FINAL APPLICATION TO AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENVIRONMENT AND HERITAGE ON THE ABROLHOS ISLANDS AND MID WEST TRAWL MANAGED FISHERY

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

For Consideration Under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999*

JUNE 2004

Department of Fisheries
Government of Western Australia

Fish for the future

DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA
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1. INTRODUCTION TO THE APPLICATION

1.1 DESCRIPTION OF INFORMATION PROVIDED

This is an application to the Department of Environment and Heritage (DEH) to assess the Abrolhos Islands and Mid West Trawl Managed Fishery (AIMWTMF) against the Australian Government Guidelines for the Ecologically Sustainable Management of Fisheries. The submission of a successful application against these guidelines is now needed to meet the requirements under Part 13 and 13 A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC), to enable the saucer scallop *(Amusium balloti)* and western king prawns (*Penaeus latisulcatus)* 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 2004.

The information provided in this application covers all the elements specified in the *Guidelines for the Ecologically Sustainable Management of Fisheries* (located on the DEH website www.deh.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 the fishery. The application includes:

- Comprehensive background information on the history of the AIMWMTF and a description of the management arrangements and the biology of the saucer scallop and western king prawn, which provides the context for assessing this application (see Section 2 for details).
- A description of the National Ecologically Sustainable Development (ESD) reporting framework and methodology that was 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 Australian Government Guidelines. These criteria include the "General Requirements", which cover many of the governance aspects related to the management of the AIMWTMF, 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.
- At the end of Section 4 there is an OVERVIEW TABLE that for each issue outlines, which 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 this fishery, presented in the National ESD format, covering each of the environmental and governance issues relevant to this application for the 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 fishery is not required.

1.2 OVERVIEW OF APPLICATION

There are two target species for the AIMWTMF, the saucer scallop and, in the Port Gregory area, western king prawns. Scallop landings have varied dramatically over the last 17 years depending primarily on the strength of recruitment. The annual catch of scallops for the AIMWTMF in 2002 was very low, at 194 tonnes whole weight, with a landed value of $0.6 million and 1.7 tonnes of prawns were landed with a value of $16,000 but surveys indicate strong scallop recruitment during 2002 that will result in very large catches during 2003.

The AIMWTMF is managed using a comprehensive set of regulations that include limits on vessel numbers, gear, closed seasons and areas. Each of these has been refined through time and is subject to regular reviews to achieve the overall aim of successful management.

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

The maintenance of scallops stocks within the stock abundance levels that should provide the normal (but highly variable) recruitment leading to the successful continuation of the fishery has been achieved through the combination of:

- having a large amount of relevant and accurate information on the biology and recruitment status of the scallop species, and
- the proactive management used in the fishery.

This application covers both the catch of scallops and Western king prawns but focuses mainly on the primary target species in the fishery, scallops. The fishery has taken positive steps to minimise wider ecosystem interactions. Trawling is restricted to a relatively small area of the Abrolhos Islands region, and occurs predominately over sandy substrates. Bycatch is not a significant problem in this fishery since the mesh size used in the fishery excludes most of the smaller species from being caught. Furthermore, bycatch reduction devices (in the form of grids) became compulsory for the AIMWTMF in 2003, which will minimise or eliminate the potential for impacts on large species (eg turtles).

Consequently, the management regime for the AIMWTMF 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 ON FISHERY

2.1 DESCRIPTION OF THE FISHERY

2.1.1 LOCATION OF FISHERY

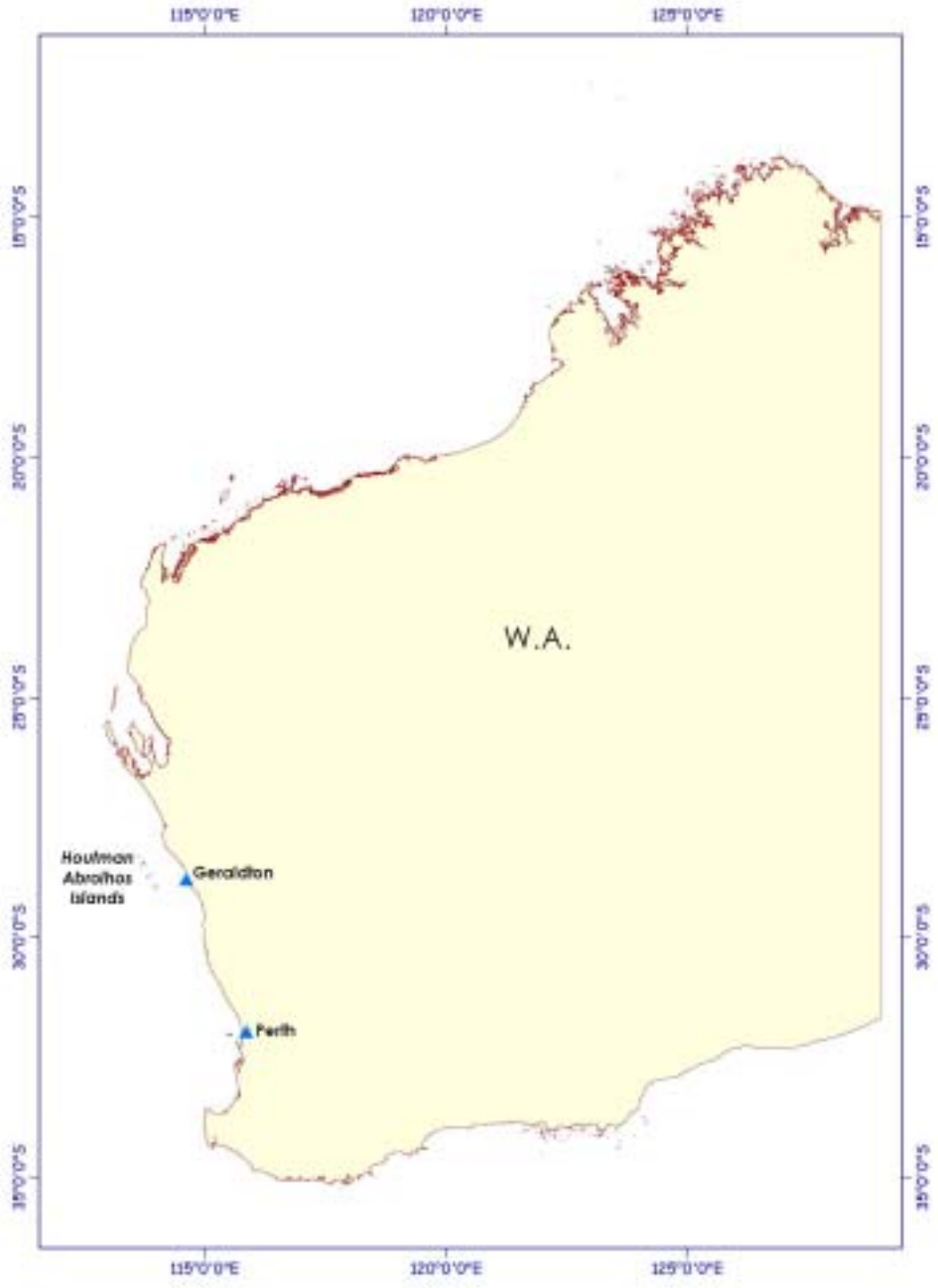


Figure 1 AIMWTMF fishery locality map.

The AIMWTMF exists within the waters of the Abrolhos Islands off the mid west coast of Western Australia (WA) (Figure 1). The physical area of the fishery is described as:

> *"the waters of the Indian Ocean between 27°51' south latitude and 29°03' south latitude on the landward side of the 200m isobath (*Figure 2).

The licence area for the fishery extends out into Commonwealth waters with many of the principal fishing areas within State waters. The main fishing grounds associated with the AIMWTMF have traditionally centred on the waters surrounding the core Abrolhos Islands area. This region is encompassed in the A-zone of the Western Rock Lobster Managed Fishery (WRLMF) and the original schedule of the area for the limited-entry scallop fishery used the boundaries of this A-zone (at that time) as the legal boundaries for the scallop fishery (Dibden and Joll, 1998). The Rock Lobster A-zone was eventually amended, and the eastern boundary of the trawl area legislated as a line that ran in a south-easterly direction from latitude 27° 51'S, longitude 113° 46'E to lat. 29° 03'S, long. 114° 18'E (Figure 2). Trawling for scallops is not permitted east of this line.

Further changes were made to the boundaries of the Abrolhos Islands fishery in 1987. The legal area of the fishery was extended from the eastern A-zone boundary to the coast, as this provided a higher level of protection against illegal trawling in this area. The area remained closed to trawling, however, except for a coastal zone that formalised and limited access to a small prawn fishery off Port Gregory, south of Kalbarri (Joll, 1989). The fishery in this region primarily targets western king prawns (*Penaeus latisulcatus*), using nets with 45 mm mesh in the cod-ends and 51 mm mesh in the remainder, and is limited to vessels with Mid-West Trawl Fishery endorsements (Joll, 1989).

In the mid-1990's, a strong demand for scallop meat (and the subsequent increase in profitability) together with improvements in navigational technology (depth sounder, GPS etc.), led to an expansion in the areas trawled in the AIMWTMF as fishers sought potential new scallop grounds (Dibden and Joll, 1998). This expansion generally occurred within the traditional Abrolhos fishing grounds, although some exploratory trawling took place in previously untrawled locations around the Abrolhos Islands region as well as (illegally) in the closed waters south of the Port Gregory trawl zone (Dibden and Joll, 1998). Locations suitable for scallop trawling were believed to exist within these closed waters in areas known as the "North Kidney Patch" and "South Kidney Patch" (Figure 2). Some illegal fishing activity in 1993 led to the discovery of a high concentration of scallops in the South Kidney Patch, and as a result requests for vessels to be given permission to fish the area were received (Dibden and Joll, 1998). Following the trawl and echo sounder surveys by the Department of Fisheries which supported indications of a large stock of scallops in an area predominantly suitable for trawling, the South Kidney Patch area was opened for a trial period of two weeks in late March 1994, resulting in a catch of more than 160 tonnes of scallop meat (Dibden and Joll, 1998).

The maximum number of licences for the AIMWTMF is 17 licences, however in some years not all the licences are utilised. The majority of the fleet also have endorsements to operate in other scallop/prawn fisheries.

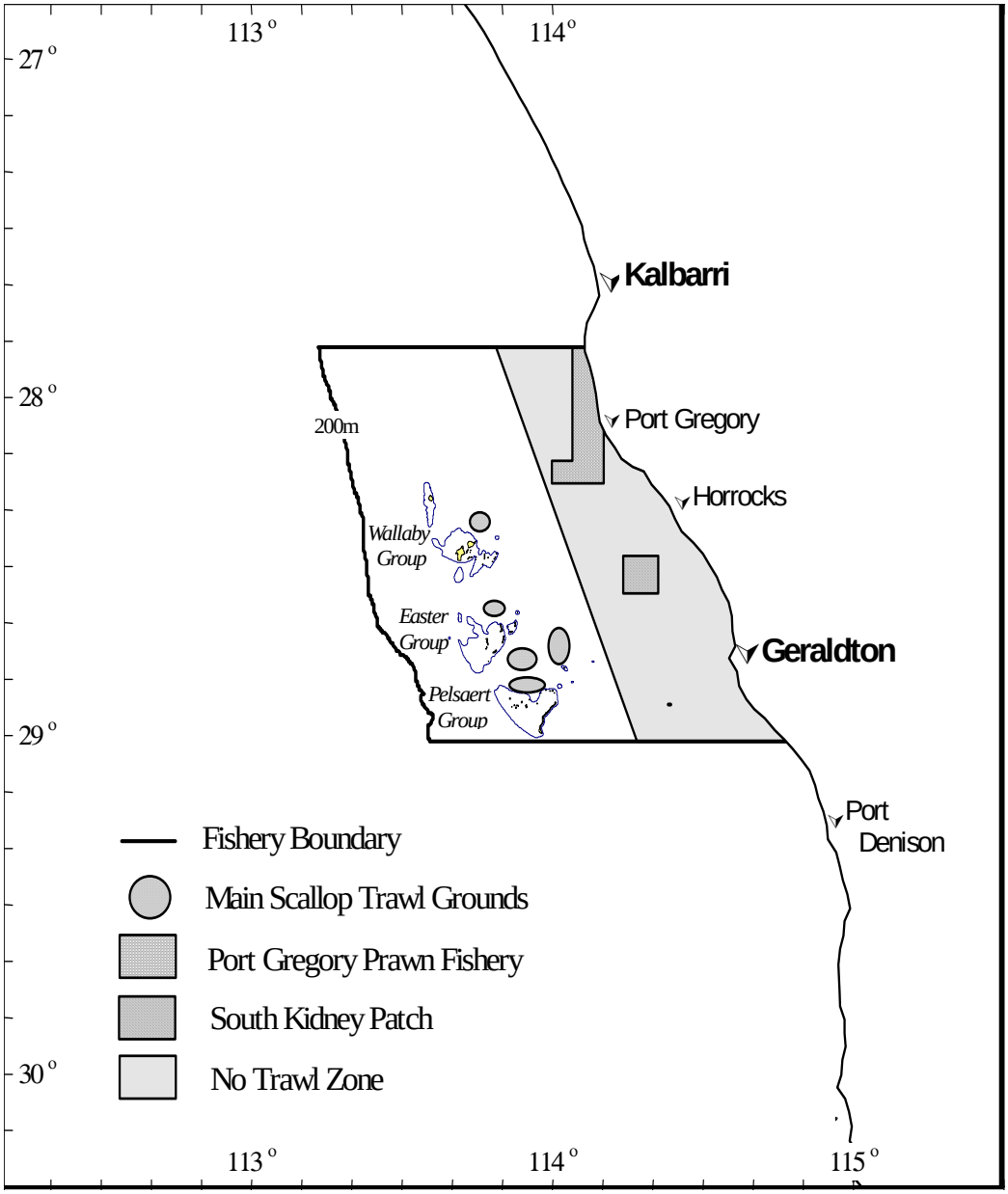


Figure 2 Map showing the boundaries of the AIMWTMF.

Prior to 1983, annual catches of scallop meat from the Mid-West Trawl Fishery ranged from just 0.3-47.0 tonnes (Table 1). Following the 1983 freeze on vessel numbers in Shark Bay, the large number of operators who transferred their efforts to the Abrolhos grounds caused a dramatic increase in fishing effort to occur. Coupled with an apparent increase in stock levels, significant increases in catch resulted. The region quickly became heavily fished, and after two above-average years, the catch plummeted to just 10 tonnes meat weight for the 1985 season. The Abrolhos Islands and Mid-West Trawl was declared a limited entry fishery in 1986 and subsequent catches ranged from 17.5-80.2 tonnes meat weight between 1986 and 1992. Following this period, there appeared to be another significant increase in stock levels. Consequently, fishing effort and subsequent landings increased significantly, peaking

in 1994 with a record catch of 526.7 tonnes meat weight (whole weight is approximately 5 times the meat weight) (Table 1, Figure 3).

Most scallops are caught in the area immediately to the east of the Abrolhos Islands (Figure 2). In most years, the vast majority of the total yearly catch is taken during the first two to three weeks of the season. In years when the Shark Bay Scallop Managed Fishery (SBSMF) does not open until early-mid May, vessels with appropriate endorsements leave to fish in Shark Bay.

Western king prawns are a minor target species for the fishery as relatively small amounts are caught or in some cases none are caught in a year. The fishery catches western king prawns in the Port Gregory area of the licence area (Figure 2). Over the last 10 years the average annual catch of western king prawns has been 600 kg by an average of two boats. In 2002, 1.1 tonnes of western king prawns were caught by the fishery (Table 2).

Table 1 Historical scallop catch and effort for the AIMWTMF (1967-2002).

YEAR	Total Landings (tonnes meat)	Boats Fishing	Nominal Effort (hrs)[1]	Standardised Effort (hrs)[2]	Swept Area (nm^2)[3]	Standardised Catch Rate (kg meat/hr)
1967	4.6	3	•	•	•	•
1968	25.9	8	•	•	•	•
1969	0.0	0	•	•	•	•
1970	0.0	0	•	•	•	•
1971	0.0	0	•	•	•	•
1972	0.0	0	•	•	•	•
1973	0.3	3	•	•	•	•
1974	4.2	4	•	•	•	•
1975	6.7	6	•	•	•	•
1976	2.9	4	•	•	•	•
1977	0.8	3	•	•	•	•
1978	0.0	0	•	•	•	•
1979	0.0	0	•	•	•	•
1980	12.3	2	•	•	•	•
1981	28.5	6	•	•	•	•
1982	47.0	9	•	•	•	•
1983	158.2	22	•	•	•	•
1984	219.1	40	•	•	•	•
1985	10.0	27	3566	•	•	•
1986	74.2	28	4799	•	•	•
1987	67.6	16	4612	•	•	•
1988	23.6	20	5615	•	•	•
1989	43.1	14	5737	•	•	•
1990	25.8	20	4670	•	•	•
1991	17.5	12	3214	•	•	•
1992	80.2	8	3449	•	•	•
1993	292.2	12	9635	•	•	•
1994	526.7	19	17508	•	•	•
1995	317.4	19	13185	•	•	•
1996	228.7	16	9280	•	•	•
1997	8.8	17	1138	•	•	•
1998	42.3	16	1915	1600	39.8	26.4
1999	117.7	16	2865	2307	57.4	51.0
2000	85.7	14	1281	1134	25.3	75.5
2001	244.1	16	4773	3998	86.2	61.1
2002	38.9	15	1048	912	20.0	42.7

1. **Nominal Effort:** Total number of hours fished by the whole fleet, regardless of net headrope length.
2. **Standard Effort (effective effort):** Total number of hours fished with each vessel standardised as if towing nets with 14 fathoms of headrope length. ie. for each vessel: std hrs= total hours fished x (headrope length (fthm)/14)
3. **Swept Area:** standard effort (hrs) x speed (kts) x headrope length (fthms) x net 'inefficiency' factor
   No. fathoms in a nautical mile
   Speed - 3.0 knots (standardised across fleet)
   Net 'inefficiency' factor - 0.6
   No. fathoms in a nautical mile – 1012.68

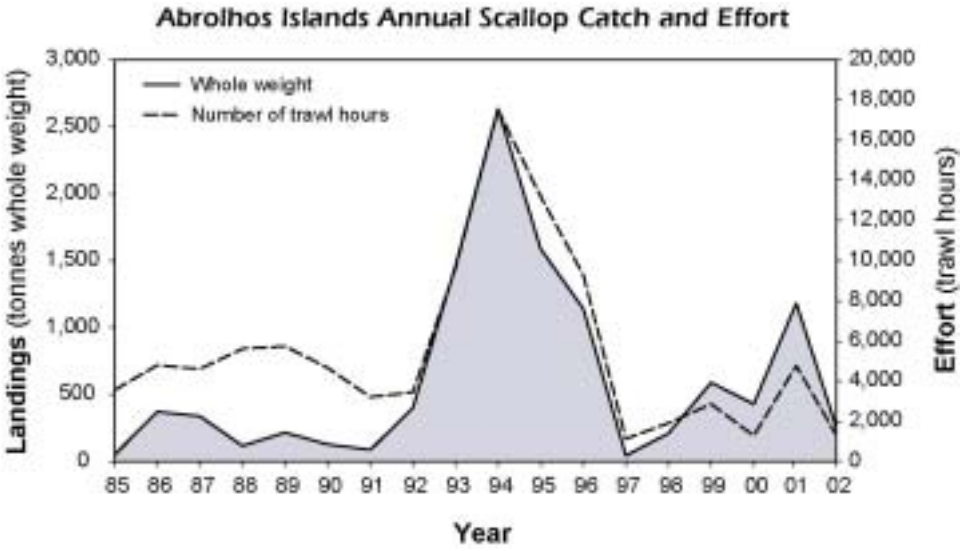


Figure 3 Annual scallop landings for the AIMWTMF, 1985–2002.

