, peaking in June and July, the CPUE for line fishing in June and July is used as the index of abundance. The 500 kg/day, performance limit is shown as the horizontal yellow line.

In 2001, new management arrangements were introduced under the provisions of the Shark Bay Snapper Fishery Management Plan Amendment 2000. The fishery is now quota-managed on a year-round basis, and a minimum holding of 100 quota units applies. Although units are transferable, a number of governing policies and principles exist. The total allowable commercial catch under the new year-round quota system is 563.75 tonnes. There are 5125 units of entitlement available in the Snapper fishery, which results in a unit value of 110 kg. This equates to the minimum unit holding of 100 units equalling 11 tonnes.

Effort is likely to be around 820-950 standard June-July line boat days. It is expected that the new management arrangements will facilitate utilisation of latent effort, e.g. from the Shark Bay prawn and scallop trawler fleet.

In addition, results from the two studies currently underway for the Snapper fishery (age-structured stock assessment model mentioned above and a study of the mortality of released snapper) will allow the Department of Fisheries to examine various management issues such as the implementation of a managed Wetline fishery and changes in the total allowable snapper catch.

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

In WA, *Pagrus auratus* is found from the South Australian border through to Barrow Island in the Northwest. The species is found along the continental shelf as well as in marine embayments and estuaries.

Research has shown that there are three distinct stocks of pink snapper within the Shark Bay region. The three populations are genetically different which implies no mixing or inter-breeding. There are two populations within the inner gulfs of Shark Bay and one that inhabits the mouth and outer ocean. Each population appears to have evolved to a different set of optimal environmental conditions (i.e. salinity, range etc). New evidence indicates that the snapper population inhabiting the Denham Sound part of the outer bay has only limited mixing with the ocean stock (M. Moran<sup>2</sup>, pers. comm.). See Background Information Section 2 for more information.

Only the oceanic stock, which inhabits the mouth of the Shark Bay region and the outer ocean is harvested by the Snapper fishery.

**1.1.4 There are reliable estimate 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 above for the Snapper fishery, data covering each of the sources of removal are outlined. While there is no indigenous fishery there is a recreational fishery for the pink snapper (oceanic stock). The recreational take is factored into the management for this species in the Shark Bay Snapper commercial fishery through setting the TAC or quota. The Gascoyne Recreational Fishing Survey, conducted between April 1998 and March 1999 (Summer et al., 2002), has estimated the recreational catch at 14 tonnes, approximately 3% of the commercial catch. In addition, there is recreational catch of pink snapper (oceanic stock) by charter boats. Preliminary results from charter boat returns indicate the take by charter boats for 1998/99 was about 6 tonnes. In total, the recreational catch of pink snapper (oceanic stock) is approximately 4% of the commercial catch. Thus the total catch from all sources has been below about 550 tonnes.

Sector	Catch Data Collected	Frequency
Commercial	Catch and disposal Record form- daily basis, Fishers monthly returns (CAES), Size frequency Information	Daily or monthly during the season
Recreational	Creel Survey	Every five years
Indigenous	Not applicable	Not applicable
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.**

A production model was developed in the 1980s based upon the catch and catch rate of the Snapper fishery during the previous 20 years. This model suggested that the maximum sustainable yield (MSY) for this stock was 600 tonnes per annum.

<sup>2</sup> Mike Moran, Department of Fisheries – Research Division.

The past and present TACs that have been introduced since this time have been set at a conservative level of 550 tonnes (peak season) and 563.75 tonnes per annum, respectively. The annual catch over the last 12 years has been between 500 and 530 tonnes without any sign that this has affected either breeding stock levels or recruitment levels. Hence, it appears that it is a sound estimate of the productivity of this stock. In addition, the development of an age-structured model will allow the Department of Fisheries to reassess the current TAC of 563.75 tonnes and further ensure that the harvest level is set appropriately.

## **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.**

The current limit reference for pink snapper is 500 kg/day for the fishery in June-July. As previously mentioned, the CPUE for line fishing during this period is used as an index of abundance. Although the catchability of the snapper varies markedly throughout the year, the catch and catch rates peaks in June-July and this period is therefore the most appropriate estimator of abundance. If catch rates fall below 500 kg/day, such a decline would represent a 20% drop below the 10-year average (593 kg/day) and would warrant a review and likely changes to the management arrangements unless it could be demonstrated that the drop was not due to a decline in the stocks.

As previously mentioned, the Department of Fisheries is developing an age-structured model for the snapper stocks from which the current TAC can be reassessed. The development of this model is progressing well, and there are good records of age compositions of Shark Bay snapper from throughout the 1990s to provide data for the model. Catch monitoring, to provide up-to-date age composition data, will be undertaken every second or third year. The periodicity of this catch sampling will remain under review on an on-going basis to ensure that it is adequate for providing sufficient input to the model to allow for the provision of adequate scientific advice. The resulting model and additional catch monitoring will provide the Department with an additional approach of assessing the snapper stocks resulting in a more robust management for the stocks.

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

A full description of the management arrangements is located in the attached Shark Bay Snapper Fishery Management Plan. A full discussion of the main regulations and their justifications are located in Section 2. The following is a summary of the management arrangements for the Snapper fishery:

- The fishery is managed through input controls (including number of licenses and gear restrictions) and output controls (quotas and minimum legal size limit).

- The annual fishing season has a TAC (currently 563.75 tonnes) from which catch and effort data is assessed on an annual basis against a minimum catch rate level (500 kg/day). Closures and quota limitations can be made mid-season by the Department of Fisheries.
- Compliance policing monitors both the commercial fishermen and processors.
- Any significant declines in the stock either from environmental effects or due to fishing are observed in time to implement appropriate risk management interventions.
- The performance of the fishery is reviewed and reported on annually.

Significant effort is put into ensuring adequate compliance with these regulations. Inspections of snapper boats at the point of landing are carried out by Fisheries Officers, which enables checks of the size of snapper taken, quantities and licences. Furthermore, there are catch inspections done at the processors, which further ensure size limits and quotas are being followed in the fishery. Additionally, at-sea inspections of the snapper and non-snapper boats are also carried out.

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

There are several by-product species that are each only taken in relatively limited quantities by the Snapper fishery (a total of only 106 tonnes across > 10 species) compared to other fisheries in the same area. These by-product species are the target species of the Western Australian Wetline Fishery and therefore will be assessed under that fishery (Section 5.1.2).

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

The Snapper fishery has been in operation for over 40 years and the present quota based scheme has been in place, in various forms, since the late 1980s. For the past 10 years, the management actions appear to have been extremely effective at maintaining the pink snapper stocks and this is reflected in the average catch rate for this period (595 kg/day). There is a high probability that the effectiveness of the management actions will be maintained, if not improved by the recent changes to the management arrangements. Under these changes to the Shark Bay Snapper Fishery Management Plan the fishery is now fully quota-managed on a year round basis. Furthermore, the changes simplify the complex management and administrative arrangements previously in place while providing more flexibility for both the industry and Department of Fisheries.

There are two studies presently underway to improve the management arrangements for the fishery. One of the studies aims to create age-length keys to convert length-frequency to age-frequency data for use in an age structured stock assessment model. A large sample of fish have been aged each year using scale or otolith bands. This model will then be used to examine management scenarios for the fishery such as changes in the total allowable catch. The second study is examining the mortality of released snapper, eg undersize. The final results from this study will also be incorporated into the management scenario evaluations.

The management responses that are currently in place for the Snapper fishery are very detailed, both for current actions, future actions and if the performance limits are reached/approached (see Section 5.1.1.1). The use of a limit reference catch rate for the pink snapper provides a mechanism for protecting the stock each year.

Strategies available to offer further protection to the spawning stock for pink snapper, if the catch rate falls below the threshold set, would include:

- Reduce quota allocations for the following season;
- Additional area closures;
- Instigate temporal closures; and
- Increase minimum size limit.

If the catch rate falls below the threshold set, the Department of Fisheries could initiate these strategies within the season or, if appropriate, prior to the beginning of the next season.

## **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.*

There are no stocks within the Snapper fishery that are currently below the defined reference points/limits. Therefore 1.2.1 and 1.2.2 are not applicable.

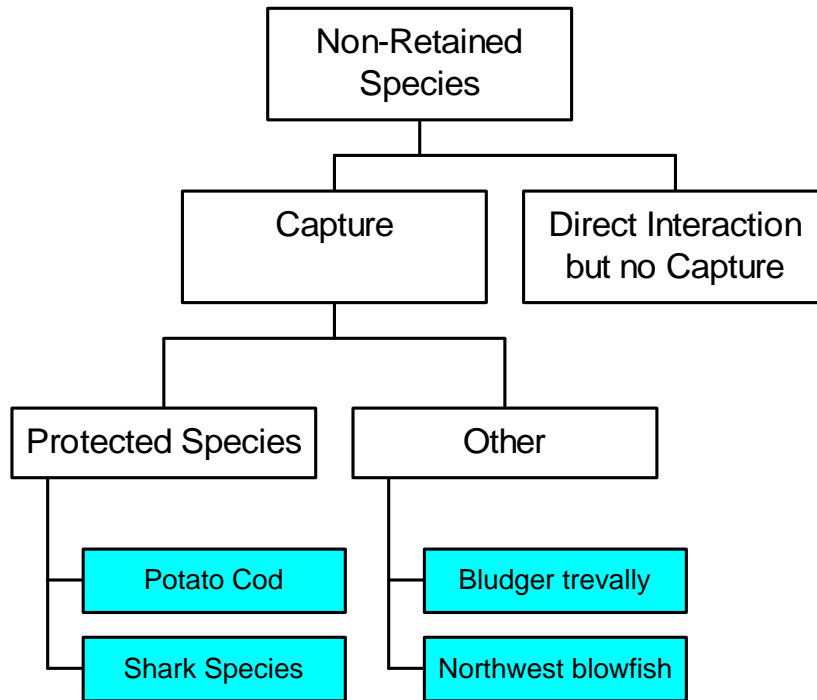
## **PRINCIPLE 2 OF THE COMMONWEALTH GUIDELINES**

### **OBJECTIVE 1. BYCATCH**

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

Four non-retained species/groups were identified in this fishery and are shown below in the component tree. The impacts of the fishery were identified as having a negligible risk to all four of the non-retained species/groups and therefore only a brief justification was required (Section 5.2). The threatened and protected species (eg potato cod) are covered in Objective 2.2; the remaining non-retained (bycatch) species are covered under objective 2.1.

The minimal bycatch issues associates with this fishery and the negligible risks involved demonstrates that the performance of the Snapper fishery is not threatening any bycatch species, including protected and threatened species. Consequently, it is meeting both objectives 1 and 2 of Principle 2.



## Information Requirements

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

Information on the levels of interaction with non-retained species has been obtained from interviews and discussions with fishers. Observer information has also been collected by Departmental staff aboard the vessels operating in this fishery.

## Assessments

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

A formal risk assessment for the identified non-retained/bycatch species was completed (see Section 5.2 for details on how this was completed). This assessment concluded that the Snapper fishery was of negligible risk to bludger trevally and North-West blowfish.

#### *Bludger Trevally-Summary*

#### **ERA Risk Rating (C0 L4 NEGLIGIBLE)**

Since the distribution of this species is highly variable throughout the fishing area, it is either caught in relatively large amounts or none at all. This species is usually returned to the sea alive. The level of catch compared to the species overall distribution suggests that the fishery has little impact on the stocks.

*North-West Blowfish-Summary*

**ERA Risk Rating (C0 L5 NEGLIGIBLE)**

This species commonly occurs at high densities within Shark Bay and as a result is caught by the Snapper fishery. This species is returned alive to the water by the Snapper fishery. While some mortality of the species may occur due to the Snapper fishery, it does not appear to have impacted their sustainability.

**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.**

The take of bludger trevally and northwest blowfish by this fishery were identified as negligible risks and therefore do not require specific management responses.

**2.1.4 An indicator group of bycatch species is monitored.**

Not applicable.

**2.1.5 There are decision rules that trigger additional management measures when there are 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.**

Not applicable.

**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 avoids 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.**

Information on the levels of interaction with non-retained species has been obtained from interviews and discussions with fishers. There has also been observer information collected by Departmental staff that has often been aboard the vessels operating in this fishery.

