APPLICATION TO AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENVIRONMENT AND HERITAGE ON THE ONSLOW AND NICKOL BAY PRAWN MANAGED FISHERIES

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

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

OCTOBER 2003

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 Onslow Prawn Managed Fishery (ONPMF) and the Nickol Bay Prawn Managed Fishery (NBPMF) 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 A of the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC), to enable the banana prawn (*Penaeus merguiensis*), brown tiger prawn (*Penaeus esculentus*), endeavour prawn (*Metapenaeus endeavouri*) and western king prawn (*Penaeus latisulcatus*) and other relevant by-products of these two fisheries 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 these fisheries. The application includes:

- Comprehensive background information on the history of the ONPMF and NBPMF, the biology of the primary species (banana prawn, brown tiger prawn, endeavour prawn and western king prawn) and a description of the current management arrangements, 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 and www.fisheries-esd.com 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 ONPMF and NBPMF, 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 component reports contained in Section 5. {Referral to this additional information is facilitated by the incorporation of appropriately placed hyperlinks (electronic version only)}.
- At the end of Section 4 there is an OVERVIEW TABLE that outlines for each issue, which the 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 presented in the National ESD format as outlined in the Department's ESD Policy (Fletcher, 2002). This covers each of the environmental and governance issues relevant to this application for both fisheries. These reports 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 ONPMF and NBPMF is not required.

1.2 OVERVIEW OF APPLICATION

The banana prawn, brown tiger prawn, endeavour prawn and western king prawn are the four primary species targeted by the ONPMF and NBPMF. The five-year average landed values for these fisheries are $1.3 million for the ONPMF and $2.9 million for the NBPMF. The annual values can, however, vary widely among years given the large variations in total landings. In 2001, the total landings for the primary species in the ONPMF were 63 tonnes with a landed value of only around $900,000 as compared to 93 tonnes in 1999 with a landed value of $1.4 million. Similarly, in 2001 the NBPMF landed only 22 tonnes of prawns in 2001 with a value of $300,000 as compared to 259 tonnes of prawns in 1999 with a landed value of $3.3 million.

Both fisheries have been operating under a detailed and sophisticated management regime since 1991 using a comprehensive set of regulations that include limits on vessel numbers, gear, zoning, seasonal and spatial closures. 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, and the specific management plan for each fishery, adheres to arrangements established under relevant Australian laws with reference to international agreements as documented in Section 5.4.2.

The combination of having a large amount of relevant and accurate information on the biology of the prawn species, the sophisticated suite of management arrangements in place and the proactive management used in the two fisheries has resulted in the maintenance of prawn stocks as well as the successful continuation of both fisheries.

In the ONPMF and NBPMF there are features that minimise wider ecosystem interactions. Trawlers in both fisheries operate over a relatively small area of the Onslow and Nickol Bay areas, and these are predominately over mud and sand habitats. However, bycatch reduction devices and turtle excluding devices are currently being phased-in, which will minimise or eliminate the potential for impacts on other species.

Consequently, the management regimes for the ONPMF and NBPMF 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 ON THE ONSLOW AND NICKOL BAY PRAWN MANAGED FISHERIES

2.1 DESCRIPTION OF THE FISHERY

2.1.1 ONSLOW PRAWN MANAGED FISHERY

The ONPMF targets western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus endeavouri*) and banana prawns (*Penaeus merguiensis*). This is an otter trawl fishery with opening and closing dates that vary from year to year based on advice from the Research Division of the Department of Fisheries. Different areas within the fishery have different season dates, which allow access to target species, usually tiger and banana prawns, at appropriate times (see below).

The *Onslow Prawn Fishery Management Plan 1991*, defines the fishery as existing within 'all Western Australian waters of the Indian Ocean below high water mark lying west of 116º45' east longitude and east of a line commencing at the high water mark on the mainland due south of the southernmost extremity of Locker Island drawn due north to the high water mark at the extremity; thence northwesterly to the high water mark at the southern most extremity of Serrurier Island; thence northerly along the high water mark of that island on its western shore to its northernmost point; thence due north' (Figure 1). The waters within the fishery are further divided into three fishing areas: Area 1, Area 2, and Area 3 (Figure 1). In addition, there are also three designated nurseries (Figure 1): Ashburton Nursery, Coolgra Point Nursery and Fortescue Nursery.

Management controls for the ONPMF are based on limited entry, seasonal and area closures, gear controls and restrictions on boat size. The first steps to introducing bycatch reduction devices (BRDs) into the fishery were taken in 2001 with vessels required to have half their gear fitted with BRDs. Vessel monitoring system (VMS) requirements came into force on 1 October 2002.