Table 2 Prawn catches and number of days fished recorded from Port Gregory between 1994 and 2003.

Year	King prawns (kg)	Coral prawns (kg)	Days Fished
1994	437	900	22
1995	63	399	11
1996	137	398	10
1997	162	226	19
1998	48	96	3
1999	1990	4200	40
2000	0	0	0
2001	0	0	0
2002	1121	630	13
2003	0	0	

2.1.2 FISHING METHODS

There are two target species for the AIMWTMF, the saucer scallop (*Amusium balloti)* in the Abrolhos Island area and the western king prawn (*Penaeus latisulcatus)* in the Port Gregory area (Mid West Trawl endorsement) and this influences the gear used in the two parts of the fishery. The scallop boats in the AIMWTMF fishery tow two low-opening demersal otter trawl nets (mesh size to 100 mm). The boats targeting prawns in the Port Gregory area can tow nets with mesh not less than 45 mm in the codend and 51 mm in the remainder of the net.

Tow speed is around 2.5 to 3 knots and duration can vary from around 20 minutes to up to 120 minutes, depending on scallop abundance. In the AIMWTMF two otter boards, each 2.29 metres in length and 0.91 metres in height are attached at the extremities of each net at the opening (Figure 4). The height of the fishing gear is set

by the height where they are connected to the otter boards. Forces produced by water flowing over the otter boards open the trawl nets laterally. The lateral spread is vital to the catch efficiency of trawl gear and determines the area swept. Generally, the opening width of the net is between 60% and 85% of the length of the headrope. Short dropper chains to the footrope attach a ground chain, with links of a maximum of 10 mm diameter metal. The ground chain travels across the sea floor and disturbs scallops so they rise from the seafloor and into the oncoming net. Low opening nets have the headrope as a lead-ahead, which creates a net veranda and is set in front of the footrope and ensures that scallops disturbed by the ground chain do not usually pass over the headrope. The ground chain is designed to skim over the sand instead of digging into the sea floor.

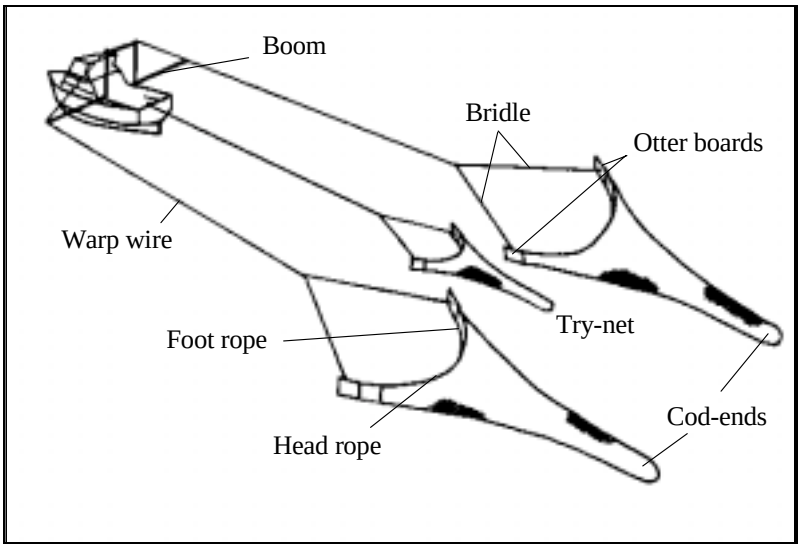


Figure 4 The standard twin otter rig and try gear used by scallop trawlers in AIMWTMF.

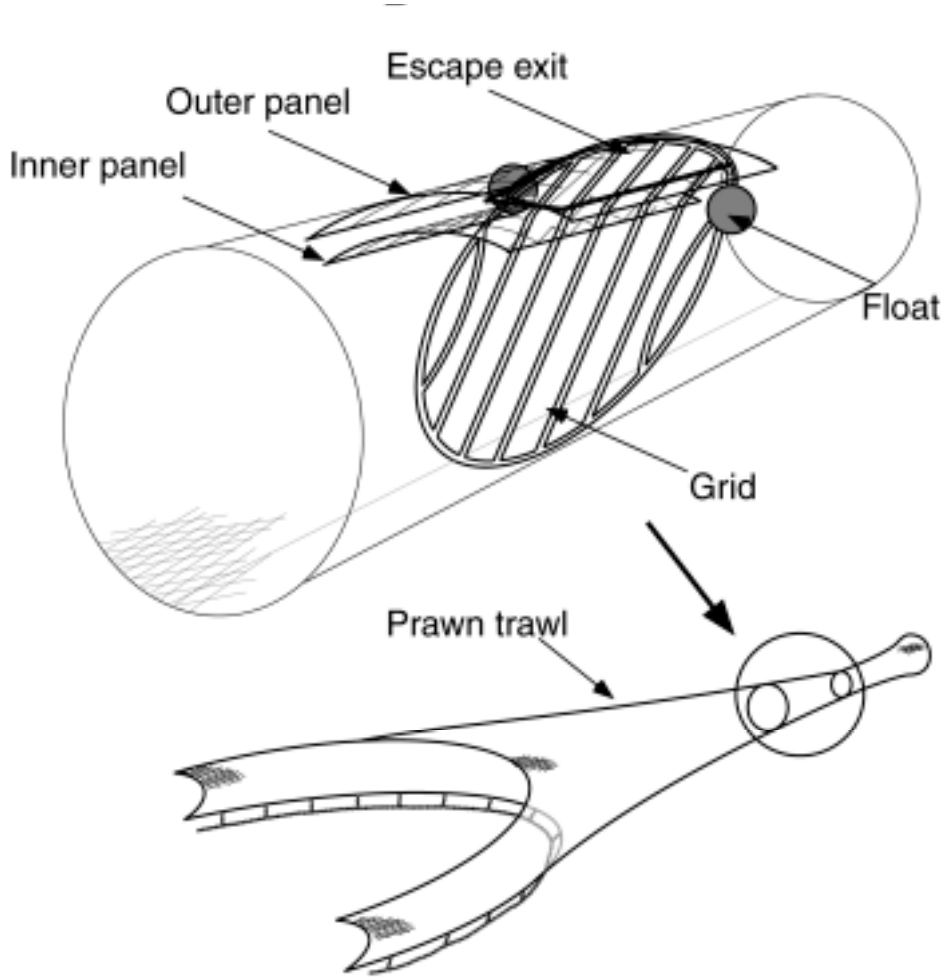


Figure 5 Diagrammatic representation of the type of BRD used in AIMWTMF, and it's location in the trawl (scallop and prawn) net.

In 2002, preliminary bycatch reduction devices (BRD) trials were commenced in AIMWTMF. These trials tested different turtle exclusion devices or grids in the fishery. In 2003, grids became mandatory in all nets for the fishery (Figure 5).

2.1.3 MANAGEMENT

Management of the fishery is aimed at catching scallops at the best size and condition for the market, thereby maximising the economic return, whilst maintaining breeding stock levels. Because the scallop stock commences spawning in August continuing through until February/March the breeding stock is fully protected. Meat condition is optimal around mid May and hence the season opens on the first Tuesday in April.

The current management plan for the AIMWTMF is a formal statutory document that provides the framework for the management measures for the fishery. Annual meetings are held with license holders, which provide the basis for cooperative management of this fishery through the provision of advice. The advice provided

allows for the management to be tailored to providing adequate levels of breeding stocks whilst achieving the best economic return from the available scallop resource. The management framework aims to catch scallops at a size and reproductive condition that maximizes meat weight and condition while maintaining sustainability of the fishery.

Management of the AIMWTMF is based on limited entry, boat size, gear controls, area closures and the timing and duration of the fishery.

Small numbers of vessels and limited entry fishery. There are a limited number of vessels operating in the fishery. The number of licensed vessels currently is 17.

Seasonal closure. The fishery is generally closed between 1 July and 1 April each year. The opening of the Abrolhos Island scallop season is influenced by the larger WRLMF and as a result set as the second Tuesday in April. Since 1984, the opening for the Abrolhos scallop season has been run in conjunction with the rock lobster season primarily due to the cost-effectiveness of using fishery patrol vessels already present in the area to monitor the rock lobster fishery. While the opening is similiar for the two fisheries the length of the season is independent of the WRLMF and is set by pre-season surveys.

Area closures. Only the deeper soft bottom areas are open for scallop trawling (Figure 2). The Abrolhos Islands Reef Observation Areas is a permanent closure to protect sensitive reef habitat. As a result 37% of the licence area is permanently closed to fishing.

Time closures. During the scallop season trawling can take place 24 hours a day.

Crew restrictions. Scallop trawlers are limited to thirteen crew members.

Gear controls (Net size, board size, net mesh size and size of try gear). The fishing gear (net size) is unitised, with one headrope unit converting to 4 fathoms. The entire entitlement is 46 units, or 184 fathoms. Specifications for these input controls are part of the Management Plan. Compliance policing is a major part of attaining adherence to the input controls and closures imposed on this fishery. Sea patrols and radar watches are conducted on a random basis during the season to check gear at sea. Additionally, the compliance staff conducts license and gear inspections in port prior to the start of the season.

Bycatch Reduction Devices. No fishing for scallops or prawns is to be carried out in the AIMWTMF unless all otter trawl nets except try nets, when in use, are fitted with a 'grid'. The grid specifications are as follows:

a) a rigid inclined barrier (installed at an angle no greater than 60°), comprising bars that are attached to the circumference of the net which guides animals and/or objects (including turtles) towards an escape opening forward of the grid;

b) an escape opening with the following minimum measurements when measured with the net taut:

i) 75 centimetres across the widest part of the net; and

ii) a perpendicular measure of 50 centimetres from the midpoint of the width measure in i) above.

c) a maximum vertical bar clearance spacing of 20 centimetres;

d) *an optional horizontal opening at the bottom of the grid, no higher than 30 centimetres.*

Vessel Monitoring System. In the 2001 season, the Vessel Monitoring System (VMS) was introduced into the AIMWTMF. The VMS enables Department of Fisheries to monitor a vessels location and speed with particular attention paid to the surveillance of closed areas.

By-product Species. It should be noted that there is currently no effort directly for the management of by-product species of this fishery. However, due to the mesh size (scallop only), small number of active days (prawn trawlers only) and low trawl speed, retained by-product species taken in this fishery is a very minor component of the catch.

2.1.4 HISTORY

The Abrolhos Islands area was first fished commercially for scallops during the late 1960's, although no fishing occurred in the region between 1969-1972 (Joll, 1989). The fishery then operated intermittently over the next five years, with catches ranging from 0.3 to 6.7 tonnes of meat landed by between 3 and 6 vessels. After a poor season in 1977 (0.8 t meat), fishing for scallops again ceased during 1978-1979 (Joll, 1989).

With just two vessels in operation, the Abrolhos fishery recommenced in 1980. Both catches and vessel numbers increased over the next few years, primarily due to an increase in scallop price, improvements in operating efficiency, an apparent increase in scallop stocks, and a decrease in the problems associated with larval nematodes (Joll, 1989). Following a freeze on vessel numbers in Shark Bay in 1983, a large number of operators transferred their efforts to the Abrolhos grounds causing vessel numbers to escalate dramatically (Table 1). This increase in fishing pressure greatly reduced the catch share among vessels in the fishery, causing individual profitability to become severely jeopardised. Because of this large influx of vessels, and the associated impacts on catch share and commercial viability, the entry of further vessels was restricted in 1985 (Joll, 1989). In 1986, the fishery was moved from an open entry to a limited entry fishery with a maximum of 30 licences available (Joll, 1989). Following this decision, the maximum number of vessels allowed to operate in the fishery was gradually reduced through a two-for-one net reduction on transfer of licence. The two-for-one reduction has since been removed from the Management Plan and there are currently 17 licences operating in the fishery.

2.1.5 NON-RETAINED SPECIES

While target stocks are well maintained in this fishery, public concern in recent years has increased regarding general bycatch resulting from fishing activities. The bycatch generated by scallop trawling in the AIMWTMF is relatively minimal compared to that of other trawling fisheries primarily because of the larger mesh size used,

targeting of scallop aggregations, slower trawling speeds and relatively short fishing season. While the prawn trawlers use a larger mesh size than the scallop trawlers, the minimal trawling activity (average of 13 days trawling per year over the last 10 years) and the slow trawl speeds would result in the total bycatch volume being very small compared to other trawl fisheries.

2.1.6 RESEARCH

Research into the biological and environmental aspects of WA scallop stocks and commercial exploitation, has been carried out by the Department of Fisheries since the late 1960s. This research was aimed at determining basic biology of the species to ensure that the scallops are being harvested at ecologically sustainable levels whilst achieving the best economic returns from the available scallop resource.

The Department has been conducting pre-season surveys of residual stocks in the Abrolhos since 1997 (further details in Section 5.1.1.1). These annual surveys measure the abundance of residual scallops remaining after the spawning season providing an annual spawning stock index that is independent of catch records. These data allow the annual management arrangements (and industry harvesting strategies) to be tailored to the expected abundance of scallops available to the fishery because of the significant correlation between the abundance of residuals and the following year's catch (Section 5.1.1.1).

In addition, the fleet has provided a detailed record of all the scallops taken since the mid 1980s in a research logbook system completed by all vessels. This collection of fisheries dependent data (voluntary logbooks, catch and effort statistics system (CAESS) and processor unload records) for stock assessment and monitoring of the scallops will continue for the AIMWTMF.

2.2 BIOLOGY OF SAUCER SCALLOP

Distribution and Stock Structure

The saucer scallop, *Amusium balloti*, belongs to the family Pectinidae. The western population of *A. balloti* has a distribution spanning most of the WA coast, having been recorded from Broome in the north to Esperance in the south (Figure 6). The greatest numbers are found in Shark Bay and around the Abrolhos Islands (Joll, 1989). The eastern population of *A. balloti* occurs from Innisfail, Queensland to Jervis Bay, New South Wales (Kailola *et al.*, 1993). Therefore, the distribution of the eastern and western populations of saucer scallops are separated across the northern Australian waters thus resulting in two separate populations.

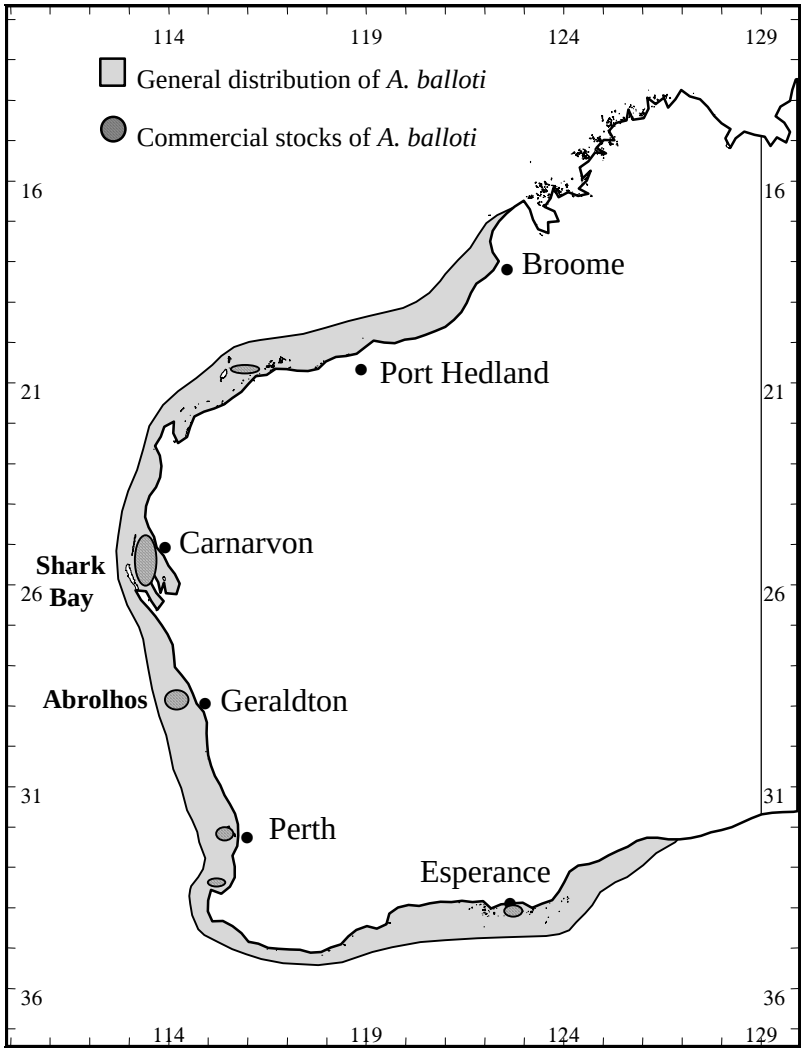


Figure 6 Map showing the distribution of *Amusium balloti* in WA.

There is uncertainty regarding differences (if any) in taxonomy between the eastern and western population of saucer scallops. While there is some varying usage of nomenclature it is likely that the eastern population and western population are the same species or sub-species. In Kailola *et al.* 1993, the eastern and western populations are referred to as separate sub-species (Ballot's saucer scallop in the east and Western saucer scallop in the west) as a result of research conducted in Queensland. This research found that not only were there differences in the genetic make-up of the two populations but the degree of difference indicated that there is probably no interbreeding between the two (Kailola *et al.*, 1993). In this report the Department of Fisheries will refer to the commercial scallop caught in the AIMWTMF as the saucer scallop, *Amusium balloti* from the western population.

Although *A. balloti* has an extensive distribution, it tends to be restricted to areas of bare sand in the more sheltered environments found in the lee of islands and reef systems. The species has been reported occurring in depths from 10-75m in discrete beds, up to 15 km in length, at densities of up to 1 per m^2 (Dredge, 1988; Kailola *et al.*, 1993).

Life History

Early growth of this species is rapid and although saucer scallops have been recorded reaching 140mm in length and living up to 3-4 years, most appear to live no more than two years and usually attain a maximum size of around 115mm (Heald, 1978; Dredge, 1988).

The reproductive cycle among Abrolhos Island scallop stocks begins with the onset of gametogenesis in August to March/early April, with spawning occurring 4-8 weeks after the onset of gametogenesis (April/May through to December) (Joll and Caputi, 1995a). Although it was originally believed that the reproductive cycle of the saucer scallop was triggered by changes in water temperature in the range of 18°-23°C, recent research conducted by Joll and Caputi (1995a), has found that the relationship between changes in gonad weight and water temperature is tenuous for *A. balloti* on the WA coast.

Saucer scallops are broadcast spawners, releasing their eggs and sperm into the surrounding waters for fertilisation to occur in the water column (Kailola *et al.*, 1993). The life cycle for the saucer scallop is depicted below in Figure 7.