## **Assessments**

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

A formal risk assessment for the identified non-retained/bycatch species was completed (see Section 5.2 for details on how this was completed). This assessment concluded that the Snapper fishery was of negligible risk to potato cod and shark species.

#### *Potato Cod-Summary*

#### **ERA Risk Rating (C0 L3 NEGLIGIBLE)**

The potato cod is a protected species under the *Fisheries Resources Management Regulations, 1995* and is caught occasionally by the Snapper fishery. It is estimated that only 4 or 5 individuals are caught per year and all of these are returned alive. Since most are expected to survive there should be virtually no impact on the stocks of these species.

#### *Sharks- Summary*

#### **ERA Risk Rating (C0 L1 NEGLIGIBLE)**

The Snapper fishery very occasionally catches sharks. There is anecdotal evidence that 2 grey nurse sharks have been caught over the period of the fishery (which is in excess of 15 years). Whilst the grey nurse shark is listed as a vulnerable species under the EPBC (mostly due to its status in eastern states) there is no dedicated fishing on sharks within the boundaries of the Snapper fishery, so there are no cumulative impacts on these species. Consequently, given the extremely low encounter rate of the fishery with these species and this would probably not lead to mortality, this fishery is not likely to be having a negligible impact.

### **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 Snapper fishery.

## **Management Responses**

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

Current management prohibits the landing of these species; however there are very few encounters (less than one per year) and these are expected to not result in any mortality hence no extra management response is required.

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

Not applicable.

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

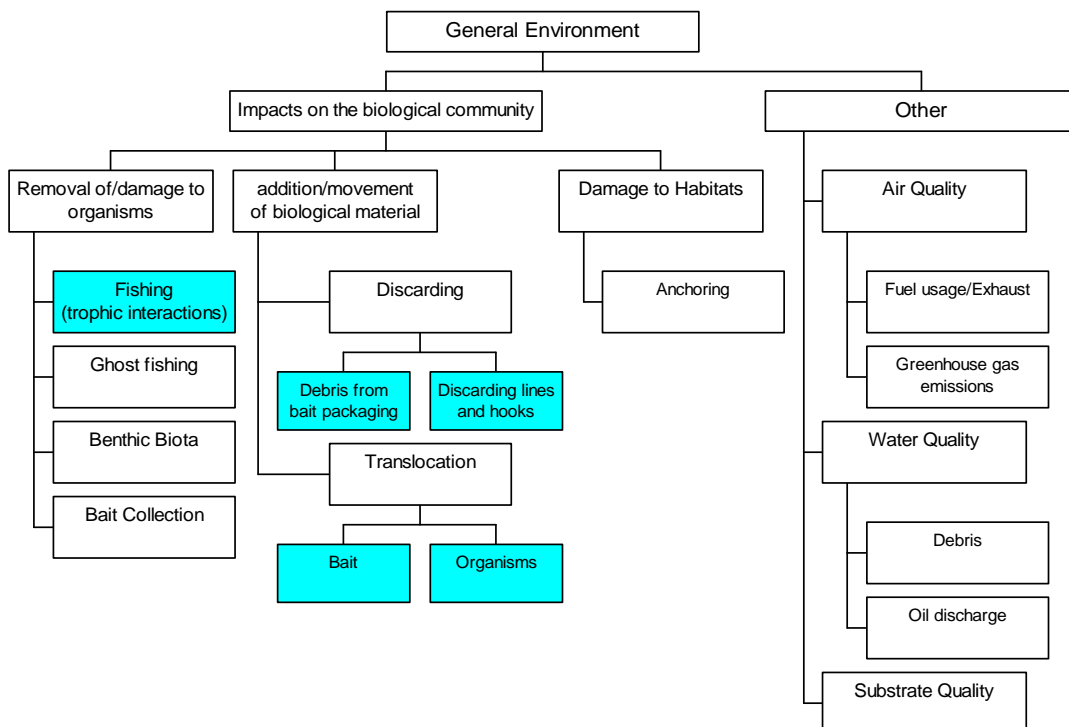
Given the extremely low levels of interaction of this fishery with protected species, it is more than likely that the current situation of having only negligible impacts on these species will continue.

**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 Snapper fishery 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 six issues identified for the Snapper fishery, three were of **LOW risk** (removal of all species, translocation of bait and discarding debris from bait packaging) the other three were rated as **NEGLIGIBLE risk** (translocation of organisms on vessel hull, discarding of lines and hooks and anchoring). Consequently, the Snapper fishery’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 Snapper fishery- in terms of levels of catch and effort. There are also a number of publications that provide valuable information on trophic interactions in addition to the research that the Department of Fisheries has undertaken and is currently working on.

### 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 Snapper fishery (see component tree for issues). The identified issues were assessed and a summary of the outcomes is located in Table 4. Complete justifications are located in the performance reports in Section 5.3.

**Table 4. Summary of risk assessment outcomes for environmental issues related to the Snapper fishery.**

ISSUES	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Removal of material from the environment:			
Impact of removing all species	Low	It is estimated that the proportion of snapper taken by the fishery, compared to the total virgin stock level, is probably 30% suggesting that a large biomass of snapper still remains (i.e. 70%). Since snapper are generalist carnivores and do not have close association with any particular prey species the impact of lower abundance of snapper would be distributed across many species. Additionally, snapper are only one of the many demersal carnivorous scalefish in Shark Bay. Most of the total snapper population remains (70%). They are only seasonally abundant in the areas of capture hence these areas are already subjected to temporal variations in predation rates	5.3.1.1
Addition/Movement of material to the environment:			
Translocation of organisms on vessel hulls	Negligible	Vessels in this fishery do not move out of the west coast region. There is already a strong natural connection of species along the	5.3.2.1

		western coast due to the Leeuwin Current, which provides for the natural movement of species along the coast.	
Translocation of bait	Low	The preferred bait used in this fishery is pilchards- but other clupeoid fish, squid and cuttlefish are used when pilchards are not available. Western Australian and imported pilchards are most used. Since Shark Bay is at the extreme northern limitation of the pilchards' distribution on the west coast the risk is low for pilchard-specific diseases.	5.3.2.2
Discarding debris from bait packaging	Low	Disposal facilities are provided to the fishermen at port.	5.3.2.3
Discarding lines and hooks	Negligible	Lines are not able to ghost fish once lost. Lost lines are not common	5.3.2.4
<b>Damage to habitats:</b>			
Anchoring	Negligible	Operators within the fishery may occasionally anchor when a patch of fish are found and may be in either sponge or sand habitats. Area over which fishing is actually conducted represents around 1% of the area available to the fishery.	5.3.3.1

## 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 application 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.**

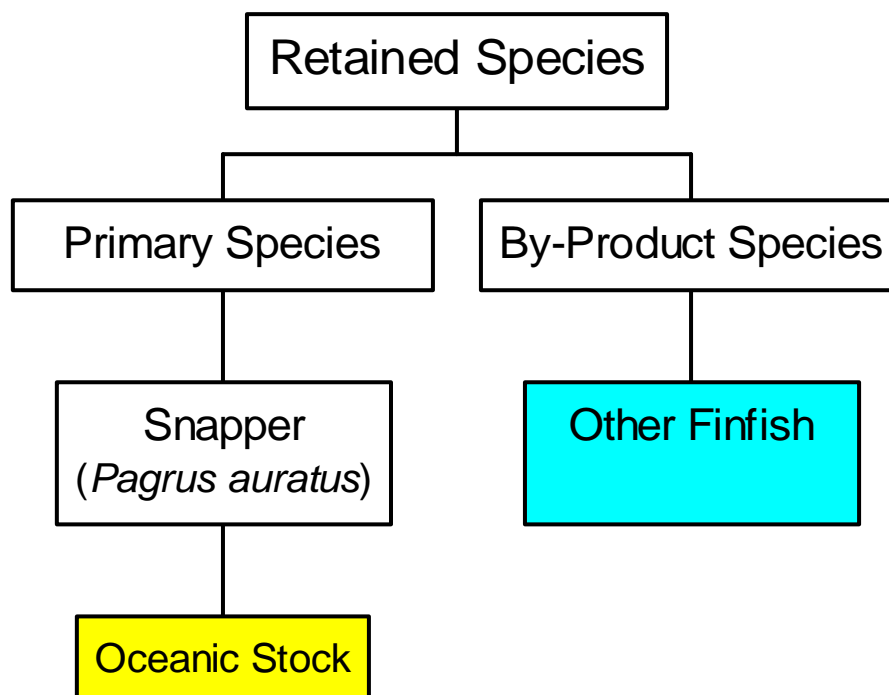
The risk assessment identified that under current management arrangements there have been minimal or negligible impacts from the Snapper fishery on the broader ecosystem even after around 40 years of fishing. It is, therefore, highly likely that the fishery will continue to meet the objectives of having only acceptable levels of impact. If future studies indicate that further management is required for one or more

of the various habitat types and the bycatch species, then appropriate actions will be developed.

## 5. PERFORMANCE REPORTS

### 5.1 RETAINED SPECIES

#### COMPONENT TREE FOR RETAINED SPECIES OF THE SBS FISHERY



**Figure 11. Component tree for the retained species.**

**Yellow boxes** indicate that the issue was considered high enough risk at the August 2001 Risk Assessment Workshop to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

#### 5.1.1 PRIMARY SPECIES

##### 5.1.1.1 PINK SNAPPER

#### Rationale for Inclusion

Pink snapper (*Pagrus auratus*) is the target species for this fishery and therefore the potential impact of the fishery on their stocks needs to be assessed.

#### ERA Risk Rating: Impact on breeding population (C3 L4 MODERATE)

In Shark Bay, there are at least three genetically distinct stocks of pink snapper, which includes the oceanic and a number of inner bay stocks. New evidence indicates that the Denham Sound part of the bay has a snapper population that only has limited

mixing with the oceanic stock (M. Moran<sup>3</sup> pers. comm.). For management purposes, Denham Sound is treated as a distinct inner bay stock. The Snapper fishery targets the oceanic stock and therefore is the only stock assessed in this report. The inner bay stocks are mostly targeted by recreational fishers and are subject to separate management arrangements. Due to the increasing recreational pressure on inner Shark Bay fish stocks, two dedicated studies are being carried out to provide specific information on the status of the inner bay pink snapper and black snapper stocks.

The potential consequence of fishing on the oceanic stock of pink snapper was classified as 'severe' but with only a 'possible' likelihood.

This rating was applied because of the concern about the relatively unknown level of mortality of snapper that may be occurring from the activities of the "Wetline" fishers that must discard snapper because they do not have snapper quota but can still fish within these areas. This would be of particular importance when the wetliners fish in deep waters since they are targeting the same stock (oceanic) as the Snapper fishery. Against this uncertainty, the current take of snapper by the managed fishery and operations of the other sectors have been occurring for over 15 years and the stock appears to still be healthy. The impacts of catch and release on the mortality rates of this species is currently under investigation.

Whilst the Department of Fisheries has not determined the precise nature of the stock/recruitment relationship for the snapper stock in this region, some assumptions can be made based on the general body of knowledge derived from other similar finfish fisheries in Australia and throughout the world. It has been reported that there is no relationship between recruitment and spawning stock size for this species in New Zealand (Gilbert, 1997). The levels of recruitment for finfish species similar in biology and dynamics to snapper (only moderately vulnerable) are generally considered to be unaffected whilst the spawning stock is greater than 30% of the virgin biomass (based on the suggestions in Mace, 1994; Gabriel and Mace, 1999). For this stock of snapper, recruitment appears to be relatively consistent amongst years and does not suffer from the large interannual variations seen in other stocks (eg SA - McGlennon et al, 2000) this makes it relatively resilient to fishing with a constant catch, i.e. quotas, provided the quotas are set low enough. The quotas in this fishery are set with the purpose of maintaining biomass at above half of the unfished level.

The combination of the yield per recruit information, the small proportion of undersized fish that are caught and returned plus having a fishing mortality rate that is known to be less than 0.3, it is estimated that at least 30% of the virgin biomass of pink snapper remains. Estimates from a stock production model indicate that the current spawning biomass may be as high as 60% of unfished levels. Consequently, the combination of these two sets of information suggests that between 30 to 60% of the spawning biomass remains. This is above the assumed point (30%) where recruitment may become affected by stock size.