This fishery has a total of 31 licencees. Not all licensees are permitted to fish the entire range of this fishery. Each licence is endorsed with a class according to the area or areas of the fishery for which it is issued:

Class of licence	Area/s permitted to fish	Number of Licensees
A	1, 2, 3	4
B	2, 3	3
C	2	12 (Exmouth Gulf boats)
D	3	12 (Nickol Bay boats)

Within the extensive licensed fishing zone, the functional fishery area only comprises relatively few discrete areas offshore from nursery areas that are fished (less than 5% of the overall 'defined fishery area'). Some of the inshore prawn trawling grounds are

permanently closed due to navigation hazards or exclusion zones around iron ore, salt and gas loading jetties. Consistent annual effort occurs mostly between the Ashburton River and Onslow (Area 1) for banana and king prawns, and in the Mangrove Passage area (Area 2) for tiger prawns. Trawling occurs over a very small proportion (<5%) of the king prawn habitat, as prawn densities in most areas are too low for economically viable trawling. In contrast, fishing covers a high proportion (50%) of the discrete areas where banana prawns are found, offshore of river estuaries.

Most Onslow prawn licensees also hold licenses in other trawl fisheries such as Pilbara Fish Trawl Interim Managed Fishery (PFTIMF), NBPMF, Exmouth Gulf Prawn Managed Fishery and Kimberley Prawn Managed Fishery. There are currently five vessels that also operate within the Pilbara Fish Trawl Interim Managed Fishery and 26 vessels that also operate in the Kimberly Prawn Managed Fishery. In addition, there are 12 vessels that also fish in the NBPMF and 12 vessels that also fish in the Exmouth Gulf Prawn Managed Fishery.

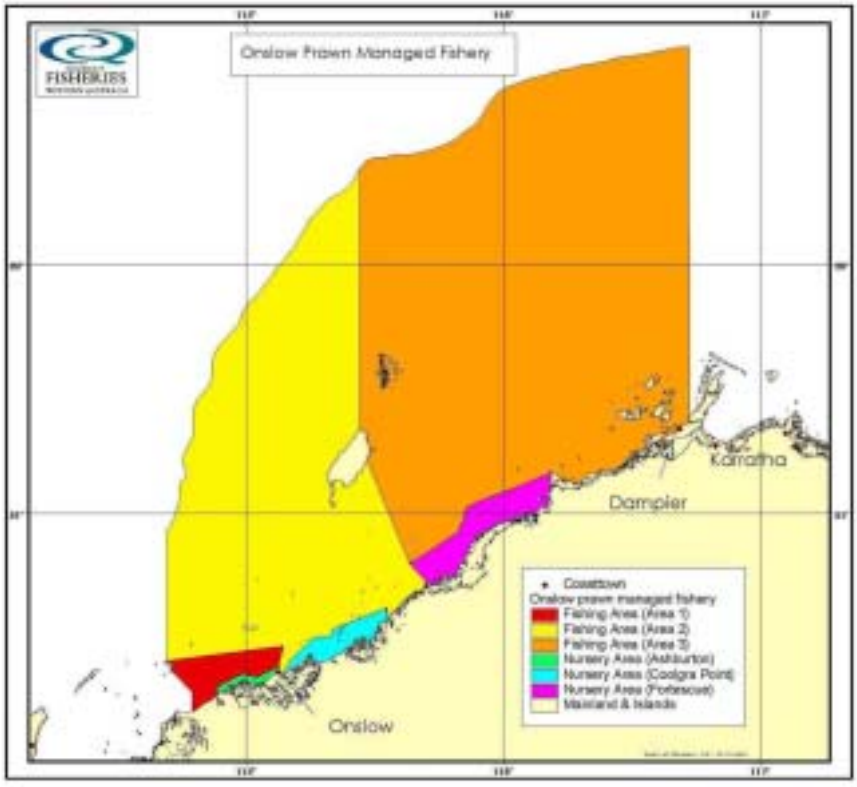


Figure 1 ONPMF licence area and designated nurseries.

2.1.2 NICKOL BAY PRAWN MANAGED FISHERY

The Nickol Bay Prawn Managed Fishery (NBPMF) targets banana prawns (*Penaeus merguiensis*), western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*) and endeavour prawns (*Metapenaeus endeavouri*). It also uses the otter-trawl method to capture these species.

Management controls for the NBPMF are based on limited entry, seasonal and area closures, gear controls and restrictions on boat size. The first steps to introducing

BRDs into the fishery were taken in 2001 with vessels required to have half their gear fitted with BRDs. In addition, the VMS was implemented in the fishery in 2002.

The boundaries of this fishery are 'all the waters of the Indian Ocean and Nickol Bay between 116°45′ east longitude and 120° east longitude on the landward side of the 200 m isobath' (Figure 2). The total area for the fishery is 22,450 nm^2. In 2002 the total area trawled was 1360 nm^2 representing approximately 6% of the total area.