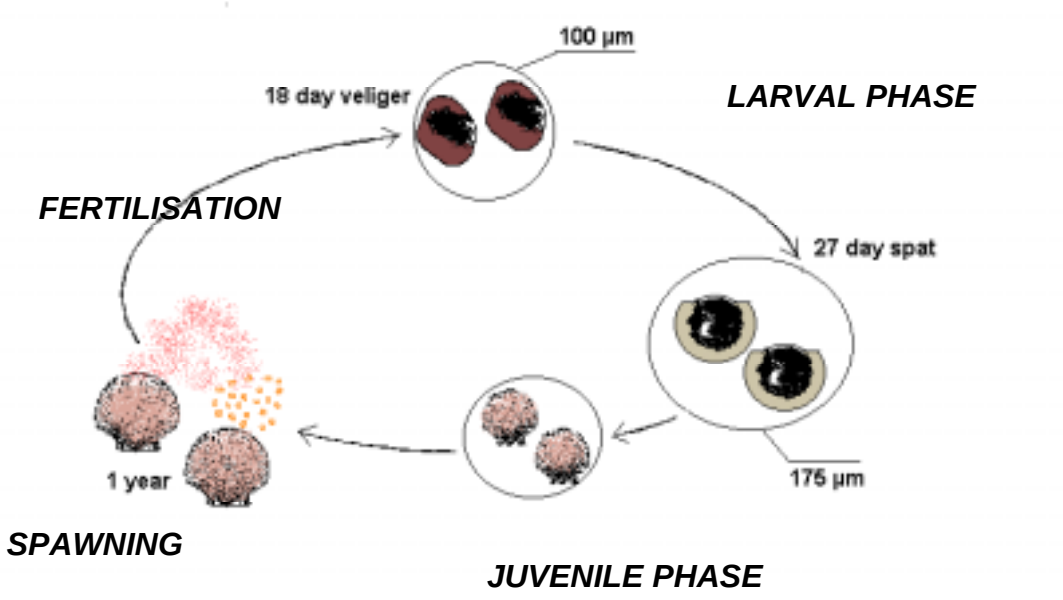


Figure 7 Life cycle of the saucer scallop, *Amusium balloti.*

The planktonic, larval phase of the saucer scallop lasts between 12 and 24 days (Rose *et al.*, 1988). Success of the larval phase appears to be governed by prevailing oceanographic events, which greatly influences settlement locations and subsequent recruitment patterns. The predominant oceanographic influence along the WA coast is the Leeuwin Current, a southward flowing current of relatively warm, tropical water that is low in salinity (Joll and Caputi, 1995b). While the environmental mechanisms

relating to the recruitment variability of *A. balloti* are yet to be fully understood, it appears that in years of strong Leeuwin Currents there is an increased likelihood that larvae are flushed away from areas of suitable recruitment habitat. This hypothesis is supported by research data, which indicates that in years when the current flow is strong, scallop recruitment in Shark Bay is low and vice versa (Joll and Caputi, 1995b). Highly variable settlement of saucer scallops, due to environmental conditions have been observed in the AIMWTMF with very high settlement observed in the AIMWTMF in 2002. It is also quite possible that the Leeuwin Current could have some temperature effects on spawning or fertilisation because of associated warmer waters (Joll and Caputi, 1995b).

Following the larval phase, juvenile scallops settle out as spat over a period of several days (Rose *et al.*, 1988). During this time, they crawl actively using a well-developed, ciliated foot, and do not appear to attach permanently to the substrate (Rose *et al.*, 1988). A week after settlement, a byssal notch and associated threads develop on the dissoconch of the right valve, although attachment to the substrate remains very weak and is never permanent (Rose *et al.*, 1988).

Growth of these new recruits is rapid. Scallops derived from a spawning season (August-Feb/March) reach sizes 90 mm in shell height by July and entering the breeding stock at that time (Joll and Caputi, 1995a).

Saucer scallops are filter feeders, removing small organic material and particulates from the surrounding water. Known predators include pink snapper (*Pagrus auratus*) and octopus.

2.3 BIOLOGY OF WESTERN KING PRAWNS

Distribution and Stock Structure

The western king prawn, *Penaeus latisulcatus*, is a decapod crustacean of the family Penaeidae. *P. latisulcatus* has been reported from the Indo-West Pacific region, the Red Sea, and Arabian Gulf in the west, through Malaysia, Korea and Japan to the north and through Indonesia to New Guinea and Australia to the south (Grey *et al.*, 1983). Within Australian waters *P. latisulcatus* has been reported from South Australia (SA), Western Australia, Northern Territory, Queensland and down the east coast to northern New South Wales (Grey *et al.*, 1983). Electrophoretic studies found genetic differences among the populations sampled from WA, the Gulf of Carpentaria and SA (Richardson, 1982). Furthermore, this species generally only forms high level stocks in areas associated with the hypersaline waters of marine embayments (Kailola *et al.*, 1993), which are likely to be largely independent of each other in terms of dynamics. This species is the dominant penaeid prawn species in the WA and SA fisheries, representing about 65% and 100% of their total catches, respectively.

They are highly nocturnal feeders and are fished for at night (Grey *et al.*, 1983).

Life History

The species can live for up to 4 years, although animals greater than 2 years are rarely caught under current harvesting practices. King prawns become mature at 6 to 7 months of age at around a size of 25 mm carapace length.

When prawns mate, the male needs to be hard shelled and the female needs to be soft shelled (newly moulted). The male inserts a sperm capsule (spermatophore) into the female. This spermatophore remains inside the female reproductive organ (thelycum) until the female is ready to spawn. The female's ovary develops rapidly and the eggs are released into the water before the female moults again, normally within a period of about one month (Penn and Stalker, 1979). At spawning, the eggs are released from small pores at the base of the third walking legs (Walker, 1975). Western king prawns have the ability to spawn numerous times throughout the year, producing approximately 100,000 to 700,000 eggs per spawning.

The larval development of *P. latisulcatus* has been described by Shokita (1970). During spawning the females swim near the bottom releasing the eggs, which float and usually hatch within 24 hours. After hatching from the egg the larvae called nauplii swim freely in the water column but do not feed. During the nauplii stages the larvae utilise stored food from the egg, completing a series of six moults before developing to the next larval stage (Penn and Stalker, 1979). The larval development continues through several stages: protozoea, mysis and postlarvae. This process generally takes from one to three weeks before the larvae are at the stage where they can settle onto the sea floor. During this period, predators are responsible for the high mortality rates of the larvae. If by this time the larvae have drifted to a suitable nursery area (i.e. shallow sand/mud flats) they will settle (at around 10 mm total length) and continue to grow into juveniles. If settlement occurs into unsuitable habitats they are likely to perish (Penn and Stalker, 1979).

Juvenile western king prawns bury into the substrate (generally shallow sandy banks) during the day. Whilst in the nursery grounds western king prawns are nocturnal and forage at night feeding on small animals and detritus. Juveniles spend around three to six months in nursery grounds, which allows them to physically mature to between 107 and 127 mm total length (Penn and Stalker, 1979). At this point they attain a size, which relates with them migrating offshore to oceanic waters and subsequently, entering the trawl fishing grounds. This migration takes place in the summer and autumn of each year and is termed recruitment to the fishery.

The king prawn feeds primarily on meiofauna and decayed organic matter (detritus) and are prey to a large variety of fishes and molluscs, e.g. squid and cuttlefish.

2.4 MAJOR ENVIRONMENTS

2.4.1 PHYSICAL ENVIRONMENT

The Abrolhos Islands are bathed by the warm waters of the Leeuwin Current, and the Abrolhos coral reefs are the southern most in the Indian Ocean. The Abrolhos marine ecosystem is a unique assemblage of tropical and temperate species of algae, fish, reef corals and other invertebrates. The tropical coral reefs occur beside and amongst temperate algae species. Superimposed on the tropical/temperate species-overlap are endemic species, some of which are commercially important, such as the western rock lobster (*Panulirus cygnus)* and the baldchin groper (*Cehoerodon rubescens)* (Webster *et al.*, 2002).

Scallop fishing activity is usually to the east of the island groups to waters deeper than 30m and also in between the island groups (Webster *et al.*, 2002). A detailed description of the marine environment of the Abrolhos Islands is provided in Webster *et al.* (2002).

2.4.2 ECONOMIC ENVIRONMENT

The majority of the annual catch is destined for export as frozen scallop meat to Asia, principally via Hong Kong markets. Very small quantities of scallops are occasionally left 'roe-on', in the shell or in the half-shell to supply the gourmet seafood market.

Wholesale market prices for scallops have fluctuated markedly over the last ten years, plummeting from $16/kg in 1987 to $8.50/kg by 1991, before steadily improving to peak at $30.00/kg in 1997 (Table 3). Market variability has arisen primarily in response to product availability and condition, although poor marketing in the face of a large supply and price manipulation by Hong Kong buyers was blamed for the low prices in the early 1990s. The average price for scallops in 2002 was $16.50/kg meat weight and $16.80 for 2003.

Size and condition of the meat play an integral part in determining the market value of scallop meat, and consequently these factors greatly influence selection of appropriate seasonal opening dates. Higher prices are usually paid for larger scallops, so it is desirable to open the scallop fisheries when meats may reasonably be expected to be better than the 40/lb criterion, as this size is preferred on the export market.

2.4.3 SOCIAL ENVIRONMENT

This fishery utilises large numbers of crew (up to 13 per vessel) to carry out on-board processing during the short annual season. The estimated employment for the 2001 was 200 skippers and crew (Sporer and Kangas, 2001). The fishery provides regional employment in Geraldton and Carnarvon for onshore processing and maintenance.

Table 3 Annual values ($million Aust) for each of the Western Australian scallop fisheries, 1985-2002.

YEAR	AVE. PRICE*	Shark Bay	Abrolhos	South Coast	South West	Nickol Bay	TOTAL
1985	11.00	2.5	0.1	0.03	0.01	0.0	**2.64**
1986	15.50	3.5	1.0	0.25	0.03	0.01	**4.79**
1987	16.00	8.0	1.1	0.36	0.4	0.01	**9.87**
1988	17.00	12.0	0.4	0.47	0.07	0.36	**13.30**
1989	17.50	2.1	0.8	0.22	0.1	0.05	**3.27**
1990	14.50	7.0	0.4	0.03	0.6	0.18	**8.21**
1991	8.50	21.5	0.2	0.19	0.2	0.11	**22.20**
1992	14.00	58.0	1.1	0.27	0.2	0.01	**59.58**
1993	17.00	32.9	4.7	0.01	0.1	0.02	**37.73**
1994	20.00	17.2	10.0	0.01	0.07	0.01	**27.29**
1995	28.50	17.0	9.1	0.79	0.1	0.01	**26.91**
1996	28.25	10.1	6.5	0.49	0.1	0.01	**17.20**
1997	30.00	9.9	0.3	0.78	0.04	0.01	**11.03**
1998	22.00	N/A	0.9	N/A	N/A	N/A	
1999	21.75	N/A	2.6	N/A	N/A	N/A	
2000	26.25	N/A	2.3	N/A	N/A	N/A	
2001	20.50	N/A	4.8	N/A	N/A	N/A	
2002	16.50	N/A	0.6	N/A	N/A	N/A	

3. METHODOLOGY

3.1 SCOPE

This application is based upon the ESD report for the AIMWTMF. The ESD report was generated by assessing "**the contribution of the AIMWTMF to ESD".** This assessment examined the benefits and the costs of the AIMWTMF across the major components of ESD (see Table 4). In doing so, it will eventually provide a report on the performance of the fishery for each of the relevant ecological, economic, social and governance issues associated with this fishery. Given the timeframes involved, only the criteria required for the "Guidelines for the Ecologically Sustainable Management of Fisheries", which cover mainly the environmental elements of ESD (outlined below in Table 4) were generated for this application.

Table 4 Main 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 AIMWTMF. It was based upon using the National ESD Reporting Framework, which is outlined in detail in the WA ESD policy paper (Fletcher, 2002) and in the "*How to Guide*" (Fletcher *et al.*, 2002) located on the website (www.fisheries-esd.com):

1. The issues that needed to be addressed for the fishery were determined through an internal workshop for the fishery, which utilised information generated through the external workshops held for the Shark Bay Prawn Managed Fishery (SBPMF) and SBSMF and the Exmouth Gulf Prawn Managed Fishery (EGPMF) (due to the similarities between the trawl fisheries). This process was facilitated by adapting the set of "Generic ESD Component Trees" into a set of trees specific to the AIMWTMF.

2. 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 however were also recorded.
3. An assessment of the performance for each of the issues of sufficient risk to require specific management actions was completed using a standard set of report headings where operational objectives, indicators and performance measures, management responses etc were specified.
4. An overview assessment of the fishery was completed including an action plan for activities that will need to be undertaken to enable acceptable levels of performance to continue or, where necessary, improve the performance of the fishery.

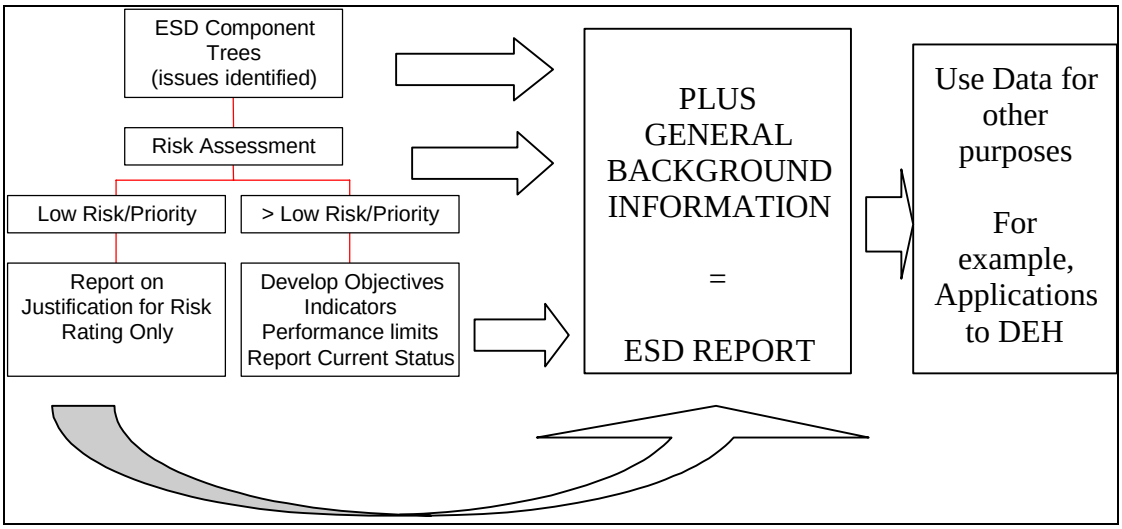


Figure 8 Summary of the ESD reporting framework processes.

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 3). 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 SCFA and ESD reference groups within each of the major component areas and arranged into a series of "generic" component trees (See Fletcher (2002) and the www.fisheries-esd.com web site for a full description). These generic trees were used as the starting point for identifying the issues. These trees were subsequently adapted into trees specific to the AIMWTMF by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (see Figure 9).

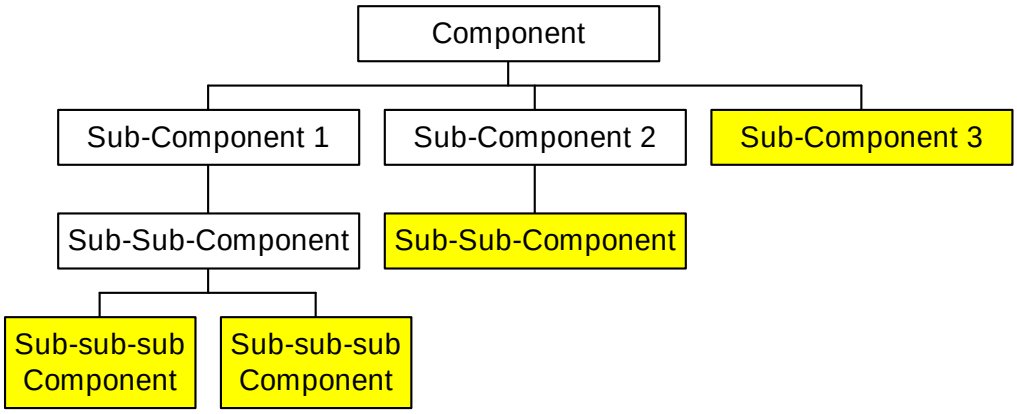


Figure 9 Example of a component tree structure.

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 internal workshop was consistent with the Australian Standard AS/NZS 4360:1999 Risk Management, concentrating on the risk assessment components. The general Risk Assessment process is well documented but in summary, it considers the range of potential consequences of an issue/activity and how likely those consequences are to occur. The combination of the level of consequence and the likelihood is used to produce an estimated level of risk associated with the particular hazardous event/issue in question.

Due to the similarities of this fishery with the SBSMF and SBPMF as well as the EGPMF (all of which went through the full risk assessment process with two external workshops), only an internal workshop was held for the fishery. Consequently, the information collected through the other fisheries risk assessment process was applied and utilised to generate the application for the AIMWTMF.

An estimate of the consequence level for each issue was made by the group at this internal 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 judgments 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 AIMWTMF was based at the population not at the individual level. Obviously catching one fish is always catastrophic for the individual but not always for the population. Similarly, when assessing possible ecosystem impacts this was done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or individuals of non-target species.

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

From these two figures (consequence and likelihood), the overall risk value, which is the mathematical product of the consequence and likelihood levels (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 5).

Table 5 Risk ranking definitions.

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

In general, only the issues of sufficient risk (Moderate, High & 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 6). 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 6 The National ESD reporting framework headings used in this report.

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

The completion of these component reports was initiated after the internal workshop for the AIMWTMF back in August 2002. Progress towards completing these reports was subsequently made by a variety of Departmental staff. The draft application was sent to DEH and stakeholders including industry members and industry groups for review. This final application was generated after the review process.

4. ASSESSMENT OF THE AIMWTMF MANAGEMENT REGIME AGAINST THE AUSTRALIAN GOVERNMENT GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

GENERAL REQUIREMENTS OF THE GUIDELINES

The management arrangements must be:

Documented, publicly available and transparent

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

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

In addition to the legislative requirements, the current management regime, as documented in the formal set of management regulations, can be purchased by interested parties from the State Law Publisher or viewed on line through the Department of Fisheries website.

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.

Once completed, the full ESD Report on the AIMWTMF 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.

Furthermore, the Department of Fisheries will be reporting on the performance measures outlined in this document for the fishery annually in the State of the Fisheries Report. This document is published and available on the Department's website.

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

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 management arrangements for the AIMWTMF have been developed through formal consultation with the industry and community. Depending on the nature of the

matter under consideration, submissions may also be sought from industry groups (eg WA Fishing Industry Council - WAFIC), other stakeholder groups (eg Recfishwest, Conservation Council of WA) and the general public.

The Department of Fisheries arranges annual meetings with industry members regarding the fishery. These meetings review data from the past seasons harvest and discuss management arrangements. In addition, for the SBPMF, SBSMF and EGPMF (three similar trawling fisheries) a workshop was held to seek outside involvement in the development of the ESD reports. This workshop included industry members, industry representative groups, non-government environmental organisations, scientific researchers and other state government agencies as well as a representative from DEH. The information that was collected through the two workshops in the development of the SBPMF, SBSMF and EGPMF assessment reports has been incorporated within this report. The issues identified for this fishery are very similar to those affecting this fishery. Details of the methodology used to generate this report including how the issues were identified, how these identified issues were subjected to a risk assessment, and how the objectives etc were developed are described in Section 3.5.

Ensure that a range of expertise and community interests 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;
- WAFIC; and
- Industry Representatives.