Therefore, it was only considered **possible** that a **severe** consequence (recruitment overfishing) could occur. This results in the overall risk rating of 12, which is a

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<sup>3</sup> Mike Moran, Department of Fisheries – Research Division.

**MODERATE Risk.** Thus continued explicit management is required to maintain acceptable performance.

### **Operational Objective**

To maintain the spawning stock of pink snapper at or above an identified level that minimises the risk of recruitment overfishing.

#### ***Justification:***

*An operational objective that maintains the potential for recruitment to continue at historical levels is consistent with the statutory obligation under section 3 of the FRMA “ to conserve, develop and share fish resources of the State for the benefit of present and future generations.” It is also consistent with the guiding principles adopted by the Shark Bay Snapper Working Group that include ensuring “the maintenance of the pink snapper stocks at sustainable levels for the present and future benefits of industry and the community.”*

### **Indicator**

Catch Rate (kg/standard boat day) during the June – July period.

The CPUE for line fishing during the peak period is used as the index of abundance because the catchability of the snapper varies markedly throughout the year and peaks in June –July. Using the period when peak catches and catch rates occur is the most appropriate and consistent estimator of local abundance.

### **Performance Measure**

500 kg/standard June-July boat day.

#### ***Justification:***

*The pink snapper stock is close to fully exploited. A stock production model assessment in the mid-1980s estimated maximum sustainable yield at around 600 tonnes. The average annual commercial catch for the 1990s has only been 503 tonnes due to the imposition of quotas during this period.*

*Over the past 10 years catch rates have been relatively stable, averaging 595 kg/boat day. Consequently if the catch rate falls below 500 kg/day such a decline would represent a 20% drop below the 10-year average. This percentage of decline would warrant some level of investigation and possible actions.*

### Data Requirement for Indicator (and Availability)

Data Required	Availability
Catch of Snapper by the Commercial Fishery	This is available from the quota – Catch & Disposal Record form (unload data) provided on a daily basis by the fishers and lodged at the Carnarvon Office. This information is available from the period when the fishery became quota managed in the 1980s. This data is also provided on the monthly returns submitted by fishers for input into the CAESS (Catch and Effort Statistics System). These data are available since the mid 1970s.
Effort – Days fished in the June –July period	These data are obtained from the monthly CAESS returns and from the number of Catch & Disposal Records submitted by fishers.
Size Frequency Information	Lengths (and otoliths/scales) of a sub-sample of snapper landed by the fishery have been obtained. These are available for some years only (1980s lengths & scales; 1990s lengths & otoliths).

### Evaluation

**Summary:** The overall breeding stock level for the oceanic snapper stock is not measured directly although the catch, being all mature fish, is a reflection of the size of the breeding stock. There are no indications of insufficient breeding stock from either the data on catch rates, the locations fished or the size frequency of the catch. Thus the catch rates at 590 kg/day are well above the performance measure.

This is in contrast to the inner Shark Bay stocks of snapper (which are genetically distinct from the oceanic stock), where the breeding stock levels have been seriously impacted by (recreational) fishing.

**Landings:** The managed Snapper fishery operates on the oceanic stock of snapper, which is distinct from the inner Shark Bay stocks. Catches of snapper from the oceanic stock during 2000 were slightly higher than the previous year, at 488 tonnes compared with 450 tonnes in 1999. The total commercial catch of this fishery is generally limited more by market capacity than by the availability of fish.

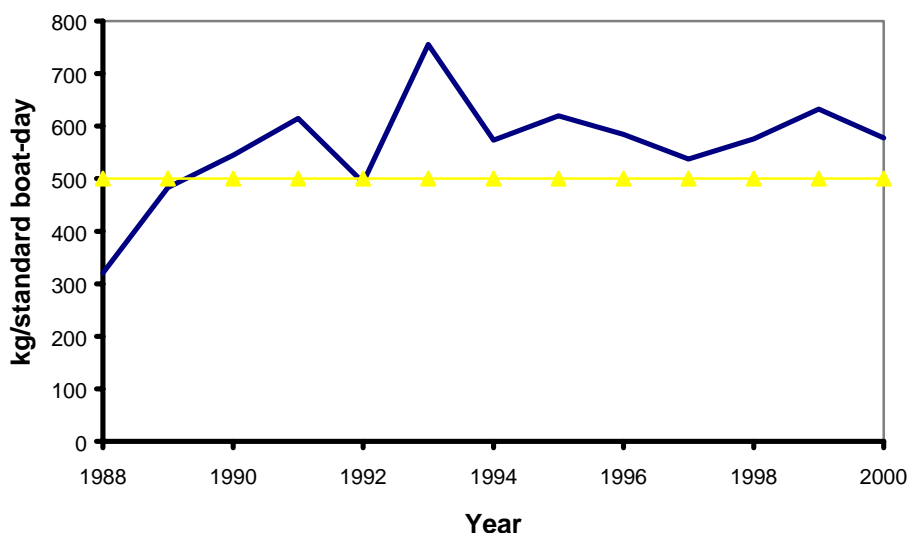
The Snapper fishery also took 106 tonnes of other finfish species in 2000. These are detailed in Table 5.

**Fishing effort:** The effectiveness of fishing effort varies markedly on a seasonal basis. Fishing effort in 2000 was 845 standard June–July line boat days compared with 712 days in 1999 and 984 days in 1998.

**Catch rate:** The catch per line boat day of the managed fishery licensed boats for the peak months (June–July) was 578 kg in 2000, very close to the average for the 1990s of 593 kg/boat day, compared with 632 kg/boat day in 1999 (Shark Bay Snapper Figure 12). This is well above the performance limit of 500kg/day.

**Recreational component:** The Gascoyne Recreational Fishing Survey, conducted between April 1998 and March 1999 (Sumner et al., 2002), estimated the recreational catch from the oceanic stock of snapper at only 14 tonnes, i.e. approximately 3% of the commercial catch. In addition, there is a recreational catch of pink snapper (oceanic) taken from charter boats. Preliminary results from charter boat returns indicate the take by charter boats for 1998/99 was about 6 tonnes. Thus, the total recreational snapper catch is approximately 4% of the commercial catch.

As previously mentioned, the genetically distinct inner Shark Bay stocks of snapper, most of which are taken by recreational fishers, are subject to separate management arrangements. Subsequently, these fisheries are not covered in this report and are reported under the recreational fishery for snapper.



**Figure 12. Snapper Fishery CPUE** CPUE by year from 1988 to 2000 for the Shark Bay Snapper Managed Fishery. Units are kg whole weight of pink snapper per standard boat day. As catchability varies markedly throughout the year, peaking in June and July, the CPUE for line fishing in June and July is used as the index of abundance. The 500 kg/day, performance limit is shown as the horizontal yellow line.

**Robustness :**  
**Moderate**

Currently the assessment of the spawning stock of oceanic snapper is largely derived from catch and effort returns provided by the fishers. The long-term data series from this fishery as well as initial assessments of sustainable yield indicate that the fishery

is not operating close enough to the levels where problems with recruitment may begin to occur. Consequently, the current methods of management and the use of the catch rate indicator to monitor performance (in conjunction with some fishery independent information collected by research staff on the lengths of snapper taken by the fishery and the abundance of adults and juveniles and the distribution of stocks within the Shark Bay area) are sufficiently robust at the current levels of harvesting.

A FRDC-funded project, which commenced in July 2000 will utilise data collected since the 1980s to assess the potential for increased yields from this oceanic snapper stock.

## **Fisheries Management Response**

**Current:** The Snapper fishery has been in operation since the late 1980s, and has been managed using a mixture of input and output controls. The relevant management instruments include the Shark Bay Snapper Management Plan 1994, the Shark Bay Snapper Managed Fishery Licence, plus the FRMA. The total allowable catch for each season was set at 550 tonnes (peak season) for the past 10 years prior to the change to the management arrangements in 2001.

In 2001, new management arrangements were introduced under the provisions of the Shark Bay Snapper Fishery Management Plan Amendment 2000. The fishery is now quota-managed on a year-round basis with a minimum holding of 100 quota units applied (except for prawn and scallop operators). Units are transferable; although a number of governing policies and principles exist.

There are 24 licences, but some boats have several managed fishery licences aggregated on one Fishing Boat Licence (FBL). Shark Bay prawn and scallop trawlers (41 in total) were also granted a Snapper Fishery Managed Fishery Licence (MFL) through the 2000 amendment, which converted their historical permissive take of 1 tonne per boat into 10 units.

There is a minimum legal size of 41 cm, which was introduced in the late 1980s based upon the length at which pink snapper in the Shark Bay region become sexually mature.

Fishers are restricted to the use of hook and line to catch pink snapper within this fishery but there is no limit on the number of lines or hooks that can be used. Additionally, the fishers in this managed fishery are not permitted to take snapper from the inner gulf stocks.

## **Future:**

The current FRDC project, which will finish in 2003, is aimed at developing an age-structured model from which the current TAC of 563.75 tonnes can be reassessed. The development of this model is progressing well, and there are good records of age compositions of Shark Bay snapper from throughout the 1990s to provide data for the model. Successful implementation of this model will provide a basis for managing the fishery within the coming years. In addition, catch monitoring will be undertaken

every second or third year to provide up-to-date age composition data. The periodicity of the catch sampling will remain under review on an on-going basis to ensure that it is adequate for providing sufficient input to allow for the provision of adequate scientific advice. Until the results from this research become available, monitoring of the fishery will continue to be undertaken annually mainly using CAES data.

#### **Actions if Performance Limit is Exceeded:**

The following strategies are available for the Department of Fisheries to use if the catch rates fall below the threshold indicated above:

1. Investigate why the acceptable catch rate has not been met. Evaluate if there has been a shift in the targeting of snapper through market forces or other factors, which could explain the variation. If variation is due to an acceptable non-stock related explanation, then no action will be taken.
2. If indicators highlight a significant decrease in available stock, quotas can be decreased or further protection can be provided to the breeding stock within the current fishing season or prior to the beginning of the next season. Options for further protecting breeding stock include:
  - Reduce quota allocations for the following season
  - Additional area closures
  - Instigate temporal closures
  - Increase minimum size

The ability to implement these strategies is provided for within the *Fish Resources Management Act 1994* and Regulations and the Shark Bay Snapper Fishery Management Plan 2000.

#### **Comments and Actions**

The Snapper fishery has now been in operation for over 40 years and the various forms of the present quota based scheme has been in place since the late 1980s. The recent amendments simplify the complex management and administrative arrangements previously in place while providing more flexibility for both industry and the Department of Fisheries. The new management arrangements may promote fuller utilisation of the catch quota by providing mechanisms which facilitate the current catch levels from the Shark Bay prawn and scallop trawler fleet, (approximately 40 tonnes) being taken. However, a large part of the scallop and prawn fleet allocation is still attached to the trawler fleet and it is unlikely that, in the near future, the trawler fleet will take its snapper allocation given the current prawn and scallop catch levels.

#### **External Drivers**

Japanese demand for snapper has been declining in recent years and efforts have been made to access other overseas and Eastern States markets. Any significant change in markets could affect the operation of the fishery and therefore the data generated,

although the quota limit and seasonal catchability of the stock limit any tendency to increase catch.

### **5.1.2 BY-PRODUCT SPECIES**

There are a number of by-product species that are taken in relatively minor quantities by the Snapper fishery (Table 5): Consequently, these were all rated as being at **NEGLIGIBLE** risk from the Snapper fishery.

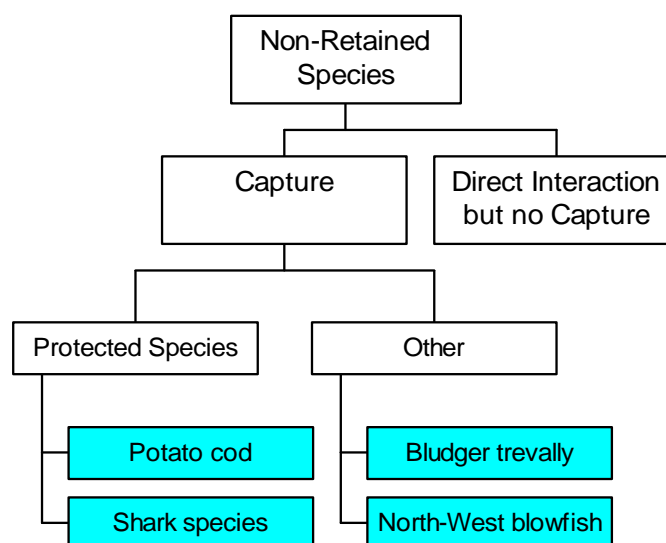
These species are the target species of the Western Australian Wetline Fishery, which is responsible for the management of this suite of species. As a consequence the assessment and management of these by-product species will be dealt with under the environmental assessment of the Wetline fishery. The catches taken by the Snapper fishery will be included in these analyses, along with all other sectors (eg recreational).