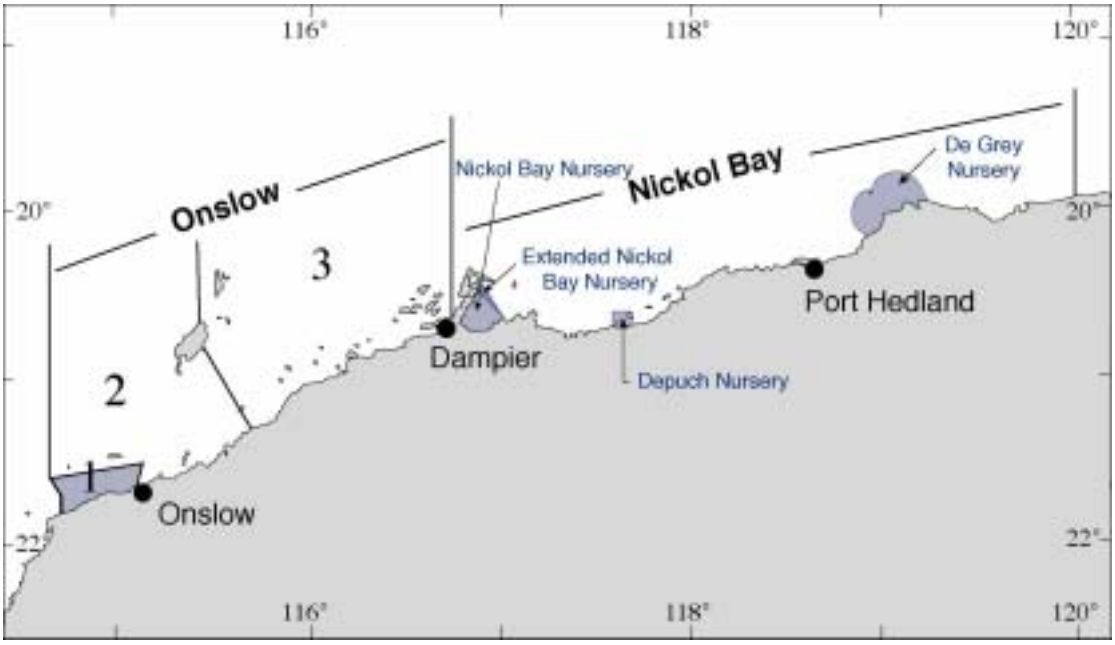


Figure 2 ONPMF and NBPMF licence areas.

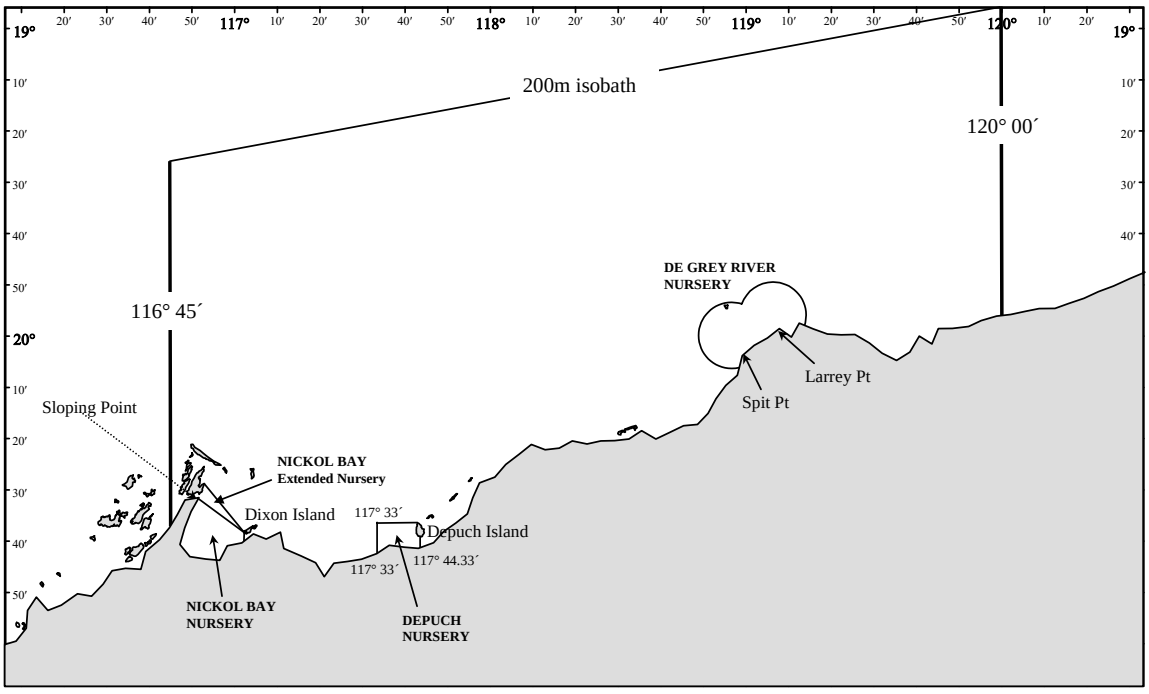


Figure 3 Designated nursery areas in NBPMF.