As was previously mentioned in the above guideline, information generated from the workshop that was conducted for the SBPMF, SBSMF and EGPMF was used in this application. The groups that were involved in the workshop, generation and review of these three fisheries applications included:

- Department of Fisheries, WA;
- Department of Environment, WA;
- DEH;
- Department of Conservation and Land Management;
- The trawling industry;
- WAFIC;
- Recfishwest;
- Conservation Council of WA;
- University of WA; and
- Museum of WA.

The general consultation methods used for this fishery are summarised in the Governance Section 5.4.2.1.

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

The ESD Component Reports (see Section 5) contain the available objectives, indicators and performance measures for measuring the effectiveness of the management arrangements for the AIMWTMF. The performance measures used within this report will be reported against in the future State of the Fisheries Reports. In addition, this report will be formally incorporated into the management regime and decision making process for the 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 AIMWTMF fishery provide 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 control measures based upon limiting the number of vessels allowed to operate in the fishery and the amount (and type) of gear each of these boats may use.

These arrangements have been varied during the past years to ensure that management remains appropriate to achieve the sustainability objectives for the fishery. Thus there have been changes to the opening of the fishing season based on pre-season spawning surveys; changes to compliance policing (eg VMS fitted to vessels); changes to gear requirements (eg use of BRDs); and changes to fishing grounds (eg permanent and temporary closures).

Contain the means of enforcing critical aspects of the management arrangements

The Department of Fisheries, WA employs operational staff to ensure compliance with the critical aspects of the management arrangements for this fishery. This includes at-sea patrols to ensure restrictions on gear and other operational rules are being adhered to while closed seasons and areas are enforced by both VMS and at-sea patrols. Currently, there are approximately 2 at-sea patrols conducted with most compliance checks done at port prior to the vessel going out to sea.

The Department of Fisheries is currently undergoing a compliance risk assessment for each fishery. It is intended that this risk assessment will enable the Department to better direct resources to further increase the effectiveness of the limited compliance

activities. It is expected that the compliance risk assessment will be completed for this fishery by 2005.

Given the value of the 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.

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 for each fishery through the completion of the "State of the Fisheries" report. This is updated and published each year following a review 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. See Section 5.4.3.1 Assessments and Reviews for more information.

The ESD Component Reports contain a comprehensive performance evaluation of the fishery based upon the framework described in the ESD policy (Fletcher, 2002). This includes the development of objectives, indicators and performance measures for all aspects of this fishery and includes 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

The Department 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.

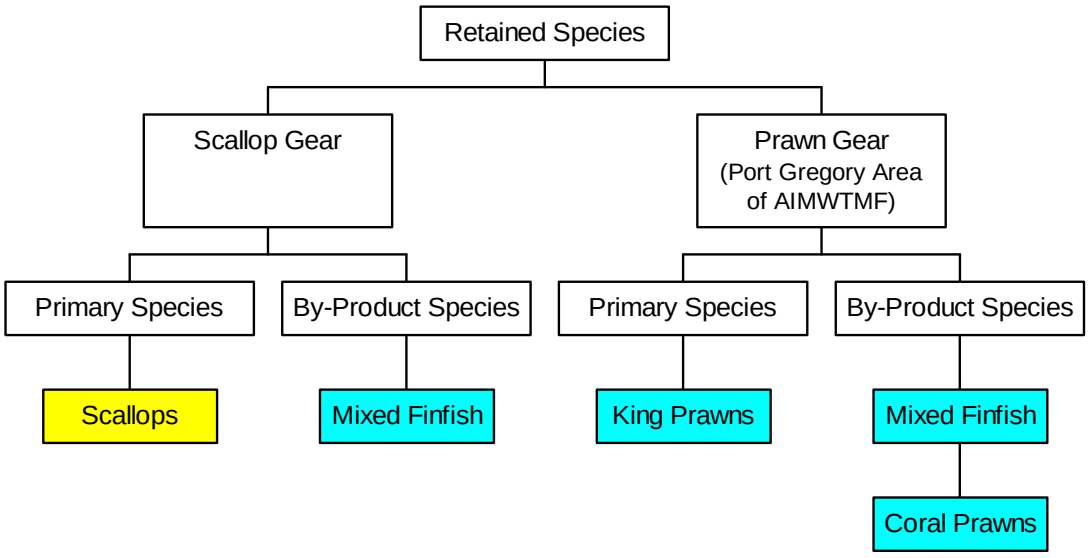
Require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy

The management regime complies with all relevant threat abatement plans for species where there is an interaction. Details are provided in the 'non-retained species' Section of the ESD Report (Section 5.2). A Bycatch Action Plan will be developed for this fishery using the information provided in this application. In addition the management for all WA fisheries adhere to the relevant international agreements such as the *International Convention for the Prevention of Pollution from Ships* (MARPOL) and the *United Nations Convention on the Law of the Sea*.

PRINCIPLE 1 OF THE GUIDELINES

OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVELS OF TARGET SPECIES

A 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 AIMWTMF using scallop and prawn gear is shown above. The target species for the fishery when using scallop gear is saucer scallop (*Amusium balloti*) and has been assessed with appropriately detailed reports having been compiled. Only the saucer scallop was caught in sufficient quantities by this fishery to warrant detailed attention and a full report even though it was only given a **Low Risk** (Section 5.1.1.1). Only one by-product species group was identified as being retained when fishers were using scallop gear, mixed finfish. In the Port Gregory Area of the AIMWTMF fishers use prawn gear to target western king prawns (*Penaeus latisulcatus*). Two by-product species were identified, mixed finfish and coral prawns. The take of mixed finfish as a by-product species group in the Port Gregory Area and the rest of AIMWTMF were considered together in Section 5.1.2.1 and were given a **Negligible Risk** rating. As a result of the risk level given to mixed finfish only a brief justification was required. The by-product species of coral prawns in the Port Gregory Area of AIMWTMF was given a **Negligible Risk** rating thus requiring only a brief justification (Section 5.1.1.2).

An assessment of the current performance demonstrates for the fishery that scallops and western king prawns are being maintained above levels necessary to maintain ecologically viable stock levels. Thus, in summary:

- An annual biological survey in the AIMWTMF is conducted and designed to measure the abundance of residual stock thus providing an index of post-spawning stock abundance. This survey is conducted between October/November and is used to estimate the catch available for the following season. The setting of the closing date each year allows for a limit on the season and ensures that newly settled recruits are not targeted at the end of the season thus allowing an adequate level of spawning for the following spawning period.
- Western king prawns are a minor target species for the AIMWTMF in the Port Gregory Area. Over the last ten years the average annual catch has only been 600 kg.
- The level of capture of other by-product species by this fishery is too small to have a significant impact on their dynamics.

Consequently, this fishery is meeting the requirements of Principle 1.

Information Requirements

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

Data are collected through a combination of fishery dependent and fishery independent systems, many of which have been in place for decades. These on-going monitoring programs are supported by a long history of research programs on the biology and ecology of scallops along the west coast of WA.

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. The requirements are summarised as follows:

Monitoring Program	Information Collected	Robustness
Fishery independent survey	Annual biological survey that measures the abundance of residual stock and provides an index of post-spawning stock abundance since 1997.	High
Voluntary daily logbooks	Filled out since the mid 1980's. Hours fished, areas of operation, and estimated catch per trawl. Completed by 100% on an annual basis since 1997.	High
CAESS returns	Monthly catch and days fished. Compulsory since the inception of the fishery.	Moderate
Processor unload records	Scallop landings.	High
VMS	Location and speed of vessels – used by Department of Fisheries for managing compliance with closures.	High

	Since 2001 in AIMWTMF.	
Climatic data	Monthly Fremantle Sea Level data- used to estimate strength of Leeuwin Current; Rainfall data; Wind data and Swell Height Conditions.	High

Assessments

1.1.2 There is a robust assessment of the dynamics and status of the stock dynamics and status for the target species. Review should ideally take place every year, and no greater than three years should elapse between reviews.

The status of the stock for the AIMWTMF is determined annually from a pre-season (October - November) fishery-independent survey of recruit and residual stock levels. This survey provides the data on the relative abundance of these 2 classes of scallops for the decision making process about the start and end dates of the fishery. This allows for proper management of spawning stock levels. A relationship between the survey abundance and the following seasons catch has been determined using survey information since 1997 (Figure 10). The variable ending date, which is determined by the results of these surveys, ensures that there will always be sufficient spawning irrespective of the level of recruitment.

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 reported annually within the State of the Fisheries Report.

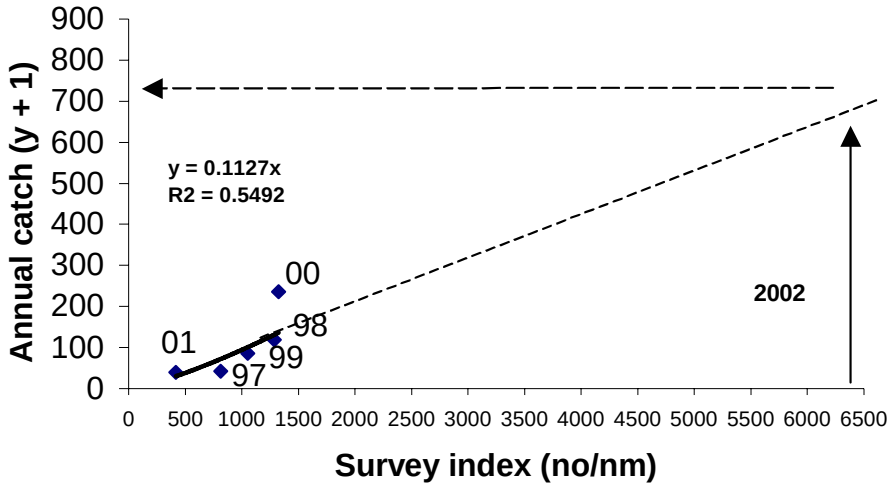


Figure 10 Relationship between survey index and following seasons catch (years indicate year of survey).

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

The distribution of this species of scallop has been well documented, occurring from Esperance to Broome with a number of locations where there are commercial abundances in WA (see also Figure 6 located in the Background Section).

Additionally, *Amusium balloti* occurs from Queensland to New South Wales in eastern Australia. It is also commercially harvested in the eastern states but the distribution of the east and west populations of the saucer scallops are separated across the northern Australian waters (see Section 2.2 for more information).

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

Within the list of monitoring programs outlined above for the fishery, data covering each of these sources of removal are outlined. Given the nature of this fishery, only the estimates of removals by the commercial sector are required and these are collected on a daily to monthly basis during the fishing season. There are no recreational or indigenous fisheries for scallops in Abrolhos Islands. Furthermore, there is a minimal likelihood of a significant level of illegal capture of scallops by the commercial fleet.

Sector	Catch Data Collected	Frequency
Commercial	Fishers monthly returns, Processor unload records, Voluntary daily logbooks.	Daily or monthly during the season.
Recreational	N/A	N/A
Indigenous	N/A	N/A
Illegal	N/A	N/A

1.1.5 There is a sound estimate of the potential productivity (maximum safe long term yield) of the fished stock/s.

The status of the stock is determined from a pre-season survey of recruitment and residual stock conducted between October and November. This survey provides the data for the decision making on the start date of the fishery and allows for the management and presence of the spawning stock from year to year. The level of recruitment of this species (as with all species of scallops) is highly variable and as a result the catch varies greatly from year to year (Figure 11).

Over the last 17 years, scallop landings have varied greatly in this fishery from around 44 to 2,634 whole weight tonnes (8.8 to 526.7 meat weight tonnes) (Figure 11). Scallop landings have depended primarily on the strength of recruitment in the previous years, which is largely environmentally driven (see external drivers in Section 5.1.1.1) and the spawning stock size has not been a significant factor in determining subsequent recruitment at the levels of spawning stock so far experienced.

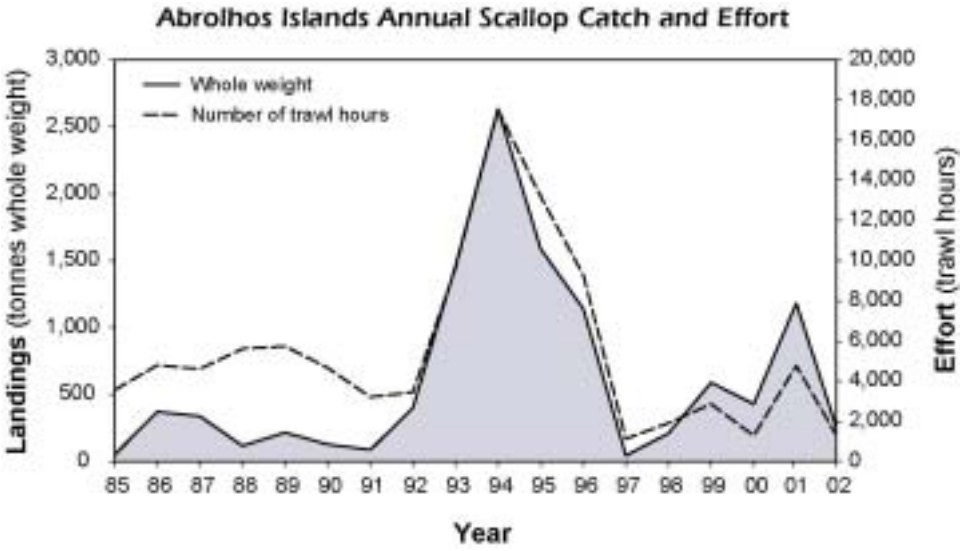


Figure 11 Annual scallop landings (whole weight) for the AIMWTMF, 1985-2002.

Management Responses

1.1.6 There is a limit reference point, which is the biological and/or effort bottom line beyond, which the stock should not be taken.

Due to the significant correlation that has been determined between the abundance of residuals and the following year's catch (Joll and Caputi, 1995a), annual management arrangements can be tailored to the expected abundance of scallops (shown in Figure 10). An adequate level of spawning occurs, as fishing takes place after the spawning season is complete. The opening date is normally set as the first Tuesday in April and the fishery closes no later than 30 June each year so that newly settled recruits are not targeted at the end of the season which ensures an adequate level of spawning is present during the following spawning period. The actual time fishing ceases in any one year is economically driven with fishers stopping around 5 –7 kg/hr or 100-150 kg/day. This has been successful in maintaining the stock for the past 13 years. The full justification for selecting these reference points and the current performance against these measures are described in Section 5.1.1.1.

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

A full description of the management arrangements for the commercial fishery can be found in the management plan which may be viewed on the State Law Publisher website (see Section 4 General Guidelines). A full discussion of the main regulations and their justifications are located in Section 2.2. In summary, these arrangements include:

- Limited number of vessels operating in fishery.
- Closed season generally between 1 July and 1 April the following year.
- Permanent area closures.
- Crew restrictions.

- Gear controls that include unitising of fishing gear (net size) with one headrope unit converting to 4 fathoms. The entire entitlement is 46 units, or 184 fathoms.
- Requirement for VMS on all fishing vessels.

Significant effort is put into ensuring adequate compliance with these regulations. This includes at-sea patrols to ensure restrictions on gear and other operational rules are being adhered to while closed seasons and areas are maintained by both VMS and at-sea patrols.

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

The relatively small area of operation of this fishery (over sand habitat) combined with the short time the fishery operates (only a few months per year for scallop; average 13 days per year for prawn trawlers), the large mesh size (scallop only) used and the slow speed of trawling results in this fishery only catching relatively small amounts of by-product species. Full descriptions of the information available and the levels of risk of impact on these by-product species from the fishery are located in sections 5.1.2.1 and 5.1.2.2. None of the by-product species were rated as having sufficient risk to require specific ongoing monitoring except for the monthly return information on landed catches.

Mixed Finfish- Summary - AIMWTMF
ERA Risk Rating (C0 L6 NEGLIGIBLE)

Less than one tonne of mixed finfish species are recorded as landed in this fishery and the prawn fisheries annually. The level of catch is not likely to have any impact on the stock. The introduction of BRDs in 2002/03 will further reduce the amount of fish taken by trawl in the fishery.

Coral Prawns- Summary
ERA Risk Rating (C0 L6 NEGLIGIBLE)

Coral prawns (more than one species of small prawns) are retained as a by-product of the prawn fishery in Port Gregory (located within the AIMWTMF). Less than one tonne of coral prawns are recorded as landed in this fishery annually.

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

Management actions taken over the past 17 years have been effective and there is, therefore, an extremely high probability that they will continue to achieve the main objective of maintaining the scallop spawning biomass for the fishery.

In the case of the AIMWTMF the ability to directly monitor stock abundance levels through a survey provides the data for the decision-making on the opening date of the fishery. This allows for the annual management arrangements to be tailored to the

expected abundance of scallops which ensures that adequate levels of breeding stock are present during the spawning period as well as ensuring the sustainability of this fishery. Continued monitoring of the level of stock abundance will be undertaken and if there were a reasonable likelihood that the performance limit will be reached, increased management arrangements would be implemented.

Strategies, which are readily available to offer further protection to the breeding stock for the fishery, if required, include:

a. Changes to the timing of the start of the fishing season.
b. Reduction in the length of the fishing season.
c. Area closures.

OBJECTIVE 2. RECOVERY OF STOCKS

Where the fished stocks 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 fishery that are currently below defined reference points/limits. However, the management arrangements are such for the AIMWTMF that it could be managed in a way, which would promote recovery in the event of the fishery falling below a defined reference point.

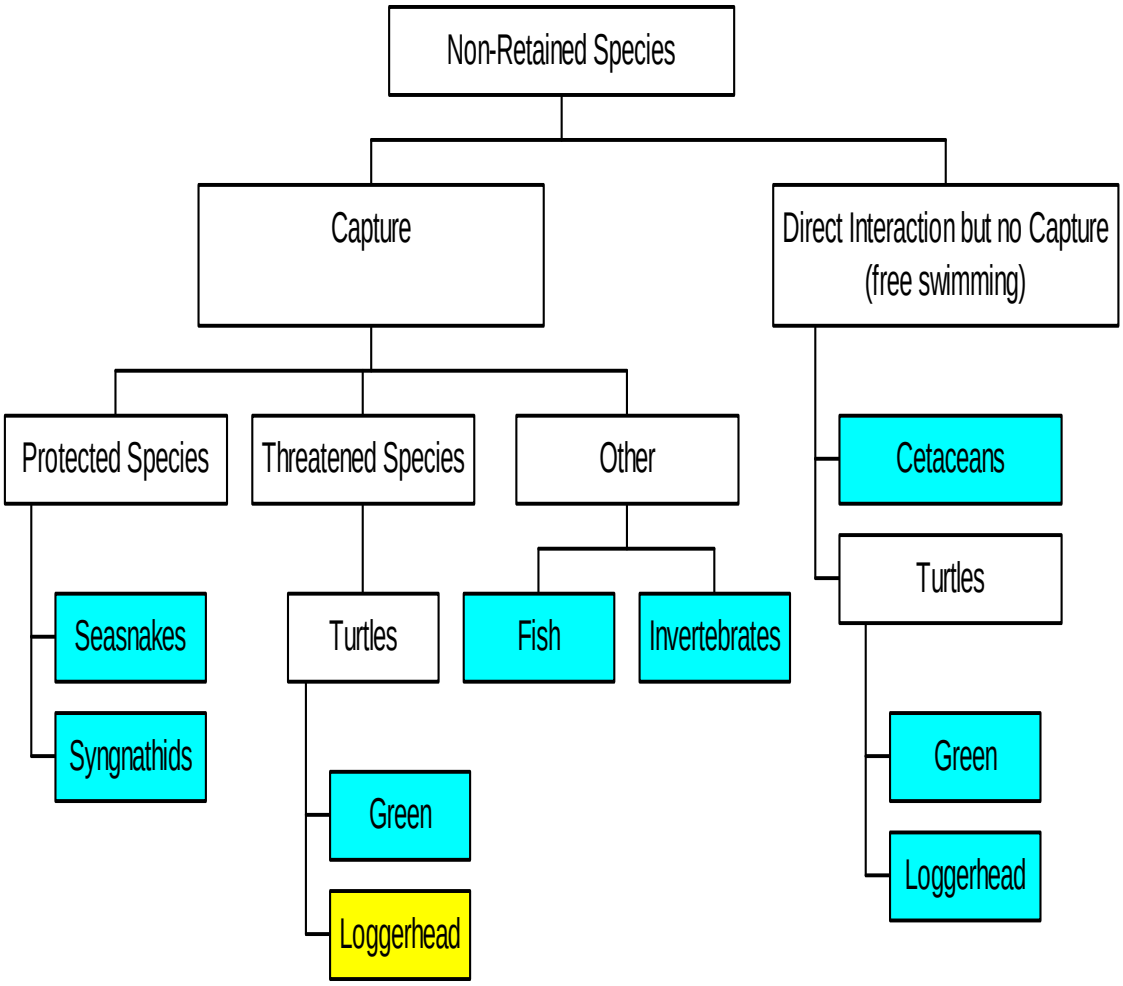
PRINCIPLE 2 OF THE GUIDELINES

OBJECTIVE 1. BYCATCH

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

There is limited information regarding the historical level and nature of bycatch in the fishery. Bycatch composition information is obtained through the pre-season surveys as well as through logbooks filled out by the fishers themselves. Researcher observations in the SBSMF indicate that the bycatch numbers are relatively lower in scallop trawling fisheries than prawn trawling due to the larger mesh size nets used, clumped distribution of the scallops and lower trawling speeds. All the bycatch species identified by the component tree were ranked as either negligible or low risks. Three of the species are not actually captured in the net but on rare occasions interact with the trawling operations. The threatened and protected species components of this group (eg turtles, syngnathids, seasnakes) are covered in objective 2.2; the remaining non-retained (bycatch) species are covered under objective 2.1.