**Table 5. Catches in 2000 by the Snapper Fishery licensed boats, in the area between 23° S and 26° S, of species other than pink snapper (excluding mackerels).**

<b>Species</b>	<b>Tonnes</b>
Mulloway	20.7
Cod, various species	12.1
Trevally, various	9.3
Sweetlip emperor	8.4
Spangled emperor	6.0
Red emperor	5.7
Baldchin groper	3.0
Pearl perch	2.5
Blue-spot emperor	2.0
Tailor	1.9
Sea perch, various	1.7
Flagfish	1.6
Cobia	1.6
Dhufish	1.5
Blue-lined emperor	1.1
Shark, various	1.0
Scalefish, other	13.4
<b>TOTAL</b>	<b>106.0</b>

## 5.2 NON-RETAINED

### COMPONENT TREE FOR NON-RETAINED SPECIES



**Figure 13. Component tree for non-retained species.**

**Yellow boxes** indicate that the issue was considered high enough risk at the August 2001 Risk Assessment workshop to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required- only the justification is presented.

#### 5.2.1 CAPTURED BY LINE

##### 5.2.1.1. PROTECTED/LISTED SPECIES POTATO COD

###### Rationale for Inclusion:

Participants in the Snapper fishery have been known to catch potato cod (*Epinephelus tukula*). This species is protected under the *Fisheries Resources Management Regulations* 1995 (Schedule 2 Part 10).

###### ERA Risk Rating: Impact on breeding population (C0 L3 NEGLIGIBLE)

The Potato cod is found in reef-associated, marine environments at a depth range of 10 to 150m. In Australia, the species is found around the NW of Australia and the Great Barrier Reef with its range extending into and throughout SE Asia and Indo-West Pacific.

Although this fishery occasionally catches potato cods it is estimated that only 4 to 5 are caught per year. Such captures usually occur in relatively shallow water and the potato cods that are caught are returned alive to the sea and are mostly expected to survive therefore there should be virtually no impact on the stocks of these species.

### **5.2.1.2. PROTECTED/LISTED SHARK SPECIES**

#### **Rationale for Inclusion:**

The Snapper fishery occasionally catches sharks. Grey nurse sharks (*Carcharias taurus*) occur in Shark Bay with the west coast population of this species considered vulnerable under Commonwealth legislation. It was identified that grey nurse sharks may have occasionally been caught in the past by this fishery.

#### **ERA Risk Rating: Impact on breeding population (C0 L1 NEGLIGIBLE)**

There is anecdotal evidence that 2 grey nurse sharks have been caught over the period of the fishery (which is in excess of 15 years). Sharks, which are caught within this fishery, are returned alive to the sea. Since there is no dedicated fishing on these sharks within the boundaries of the Snapper fishery, there are also no cumulative impacts on this species.

### **5.2.1.3. CATCHING BLUDGER TREVALLY**

#### **Rationale for Inclusion:**

The Snapper fishery catches bludger trevally (*Carangoides gymnostethus*).

#### **ERA Risk Rating: Impact on breeding population (C0 L4 NEGLIGIBLE)**

The bludger trevally range is from the tropical waters of Australia in Queensland, Northern Territory, Western Australia and elsewhere in the Indo-West Pacific. This species inhabits deep offshore reefs and feeds on shrimp and small fish.

It was recognised that bludger trevally are sometimes caught in reasonable numbers by the snapper fishery. The distribution for this species appears to be highly variable throughout the fishing area and therefore this species is either caught in relatively large amounts or none at all. This species is generally returned to the sea alive but there is no data on survival after discarding. Nonetheless, the level of catch compared to their overall distribution suggests that the fishery has little impact on the stocks.

### **5.2.1.4 CATCHING NORTH-WEST BLOWFISH**

#### **Rationale for Inclusion:**

The North-West blowfish is caught regularly by the Snapper fishery.

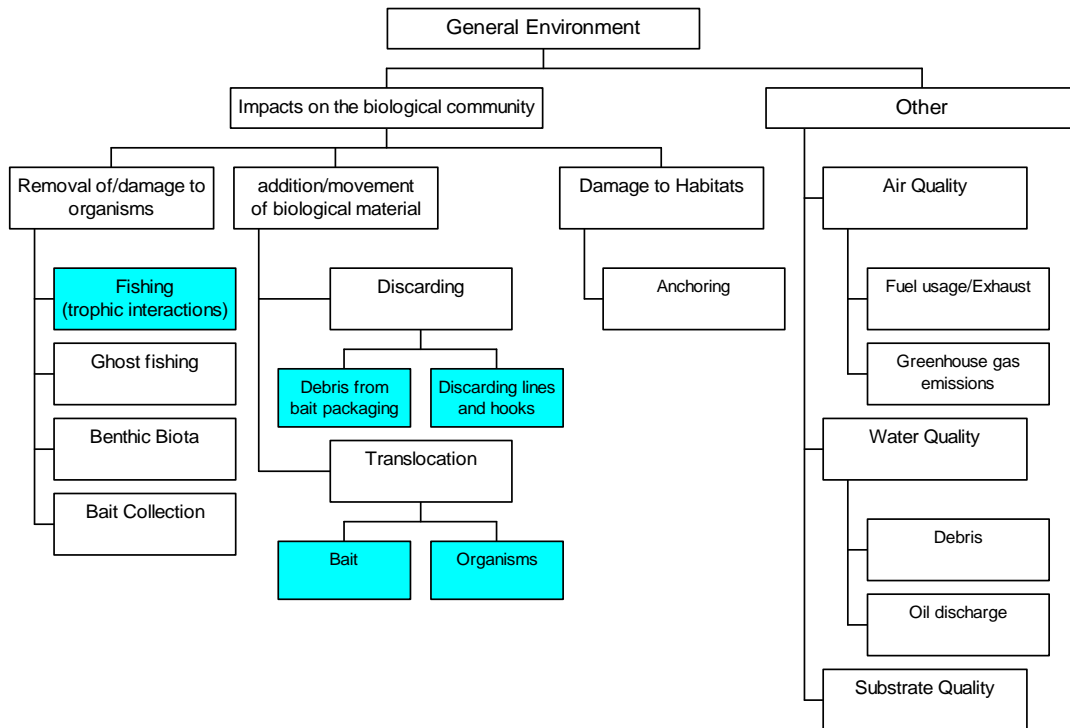
#### **ERA Risk Rating: Impact on breeding population (C0 L5 NEGLIGIBLE)**

The North-West blowfish inhabits offshore reefs in tropical waters at a depth range of 18 to 100m. It is also found throughout the Indo-West Pacific.

This species commonly occurs at high densities within Shark Bay. While mortality of some individuals may occur due to the activities of the Snapper fishery, it does not appear to have impacted their sustainability.

## 5.3 GENERAL ENVIRONMENT

### COMPONENT TREE FOR THE GENERAL ENVIRONMENT



**Figure 14. Component tree for the general environment.**

**Yellow boxes** indicate that the issue was considered high enough risk at the August 2001 Risk Assessment workshop to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required- only the justification is presented.

#### 5.3.1 IMPACTS FROM REMOVAL OR DAMAGE TO ENVIRONMENT

##### 5.3.1.1 REMOVAL OF ALL SPECIES (INCLUDING SNAPPER)

###### Rationale for Inclusion:

The assessment of what potential indirect ecosystem impacts could result from the removal of individuals of the target and other species by a fishery should always be assessed. For the Snapper fishery, there is no evidence that the effects of the removal of any one of the captured species should be examined separately - none are thought to play a “keystone role” in this ecosystem. It was, therefore, most appropriate to examine the impact of the total removals.

###### ERA Risk Rating: Impact on the environment (C2 L3 LOW)

It is estimated that the proportion of snapper taken by the fishery, compared to the total virgin stock level allows for a large biomass of snapper to remain. Snapper are known to be generalist carnivores; mostly feeding on small benthic invertebrates and do not, therefore, have a close association with any particular prey species. This

means that the impact of a lower abundance of snapper would be distributed across many species. In addition, snapper is just one of many demersal carnivorous scalefish in Shark Bay and therefore even with the take of snapper, there is still a large percentage of total predators available. Finally, snapper only reside in large numbers in the locations where they are captured by the fishery for only a few months of the year. It is unlikely that there would be unreasonable level of impact on these prey species.

In their review of scientific studies on the effects of fishing on marine ecosystems, Jennings and Kaiser (1998) concluded that “*where the functional and species diversity of fishes is relatively high, the indirect effects of fishing on the abundance of unfished prey species appears to be minor.*” Additionally, when looking at the geographical range of the other species of scalefish taken and the relatively small quantities involved (Table 4), the removal of these fish is not considered to present a threat to the sustainability of each of these stocks.

### **5.3.1.1 TAKING ALL BY-PRODUCT SPECIES**

This issue will be addressed under the Wetline Fishery environmental assessment.

## **5.3.2 ADDITION OF MATERIAL TO THE ENVIRONMENT**

### **5.3.2.1 TRANSLOCATION OF ORGANISMS ON VESSEL HULLS**

#### **Rationale for Inclusion:**

The movement of fishing vessels may provide a mechanism for marine species to be transported beyond their natural range. In the extreme circumstance, fishing vessels could provide a vector for disease and exotic species. Only the hulls of the vessels used in the Snapper fishery could provide the opportunity for translocation to occur since these vessels do not contain ballast, however hulls are regularly anti-fouled.

#### **ERA Risk Rating: Impact on the environment (C3 L0 NEGLIGIBLE)**

Although the consequence of introducing a non-native species or disease is potentially severe, the likelihood is quite low since the vessels used in this fishery do not move out of the west coast region (some move down as far as Geraldton). Given that there is a strong natural connection of species along the western coast due to the Leeuwin Current, which provide for the natural movement of species along the coast, the fishery would not add to the likelihood of transferral.

### **5.3.2.2 TRANSLOCATION OF BAIT**

#### **Rationale of Inclusion:**

The Snapper fishery uses bait. The preferred bait is pilchards (*Sardinops sagax*) cut in small pieces, but other clupeoid fish, squid and cuttlefish are used when pilchards are not available.

**ERA Risk Rating: Impact on the environment (C3 L2 LOW)**

The potential consequence of the fish bait used in the Snapper fishery containing disease organisms and causing the introduction of disease is considered potentially severe. It was also considered to be a higher than rare likelihood as this has been implicated in other disease situations (i.e. pilchard die-offs in 1995 and 1998/99).

The Snapper fishery generally uses Western Australian and imported pilchards as the preferred bait. Since Shark Bay is at the extreme northern limit of the pilchards' distribution on the west coast the risk with respect to pilchard specific diseases is low. This risk of notifiable diseases from imported product is now being managed by Australian Quarantine Inspection Service (AQIS) under their sanitary requirements as imposed by specific import permit. The fishery will have to comply with whatever standards are imposed by AQIS.

**5.3.2.3. DISCARDING DEBRIS FROM BAIT PACKAGING**

**Rationale for Inclusion:**

Due to the diversity of megafauna within the Shark Bay region, bait bands lost overboard in this area could potentially cause an impact.

**ERA Risk Rating: Impact on environment (C1 L2 LOW)**

While the industry reports that bait packaging is not discarded overboard, it is acknowledged that accidental losses do occasionally occur. Fishers are now very diligent in avoiding this situation wherever possible. Consequently it should be an infrequent event. In addition, industrial type steel bins are located at the Carnarvon "snapper" jetty, "T" (prawn and scallop) jetty and Nor-West Seafoods wharf. This provides fishermen with the appropriate disposal facilities and to encourage disposal of bait packaging onshore. Furthermore, every Nor-West Seafoods trawler has a large plastic "sulo" bin onboard and there is a strict company policy in place that all plastic and non-biodegradable material be retained onboard.