There are a number of major fishing areas (Figure 3) within the fishery that have different opening and closing dates whilst the remainder of the area remains open all year round. These opening and closing dates can vary from year to year. Below is an example of the opening and closing dates from the 2001 season:

Nickol Bay Nursery	1 May-1 August
Extended Nickol Bay Nursery	1 May-15 November
Depuch Nursery	1 May-1 August
De Grey Nursery	1 May-15 November
Onslow Area 3	1 March-11 November

There were 14 boats licensed to trawl for prawns in Nickol Bay during 2001. The small fleet fishes on a limited number of discrete fishing grounds, making up less than 5% of the coastal habitat within the fishery.

Fishing Methods (see Appendix 1 for terminology)

The trawl gear used in the ONPMF and NBPMF is dependent on the area fished. In Onslow, Area 1 fishers are permitted to use twin demersal otter trawl gear, comprising two 10.98 metre trawl nets. Two types of nets are utilised in Area 1 depending on the target species. Flat nets (Figure 4) are used when fishers are targeting western king and brown tiger prawns; 'banana' nets are used when targeting banana prawn aggregations. The banana nets are comprised of two flat nets sewn together with effectively one wide opening.

The only limitation on the gear used in Nickol Bay and Onslow is the overall headrope length. Consequently, multiple configurations of otter trawl are allowed in Onslow Areas 2 and 3 and Nickol Bay, including the use of try nets with a headrope not exceeding five (5) metres in length, as long as the combined total headrope length does not exceed 29.27 metres. Most fishers fishing Onslow Areas 2 and 3 and Nickol Bay utilise either twin or quad otter trawl gear within the 29.27 metre headrope length restriction (Figure 5). In Onslow Area 1 only two nets are permitted with an overall headrope length of 10.98 metres.

Trawl shots in the ONPMF and NBPMF generally average between 90 and 180 minutes in duration, with variations due to the species targeted. When targeting banana prawn aggregations, trawl shots may be as short as 30 minutes. The depths at which trawling takes place depends on the species targeted. Trawling generally occurs in water depths between three and six metres around river mouths when predominantly targeting banana prawns. Most other target prawn species are caught in water depths ranging from eight to fifteen metres. While trawling, fishing vessel speed is generally between three and four knots.

In addition, the fleet is currently trialing BRDs in the form of grids. BRDs will be mandatory throughout the fleet in 2003 and fish exclusion devices will be introduced in 2004/05.

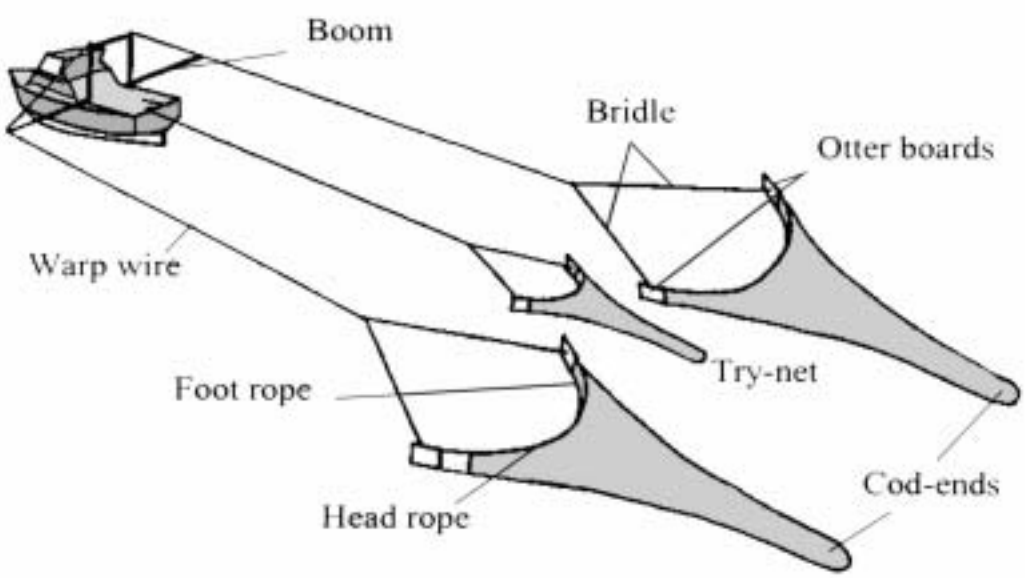
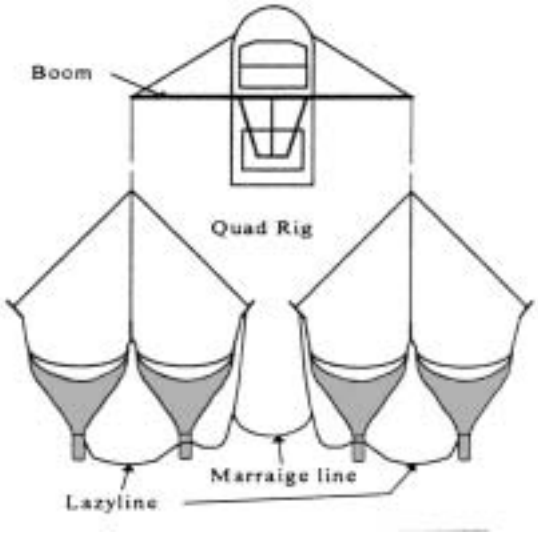