Comprehensive reports on each of these bycatch (non-retained) species are presented in Section 5.2 NON-RETAINED SPECIES. These assessments indicate that the performance of the fishery is currently adequate in not threatening any of the bycatch (non-retained) species and is therefore meeting 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.

There is limited information on the nature and volume of bycatch species for the fishery. As was previously stated information on the bycatch composition has come from pre-season surveys and logbooks, which the fishers fill out themselves. In addition, information has come from data that has been collected in other similar fisheries such as the SBSMF. In July 2000, a two-year FRDC funded research program on the implementation of BRD began. This included an observer program designed to record, identify and quantify bycatch in the SBSMF. The information gathered in this research program has been utilised in the assessment for the 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 each of the identified non-retained/bycatch species (including those with direct interaction but no capture) was completed (see Section 3.4 for details). In the capture category for non-retained species, this assessment concluded that the fishery was of negligible risk to discarded fish and invertebrates.

Discarded Fish – Summary
ERA Risk Rating (C0 L5 NEGLIGIBLE)

Since trawling is a non-selective form of fishing other species such as adult small species and juveniles of other larger fish are caught. Since these fish are generally not of commercial value, they are discarded overboard. Teleost species caught are generally dead when discarded however elasmobranchs are usually returned alive. It is generally agreed that the extent of bycatch generated from scallop trawling is relatively minimal compared to that generated by prawn trawling. In general, the bycatch generated by this fishery through the prawn and scallop fishing would be minimal.

The reason for the low amount of discards is threefold for scallop trawlers in the fishery. Firstly, the larger 100 mm mesh size used on the scallop nets (designed to avoid the capture of prawns and reduce the catch of small scallops) allow a large proportion of fish to escape from the net, meaning that very few fish that enter the net are retained. Secondly, the clumped distribution of scallops allows trawlers to target aggregations of scallops without collecting high numbers of non- targeted species. Thirdly, the lower trawling speed (2.5 – 3 knots) probably allows some of the stronger swimming species to escape via the mouth of the net.

While the prawn trawlers operate with a larger mesh size than the scallop trawls the volume of bycatch for this fishery would be very small compared to other trawl fisheries as the amount of fishing is limited to only 13 days per year on average for the last 10 years. For full details see 5.2.1.5.

Invertebrates – Summary
ERA Risk Rating (C0 L5 NEGLIGIBLE)

The configuration of the trawl gear and the mesh size largely precludes the capture of invertebrate species living on or in the substrate. This design minimises the capture of invertebrates other than scallops. Additionally, diver and underwater video observations suggest that the scallop trawl areas of Abrolhos Islands are typically sand bottom and contain few large invertebrates (Dibden and Joll, 1998). Consequently, the Risk Assessment concluded that the fishery would only have a negligible impact on each of these species. For full details see 5.2.1.6.

Management Responses

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

The combination of seasonal and area closures and the relatively small area trawled in the fishery plus the limited number of licences in which this fishery operates within greatly reduces the impacts on all of these affected species.

In addition, the introduction of BRDs within all nets in the AIMWTMF will further reduce the overall bycatch taken by this fishery, in particular turtles and large species.

BRDs are now compulsory in this fishery. As outlined in Section 2.1.3 the grid specifications are as follows:

a) a rigid inclined barrier (installed at an angle no greater than 60°), comprising bars that are attached to the circumference of the net which guides animals and/or objects (including turtles) towards an escape opening forward of the grid;
b) an escape opening with the following minimum measurements when measured with the net taut:
    i) 75 centimetres across the widest part of the net; and
    ii) a perpendicular measure of 50 centimetres from the midpoint of the width measure in i) above.
c) a maximum vertical bar clearance spacing of 20 centimetres;
d) *an optional horizontal opening at the bottom of the grid, no higher than 30 centimetres.*

2.1.4 An indicator group of bycatch species is monitored.

The minimal risks associated with this group of non-retained species, results in it being unnecessary to monitor any of these species on a regular basis.

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

The risks associated with this group of species will be reassessed at the next major review of the fishery. This will occur within five years as a requirement of the WA ESD policy.

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

Given the relatively low levels of interactions of the fishery with non-retained species and the introduction of BRDs in AIMWTMF in the 2002/03 season makes it likely that there will continue to be only minimal and acceptable levels of impact on this group of non-threatened/not protected species by the fishery.

OBJECTIVE 2. PROTECTED SPECIES

The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or 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.

As previously mentioned, there is limited direct information available on the nature and volume of bycatch species for the AIMWTMF. Information has come from pre-

season surveys, logbooks and data that have been collected in other similar fisheries such as SBSMF. These results have been utilised in the assessment of this fishery. In 2004 formal recording of interactions with protected/listed species was initiated 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 each of the identified non-retained/bycatch species (including those with direct interaction but no capture) was completed (see Section 3.4 for details). In the capture category for non-retained species, this assessment concluded that the fishery was a low risk to seasnakes and syngnathids. The AIMWTMF was a negligible risk to loggerhead and green turtles. For the direct interaction but no capture category for non-retained species, this assessment concluded that the AIMWTMF was of negligible risk to loggerhead and green turtles.

Capture

Loggerhead and Green Turtles – Summary
ERA Risk Rating (C0 L6 NEGLIGIBLE)

Loggerhead turtles (*Caretta caretta*) and green turtles (*Chelonia mydas)* have been caught incidentally in the AIMWTMF over the period of its operation in very low numbers. The loggerhead and green turtles are resident in low numbers in the waters off the Abrolhos Islands (Webster *et al.*, 2002). Both of these species are towards the southern extent of their range, and do not breed in the Abrolhos because water temperatures are too low (*Dr R. Prince, Department of Conservation and Land Management, pers. comm.*). This, coupled with the introduction of BRDs in 2003 will exclude turtles from trawls.

Syngnathids – Summary
ERA Risk Rating (C1 L2 LOW)

Syngnathids are occasionally caught in the AIMWTMF and are generally discarded, presumed to be dead. Results from an observer program for the prawn trawling fisheries suggests that very low numbers of syngnathids are caught in the order of 1 per night across the entire fleet. The number caught by the scallop fleet is likely to be lower than this, given the larger mesh sizes and slower speeds used by the fleet. A full rationale for the minor risk rating for syngnathids is documented in section 5.2.1.2.

Seasnakes – Summary
ERA Risk Rating (C1 L2 LOW)

Seasnakes are caught in low numbers in the AIMWTMF but are generally returned to the water in a live state and have relatively good survival following their return to the water. The full rationale for the minor risk rating for seasnakes is documented in section 5.2.1.3.

Direct Interaction but no Capture

Green and Loggerhead Turtles – Summary
ERA Risk Rating (C1 L4 LOW)

The boats in AIMWTMF could possibly interact (without capture) with loggerhead and green turtles. There have been no reports of turtles interacting with trawl vessels (eg being knocked by boats or nets but not being captured), but formal recording of such events that might occur has not been attempted. Furthermore, the relatively slow speed at which trawlers travel is also likely to be a mitigating factor. Most of the reports of marine wildlife being hit by boats etc. involve high-speed boats that leave limited time for an animal to move out of the path of the boat. Scallop trawlers travel at relatively slow speeds of 2 to 3 knots and up to 9 knots while steaming, and as such are unlikely to hit wildlife where avoidance behaviour is not impeded. The full rationale for the minor risk rating for green and loggerhead turtles is documented in section 5.2.2.1.

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 fishery.

Management Responses

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

As previously mentioned above in 2.1.3, with the introduction of BRDs in 2003 in the AIMWTMF, it is expected that the quantity and likelihood of bycatch captures will be minimised.

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 relatively low levels of interactions of the fishery with non-retained species and the introduction of BRDs, it is likely that the current situation of only having minimal and acceptable levels of impact on these threatened species by the fishery will continue or diminish further. As was previously mentioned in 2004 fishers within the AIMWTMF were required to record all interactions with protected/listed species in the logbooks. The Department of Fisheries conducted pre-season briefings with the operators within the fishery and supplied pamphlets identifying the turtle and seasnake species they were likely to encounter to increase accurate identification. Nonetheless, if and when monitoring data becomes more available, the suitability of the current performance limits may need to be reviewed. If they are inappropriate

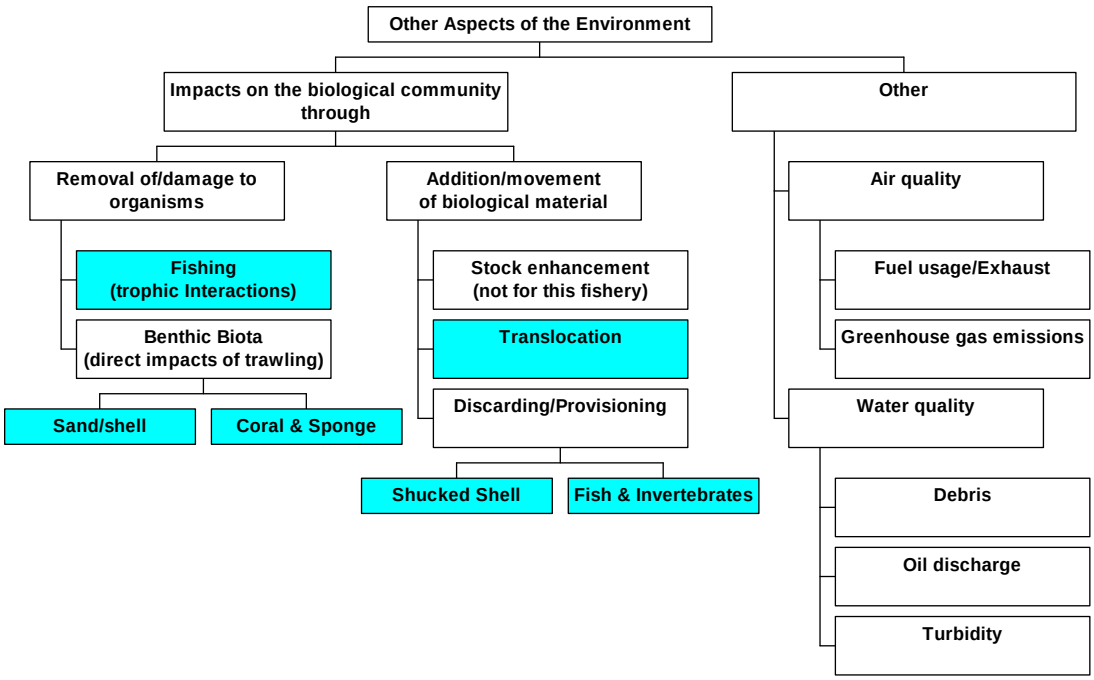
and/or the level of interactions increases, appropriate alterations to practices will be taken.

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 this fishery are shown in the following 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 fishery, four (trophic interactions, impacts on sand/shell, coral/sponge habitat and discarding/provisioning) were rated as low risk, two (translocation and discarding scallop shells) were rated as negligible. Consequently, the current performance for the fishery 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 collected 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 for a sensible assessment of the level of risk to be determined. This information includes data directly related to the fishery in terms of the stock assessment and status of scallop stocks, levels of catch and effort, gear designs, area swept by the fleet and understanding of spatial and temporal closures. There are a number of research publications that provide valuable evidence on the effects of otter-trawling on sand and coral communities, and trophic structures in similar fisheries/environments in other parts of Australia and elsewhere. Consequently, the

levels of information available for most issues identified allowed a sensible assessment of the level of risk to be determined.

Assessments

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 fishery (see component tree for issues). The identified issues that were assessed and a summary of the outcomes are located in Table 7 – complete justifications are located in the performance reports in Section 5.3.

Table 7 Summary of risk assessment outcomes for environmental issues related to the AIMWTMF.

ISSUE	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
TROPHIC INTERACTIONS:			
Impact of taking retained and non-retained species from the environment	Low	The total level of biomass (excluding shell) taken by this fishery is very small. None of the species taken are known to be an exclusive food source for any predator and no predators are taken in any quantity.	**5.3.1.1**
IMPACTS ON BENTHIC BIOTA:			
Sand/shell	Low	The fishers operate over very small proportions of the licence areas in the fishery and therefore few areas are impacted from trawling. Studies elsewhere have shown only minor and short-lived damage from this type of trawling in sandy areas. Furthermore, trawling occurs for a maximum of 3 months in the fishery, which allows for the habitat to recover, if needed.	**5.3.1.2**
Coral/sponge	Low	There are coral areas around the Abrolhos Islands but these areas are either not trawled or closed to trawling (i.e. reef observation areas). Scallop trawlers also do not operate in coral/sponge habitats due to the damage that can occur to the nets when trawling over hard objects. As a result 37% of the total area is permanently closed to trawling.	5.3.1.3

ADDING OR MOVING MATERIAL:			
Translocation	Negligible	The Leeuwin Current provides a natural connection between the trawling grounds and Fremantle (where most vessels go to for seasonal maintenance).	5.3.2.1
Discarding/Provisioning	Low	The low number of fish discards combined with the low number of operators and the large area over which the organisms are discarded results in any impacts being diffused. Introduction of BRDs in the AIMWTMF will reduce the amount of bycatch generated by this fishery, which in turn reduces the amount of discards.	5.3.2.2
Discarding Scallop Shells	Negligible	Discarding of scallop shells has been an issue in the AIMWTMF in the past when smaller boats were sometimes used. During rough conditions, shells were shucked and discarded in small discrete sheltered areas leading to an accumulation of shell. However, the AIMWTMF now uses mostly large boats and covers large areas thus allowing the discarded shells to be spread out over the fishery area.	5.3.2.3

Thus, all of these issues were rated as NEGLIGIBLE or LOW risk.

Management Responses

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.

The most important management action that ensures there is minimal impact on the broader ecosystem is to ensure that there is an adequate level of spawning stock to ensure recruitment is not affected by spawning stock abundance. Furthermore, while scallops are filter feeders, removing small organic material and particulates from the surrounding water they are only one of a large number of such feeders in this region. Furthermore, they are not the sole prey for any species. It should also be noted that recruitment and stock abundance are highly variable from year to year and therefore the ecosystem does not depend on relatively static levels of scallop stock abundance. Consequently, by ensuring adequate levels of spawning stock serves to achieve two objectives (eg a sustainable fishery and minimising impacts on any trophic interactions). Other management measures such as gear restrictions, spatial and seasonal closures and limiting the number of operating vessels also further minimise the potential for impacts on bycatch species and other indirect impacts. In addition, planned future research will help to further minimise the potential for impacts in the future by expanding our knowledge of the broader ecosystem.

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 indicated by application of the precautionary approach.

None of the issues was found to be of sufficient risk to require specific target levels as they are effectively covered by the other management arrangements and trigger points (e.g. recruitment level of scallops). However, the management arrangements are sufficiently flexible and dynamic to be capable of responding to a future problem.

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

Given that the risk assessment identified that under current management arrangements there have been minimal or negligible impacts from the fishery on the broader ecosystem even after around many years of fishing, it is highly likely that the fishery will continue to meet the objectives of having acceptable levels of impact. If future studies indicate that further management is required for various habitat types and the composition and abundance of by-product and/or bycatch species, then appropriate actions will be developed.