**5.3.2.4 DISCARDING LINES AND HOOKS**

**Rationale for Inclusion:**

Line fishing is the only permitted method of fishing within this fishery. The number of hooks per line varies but is usually around 15; however, when a large school of fish is being fished, the fishers will clip on more hooks per line.

**ERA Risk Rating: Impact on environment (C0 L5 NEGLIGIBLE)**

Lines are not able to ghost fish once lost (they are not attached to floats), further the areas where they fish means that hook ups are rare and large amounts of lost line is not common. Therefore, this issue was given an overall risk ranking of 'negligible'.

### **5.3.3 DAMAGE TO HABITATS**

#### **5.3.3.1 ANCHORING**

##### **Rationale for Inclusion:**

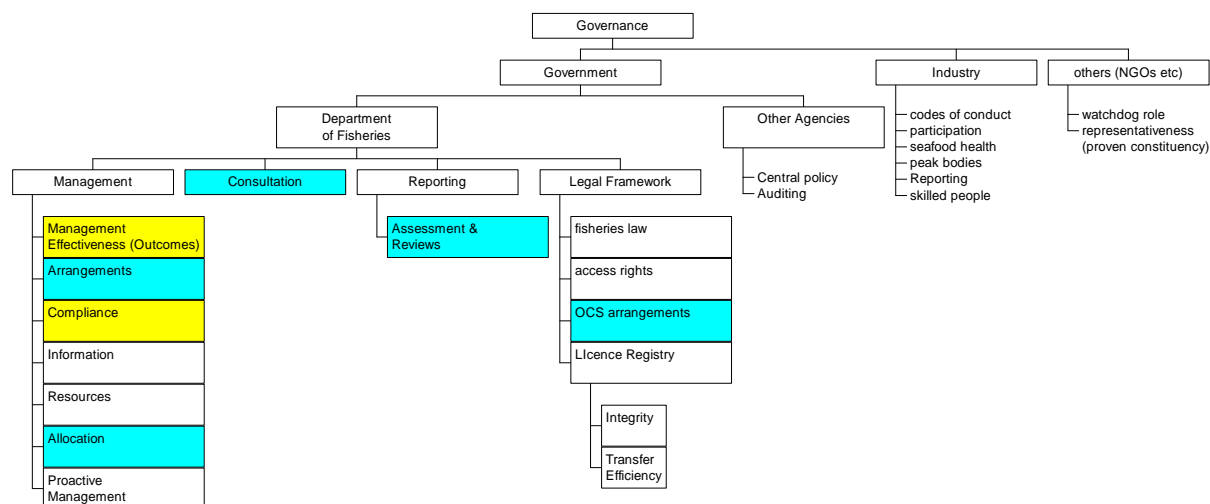
Fishing operations in the Snapper fishery may involve anchoring the vessels when fishing. Therefore, this activity could have an impact on the benthic habitat.

##### **ERA Risk Rating: Impact on habitats (C0 L4 NEGLIGIBLE)**

The Snapper fishery occurs over deeper patches of hard bottom around the entrances to Shark Bay and in the adjacent ocean waters. Underwater video work has shown that the habitat is dominated by sponges, soft corals and gorgonians. Fishing does not normally occur over seagrass or hard coral habitats and furthermore as part of the fishery management plans there is no commercial snapper fishing allowed in coral areas. The Snapper fishery vessels may occasionally anchor when a patch of fish are found, depending on water currents this may be either in sponge or sand habitats. The area over which the fishery is actually fishing represents around 1% of the total area available to the fishery.

## 5.4 GOVERNANCE

### COMPONENT TREE FOR THE GOVERNANCE OF THE SHARK BAY SNAPPER FISHERY



**Figure 15. Component tree for governance.**

Nb- no generic components have been removed from the tree but only those boxes that are blue or yellow will be reported in this application.

#### 5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT

##### 5.4.1.1 MANAGEMENT EFFECTIVENESS (OUTCOMES)

#### Rationale for Inclusion:

The effectiveness of management activities should ultimately be reflected by the extent to which the Snapper fishery continues to produce expected outcomes. The expected outcome in this case is that licensees are able to comfortably catch their TAC of 563, 750 kilograms. The community's expectation is that the commercial fishermen should be able to catch the TAC regardless of external factors (for example, recreational catch, impact by other commercial fishermen). Any reduction in the ability of the fleet to meet the TAC 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.

#### Operational Objective

Those licensees in the Snapper fishery are able to take the TAC exerting acceptable levels of effort and without adversely impacting on overall snapper stock levels.

**Justification:**

*If the output control (that is, the TAC) developed for the Snapper fishery is realistic then one would assume that the TAC is set at a level which effectively ‘buffers’ external factors (such as, recreational catch, impact by other commercial fishermen). As such, one would expect commercial fishermen to be able to catch the TAC in a timely manner.*

*In the event commercial fishermen were unable to catch a significant proportion of the TAC, 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 fleet to catch the TAC – or the reason may stem from changes to the market price and hence the incentive to fish.*

**Indicator**

The indicator used is the proportion of the TAC caught by the fishery combined with the number of days taken to achieve the TAC.

**Performance Measure**

The two performance measures used for this fishery are that the number of days effort required to take the TAC remains in the acceptable range of 820-950 standard ‘June-July’ line boat days and the % of the TAC caught is above 80%.

**Justification:**

*This range of days has been calculated using the historical practices of the fleet over the past 14 years.*

*The proportion of the TAC caught per year has always been above 80% since its inception 14 years ago. This has been through periods of poor prices and hence should reflect the lowest point based on normal fluctuations in weather and markets.*

**Data Requirements for Indicator**

<b>Data Requirement</b>	<b>Data Availability</b>
Historical catch levels	Yes – records available and accessible
TAC	Yes – available
Level of fishing effort	Yes – available through CAESS data (noting seasonal variations)
Annual catch	Yes - available through CAESS data
Impacts from other resource users	Yes – estimates of recreational take but no real understanding of impact from ‘catch and release’ by recreational and other commercial line fishermen in area

Environmental impacts	No – no real understanding of impact of environmental conditions on stock abundance
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## **Evaluation**

### **Commercial catch**

The peak season TAC (that is, May- August) during 2000 was set at 550, 000 kilograms with the off-peak being managed via gear restrictions. The catch in 2000 was 488 tonnes, which equates to 89% of the TAC and is above the performance measure (80%).

### **Fishing effort**

The fishing effort in 2000 was 845 standard June – July line boat days compared to 712 in 1999 and 984 in 1998. Thus the fishery is currently meeting this performance measure.

### **Robustness Medium/High.**

The data required for the indicator in most cases is readily available and the TAC is based on peer reviewed statistical calculations.

The changes in fishing power and fleet efficiency over time need to be evaluated and considered in these analyses to ensure that the measures continue to be relevant.

## **Fisheries management Response**

### **Current**

The management measures imposed in 2001 were intended to simplify the management arrangements for both the Department and industry. The TAC has been increased slightly since the introduction of the new management arrangements so as to accommodate a unit value, which is a whole number. That is, 5125 units within the Snapper fishery and a TAC of 563,750 kilograms equates to a unit value of 110 kilograms.

### **Future**

The Department is doing further work to improve both the measurement of fishing efficiency and the understanding of the relationship between environmental factors and catch/stock abundance.

The FRDC project mentioned above should also provide further information on the catch and effort/stock abundance relationship for oceanic snapper.

### **Response if performance limit triggered**

In the event the number of days effort required to take the TAC exceeded that acceptable range of 820-950 standard 'June-July' line boat days or the % of the TAC caught fell below 80% then a review would be undertaken. The review would first examine the likelihood of environmental factors and market/prices factors causing the reduction in effort as well the impact of other resource users and the fishing practices themselves (in order to accommodate 'technology creep' etc). In the event the reduction in CPUE were found to be reflective of stock abundance then it would be recommended that the TAC be reduced, as well as possible further restrictions to recreational fishermen.

### **Comments and Actions**

The Department has recently completed a study (FRDC 2000/194) looking at the post-capture mortality rates of snapper caught and returned to the water (by commercial and recreational fishermen). Preliminary results indicate that mortality rates increase with depth. The final results of this study may have ramifications to size limits across all sectors.

### **External Driver Checklist**

As yet unquantified environmental factors such as climatic changes, ocean currents, etc may impact the size and availability of the exploitable biomass.

The direct impact of recreational fishermen and other fishing activities (for example, trawling and other line fish fishing) is also unknown.

Similarly, the impact from increased general human interaction (for example, boating and diving activities) is also unknown.

Market capacity/demand may also affect the take of snapper. For example, a reduction in beach price may encourage fishermen to utilise other fishing entitlements therefore depressing the snapper take. Presumably this would also coincide with a measurable reduction in effort.

Finally, gradual refinements in fishing and fishing related technologies (for example, GPS, sounders etc) might also result in an increase in fishing efficiency.

### **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; in addition to this there are Management Plans, Orders, Regulations, Ministerial Policy Guidelines (MPG) and Policy Statements.

The *Shark Bay Snapper Management Plan 1994* (the Plan) and subsequent amendments are provided for under the FRMA and in conjunction with the Fisheries Resources Management Regulations (FRMR) and MPG effectively sets out the rules under which the Snapper fishery is to operate. The Plan and associated documents (which includes the ESD report) should include all information expected to be in a “best practice” set of management arrangements (as defined in the Department’s ESD Policy – Fletcher 2001).

These arrangements should contain:

- An explicit description of the management unit.
- The issues addressed by the plan.
- Descriptions of the stocks, their habitat and the fishing activities.
- Clear operational (measurable) objectives and their associated performance measures and indicators.
- Clearly defined rules, including what actions are to be taken if performance measures are triggered.
- Economic and social characteristics of the groups involved in the fishery.
- Management and regulatory details for the implementation of the actual management arrangements.
- The reporting and assessment arrangements.
- How and when reviews of the plan will occur (including consultation mechanisms).
- A synopsis of how each of the ESD issues are being addressed.

These arrangements should include (but are not limited to) the criteria to operate in the Snapper fishery, the manner of fishing, fishing zones, licence renewals, transfers and cancellations, offences and major provisions and the process for amending the Plan.

### **Operational Objective**

The Department, in consultation with the Shark Bay Snapper Fishermen’s Association and the Shark Bay Snapper Managed Fishery Working Group and other stakeholders, periodically review the Plan, related legislation, regulations and arrangements to ensure it remains relevant and aligned with the management objectives of the Snapper fishery and that they collectively cover the 10 main principles (as described above).

### ***Justification:***

*To have an effective and understandable Plan for the management of the Snapper fishery with all 10 principles covered within the suite of arrangements developed for the Snapper fishery.*

### **Indicator**

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

## **Performance Measure**

This should be 100%.

## **Evaluation**

Each year an Annual General Meeting is organised for the industry and Department to raise any issues. As a result, a periodic review is done on an annual basis, although outside of this timeframe any major problems with management arrangements can be raised by anyone (industry or internally) at any time and they will be addressed.

As an over-arching sub-component the performance of the management arrangements is evaluated on two levels – the micro level (that is, the relevance of individual clauses and the role they play) and the macro level (that is, the relevance of the Plan as a whole and the role it plays).

The current performance is assessed against each of the main principles, which are required under the collective management arrangements:

1. **An explicit description of the management unit** – the management unit is explicitly described in the “Declaration of the Snapper fishery” section of the Plan.
2. **The issues addressed by the Plan** – 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 Snapper fishery and fishing activities are well 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 and there is to be a greater level of detail accumulated during the process of completing the remainder of the ESD components.
7. **Management and regulatory details for the implementation of the actual management arrangements** – the regulations relating to the Snapper fishery are located in both the Plan and the FRMR and orders (a set of which has been provided to EA).
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 Snapper fishery are comprehensive and are performing well. The fact that the management arrangements are contained within enforceable legislation provides a high degree of stability with respect to how the Snapper fishery 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.

## **Fisheries Management Response**

Management has successfully administered the Plan and related legislation to achieve and pursue the stated objectives. Changes, such as the current year round quota based management package, (introduced in 2001) have occurred from time to time to address key concerns or issues and it is expected that the management arrangements will continue to evolve over time through the established process.