Figure 4 The standard twin demersal otter trawl used in Area 1 of ONPMF.



(Source: adapted from Sterling, 1998)

Figure 5 The standard quad otter rig without try gear used by prawn trawlers in Area 2 and Area 3 of the ONPMF.

Management

The *Onslow Prawn Management Plan 1991* and the *Nickol Bay Prawn Management Plan 1991* are the current management plans for the ONPMF and NBPMF and are formal statutory documents that set out the management arrangements for the two fisheries. Management controls for the ONPMF and NBPMF are both based on limited entry, seasonal and area closures, gear controls and restrictions on boat size.

The Onslow Prawn Fishery was declared a managed fishery in 1991. A rationalisation program and a limited entry fishery were created in 1990 with only six

vessels allowed to operate in Area 1. The fishers themselves decided to buy out two vessels over a 10-year period. At the request of industry, trawl gear was restricted to two nets and a headrope length of 10.98 metres for Onslow Area 1 region. This arrangement was incorporated into the Plan through an amendment in 1994.

In 2001 the ONPMF Plan was again amended to remove the non-transferability provisions on C and D class licences. However, holders of these licences need to hold an Exmouth Gulf Prawn or Nickol Bay Prawn Managed Fishery Licence for the Onslow licence to be effective.

A summary of these input based controls outlined in the Plans for these fisheries is as follows:

- ***Small numbers of vessels and limited entry fishery.*** There are a limited number of vessels operating in the Onslow and Nickol Bay fisheries. There are thirty-one vessels operating in the ONPMF (12 of which are also Nickol Bay boats which are only licenced for Area 3 of ONPMF and 12 of which are also Exmouth Gulf boats which are only licenced for Area 2 of the ONPMF). There are fourteen vessels operating in the NBPMF.
- ***Seasonal closure.*** The ONPMF is generally closed between mid November and 1 March and the NBPMF has specific areas that are closed between mid November and 1 May, to allow prawn stocks to rejuvenate.
- ***Gear controls.*** There is a series of gear controls that include restrictions on the number of nets and the length of trawl net headrope.
- Additionally, in 2003 the VMS will be fully introduced into the fisheries. The VMS enables the Department of Fisheries to monitor a vessel's location and speed with particular attention paid to the surveillance of nursery areas.

Target Species

ONPMF

In the ONPMF, tiger and king prawns have been the dominant species caught over the long term with total landings ranging from approximately 60 to 130 tonnes. A smaller portion of endeavour and banana prawns make up the remainder of the prawn catch. Prawns and retained by-product species are generally graded and frozen on board.

Western king prawns have comprised 33% of total target catch over the past five years (Figure 6) and the catch has remained relatively stable (15 to 60 tonnes). This indicates that environmental effects such as cyclonic activity (producing heavy rainfall) have relatively minor effects on the abundance of the king prawn stock. However, fishers report that there can be an indirect, short-term impact on the distribution of king prawns when heavy rainfall inland and subsequent river flooding appear to disperse the stock, affecting catches in the short term. At times, debris from flooding is reported to restrict fishing activities and hence landings for the year. The area trawled represents only a small portion of their known habitat (less than five percent) within the region. Due to their dispersed nature, densities are generally too low for viable fishing in other areas. This is because of the high costs of operating the larger boats when prawn abundances are relatively low.

Brown tiger prawns are affected by environmental conditions and catches from this fishery are quite variable (5 to 120 tonnes; Figure 6). It is likely that severe cyclonic activity impacts negatively on tiger prawns in some years, and moreover, the effect varies depending on whether juvenile prawns are still in vulnerable, shallow nursery areas at the time. Brown tiger prawns comprised 16% of the total target catch over the past five years and are fished for in the Mangrove Passage area. Fishing covers a high proportion of their known distribution within the fishery.

Banana prawns numbers are highly variable (2 to 90 tonnes). They comprised 39% of total target catch over the past five years but only 20% over 10 years (Figure 6). Banana prawns are prevalent and considered a prime target species during favourable environmental conditions, in particular following high rainfall associated with cyclonic activity during the summer months, December through March. Adult banana prawns can withstand high-energy cyclonic events and a positive correlation appears to exist between summer rainfall and banana prawn numbers. They are predominantly fished between Ashburton River and Onslow during the day, and after heavy rains. Endeavour prawns have comprised 11% of total target catch over the past five years and are also impacted directly by cyclonic conditions (Figure 6).