OVERVIEW TABLE

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

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	DEH Guidelines Covered	Actions
RETAINED SPECIES (Component Tree)						1.1	
5.1.1.1 Scallops	Yes	Annual biological survey which measures abundance of residual stock.	The Residual Stock index determines a predicted catch that should set the length of the season.	Acceptable	Medium	1.1.1 – 1.1.7	Continue and improve current monitoring, management and assessment arrangements
5.1.1.2 Western King Prawns	No- Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Review Risk at Next Major Assessment
5.1.2.1 Mixed Finfish	No- Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Review Risk at Next Major Assessment
5.1.2.2 Coral Prawns	No- Negligible Risk	N/A	N/A	N/A	N/A	1.1.1 – 1.1.7	Review Risk at Next Major Assessment
NON-RETAINED SPECIES (Component Tree)						2.1 and 2.2	
5.2.1.1 Loggerhead and Green Turtles	No- Negligible Risk	N/A	N/A	N/A	N/A	2.2.2 – 2.2.6	Review Risk at Next Major Assessment
5.2.1.2 Syngnathids	No- Low Risk	N/A	N/A	N/A	N/A	2.2.2 – 2.2.6	Review Risk at Next Major Assessment
5.2.1.3 Seasnakes	No- Low Risk	N/A	N/A	N/A	N/A	2.2.2 – 2.2.6	Review Risk at Next Major Assessment

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	DEH Guidelines Covered	Actions
5.2.1.4 Discarded Fish	No – Negligible Risk	N/A	N/A	N/A	N/A	2.1.1 – 2.1.6	Review Risk at Next Major Assessment
5.2.1.5 Invertebrates	No- Negligible Risk	N/A	N/A	N/A	N/A	2.1.1 – 2.1.6	Review Risk at Next Major Assessment
5.2.2.1 Interaction with Turtles	No – Negligible Risk	N/A	N/A	N/A	N/A	2.1.1 – 2.1.6	Review Risk at Next Major Assessment
GENERAL ENVIRONMENT (Component Tree)						2.3	
5.3.1.1 Trophic Interactions	No- Low Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment
5.3.1.2 Impacts to Sand/Shell Habitat and Ecology	No- Low Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment
5.3.1.3 Impacts to Coral/Sponge Habitat	No –Low Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment
5.3.2.1 Translocation	No- Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment
5.3.2.2 Discarding/Provisioning	No- Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment
5.3.2.3 Discarding Scallop Shells	No- Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment

5. PERFORMANCE REPORTS

5.1 RETAINED SPECIES

COMPONENT TREE FOR RETAINED SPECIES OF THE AIMWTMF

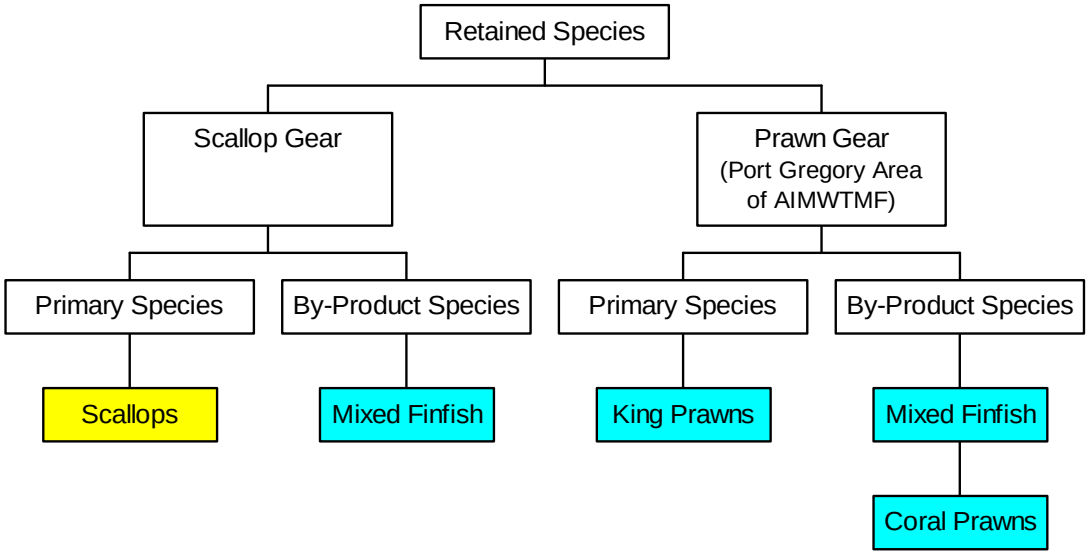


Figure 12 Component tree for the retained species.
Yellow boxes indicate that the issue was considered high enough risk to warrant having a full report on performance. Blue boxes indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.1.1 PRIMARY SPECIES

5.1.1.1 SCALLOPS

Rationale for Inclusion:

Scallops (*Amusium balloti*) are the main target species for the AIMWTMF.

ERA Risk Rating: Impact on breeding population (C2 L3 LOW)

In terms of consequence, fishing for scallops in the AIMWTMF was determined to have only a 'moderate' impact on the breeding population level. The dynamic management arrangements for this fishery are based on a pre-season survey that provides an estimate of the level of effort that can be placed on the stocks to optimise harvesting levels while sustaining breeding stock levels. The spawning period of scallops in this fishery is between August and February/March (Joll and Caputi, 1995a) and fishing does not commence until April so all catch consists only of post-spawning stock so there is no concern regarding security of the breeding stock (Harris *et al.*, 1999). This consequence was considered 'unlikely' to occur with management

designed to ensure that this moderate level of harvesting occurs. The overall risk rating is therefore 'low'.

Operational Objective

Ensuring there is sufficient breeding stock at the time of spawning to minimise the risk of recruitment overfishing.

Justification:

Scallops can be fished to reasonably low levels due to their life history strategies of short life span, high fecundity and high natural mortality. In the AIMWTMF the spawning period is between August and February/March ensuring that all stock is able to spawn before harvesting commences in April.

Indicator

An annual biological survey, designed to measure the abundance of residual stock provides an index of post-spawning stock abundance, which is independent of fishery catch records. The survey is usually carried out in October/November and is used to estimate the catch available for the following season. The opening date is normally set as the first Tuesday in April and the fishery closes no later than 30 June each year so that newly settled recruits are not targeted at the end of the season to ensure an adequate level of spawning is present during the following spawning period.

In addition, catch data from voluntary logbooks is collected on a daily basis. This information allows for an accurate assessment of the total effort in the fishery and spatial distribution of scallops in Abrolhos Islands because it provides the Department of Fisheries with information on hours fished, areas of operation and estimated catch per trawl. Independent data on the spatial operation of the fleet is also available from VMS.

Performance Measure

The Residual Stock index determines a predicted catch that should set the length of the season.

Justification:

Scallops in the Abrolhos Islands spawn between August to February/March and therefore spawning takes place before the opening of the fishing season in April. A significant correlation has been determined between the abundance of residuals in October/November and the following years catch and this allows annual management arrangements to be tailored to the expected abundance of scallops (Figure 13).

Since a spawning stock and recruitment relationship hasn't been experienced in this fishery, annual management arrangements are based on the relationship between residual abundance and following year's catch which has been successful in maintaining the stock for the past 13 years. The end of the season is currently set at no later than 30 June although in low catch years, the fishery has closed on 31 May.

The actual time fishing ceases in any one year is economically driven with fishers stopping at around 5 - 7 kg/hr or 100 - 150 kg/day.

Data Requirements for Indicator

Data Requirement	Availability
Fishery Independent Survey	Yes, since 1997.
Catch utilising commercial catch and effort information provided through voluntary daily logbooks completed by 100% fishers	Yes, available on an annual basis since 1997.
Monthly commercial CAESS returns	Yes.

Evaluation

Summary: The management arrangements provide adequate protection of the spawning stock as fishing commences after the spawning period in the AIMWTMF.

Scallop landings for the AIMWTMF have varied dramatically over the last 17 years (Figure 13) depending primarily on the strength of recruitment. Recruitment strength is largely independent of spawning stock size being environmentally driven (see external drivers section below).

The status of the stock is determined from a pre-season (November-December) survey of residual stock. A relationship between the survey abundance and the following seasons catch has been determined using survey information since 1997 (Figure 13).

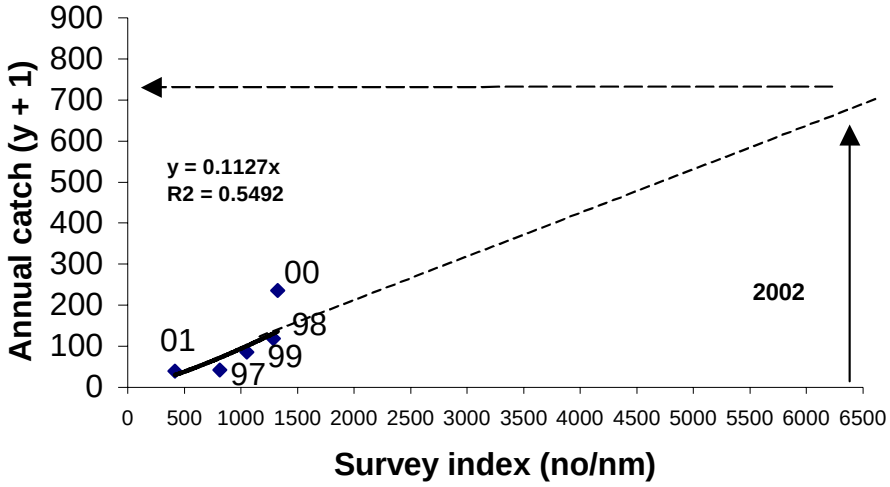


Figure 13 Relationship between survey index and following seasons catch (years indicate year of survey).

The total landings for the 2002 season were 195 t whole weight of scallops compared to 1,182 t whole weight in 2001 (Figure 14). The catch prediction for the 2002 season, based on pre-season survey, was between 200 and 300 t whole weight. The catch was just below this predicted catch range but still within the defined acceptable catch range for this fishery.

A total of 1,048 trawl hours (nominal effort) were recorded for the 2002 season, equivalent to 912 standardised trawl hours (standardised to 14 fathoms headrope length). This is much lower than the 3,998 standardised trawl hours recorded in 2001 owing to the much lower abundance of scallops in 2002 (Figure 14). This effort level represents a fishing season of 6 days' duration in 2002, compared to 21 days in 2001.

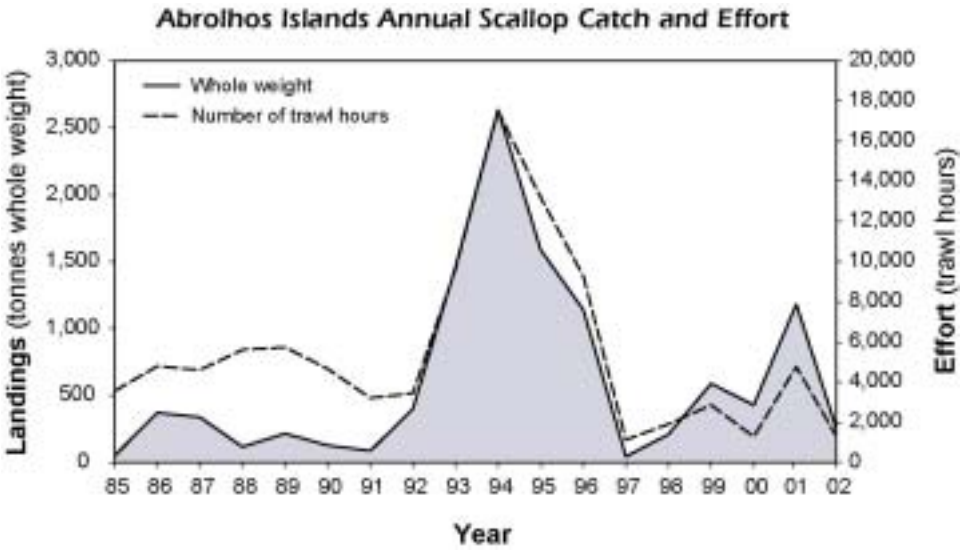


Figure 14 Annual scallop landings for the AIMWTMF, 1985–2002.

Using the November 2002 survey data, the projected catch range for 2003 is likely to be 2,900–4,350 t whole weight for the surveyed areas, which should result in a record catch for the Abrolhos Islands. During the survey, all areas showed evidence of moderate to high levels of recruitment.

Robustness
Medium

The estimates for AIMWTMF are considered relatively robust as they:

a) Provide a statistically demonstrated high degree of confidence.
b) They are direct estimates of residual strength.
c) Estimates are calculated by a source independent of the fishers.

Fisheries Management Response

Current: The AIMWTMF is managed through a series of input controls:

a) The number of licence holders.
b) The sizes of vessels that they can use.
c) Mesh size and ground gear regulations.
d) The annual fishing season is for a limited period

Furthermore, the Department of Fisheries management arrangements include:

- Compliance policing, which includes use of VMS;
- Gear checks;
- Monitoring of improvements in technology that may increase fishing efficiency; and
- Ensuring that any significant declines in the breeding population either from environmental effects or due to fishing are observed in time to implement appropriate management interventions.

Future: As pre-season surveys in this fishery began in 1997 the Department recognises the need to acquire more information on the relationship to increase the accuracy of the prediction of the catch (e.g. establishment of a relatively robust dataset). The Department is also investigating the implementation of recruit surveys in the fishery to further improve catch predictions.

Actions if Performance Limit Exceeded:

1. Strategies available to offer further protection to the breeding stock if required include:
   a) changes to the timing of the start of fishing season,
   b) a reduction in the length of the fishing season, and
   c) area closures.

Comments and Actions

There is a process of continual improvement in the on-going development and refinement of the methods used to determine stock estimates. This relates to both the collection of information and method of analysis. The use of the Geographic Information System (GIS) for analysing data has commenced for the AIMWTMF. This will provide the Department of Fisheries with more comprehensive data from which to generate the distribution and density of scallops and density of trawl activity in the Abrolhos Islands.

External Driver Check List

The high level of recruitment seen in 2002, following a very low catch season, highlights the dependence of recruitment success upon environmental conditions such as the Leeuwin Current rather than spawning stock levels, and illustrates the extreme annual variability in recruitment. As more years of pre-season survey and catch/effort data become available, the relationship between environmental factors and recruitment will be further evaluated.

The most significant risk factors in the context of external drivers are probably cyclonic activity and to a lesser degree the potential for significant environmental pollution (i.e. oil or chemical spills in key breeding areas) or habitat degradation. Major changes in circulation patterns caused by different climatic forces would have an impact on recruitment patterns.

5.1.1.2 WESTERN KING PRAWNS

Rationale for Inclusion:

Western king prawns (*Penaeus latisulcatus*) are a minor target species for the AIMWTMF in the Port Gregory area. Over the last 10 years the average annual catch of western king prawns is 600 kilograms by an average of two boats. In 2002, 1.1 t of king prawns and 0.6 t of coral prawns were reported as landed in the Port Gregory area.

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

In terms of consequence, fishing for prawns in the AIMWTMF was determined to have only a 'negligible' impact on the breeding population level. Only sporadic fishing (by only a few boats) occurs of king prawns in a limited area. This consequence was considered 'likely' to occur. The overall risk rating is therefore 'negligible'.

5.1.2 BY-PRODUCT SPECIES

5.1.2.1 MIXED FINFISH

Rationale for Inclusion:

Less than one tonne of mixed finfish species are recorded as landed in the AIMWTMF and prawn fisheries annually.

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

The level of catch by trawl is not likely to have any impact on the stock. The introduction of BRDs in 2002/03 will further reduce the amount of fish taken by trawl in the AIMWTMF.

5.1.2.2 CORAL PRAWNS

Rationale for Inclusion:

Coral prawns (more than one species of small prawns- *Metapenaeopsis* spp.) are retained as a by-product of the prawn fishery in Port Gregory (part of the AIMWTMF). Less than one tonne of coral prawns are recorded as landed in the AIMWTMF annually.

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

In terms of consequence, fishing for prawns in the AIMWTMF was determined to have only a 'negligible' impact on the breeding population level. Only sporadic fishing (by only a few boats) occurs of king prawns in a limited area. This consequence was considered 'likely' to occur. The overall risk rating is therefore 'negligible'.

5.2 NON-RETAINED SPECIES

COMPONENT TREE FOR NON-RETAINED SPECIES OF THE AIMWTMF

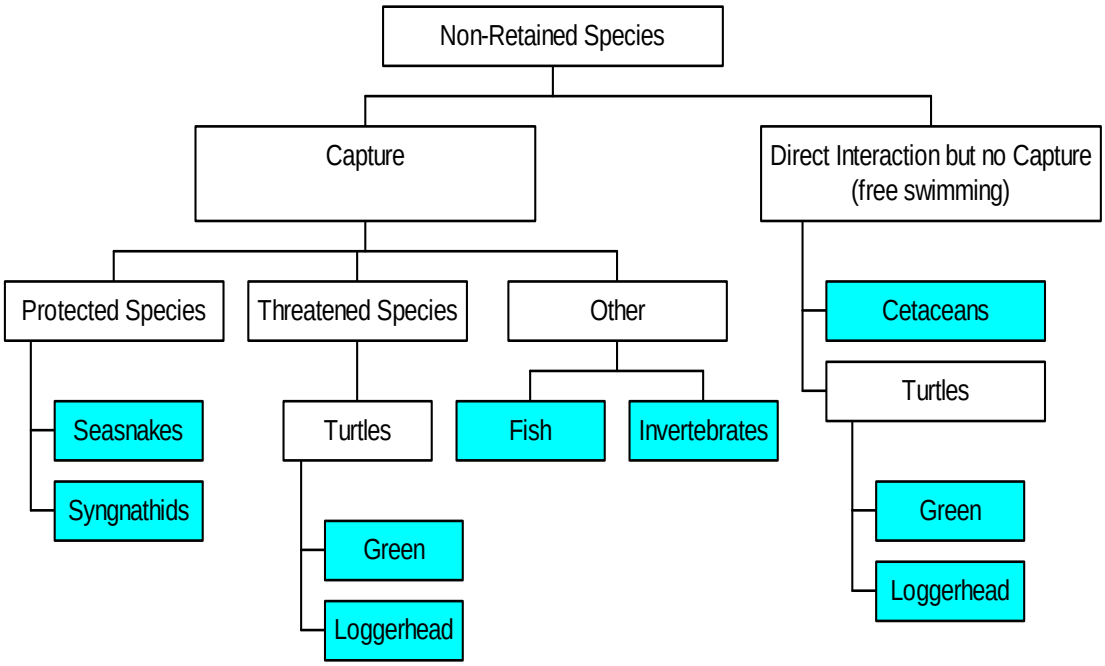


Figure 15 Component tree for non-retained species.

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 IN NETS

5.2.1.1 THREATENED/LISTED SPECIES LOGGERHEAD AND GREEN TURTLES

Rationale for inclusion:

Loggerhead turtles (*Caretta caretta*) and green turtles (*Chelonia mydas)* have been caught incidentally in the AIMWTMF over the period of its operation in very low numbers. Loggerhead turtles are considered threatened species under Commonwealth and the equivalent State wildlife conservation legislation as a result of the current status of their populations.

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

This component was considered a 'negligible ' risk, indicating that only a brief justification report is required. The determination of a negligible risk was based on the fact that:

- The loggerhead and green turtles are resident in low numbers in the waters off the Abrolhos Islands (Webster *et al.*, 2002). Both of these species are towards the southern extent of their range, and do not breed in the Abrolhos Islands because water temperatures are too low (*Dr R. Prince, Department of Conservation and Land Management, pers. comm*.).
- The introduction of BRDs in 2003 will exclude turtles from trawls.

5.2.1.2 PROTECTED SPECIES SYNGNATHIDS

Rationale for Inclusion:

Syngnathids are the collective group containing organisms such as seahorses, sea dragons and pipefish. Syngnathids are occasionally incidentally caught in the AIMWTMF are generally discarded, presumed to be dead. Catch rates of all small finfish bycatch are low due to the 100 mm mesh size. Syngnathids are a protected species under the EPBC.

ERA Risk Rating: Impact on breeding population (C1 L2 LOW)

The potential consequence of the scallop trawling operations on breeding levels of syngnathids was considered 'minor'. Due to the relatively short fishing season low numbers of syngnathids would be caught. It was considered 'unlikely' that this level of consequence would result, as trawling occurs over areas that are mostly unfavourable to syngnathids, which are known to favour seagrass and detached algal communities.

Opportunistic data will be collected on the catch of syngnathids, by observers and other technical staff on the vessels from time-to-time. This data will continually be compiled to determine a better profile of syngnathid catches in this fishery.

5.2.1.3 PROTECTED SPECIES SEASNAKES

Rationale for Inclusion:

Seasnakes are caught in low numbers in the AIMWTMF and are returned to the water alive generally. All species in the family Hydrophiidae and family Laticaudidae are considered protected under the Commonwealth legislation.

Five species of seasnakes have been recorded as far as the lower west coast, including the Shark Bay seasnake, *Aipysurus pooleorum,* which is endemic to the region (Storr *et al.*, 2002).

ERA Risk Rating: Impact on breeding population (C1 L2 LOW)

During the risk assessment workshop, this component was considered a 'minor' risk due to the following:

- Anecdotal evidence suggests that caught seasnakes are alive and aggressive.
- A study of seasnake survival after being caught by trawlers in the Gulf of Carpentaria indicated that 60% of seasnakes survived (Wassenberg *et al.*, 1994).
- Most species recorded in the lower west coast are not known to be vulnerable.

5.2.1.4 DISCARDED FISH

Rationale for Inclusion:

Trawling is a relatively non-selective form of fishing. As a result, while trawling for scallops, other species are caught. Among these other species are small fish (which include both adults of small species, and juveniles of other larger fish species). These fish are generally not of commercial value and are discarded. Teleost species caught are generally dead when discarded however elasmobranchs are usually returned alive.