## **Comments and Actions**

The Snapper fishery is managed in a dynamic and consultative manner (that is, responds readily to changed circumstances), but fishermen are often resistant to change. Consequently, before effort-reduction methods are accepted by fishermen they require evidence of the need for such measures. While most fishermen have a very high level of confidence in the Department's research activities, sometimes members of industry demand certain knowledge before accepting the need for change and can then be sceptical of research findings no matter how statistically valid. 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 Snapper fishery. Nonetheless, there is generally a very good relationship between fishermen and the Departmental research scientists and most will accept the advice of the researchers (albeit after questioning it in the context of their own experiences).

The commercial success of the Snapper fishery also appears to have encouraged many fishermen to be somewhat risk averse and inclined to a very conservative approach to management (particularly given their level of investment). While this encourages an attitude of risk avoidance in terms of the sustainability of the Snapper fishery, it can also make some fishermen resistant to changes that are designed to ensure

sustainability. There is also sometimes a failure to recognise that the success of the Snapper fishery is in part, due to a history of adaptive management. Proposed changes are often questioned on the basis that: “as the Snapper fishery is operating successfully why should any changes be necessary or contemplated?”

### **External Driver Check List**

As yet unquantified environmental factors such as climatic changes, ocean currents, etc may impact on the size of the exploitable biomass despite management arrangements. Similarly, the direct impact of recreational fishermen and other fishing activities (for example, trawling and other line fish fishing) are also unknown. As a result it is therefore critical that CPUE and stock be monitored so that any changes (irrespective of origin) can be factored into the management arrangements (for example, reduction of TAC etc).

Furthermore, the impact from increased general human interaction (for example, boating and diving activities) may impact on snapper stocks but is unquantifiable at this stage.

Additionally, the resistance of fishermen to change may also impede effective dynamic management.

#### **5.4.1.3 COMPLIANCE**

##### **Rationale for Inclusion:**

Effective compliance is vital to achieve the management objectives of any fishery. The Department spends in the order of \$40-50, 000 to have enforcement and compliance monitoring in the Snapper fishery each year. This involves a mix of sea patrols and surveillance, land patrols, quota database inspections, processing factory inspections, covert surveillance operations and education programs.

##### **Operational Objective**

To have sufficiently high levels of compliance with the FRMA, FRMR and the Plan whilst ensuring the sustainability of the target stock.

##### ***Justification:***

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

## **Indicator**

The degree of understanding and acceptance of the rules governing the operation of the Fishery by the licensees and the broader fishing community as well as the level of compliance by licensees and broader fishing community with the legislation.

## **Performance Measure**

These are currently under development by the Shark Bay Snapper Fishery Working Group, who will undertake a formal compliance risk assessment.

## **Data Requirements for Indicator**

Number and type of breaches and enforcement responses (for example, warning versus prosecution). This also needs to link back to the amount of patrol hours taken to identify a breach to provide a measure of the rate of non-compliance in terms of the compliance effort.

A measure of licensee/skipper attitude to management arrangements – although it is recognised that this is subjective and may be difficult to quantify.

## **Evaluation**

Land and processor inspections were conducted together with the refining of the quota management database. The new database ensures minor discrepancies are likely to be detected prior to them evolving into major breaches of the Plan.

Compliance staff detected one ‘over quota’ offence throughout 2000/01 season. However, it should be noted that a ‘grace period’ was extended by compliance staff from January to June 2001 for minor offences whilst industry (and the Department) adjusted to the new management arrangements. Additionally, fisheries officers conducted an education program for the fishery on the new management arrangements and as a result the compliance rates this year have improved greatly.

In the 2000/01 and 2001/02 (to date) the majority of offences for the fishery related to the introduction of the new management arrangements, which were introduced to the Snapper fishery on 12 January 2001. Most of the offences were related to fishermen incorrectly or failing to complete the catch and disposal record forms. Since the Snapper fishery is quota (output) controlled, the integrity of the system relies heavily on accurate completion of the catch and disposal record forms in a timely fashion.

## **Robustness Medium.**

A continuing medium level of non-compliance is expected to continue in the short-term due to industry failing to meet quota administration tasks, such as completion of the catch and disposal record forms.

Given the nature of the quota managed fisheries and the fact that quota (units) continue to be transferred (permanently and temporarily) to 'new comers' there will continue to be a need for high level of education and liaison with industry.

## **Fisheries Management Response**

Compliance staff based in the Gascoyne will continue to conduct routine and targeted inspections of operators and processors to ensure the Plan is being adhered to. Offences relating to the completion of catch and disposal records will continue to be treated as major offences given that the integrity of the system relies heavily on accurate completion of the catch and disposal record forms.

Compliance inputs into the Snapper fishery will need to be at a fairly high level until such time as industry becomes fully conversant with the legislative requirements.

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 Snapper fishery.

A formal risk assessment should also be undertaken in consultation with industry in order to ascertain levels of risk within the Snapper fishery.

## **External Driver Checklist**

External factors, which may detract from the level of compliance include: complicated management arrangements (which has been addressed to a certain degree with introduction of new simplified management arrangements); ambiguity of Ministerial Policy Guidelines; and a lack of legislation to address impacts by others (for example, wet line fishermen).

### **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 Snapper fishery. In addition to the commercial fishery there is also a recreational fishery for snapper in WA and other commercial fisheries catching snapper but not retaining it. There are also non-extractive (i.e. Department of Conservation and Land Management, dive operations etc) interests 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 account of 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:

<b>Data Requirement</b>	<b>Data Availability</b>
Breeding stock abundance estimates	Yes– is not measured directly but data from catch rates and size/age structure are consistent with sufficient oceanic stock to maintain ongoing recruitment
Estimate of recreational catch	Yes - creel survey data available for 1998/99 suggests in the order of 4% of the catch of the oceanic stock in the Shark Bay region is taken by recreational/charter fishing
Estimate of projected growth of recreational snapper fishing in Shark Bay	Yes – can be estimated based on existing growth trends in recreational fishing and overall population growth
Impacts from other commercial	Part – an understanding of impact from

fishermen	'catch and release' by other commercial line fishermen and trawlers operating in the area is currently being investigated
Post capture mortality rates	Yes – preliminary results indicate that post capture mortality (of snapper returned by recreational and/or other commercial fishermen) increase with capture depth

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'.

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

## Evaluation

Preliminary creel survey results suggest a recreational snapper catch for the whole of the Shark Bay region of approximately 60 tonnes per annum. The catch of snapper by recreational fishers from the oceanic stock (which is the stock caught by the commercial fishery) was less than 20 tonnes. Thus, most of the recreational catch (40 tonnes) comes from the inner - western gulf region, not oceanic stock. The evaluation of the status of the inner Shark Bay stocks of snapper are located elsewhere (see State of Fisheries for details).

## Robustness

### Medium

At present, whilst there is no specific allocation made to the recreational sector their current level of take is considered sustainable. However, 'catch and release' of unwanted snapper (including undersize) may be having an additional impact on stocks given the preliminary results of the post capture mortality rates study. For the same reason, it is also important to gain some understanding of the quantities of snapper being caught but not retained (i.e. undersized/juvenile snapper) by other commercial fishing activities (for example, trawling (both State and Commonwealth vessels) and wet line fishermen).

It should also be noted that increased recreational take would prompt a reassessment of current management arrangements (for both recreational and commercial sectors).

## Fisheries Management Response

The Shark Bay Snapper Working Group has raised concerns regarding the unquantified impacts of the recreational sector and other commercial fishing activities

on oceanic snapper stocks. 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.

It should also be noted that local recreational fishing interests are catered for through the Carnarvon Regional Recreational Fishing Advisory Committee that reports to the state Recreational Fishing Advisory Committee (RFAC). The state RFAC then reports directly to the Minister on matters relating to recreational fishing, including snapper fishing in Shark Bay.

### **Comments and Actions**

Through the processes already established and underway, the Department will continue to promote the integration of fisheries management across all user groups. To this end the Department has a number of initiatives related to improving the governance and allocation and reallocation. An Integrated Fisheries Management policy was released in 2000.

This has been followed up by the formation of the Integrated Fisheries Management Review Committee, which was required to report directly to the Minister on the most appropriate framework to try and achieve the integrated objectives of resource allocation in the state. In November 2002, the Integrated Fisheries Management Review Committee released its report to the Minister. It is expected that the Minister will finalise his determinations on the new framework in 2003.

### **External Driver Checklist**

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

## **5.4.2 DEPARTMENT OF FISHERIES - LEGAL ARRANGEMENTS**

### **5.4.2.1 OCS ARRANGEMENTS**

#### **Rationale for Inclusion:**

The Offshore Constitutional Settlement (OCS) arrangements between Western Australia and the Commonwealth Government of 1988 established that it is the sole responsibility of the State of Western Australia to manage the Shark Bay snapper fishery (out to 200 nautical miles) (Figure 14). The OSC "*was developed to simplify legal arrangement for the management of fisheries operating in both State and Commonwealth waters*". (Fisheries Department of WA, 1988).

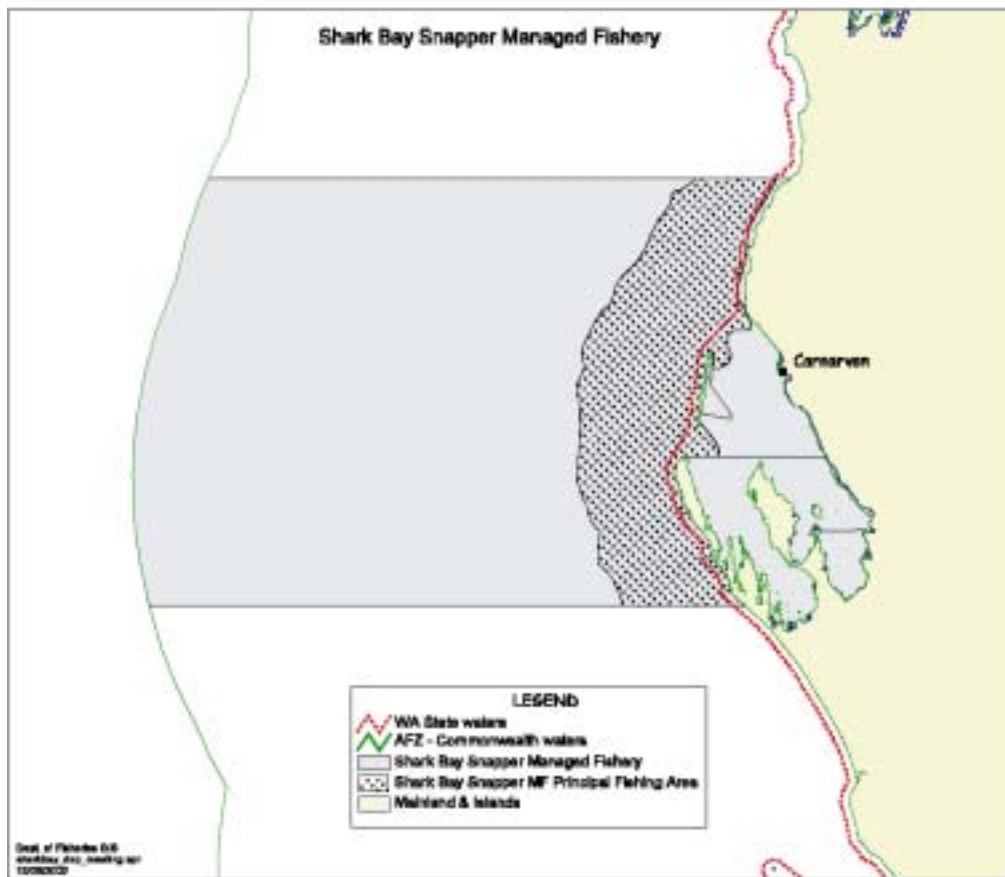
This OCS agreement, jointly signed by Ministers Kerin, for the Commonwealth Government, and Grill for Western Australia, prescribes that all scalefish fishing by line in Western Australia (which includes the Shark Bay Snapper fishery) out to the

limit of the Australian Fishing Zone is under the jurisdiction of WA. This simplified the management of the fishery from the previous system where jurisdiction was split between WA within 3 nm of the coast and the Commonwealth, outside of this area (Figure 16).