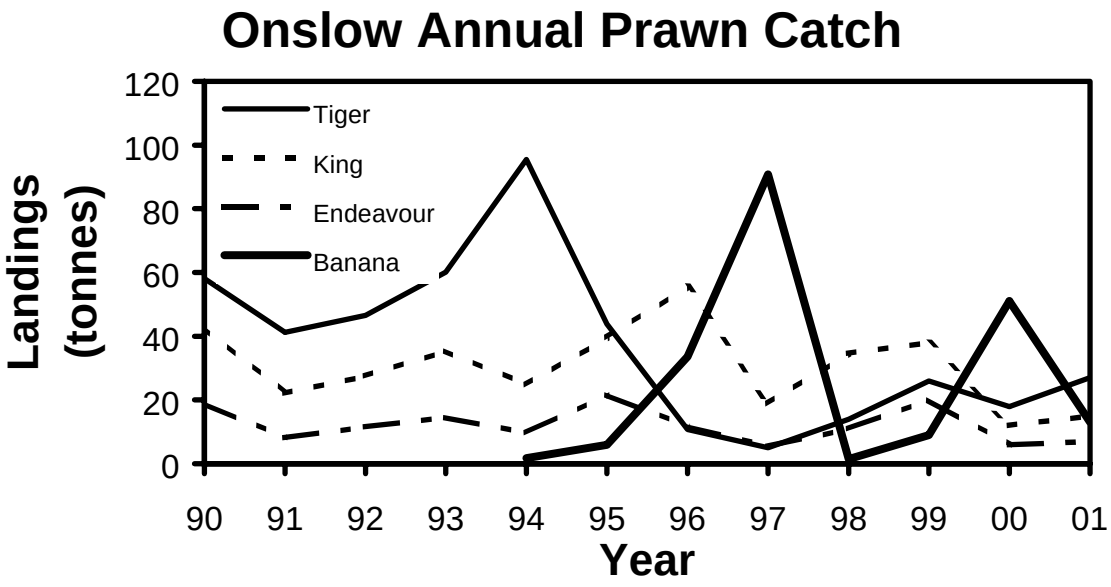


Figure 6 Catch history for the ONPMF.

No direct stock assessments are made for the target species but trends in annual catches are monitored through compulsory monthly catch returns. The catches taken are from a number of separate nursery areas and are highly variable from year to year. This is particularly the case for the rainfall-dependent banana prawn.

NBPMF

This fishery operates predominantly by targeting schools of banana prawns, which generally dominate the catch (Figure 7). King prawns are also caught (Figure 7) as

well as small quantities of tiger and endeavour prawns. The total catch ranges between 22 and 500 tonnes (Figure 7).

The catch of banana prawns is often correlated with rainfall and hence can be highly variable. Thus the annual catches for banana prawns have ranged between 11 and 470 tonnes during the 1990's.

Every boat in the NBPMF has a licence to operate in at least one other fishery. Those fisheries include the Abrolhos Islands and Mid-west Trawl Managed Fishery, the Shark Bay Scallop Managed Fishery, Onslow Prawn Managed Fishery, the PFTIMF and the Kimberley Prawn Managed Fishery. As such, the fishing effort in the NBPMF is dependent on management measures in place elsewhere, and on the catch rates available in these other fisheries. Fishing for finfish in the PFTIMF has encouraged the construction of larger boats with greater fishing power than would otherwise have been supported by fishing prawns alone. However, in recent years time quotas and other restrictions have been implemented in the PFTIMF, which has resulted in some of the larger fishing vessels returning to the NBPMF and other fisheries for which they have licences. These vessels however are not economically viable in the NBPMF in low banana prawn years and leave the fishery early, leading to highly variable effort in the fishery (Figure 8). The number of fishing days recorded were 985 in 2000, 245 in 2001 and 647 in 2002.