The impact of this source of mortality on the sustainability of those caught and discarded species is explored here.

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

It is generally agreed that the extent of bycatch generated from scallop trawling is relatively minimal compared to that generated by prawn trawling.

The reason for the low amount of discards in the scallop fishery is threefold. Firstly, the larger 100 mm mesh size used on the scallop nets (designed to avoid the capture of prawns and reduce the catch of small scallops) allow a large proportion of fish to escape from the net, meaning that very few fish that enter the net are retained. Secondly, the clumped distribution of scallops allows trawlers to target aggregations of scallops without collecting high numbers of non- targeted species. Thirdly, the lower trawling speed (2.5 – 3 knots) probably allows some of the stronger swimming species to escape via the mouth of the net.

Even though the prawn trawlers operate with a larger mesh size than the scallop trawls the volume of bycatch for this fishery would be very small compared to other trawl fisheries as the amount of fishing is limited to only 13 days per year on average for the last 10 years.

Since the number of individuals discarded is minor, it was determined ‘likely’ that this would have a ‘negligible’ impact on the breeding populations of those species.

5.2.1.5 INVERTEBRATES

Rationale for Inclusion:

Trawl gear interacts with the sea bottom where many of these species reside, and therefore there is a necessity to investigate this issue.

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

It was only considered 'possible' that the AIMWTMF could even have a 'negligible' impact on invertebrate breeding populations in the Abrolhos Islands. This low ranking is due to the following:

- Diver and underwater video observations suggest that the scallop trawl areas of Abrolhos Islands are typically sand bottom and contain few large invertebrates (Dibden and Joll, 1998*)*.
- The trawl gear is configured in a manner that largely precludes the capture of invertebrate species living on or in the substrate. The gap of approximately 150 to 300 millimetres between the ground chain and the footrope of the net is designed to reduce damage to the net through contact with the ground. This specifically serves to minimise the capture of immobile and slow moving benthic organisms (and inanimate objects), as they pass through the gap between the ground chain and the footrope. By contrast, mobile species (such as scallops and prawns) are stimulated to swim by the ground chain and move up into the water column above the footrope and are subsequently caught in the net.
- Some large immobile organisms and inanimate objects may also be 'flicked' up into the water column by the ground chain and subsequently captured in the net.

5.2.2 INTERACTION BUT NO CAPTURE

5.2.2.1 THREATENED SPECIES GREEN AND LOGGERHEAD TURTLES

Rationale for Inclusion:

Loggerhead and green turtles occur in the Abrolhos Islands in low numbers and are a threatened and vulnerable species (respectively) under Commonwealth and State legislation. This component addresses the issue of interaction between the fishery and loggerhead and green turtles that do not result in capture in particular, the issue of turtles being hit by the hull of the vessels in the fishery, and disturbance of breeding aggregations of turtles by vessel movements.

ERA Risk Rating: Impact on breeding populations (C0 L5 NEGLIGIBLE)

For the issue of possible interactions (without capture) of loggerhead and green turtles, it was considered 'likely' that the AIMWTMF would have a 'negligible' impact on the breeding populations, due to the following:

- There have been no reports of turtles interacting with trawl vessels (eg being knocked by boats or nets but not being captured), but formal recording of such events that might occur has not been attempted.
- The relatively slow speed at which trawlers travel is also likely to be a mitigating factor. Most of the reports of marine wildlife being hit by boats etc. involve high-speed boats that leave limited time for an animal to move out of the path of the boat. Scallop trawlers travel at relatively slow speeds of 2 to 3 knots and up to 9 knots while steaming, and as such are unlikely to hit wildlife where avoidance behaviour is not impeded.

5.3 GENERAL ENVIRONMENT

COMPONENT TREE FOR GENERAL ENVIRONMENT OF THE AIMWTMF

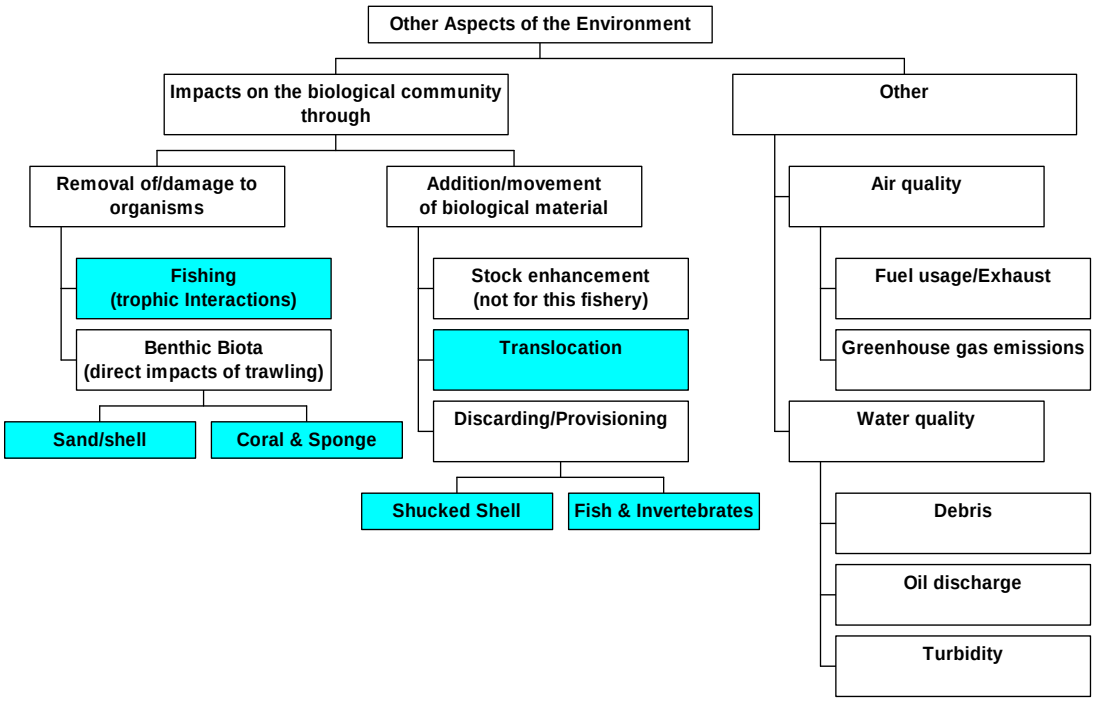


Figure 16 Component tree for the general environment.
Yellow boxes indicate that the issue was considered high enough risk at the June 2001 Risk Assessment workshop to warrant having a full report on performance. Blue boxes indicate the issue was rated as a low risk and no specific management is required – only the justification is presented.

5.3.1 IMPACTS FROM REMOVAL OR DAMAGE TO ENVIRONMENT

5.3.1.1 FISHING IMPACTS, THROUGH ALL RETAINED AND NON-RETAINED SPECIES REMOVALS ON ECOSYSTEM

Rationale for Inclusion:

Scallops play a role in the ecosystem: they provide a food source for crustaceans and fish, and also remove plankton from the water column. Additionally, the fishery takes some quantities of mixed finfish species as well as prawns. The potential impact of reducing the number of retained and non-retained species from the environment, through fishing, is investigated here.

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

The risk of an impact on the environment, from reducing the amount of retained and non-retained was considered low as:

- This fishery, in terms of the total productivity of the Abrolhos Islands, takes little material.
- None of the species captured has an exclusive predator or food source.
- Scallops are one of many filter feeders, which exist in these areas and their levels vary dramatically from natural variations.
- The fishery operates in small areas targeting the aggregations of scallops on non-fragile habitats (mostly sand) and then only for a short period of time each year.

5.3.1.2 IMPACT TO SAND/SHELL HABITAT AND ECOLOGY

Rationale for Inclusion:

The AIMWTMF operates over mostly sand and shell habitats where scallop aggregations occur. When trawling, ground chains and otter boards make contact with the sea bottom, disrupting organisms within the habitat. Evidence from video footage of trawled areas in Shark Bay suggests that trawling over sand has the effect of flattening this otherwise rippled and three-dimensional substrate. This may also indirectly affect the species that inhabit this area by changing the nature of their habitat.

ERA Risk Rating: Potential damage to sand/shell habitat (C1 L5 LOW)

The potential impact on the sand and shell habitat, as a result of the scallop trawling operations was considered to have only a MINOR consequence due to the following:

- The fishery operates over a very small portion of their licence area. Therefore there is a significant refuge area that is not trawled within the licence area for the fishery.
- The areas are usually only trawled for less than 3 months a year.

Few studies have been done on the effects of scallop trawling. However, since prawn and scallop trawling are relatively similar studies from prawn fisheries should be considered. There are a number of studies, which have shown that even in the areas where prawn trawling occurs this does not cause significant effects to the infaunal community. A meta-analysis of fishing impacts by Collie *et al.* (2000) found that otter trawling had the least impact of all forms of trawling. Specifically, Kaiser and Spencer (1996) found no detectable difference between trawled and untrawled areas (beam trawl) within mobile sediment (sand) regions. Van Dolah *et al.* (1991) studied changes in infaunal communities over 5 months for areas closed to shrimp trawling. They concluded that the seasonal reductions in abundance and number of species sampled had a much greater effect than fishing. Finally, Jennings and Kaiser (1998) suggest that light shrimp trawls do not cause significant disturbance to communities in poorly sorted sediments in shallow water.

In Australia, Gibbs *et al.* (1980) found only minimal impacts on the benthic communities in sandy areas resulting from prawn trawling in Botany Bay, NSW. In southwest WA, Laurenson *et al.* (1993) compared trawled and untrawled areas using trawl samples and underwater video. Their study concluded that the dominant fauna of each area (sand bottom) showed marked similarities, although each group had a

different group of less abundant species. The difference was attributed to the fact that the untrawled area was small and encroached in all directions by seagrass. Underwater video observation of both areas before and after the completion of the depletion experiment failed to detect any visual impact on the substrate or habitat. Extrapolating this study to the AIMWTMF would indicate that trawling causes only minor and short-lived impact to sandy habitats.

5.3.1.3 IMPACT TO CORAL/SPONGE HABITAT

Rationale for Inclusion:

Internationally, there has been concern about the impact of trawling on benthic habitats, and this has extended to Abrolhos Islands. Coral (both soft and hard types) and sponge habitats are important sites for marine species. They provide habitat for fish and invertebrates and are the feeding and recruitment sites for many species. By virtue of their shape and physical structure, coral habitats are vulnerable to physical damage and given their generally slow growth rates, are slow to recover. Although sponges are faster growing and therefore more able to withstand fishing pressure, they are still vulnerable to physical damage.

ERA Risk Rating: Potential damage to coral/sponge habitat (C1 L2 LOW)

The coral habitat in the Abrolhos Islands has enormous tourism potential because it is relatively unspoiled compared to many other areas in the world. Habitat classifications by Hatcher *et al.* (1988) identified that the total area of high biological sensitivity (fragile) habitat for the Abrolhos was 9.2%. Fragile biological communities comprised 6.5%, 5.6% and 17.0% of the Wallabi/North Island, Easter and Pelsaert Groups, respectively. Using this data from Hatcher *et al.* (1988), Wright *et al.* (1998) identified less than 10% of the Abrolhos reef area (total area) in which there was evidence of recent physical damage, or in which there was a significant potential for damage to benthic biota.

The impact of the scallop trawling activities on the coral and sponge habitats in Abrolhos Islands is considered LOW. This was a result of the following factors:

- Scallop trawlers target spawning aggregations of scallops, which occur over sandy habitat.
- There is a permanent closure around the reef observation area at the Abrolhos Islands, which amounts to 37% of the licence area that is permanently closed.
- Trawling is not possible over hard coral reef areas due to the loss of trawl gear and/or dangerous hook ups of the ground chains on the coral. Since the nets are expensive to purchase and time consuming to repair, fishing over this habitat is highly undesirable to fishers.
- With the introduction of VMS in the fishing fleet, the Department can more effectively monitor closures and boundaries to the fishery. In addition, any spread or targeting of scallops in new areas can be identified.

5.3.2 ADDITION OF MATERIALS TO THE ENVIRONMENT

5.3.2.1 TRANSLOCATION

Rationale for Inclusion:

The movement of fishing vessels provides 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. For scallop trawl vessels, their hulls mainly provide the opportunity for translocation, as these vessels do not contain ballast.

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

This risk of translocation of species occurring as a result of this fishery is considered 'likely' to be 'negligible' as vessels in the fishery have little interaction with fisheries in other regions, although some vessels have licences to operate in other trawl fisheries (Shark Bay, Kimberley and Nickol Bay/Onslow). In practice, most of the vessels exchange is between Shark Bay and the Abrolhos and Nickol/Onslow fisheries. Given the relatively short distances between these areas and the degree of faunal overlap, the translocation risks are negligible. Any change to this would result in a reassessment of the risk.

Vessels do move to Fremantle for seasonal maintenance. Much of the western coast is connected via the Leeuwin current and as such there is already a connection between Fremantle and the trawl grounds.

5.3.2.2 DISCARDING/PROVISIONING

Rationale for Inclusion:

Bycatch returned to the sea results in fish and, to a lesser extent, crustaceans being made available to others that would normally not have access to this food source. This may affect the feeding behaviour of some species, particularly predators, and increase abundances of other species throughout the water column and at the surface. For example, dead fish, which sink to the seafloor, become available to benthic scavengers these fish, would normally only be available, in that level of abundance, to pelagic predators.

Studies on the fate of discards through the trophic structure have not been undertaken in the fishery, but this is has been looked at in other fisheries:

- Britton and Morton (1994) reviewed this issue and found that discarding has had a "positive" impact on bird population numbers as they can follow the North Sea fleet and consume 50% of the discards. Other benthic fauna can only get what actually falls down on to the seabed and only in the area where they live (Ramsey *et al.,* 1997). Hence, this study concluded that discarding would not have a major impact on immobile benthic species.
- In the Great Barrier Reef trawl fishery, a study showed that the majority of the discards were fish and about 40% floated and were mostly taken in the daytime by

birds, dolphins and sharks (Poiner *et al.*, 1999). Poiner *et al.* (1999) concluded that because discards are dispersed over the seabed and most scavengers forage over a restricted area discards probably do not cause a measurable seabed impact.

- In Moreton Bay, Queensland, Wassenburg and Hill (1987) found that crabs were a dominant scavenger of bycatch from the prawn trawl fishery, with 30% of their diet coming from this source (note over 65% of the bycatch material from this fishery sinks). This study also found that trawl discards have become the principal food source for three species of seabirds (Wassenberg and Hill, 1990).

Of the discards, about 50% of the fish sink, and are mostly dead, becoming available to bottom feeders. However, in the case of this fishery the fish bycatch is very low. Most of the crustaceans (primarily blue swimmer crabs) sink and most of these are alive when returned.

ERA Risk Rating: Impact on environment (C1 L3 LOW)

The impact of the provisioning as a result of discarding bycatch from this fishery is considered 'unlikely' to have a 'minor' consequence. This was a result of the following factors:

- Although many studies have shown that various trophic groups fed on bycatch, few studies have found direct conclusive evidence of a resultant change in trophic structure.
- The area over which organisms are discarded is large in the fishery and therefore any impacts would be diffused.
- In addition to the bycatch being discarded, around 75-80% of the total weight of a scallop is also discarded. It is calculated that around 20 to 25% of the total weight of the scallop is the weight of the adductor tissue (which is kept) the rest of the scallop (i.e. mantle tissue) is discarded.
- The introduction of BRDs in the AIMWTMF will further reduce provisioning, as BRDs will reduce the amount of bycatch generated by the fishery and therefore lead to a reduction in the amount of discards.
- The AIMWTMF also complies with the MARPOL.

5.3.2.3 DISCARDING SCALLOP SHELLS

Rationale for Inclusion:

Scallop meat is removed from the shell (a process called shucking) at sea and the meat is generally packed and snap frozen at sea. Empty scallop shells are discarded overboard. The impact of discarding the shells is considered here.

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

The impact of discarding scallop shell was considered 'likely' to be 'negligible'. Discarding of scallop shells has been an issue in the AIMWTMF in the past when sometimes smaller boats were used. During rough conditions, shells were shucked and discarded in small discrete sheltered areas leading to an accumulation of shell. However, the AIMWTMF use mostly large boats and cover large areas thus allowing the discarded shells to be spread out over the fishery area.

5.4 GOVERNANCE

COMPONENT TREE FOR THE GOVERNANCE OF THE AIMWTMF

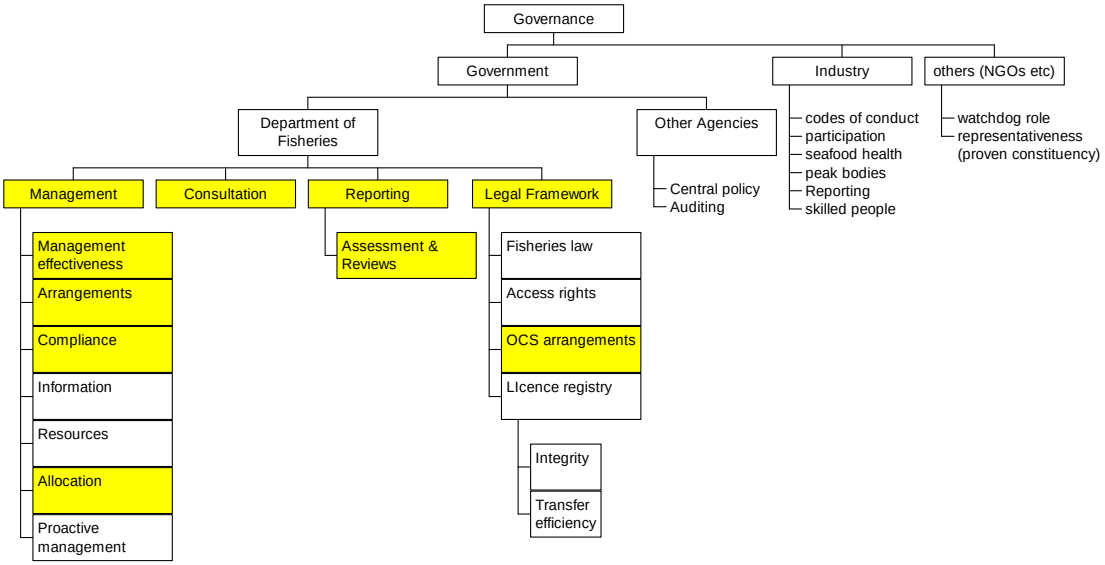


Figure 17 Component tree for governance.
Nb- no generic components have been removed from the tree but only those boxes that are yellow will be reported in this application.

5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT

5.4.1.1 MANAGEMENT EFFECTIVENESS (OUTCOMES)

Rationale for Inclusion:

The effectiveness of management arrangements in the AIMWTMF is ultimately measured by assessing the outcomes of various strategies employed to manage this fishery.

Effort in the AIMWTMF has been controlled since the introduction of a management plan for the fishery in 1993. There are also temporal (seasonal) and spatial (area) closures, gear controls and restrictions on boat size in this fishery.

Catches in the AIMWTMF are highly variable, being dependent on sporadic recruitment, which appear to be strongly influenced by environmental conditions (e.g. the Leeuwin current). As a result, the comparison of current catch to historical catch is of little value in measuring the effectiveness of management arrangements.