These arrangements are developed using Part 3 of the FRMA relating to the Commonwealth State management of fisheries and Part 5 of the Fisheries Management Act of 1991 of the Commonwealth.

### Operational Objective

To uphold the existing jurisdictional arrangements for the management of this Snapper fishery.



**Figure 16. Map of the Snapper fishery licence area detailing the WA State waters and Commonwealth waters.**

### Indicators

Approaches from the Commonwealth Government to alter the existing OCS.

## **Performance Measure**

Maintenance of the existing responsibility of the State for the management of the Snapper fishery.

## **Data Requirements**

None specific.

## **Evaluation**

The current jurisdictional arrangements are appropriate given the distribution of the oceanic snapper stocks and the good track record that exists under these arrangements for the management of the Snapper fishery.

## **Robustness**

**Very high.**

## **Fisheries Management Response**

The Department has successfully managed the Snapper fishery for many years and sees no reason to alter the jurisdictional arrangements that currently exist as they relate to snapper.

## **Comments and Actions**

It should be noted that industry has raised concerns over Commonwealth deep-water trawlers fishing within the bounds of the Snapper fishery. That is, the bounds of the Snapper fishery extend to 200 nautical miles but Commonwealth deep-water trawlers are permitted to fish in to the 200 metre isobath. This creates an overlap of boundaries. Legal advice has clarified that the deep-water trawlers may not land pink snapper within the bounds of the Snapper fishery without having a State endorsement but there is nothing prohibiting them from taking snapper as 'byproduct' and landing is outside the bounds of the Snapper fishery.

This is somewhat of a contentious issue with industry as they are of the opinion that trawlers may be adversely impacting on the snapper stocks. Currently only one deepwater trawl vessel has operated in the area and that vessel did not land snapper. However, it is likely that snapper is being taken (and returned) as bycatch only if the vessels are landing in Carnarvon.

This issue has recently been formally raised with WESTMAC (the Management Advisory Committee (MAC) which advises Australian Fisheries Management Authority on the management of the Western Deepwater Trawl Fishery and the North West Slope Deepwater Trawl Fishery) for comment (and resolution).

## External Driver Check List

Pressure to change any of the OCS arrangements by external parties.

### 5.4.3 DEPARTMENT OF FISHERIES- CONSULTATION

#### 5.4.3.1 CONSULTATION

##### 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 snapper fishery is based around a very extensive 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 Snapper fishery already has a management plan, Section 65 is the most relevant.

This states that:

##### ***S 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 snapper fishery, is designated in the management plan as 'all licensees'. There is no formal MAC, however in addition to the licensees the Department also consults with the Shark Bay Snapper Fishermen's Association and the Shark Bay Snapper Working Group as a courtesy.

### **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/ED) 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**

Provision of advice from the Shark Bay Snapper Working Group to the Executive Director (despite not being a formal group with specified reporting requirements).

Provision of Shark Bay Snapper Working Group minutes to all licensees for their information.

Proper consultation procedures have been followed in any amendment of the management plan.

An annual skippers/licensees briefing.

### **Data Requirements**

Documentation relating to provision of advice/minutes from Shark Bay Snapper Working Group to ED/licensees.

Documentation of the formal consultation procedures followed when an amendment is made.

Minutes of annual skipper/licensee briefings.

All the aforementioned data requirements are available.

### **Evaluation**

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

Decision makers take due notice of advice provided on the basis of this consultation and give reasons for decisions which vary from consultation-based advice.

Currently, there are 49 licences in the Snapper fishery. Of the 49 licences, the prawn/scallop boats hold twenty licences. Twenty-one licensees (some individuals hold multiple licences) hold the remaining 29 licences in the Snapper fishery. The Shark Bay Snapper Fisherman's Association is comprised of 21 individuals, one individual who represents the trawl licensees and 20 of the other 21 licensees in the Snapper fishery. Furthermore, all licensees are consulted in the first instance, in addition to the association and the Shark Bay Snapper Working Group.

### **Robustness**

**High.**

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

### **Fisheries Management Response**

The Department has relatively strong links to the snapper fishing industry although funding constraints (and hence limited levels of service delivery) are often criticised/not understood by industry.

### **Comments and Actions**

The Department will continue to consult with licensees (as per legislation) as well as the Shark Bay Snapper Fishermen's Association and the Shark Bay Snapper Working Group as a courtesy to ensure all relevant persons are aware of issues and are provided with the opportunity to input.

### **External Driver Check List**

Despite the robustness of the consultation processes used, disaffected parties may still seek to use political avenues to further their cause.

## **5.4.4 DEPARTMENT OF FISHERIES- REPORTING**

### **5.4.4.1 ASSESSMENTS AND REVIEWS**

#### **Rationale for Inclusion:**

It is important that the outcomes of the fisheries management processes administered by the Department for the Snapper fishery are available for review by external parties. It is also important that the community is sufficiently informed on the status of this Snapper fishery, given that it is utilising a community resource. The reports that are currently provided annually are: the State of the Fisheries Report which is tabled in Parliament, the Annual Report to Parliament, the ESD reference report, and this

application to EA. 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 annually to the Parliament and community on the status of all fisheries including the Snapper fishery and to prepare a framework for reporting on ESD 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 arrangements 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 its 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 Snapper fishery and in doing so has ensured that the community has access to this information.

In addition to this base level reporting the development of a new process that will see the Snapper fishery undergo regular independent audits ensures this sub-component is well in hand.

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.

Current reporting arrangements for this Snapper fishery include:

### **State of Fisheries**

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**

The Department also produces an Annual Report, which is tabled in Parliament. The Annual Report includes Performance Indicators that are reviewed by the OAG.

### **ESD**

The Department is currently completing a full ESD report (of which the material presented in this application is a subset), which will cover not only the environmental aspects of the Snapper fishery but the full social and economic issues. Once completed this too will be available from the web site.

### **Reports to industry**

Each year, the status of the resource, effectiveness of current management, predictions for future years catches and any proposals for alterations to arrangements are presented to fishermen 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 (including the Snapper fishery)– 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 EA under the EPBC.

## **Comments and Actions**

The processes already established and those new external review processes that are all but established ensure that there will be many opportunities for appropriateness of the management regime and the importantly the results it produces to be reviewed.

## **External Driver Check List**

The assessments provided by independent review bodies and the community.

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## **Appendix 1 Attendees at Risk Assessment Workshop**

Mr Andrew Cribb, Department of Fisheries  
Mr Dennis Hoult, Denham Professional Fisherman's Association  
Ms Edwina Davies-Ward, Marine and Coastal Community Network  
Dr Gary Jackson, Department of Fisheries  
Mr Geoff Dowsett, Industry  
Mr Guy Leyland, WAFIC  
Ms Heidi Grief, Department of Fisheries  
Mrs Jane Borg, Facilitator  
Dr Jim Penn, Department of Fisheries  
Ms Jo Bunting, Department of Fisheries  
Mr Les Moss, Shire of Shark Bay  
Dr Lindsay Joll, Department of Fisheries  
Mr Mark Grove, President, Shark Bay Snapper Fishermen's Association  
Mr Mark Hook, Shire of Shark Bay  
Mr Marshall Hipper, Industry  
Mr Martin Holtz, Recfishwest  
Dr Mike Moran, Department of Fisheries  
Dr Nic Dunlop, Conservation Council of WA  
Mr Nick D'Adamo, Department of Conservation and Land Management  
Mr Paul Bowers, Aboriginal Lands Trust  
Mr Peter Lombardo, Industry  
Mr Ray Ruby, Carnarvon RFAC and prawn licensee  
Dr Rick Fletcher, Department of Fisheries  
Mr Rod Berg, OAG  
Dr Rod Lenanton, Department of Fisheries  
Mr Roley Hawkins, Industry  
Ms Simone Retif, Environment Australia  
Dr Trevor Ward, Department of Geography

## **Appendix 2 Acronyms**

AQIS-	Australian Quarantine Inspection Services
CAES-	Catch and Effort Statistics
CAESS	Catch and Effort Statistics System
CDR	Catch and Disposal Record
CPUE-	Catch per unit effort
EA-	Environment Australia
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
GPS-	Geographical Positioning Systems
ITQ-	Individually Transferable Quota
MPG-	Ministerial Policy Guidelines
MSY-	Maximum Sustainable Yield
OAG-	Office of the Auditor General
OCS-	Offshore Constitutional Settlement
RFAC	Recreational Fishing Advisory Committee
SCFA-	Standing Committee for Fisheries and Aquaculture
Snapper fishery-	Shark Bay Snapper Managed Fishery
TAC-	Total Allowable Catch
The Plan-	Shark Bay Snapper Management Plan, 1994
WA-	Western Australia
WAFIC-	Western Australia Fishing Industry Council

## Appendix 3 Details of Consequence Tables

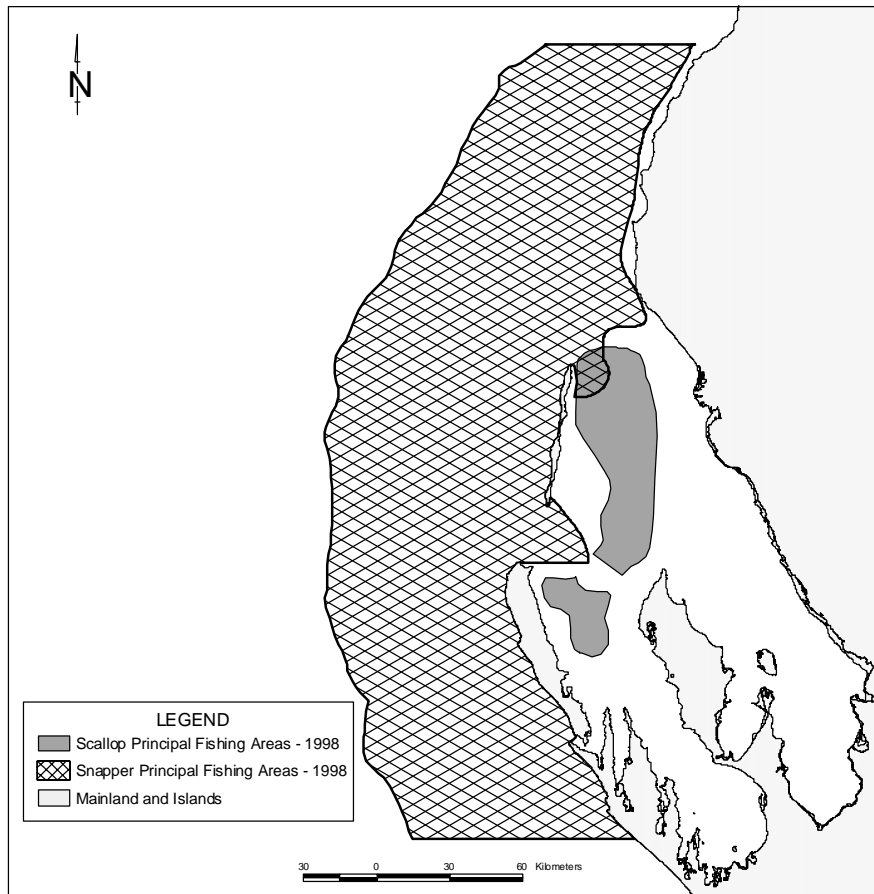
Level	Ecological
<b>Negligible</b>	<p><i>General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability</i></p> <p><b>Target Stock/Non-retained:</b> undetectable for this population</p> <p><b>Byproduct/Other Non-Retained:</b> Area where fishing occurs is negligible compared to where the relevant stock of these species reside (&lt; 1%)</p> <p><b>Protected Species:</b> Relatively few are impacted.</p> <p><b>Ecosystem:</b> Interactions may be occurring but it is unlikely that there would be any change outside of natural variation</p> <p><b>Habitat:</b> Affecting &lt; 1% of area of <b>original</b> habitat area</p> <p><i>No Recovery Time Needed</i></p>
<b>Minor</b>	<p><b>Target/Non-Retained:</b> Possibly detectable but little impact on population size but none on their dynamics.</p> <p><b>By-Product/Other non-retained:</b> Take in this fishery is small (&lt; 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 (&lt; 20%).</p> <p><b>Protected Species:</b> 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><b>Habitat:</b> Possibly localised affects &lt; 5% of total habitat area</p> <p><i>Rapid recovery would occur if stopped - measured in days to months.</i></p>
<b>Moderate</b>	<p><b>Target/Non Retained:</b> Full exploitation rate where long term recruitment/dynamics not adversely impacted</p> <p><b>ByProduct:</b> 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><b>Protected Species:</b> Levels of impact are at the maximum acceptable level</p> <p><i>Ecosystem: measurable changes to the ecosystem components without there being a major change in function. (no loss of components)</i></p> <p><b>Habitat:</b> 5-30 % of habitat area is affected.</p> <p>:or, if occurring over wider area, level of impact to habitat not major</p> <p><i>Recovery probably measured in months – years if activity stopped</i></p>
<b>Severe</b>	<p><b>Target/Non Retained:</b> Affecting recruitment levels of stocks/ or their capacity to increase</p> <p><i>ByProduct: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</i></p> <p><b>Relative levels of capture/susceptibility greater than 50% and species should be examined explicitly.</b></p> <p><i>Protected Species: Same as target species</i></p> <p><b>Ecosystem:</b> Ecosystem function altered measurably and some function or components are missing/declining/increasing outside of historical range</p>