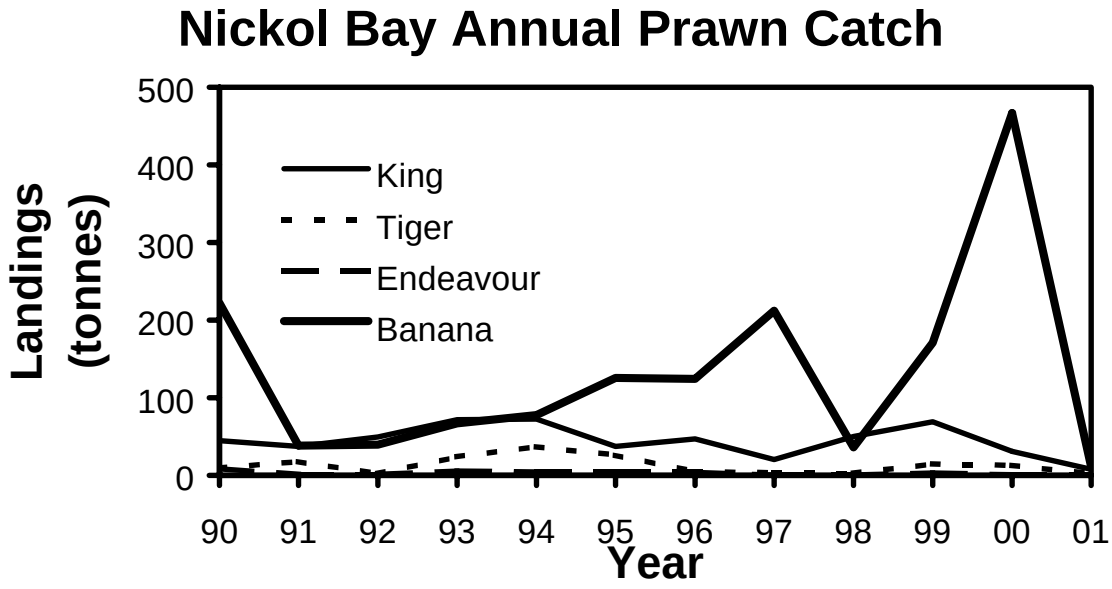


Figure 7 Catch history for the NBPMF.

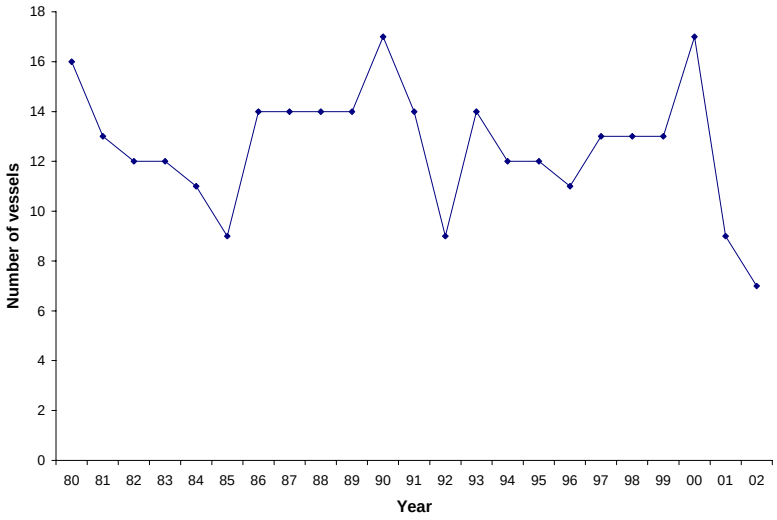


Figure 8 Number of boats operating in NBPMF between 1980 and 2002.

Research

Research for the management of these small fisheries involves stock monitoring and assessment utilising monthly return data provided by industry, information from boat skippers, and rainfall records. Stock assessment of the banana prawn stocks involves updating the catch–rainfall relationship for the NBPMF. Annual meetings are held with boat operators to consider the status of the stocks and recommend changes to fishing operations.

2.2 BIOLOGY OF BANANA PRAWNS

Distribution

The banana prawn, *Penaeus merguiensis*, is a decapod crustacean of the family Penaeidae. In Australia, banana prawns are present across northern Australia from Shark Bay in WA to the Tweed River in northern New South Wales (NSW).

This species prefers shallow estuarine and intertidal areas to depths of 45 metres. They live in turbid waters, inhabiting sheltered mangrove creeks as juveniles and medium and low-energy coastlines as adults.

Life History

The maximum life span for banana prawns is around 12 to 18 months. Banana prawns become sexually mature at around 7 to 8 months of age and subsequently spawn continually until they are caught or die. There are, however, generally spawning ‘peaks’ during both spring and autumn. The larval stage is about 2 to 3 weeks long (temperature dependent) after which the post-larvae move into and settle in shallow nursery areas. The post-larvae will spend around 2 to 4 months in nursery areas before they start to move offshore, this movement can take up to 2 months to complete. Therefore, banana prawns are around 5 to 8 months old when they move

into fishing grounds. Banana prawns typically aggregate and in some instances may be so dense as to produce surface 'boils'. This aggregating behaviour makes them highly vulnerable to exploitation.

Banana prawns are bottom feeders, mostly polychaete worms and bivalves. Predation by sharks and finfish appears to be very high, accounting for a large part of their natural mortality (Staples et al., 1985).