If the annual catch of scallops is within a range that is determined annually through predictive sampling, then it is likely that variations in annual catch would be as a result of changes in environmental or economic conditions, or planned changes to the

management of the level of commercial exploitation, and not from the depletion of the stock. Any large unexplained variation in catch is likely to be a reflection of a reduction in management effectiveness and therefore reduce the community's confidence in the management of the resource and raise concerns about the on-going sustainability of the fishery.

Operational Objective

The commercial catch of all scallops and prawns in the fishery is maintained within the annually predicted range.

Justification:

If effective management arrangements are operational in the fishery (including restrictions on effective effort levels and compliance with the regulations) then the actual total catch of scallops in each fishery should be very close to the total predicted catch. Any variation outside of the predicted total catch range would elicit the need to explain the cause of this deviation and potentially result in changes to management arrangements.

Indicator

The total actual catch compared to the historically predicted catch for scallops in the AIMWTMF.

Performance Measure

At current fishing effort levels, the catch projections for the AIMWTMF for 2002 is that the total catch of scallops should be within the range of 200-300 tonnes whole weight.

Justification:

The justification for the catch levels for scallops is located in Section 5.1.

Data Requirements for Indicator

The following data are required for this indicator:

Data Requirement	Data Availability
Commercial catch and effort	Yes – obtained annually.
Historical catch levels	Yes – records available and accessible.
Level of fishing effort and fishing power	Yes – number of vessels, days fished, hours trawled, areas of operations and activity and fishing power comparisons readily available.
Environmental indicators	Yes – key environmental indicators readily available.

Evaluation

Summary: Historical catch and effort information indicate that the predicted catch range for scallops is similar to the actual catch in any one year. Therefore, the performance measure has not been triggered and current management strategies appear to be effective in achieving the overall objectives for the fishery.

The total scallop landings in the AIMWTMF for the 2001 season were 1,182 tonnes whole weight, compared to only 429 tonnes whole weight taken in the 2000 season.

Robustness
Medium / High

The data required for the indicators in most cases are readily available. However, the changes in fishing power and fleet efficiency through time need to be evaluated and considered in these analyses to ensure that the measures continue to be relevant.

Fisheries Management Response

Management measures help to achieve the objectives for the total scallop catch (see above), but also ensure that scallops are caught at a time when the best price will be paid while also maintaining the spawning stock for scallops.

Historically, variations in catch outside of the predicted range have been explained either in terms of increased fishing effort, increased fishing efficiency or seasonal environmental factors. The response to these issues has sometimes been to reduce fishing effort (e.g. spatial or temporal closures) with a focus on limiting the exploitation of breeding stocks or new recruits and to develop better predictive models to take into account environmental factors such as sea surface temperature and ENSO, El Nino and La Nina events.

The Department of Fisheries is doing further work to improve the measurement of fishing efficiency in trawl fisheries and understanding the relationship between stock recruitment, environmental factors and catch. The Department will continue to use input controls to adjust for variations in fishing efficiency where required. Furthermore, the introduction of the VMS will enable the Department of Fisheries to collect and analyze data on the area swept by this fishery and individual trawler activity.

Actions if Performance Limit is Exceeded: If the catch were outside the range of predicted values then a review of the causes would be undertaken. This review would examine why the predicted catch range was not met. If this variation is not explained by changes in effort or environmental variations or a peculiarity of fleet dynamics and behaviour, then strategies that offer further protection to the breeding stock will be considered. These strategies, which could be employed within the season or at the start of the next season, include:

- Further reductions in the total effort expended in the fishery through a reduction in the length of the fishing season or within seasonal closures.
- Additional area closures.

Comments and Actions

While the Department has been able to maintain the catch of scallops within predicted levels, it continues to work on improving and refining the methods used to determine breeding stock estimates. The use of GIS systems for analysing data has also commenced.

External Driver Checklist

Environmental factors such as climatic changes, ocean currents and sea surface temperatures are known to impact upon recruitment and therefore are likely to significantly impact the level and productivity of scallop breeding stocks.

5.4.1.2 MANAGEMENT ARRANGEMENTS

Rationale for Inclusion:

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

In cases where the current management arrangements were developed under the previous Act (as was the case for this fishery), whilst the terminology is slightly different, the powers from the previous Act have been transferred under various sections of the Transitional Provisions of the FRMA ((S 266) Savings and transitional provisions – Schedule 3 parts 8-12, 15-19).

The Act sets out the objects for the sustainable management of fish resources in Western Australia, and provides the framework for developing and implementing management plans for each of the State's fisheries. The *Abrolhos Islands and Mid West Trawl Fishery Management Plan 1993* is effectively a set of rules for that fishery and includes, *inter alia,* clauses concerning the spatial boundaries of the fishery, gear restrictions, temporal closures and transferability arrangements.

Table 8 Objects of the *FRMA*.

Objects
(1) The objects of this Act are to conserve, develop and share the fish resources of the State for the benefit of present and future generations. (2) In particular, this Act has the following objects- (a) to conserve fish and protect their environment; (b) to ensure that the exploitation of fish resources is carried out in a sustainable manner; (c) to enable the management of fishing, aquaculture and associated industries and aquatic eco-tourism; (d) to foster the development of commercial fishing and recreational fishing and aquaculture; (e) to achieve the optimum economic, social and other benefits from the use of fish resources; (f) to enable the allocation of fish resources between users of those resources; (g) to provide for the control of foreign interests in fishing, aquaculture and associated industries; (h) to enable the management of fish habitat protection areas and the Abrolhos islands reserve.

Management arrangements for the commercial take of scallops in the AIMWTF are provided for through a MFL.

Operational Objective

In consultation with the industry members and other stakeholders, the Department periodically reviews the legislation, regulations and MPGs ensure the management framework remains relevant and aligned with the management objectives.

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

Justification:

Management arrangements ultimately enable the ecologically sustainable exploitation of a natural resource where the potential to harvest the resource may exceed the ability of the resource to replenish itself. In addition, management arrangements can assist in maintaining the economic sustainability of fisheries by regulating effort so the best possible return may be achieved for the catch.

Management arrangements can also define processes within which access to the resource can be allocated to competing user groups (including natural ecosystems).

Indicator

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

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

Performance Measure

The extent that the management arrangements are meeting the indicators above should be 100%.

Evaluation

Formal evaluation of the management arrangements for this fishery has been completed. Preliminary investigations suggest that management arrangements for the AIMWTMF are adequate in that very little potential exists for fishers to activate inappropriately high levels of effort that could place the target scallop resources at risk.

For the AIMWTF, the performance of current management arrangements can be evaluated on two levels –

1. the micro level - the relevance of individual clauses/regulations and the role they play; and
2. the macro level - the relevance of the plans, endorsements or arrangements as a whole and the role that they play.

The current performance against each of the areas required within the "plan"[1]:

1. **An explicit description of the management unit** – The management unit for the AIMWTMF is explicitly described at Section 10 of the *Abrolhos Islands and Mid West Trawl Fishery Management Plan 1993*.
2. **The issues addressed by the plan** –The issues that need to be addressed by the AIMWTMF management arrangements have been examined thoroughly and are documented within the 8 ESD component trees and their reports.
3. **Descriptions of the stocks, their habitat and the fishing activities** – The AIMWTMF stocks are described in Section 2.1 and the fishing activities are described in Section 2.2.
4. **Clear operational (measurable) objectives and their associated performance measures and indicators** – These are now located in Section 5 for each of the major issues.

[1] "Plan" – includes all management arrangements

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 are planned to be taken if performance limits are exceeded are now articulated in Section 5.
6. **Economic and social characteristics of the groups involved in the fishery** – A brief articulation of the economic and social characteristics of the fishery is located in Section 3.3 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 plan** – The regulations relating to the AIMWTMF are located in both the *Abrolhos Islands and Mid West Trawl Fishery Management Plan 1993* and the FRMR.
8. **The reporting and assessment arrangements** – These arrangements are documented in Section 5.4.4.1 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 plan will occur (including consultation mechanisms).** – The FRMA clearly sets out how the process for the review of any management plan must occur. At this time, the Department of Fisheries does not intend to formally review the management plan for this fishery. However, occasional changes to the plan are effected as required.
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 plan for the AIMWTMF and the related legislation has provided a diverse but reasonably complete set of fisheries management legislation. The fact that the management arrangements are contained within legislation for the AIMWTMF provides a high degree of stability with respect to how the fishery is managed. The process for achieving management plan changes is well understood by the majority of stakeholders and the system is flexible enough for the management process to respond to change in stimuli.

Fisheries Management Response

The Department has successfully administered the management plans and related legislation to achieve and pursue the stated objectives for this fishery. Changes have occasionally occurred (particularly in the AIMWTMF management arrangements) to address key concerns or issues.

Comments and Actions

The fishery is managed in a consultative way and would respond readily to changed circumstances. However, fishers are often resistant to change. This means that before the fishers accept changes to management arrangements, they often require substantial evidence of the need for such measures. While most fishers have a very high level of confidence in the Department's research activities, some members of the industry demand certain knowledge before accepting the need for change and can be skeptical

of research findings no matter how statistically valid. Individual fishers' views can understandably be greatly influenced by their own experiences and observations while fishing that sometimes may give them a contrary view of the state of the fishery. Nonetheless, there is generally a very good relationship between fishers and the Departmental research scientists and most will accept the advice of the researchers.

In the case of the AIMWTMF, the commercial success of the fishery also appears to have encouraged some fishers to be somewhat risk averse and inclined to a very conservative approach to managing the fishery (particularly given their level of investment). While this encourages an attitude to avoiding risks to the sustainability of the fishery, it can also sometimes make some fishers resistant to changes in fishing rules that are designed to ensure sustainability. There is also sometimes a failure to recognize that the success of the fishery is in part due to a history of adaptive management. Proposed changes are often questioned on the basis that "as the fishery is operating successfully, why should any changed be necessary or contemplated?"

External Driver Check List

- Potential resistance of fishers to support Department initiated management arrangements.
- Potential reluctance of Minister to exercise power.

5.4.1.3 COMPLIANCE

Rationale for Inclusion:

Effective compliance is vital to achieve the management objectives of any fishery. This involves a mix of sea and land patrols, radar watches, aerial surveillance and since 2001 (in the AIMWTMF), vessel monitoring systems.

All managed fishery licences in the AIMWTMF have a condition regarding the use of BRDs. This condition states:

- No fishing for prawns or scallops is to be carried out in the Abrolhos Island and Mid West Trawl Managed Fishery unless all otter trawl nets except try nets, when in use, are fitted with a 'grid'.
- A 'grid' is a device which conforms to the specifications set out in the document entitled "Bycatch Reduction Devices as defined in the Abrolhos Island and Mid West Trawl Managed Fishery" signed by they Executive Director of the Western Australian Department of Fisheries on 25 February 2003.

Operational Objective

To have sufficiently high levels of compliance with the FRMA, FRMR and various trawl management plans, regulations, conditions [endorsements] and notices.

Justification:

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

Indicators

The levels of compliance with the legislation, including the estimated level of boundary infringements, and compliance with conditions of licence such as BRDs.

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

Performance Measure

That 100% of the VMS polls from the AIMWTMF record vessels within allocated temporal and spatial boundaries.

Data Collection Requirements and Processes

- Random inspections of vessels at sea and port.
- Ongoing collection of data on illegal activities.
- Comparative data on the relative effectiveness of certain compliance techniques.
- VMS and other vessel surveillance data.

Evaluation

Zero offences were reported in 2000, 2001 and 2002 for the AIMWTMF. Thus current compliance techniques used in this fishery are resulting in compliance by the fishers with fishery rules. Sea patrols and radar watches are also conducted on a random basis through the season. Compliance operations are mainly focussed on maintaining the integrity of the nursery and/or closure areas within the fishery. Compliance staff also conducts annual licence and gear inspections both at sea and at port.

With the introduction of VMS into the AIMWTMF in 2001, it was expected that random patrol activities would decrease over time, while targeted patrols investigating specific incidences would become the major focus of patrol activities.

Robustness
Medium

The difficulties in identifying every illegal activity will remain. However, as the AIMWTMF is monitored continuously by VMS, there is little risk of temporal (seasonal) or spatial boundary infringements in this fishery.

Fisheries Management Response

Despite the relatively low levels of compliance work being done in the AIMWTMF, the Regional Services Branch of the Department continues to gather intelligence on suspected breaches within this fishery.

Comments and Actions

The Department will continue to provide a compliance service within budgetary and resourcing constraints to the fishery. It is expected that the completion of a compliance risk assessment for each fishery within the next year will enable the Department to better direct resources to further increase the effectiveness of the limited compliance activities.

In 2001, the VMS was introduced into the fishery, which enables the Department of Fisheries to monitor a vessel's location, direction and speed. This allows for particular attention to be paid to the surveillance of nursery areas.

External Driver Check List

- Changes to technology that may facilitate an increase in the level of non-compliance.
- Changes to non-Fisheries legislation and/or State/Commonwealth policy agreements (e.g. National Competition Policy) may impact upon the Department's ability to restrict activities in a way that assist management, which may impact on compliance (e.g. restrictions on processing licenses).

5.4.1.4 ALLOCATION AMONG USERS

Rationale for Exclusion:

There is no known recreational or indigenous component to this fishery.

5.4.2 DEPARTMENT OF FISHERIES - CONSULTATION

5.4.2.1 CONSULTATION (INCLUDING COMMUNICATION)

Rationale for Inclusion:

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

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

Section 65 of the FRMA states:

Section 65. Procedure before amending a 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.

Each year in January, the Department holds a meeting with the AIMWTMF licence holders. These meetings typically involve discussions about management, research and compliance issues in the fishery, and provide a forum for industry to raise concerns and/or ask questions of the Department concerning management arrangements.

Operational Objective

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

Indicators

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

Performance Measures

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

Industry meetings held annually.

Public meeting regarding this fishery and other fisheries held annually.

Publishing the State of the Fisheries Report each year.

Data Requirements

The views of industry collected from stakeholders at each annual meeting.

When an amendment is proposed, documentation of the formal consultation procedures.

Evaluation

Consultation on the management of the AIMWTMF is conducted in an open, accountable and inclusive environment where all sectors of the industry and the Department's managers and researchers collectively identify and discuss appropriate courses of action.

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

Previously, there has been a lack of pro-active consultation with other potential stakeholder groups for this fishery. However, in 2003, the Department initiated a series of public meetings around the State with a view to informing the public about the status of management and research in the State's commercial and recreational fisheries.

Furthermore, the Department publishes the State of the Fisheries Report that covers all the WA fisheries. This document details the performance of each fishery against agreed objectives. The State of the Fisheries report is widely circulated to a variety of interested parties and is also available on the website. This document provides increased transparency by providing an opportunity for all interested parties to understand the management arrangements and the current status for each fishery.

Robustness
High

The formal consultation process is very well understood with relatively high levels of participation from the various stakeholder groups.

Fisheries Management Response

The Department is attempting to improve communication links with industry in the fishery through regular correspondence and encouraging communications with the fishery management officer located in Geraldton.

Public meetings (held in regional locations) are expected to improve consultation with a wider range of stakeholder groups.

Comments and Actions

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

External Driver Check List

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

5.4.3 DEPARTMENT OF FISHERIES - REPORTING

5.4.3.1 ASSESSMENT AND REVIEWS

Rationale for Inclusion:

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

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

Operational Objective

To continue to report annually to the Parliament and community on the status of all fisheries including this 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 system by the community.

Data Requirements

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

Evaluation

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

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

Current Reporting Arrangements for this fishery include:

State of Fisheries

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

Annual Report

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

ESD

This Department will produce this report as part of the ESD Report series. Once completed this too will be available from the web site.

Reports to Industry

Each year, the status of the resource and effectiveness of current management are presented to industry in meetings in Perth.

Robustness
High

Fisheries Management Response

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

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

Comments and Actions

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

External Driver Check List

The assessments provided by independent review bodies and the community.

5.4.4 LEGAL FRAMEWORK

5.4.4.1 OCS ARRANGEMENTS

The management for this fishery falls under state jurisdiction.

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APPENDIX 1 ACRONYMS

AIMWTMF	Abrolhos Islands and Mid-West Trawl Managed Fishery
BRDs	Bycatch Reduction Devices
CAESS	Catch and Effort Statistics System
DEH	Department of Environment and Heritage
EGPMF	Exmouth Gulf Prawn Managed Fishery
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
ESD	Ecologically Sustainable Development
FRMA	*Fish Resources Management Act 1994*
FRMR	*Fish Resources Management Regulations 1995*
Grids	Turtle exclusion devices
MARPOL	International Convention for the Prevention of Pollution from Ships
OAG	Office of the Auditor General
SBPMF	Shark Bay Prawn Managed Fishery
SBSMF	Shark Bay Scallop Managed Fishery
VMS	Vessel Monitoring System
WA	Western Australia
WAFIC	Western Australia Fishing Industry Council
WRLMF	Western Rock Lobster Managed Fishery

APPENDIX 2 DETAILS OF CONSEQUENCE TABLES

Level	Ecological
Negligible	General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability **Target Stock/Non-retained:** undetectable for this population **Byproduct/Other Non-retained:** Area where fishing occurs is negligible compared to where the relevant stock of these species reside (< 1%) **Protected Species:** Relatively few are impacted. **Ecosystem:** Interactions may be occurring but it is unlikely that there would be any change outside of natural variation **Habitat:** Affecting < 1% of area of **original** habitat area *No Recovery Time Needed*
Minor	**Target/Non-retained:** Possibly detectable but little impact on population size but none on their dynamics. **By-product/Other Non-retained**: Take in this fishery is small (< 10% of total) compared to total take by all fisheries and these species are covered explicitly elsewhere. Take and area of capture by this fishery is small compared to known area of distribution (< 20%). **Protected Species**: Some are impacted but there is no impact on stock **Ecosystem:** Captured species do not play a keystone role – only minor changes in relative abundance of other constituents. **Habitat**: Possibly localised affects < 5% of total habitat area *Rapid recovery would occur if stopped - measured in days to months.*
Moderate	**Target/Non-retained**: Full exploitation rate where long term recruitment/dynamics not adversely impacted **By-product:** Relative area of, or susceptibility to capture is suspected to be less than 50% and species do not have vulnerable life history traits **Protected Species:** Levels of impact are at the maximum acceptable level **Ecosystem:** measurable changes to the ecosystem components without there being a major change in function. (no loss of components) **Habitat:** 5-30 % of habitat area is affected. :or, if occurring over wider area, level of impact to habitat not major *Recovery probably measured in months – years if activity stopped*
Severe	**Target/Non Retained**: Affecting recruitment levels of stocks/ or their capacity to increase **By-product/Other Non-retained**: No information is available on the relative area or susceptibility to capture or on the vulnerability of life history traits of this type of species. Relative levels of capture/susceptibility greater than 50% and species should be examined explicitly. **Protected Species:** Same as target species **Ecosystem**: Ecosystem function altered measurably and some function or components are missing/declining/increasing outside of historical range &/or allowed/facilitated new species to appear. **Habitat:** 30- 60 % of habitat is affected/removed. *Recovery measured in years if stopped*

Major	**Target/Non retained:** Likely to cause local extinctions **By-product/Other Non-retained:** N/A **Protected Species:** same as target species **Ecosystem:** 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 *Recovery period measured in years to decades if stopped.*
Catastrophic	**Target/Non-retained:** Local extinctions are imminent/immediate **By-product/Other Non-retained:** N/A **Protected Species:** Same as target **Ecosystem:** Total collapse of ecosystem processes. **Habitat:** > 90% affected in a major way/removed *Long-term recovery period will be greater than decades or never, even if stopped*