	<p>&amp;/or allowed/facilitated new species to appear.  <b>Habitat:</b> 30- 60 % of habitat is affected/removed.  <i>Recovery measured in years if stopped</i></p>
<b>Major</b>	<p><b>Target/Non Retained:</b> Likely to cause local extinctions  <b>By-Product:Other non-retained:</b>N/A  <b>Protected Species:</b> same as target species  <b>Ecosystem:</b> A major change to ecosystem structure and function (different dynamics now occur with different species/groups now the major targets of capture)  Habitat: 60 - 90% affected  <i>Recovery period measured in years to decades if stopped.</i></p>
<b>Catastrophic</b>	<p><b>Target/NonRetained:</b>Local extinctions are imminent/immediate  <b>By-Product/Other Non-retained</b> N/A  <b>Protected Species:</b> same as target  <b>Ecosystem:</b> Total collapse of ecosystem processes.  <b>Habitat:</b> &gt; 90% affected in a major way/removed  <i>Long-term recovery period will be greater than decades or never, even if stopped</i></p>

## Appendix 4 Figures

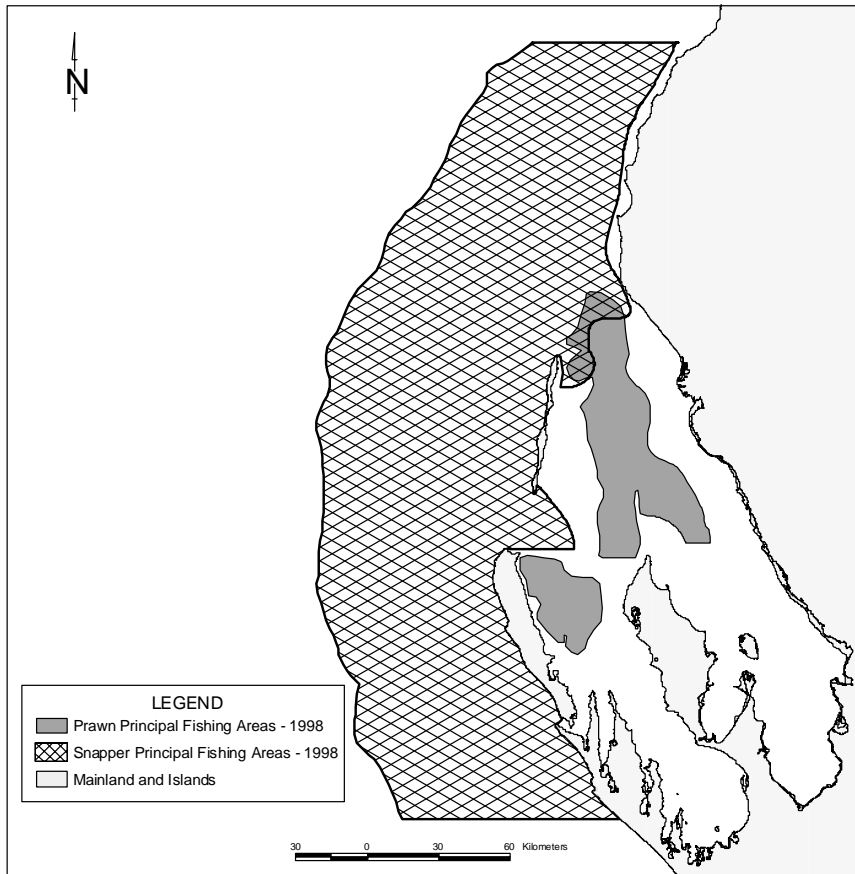
### **APPENDIX 4.1 PRINCIPAL FISHING AREAS FOR THE SHARK BAY SCALLOP MANAGED FISHERY AND SHARK BAY SNAPPER MANAGED FISHERY**

Principal Fishing Areas  
Shark Bay Scallop Managed Fishery  
Shark Bay Snapper Managed Fishery



**APPENDIX 4.2 PRINCIPAL FISHING AREAS FOR THE SHARK BAY PRAWN MANAGED FISHERY AND THE SHARK BAY SNAPPER MANAGED FISHERY**

Principal Fishing Areas  
Shark Bay Prawn Managed Fishery  
Shark Bay Snapper Managed Fishery



## **Appendix 5 Commercial Research Summary for the Snapper Fishery (1982 – 2002)**

### **1982**

- Commercial catch length frequency sampling began, on commercial boats, as an indicator of the state of exploitation of snapper stocks. Scales also collected. Trap and line fish were sampled separately until 1988.
- Daily catch and effort data collection began (fisher logbooks).
- Samples obtained in peak fishing season for studies of size at maturity and fecundity.

### **1983**

- Commercial catch length frequency sampling continued on commercial boats. Scales also collected.
- Daily catch and effort data collection continued (fisher logbooks).
- To determine the proportion of snapper schooling in the Koks Island area adult snapper tagging commenced (1982-1984).
- Attempts to apply stock-production and yield-per-recruit models to data on pink snapper commenced.
- Samples obtained in peak fishing season for studies of size at maturity and fecundity.
- Morphometrics study commenced.

### **1984-85**

- Commercial catch length frequency sampling continued on commercial boats. Scales also collected.
- Daily catch and effort data collection continued (fisher logbooks).
- Samples obtained in peak fishing season for studies of size at maturity and fecundity.

### **1986-87**

- Length frequency sampling of the commercial catch continued. Scales also collected.
- Constructed length-age relationships from scale readings.
- Continued to obtain logbook returns from commercial fishers.
- Juvenile snapper were tagged in attempt to establish the source of recruitment to the commercial snapper fishery.
- Analysis of the 1982-1986 tag return data to estimate tagging mortality, tag shedding rates and to calculate mortality due to fishing (to be incorporated into yield-per-recruit model)
- Continued attempts to apply stock-production and yield-per-recruit models to data on pink snapper.
- Survey of the amateur fishery for snapper.

- Investigation into the effects of trap fishing.
- Otolith chemistry study commenced.

### **1987-88**

- Length frequency sampling of the commercial catch continued. Scales also collected.
- Continued to obtain logbook returns from commercial fishers.
- Continued analysis of tag return data to estimate tagging mortality, tag shedding rates and to calculate mortality due to fishing (to be incorporated into yield-per-recruit model)
- Continued attempts to apply stock-production and yield-per-recruit models to data on pink snapper.
- Considering various options for future management of the fishery.
- Study commenced (with Murdoch university) to determine the distribution of trematode parasites within the snapper stock and to determine the prevalence of the parasites relative to the size and sex of the snapper.

### **1989-90**

- Continued to obtain logbook returns from commercial fishers.
- Recorded changes in prices, methods, marketing, catch and effort data.
- Continued sampling of commercial catch for length frequency and scales. Using age structure of catch to continue a cohort analysis in Koks Island region.
- Snapper morphometrics study concluded.
- Reporting and analysis of the tagging returns concluded.

### **1990-91**

- Continued to obtain logbook returns from commercial fishers.
- Recorded changes in prices, methods, marketing, catch and effort data.
- Began sampling Kai factory, instead of commercial boats directly, for length frequencies of the commercial catch.
- 500 snapper otoliths collected from Kai factory snapper to examine validity of otoliths for ageing. Using age structure of catch to continue a cohort analysis in Koks Island region.
- Continued studies/writing up of stock structure papers-otolith chemistry, genetics, tagging, morphometrics.
- Samples obtained in peak fishing season for studies of size at maturity and fecundity.
- An independent method of stock assessment, using echo-sounder transects through known schooling patches, was tested for species identity.

### **1991-92**

- Continued to obtain logbook returns from commercial fishers.
- Recorded changes in prices, methods, marketing, catch and effort data.
- Continued sampling Kai factory for length frequencies of the commercial catch.

- 500 snapper sampled at Kai factory for otoliths. Continued to examine validity of otoliths for ageing, using sectioning methods and recaptured tetracycline-injected tagged snapper. Using age structure of catch to continue a cohort analysis in Koks Island region.
- An independent method of stock assessment, using echo-sounder transects through known schooling patches was tested.
- Obtained count category processing records from snapper factory (Kai) which can be applied to the sampled length frequencies of snapper for each year.

### **1992-93**

- Continued to obtain logbook returns from commercial fishers.
- Recorded changes in prices, methods, marketing, catch and effort data.
- Continued sampling Kai factory for length frequencies of the commercial catch.
- 500 snapper from Kai factory sampled to assess value of otoliths versus scales in estimating age structure for cohort analysis.
- 300 snapper tagged, injected with tetracycline and released by R.V. *Flinders*.
- Obtained count category processing records from snapper factory (Kai) which can be applied to the sampled length frequencies of snapper for each year.

### **1993-94**

- Continued to obtain logbook returns from commercial fishers.
- Recorded changes in prices, methods, marketing, catch and effort data.
- Continued sampling of commercial catch for length frequency and 500 snapper sampled for otoliths at Kai factory. The age structure of catch used to conduct cohort analyses in Koks Island region.
- Obtained count category processing records from snapper factory (Kai) which can be applied to the sampled length frequencies of snapper for each year.

### **1994-95**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording changes in prices, methods, marketing, catch and effort data.
- Collection of 500 otoliths from Kai factory for ageing.
- Preliminary studies of otolith weight and age of snapper.
- Tested a new arrangement in the quota management of the snapper fishery-longer peak season and option to forge peak season quota to fish in off-season.
- Obtained count category processing records from snapper factory (Kai) which can be applied to the sampled length frequencies of snapper for each year.

### **1995-96**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording changes in prices, methods, marketing, catch and effort data.
- Collection of 500 otoliths and length frequency samples from Kai factory.

### **1996-1997**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording changes in prices, methods, marketing, catch and effort data.
- Collection of 500 otoliths from each of the early, mid and late parts of the peak season to determine whether the previous practice of collecting all of the otoliths in the early part of the season results in a bias in the age-length key.
- 2000 snapper tagged and injected with tetracycline in August.
- Additional statistical analysis of previous results of stable isotope and Sr/Ca ratio analyses of otolith carbonate from snapper.
- Analysis of marginal increments and tetracycline marks to validate annual band deposition on otoliths.

### **1997-98**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording changes in prices, methods, marketing, catch and effort data.
- Obtained count category processing records from snapper factories (Kai and Abacus) which can be applied to the sampled length frequencies of snapper for each year.

### **1998-99**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording changes in prices, methods, marketing, catch and effort data.
- Obtained count category processing records from snapper factories (Kai and Abacus) which can be applied to the sampled length frequencies of snapper for each year.

### **1999-00**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording methods and catch and effort data.
- Obtained count category processing records from snapper factories (Kai and Abacus) which can be applied to the sampled length frequencies of snapper for each year.
- Collection of 500 otoliths and length frequency samples from Kai factory.

### **2000-01**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording methods and catch and effort data.
- Collection of 500 otoliths and length frequency samples from Kai and Abacus snapper processing factories in Carnarvon.

- Snapper stock assessment and modelling study commenced.

**2001-02**

- Continued monitoring of fishery by obtaining logbook returns from commercial fishers and recording methods and catch and effort data.
- Relationship developed between length and weight for 300 snapper in Kai factory August 2002.