2.3 BIOLOGY OF BROWN TIGER PRAWNS

Distribution and Stock Structure

The brown tiger prawn, *Penaeus esculentus*, is a decapod crustacean of the family Penaeidae. *P. esculentus* is generally regarded as an endemic Australian species. It has a distribution around the top half of Australia and whilst the electrophoretic study on this species (Mulley and Latter, 1981) found no genetic differences amongst regions, there are a large number of functionally independent stocks. Each of these stocks is associated with relatively sheltered waters where there are also substantial amounts of seagrass, which forms the main juvenile habitat for this species (and explains their distinctive coloration).

Given this patchy distribution, there are a number of commercially abundant stocks of *P. esculentus* in Western Australia (Shark Bay, Exmouth Gulf, Onslow, Nickol Bay), Northern Territory (the Gulf of Carpentaria, Darwin, Torres Strait), Queensland (Moreton Bay, Yepoon, Mackay, Bowen and Weipa) (see Kailola et al., 1993 for map).

This species is generally found in coastal waters down to approximately 60 m but has been recorded to a depth of 200 m (Grey et al., 1983) and is commonly found over mud or sandy mud substrates by trawlers (Hall and Penn, 1979). Most spawning females are found in 13 to 20 m of water (Penn and Caputi, 1985).

Life History

This species can live for over two years although animals over two years are rarely caught under current harvesting practices. Tiger prawns become mature at 6 to 7 months of age at a size around 25 – 28 mm carapace length. The *P. esculentus* stock in Onslow/Nickol Bay follows the general penaeid life cycle described by Garcia and Le Reste (1981). Spawning is thought to take place from August through to April.

When tiger 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 her eggs. The female's ovary develops rapidly and the eggs are released into the water before the female moults again. The moulting cycle of the adult *P. esculentus* in Queensland is around 27 days (Crocos and Kerr, 1983). During spawning, which usually occurs at night the eggs are released from small pores at the base of the third walking legs (Walker, 1975). Tiger prawns produce approximately 50,000 to 400,000 eggs per spawning. The numbers of eggs

being released reaches a peak during autumn and again in spring with lower levels of spawning activity (compared to western king prawns) occurring throughout the year (Penn and Stalker, 1979).

At 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 into 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 high mortality of the larvae. If by this time the larvae have drifted to a suitable nursery area (i.e. inshore structured habitats, with fringe sand 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). In general juvenile *P. esculentus* prefers to inhabit structured habitats such as algae or seagrasses.

Juveniles spend around three to six months in nursery grounds, which allows them to physically mature to between 101 and 121 mm total length (Penn and Stalker, 1979). At which point, they attain a size that coincides with them migrating offshore and subsequently, entering the trawl fishing grounds. This usually takes place in the summer and autumn of each year and is termed recruitment to the fishery (Penn and Stalker, 1979).

The tiger prawn feeds at night, primarily on meiofauna including molluscs, crustaceans and polychaete worms (Wassenberg and Hill, 1987). They are prey to squid, cuttlefish and a variety of demersal fishes. The juveniles are particularly vulnerable to predation by fish species including barramundi, threadfin salmon, cod and small sharks.

2.4 BIOLOGY OF ENDEAVOUR PRAWNS

Distribution and Stock Structure

The endeavour prawn, *Metapenaeus endeavouri*, is a decapod crustacean of the family Penaeidae. *M. endeavouri* is restricted to northern Australian waters between northern NSW and Shark Bay in WA. (Grey et al., 1983). Population studies on endeavour prawns from Exmouth Gulf and the Gulf of Carpentaria indicate a high degree of genetic isolation. The endeavour prawns stock tends to overlap the distribution of the tiger prawn in the northern sector of the Gulf and also to some extent the king prawn distribution in the north.

This species is generally found in coastal waters down to approximately 50 m and is commonly trawled over in muddy or sand/mud sediment substrates. They are generally found inshore of the main fishing grounds for the tiger and king prawns and are therefore less vulnerable to the fishery.

Life History

Endeavour prawns spawn year round but in Queensland spawning peaks in March and September (Courtney et al., 1989). There is little information on larval development in blue endeavour prawns (Kailola et al., 1993). Juvenile endeavour prawns are most commonly associated with seagrass beds in shallow estuaries although they are occasionally found in other areas (Staples et al., 1985). They spend a short period of time in nursery areas and migration to adult habitats occurs at a small size (Buckworth, 1992). In the Torres Strait, recruitment is mainly in the summer months (Somers et al., 1987).

Endeavour prawns are carnivorous benthic feeders. Squid, cuttlefish and a host of demersal finfish species commonly prey upon endeavour prawns.

2.5 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), WA, Northern Territory, Queensland and down the east coast to northern NSW (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 western king 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 (1984). 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 3 to 6 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.

2.6 MAJOR ENVIRONMENTS

2.6.1 PHYSICAL ENVIRONMENT

The ONPMF is restricted to clean sand and mud bottoms. In the NBPMF the habitat types on the trawl areas associated with banana and king prawns are mud and sand respectively.

2.6.2 ECONOMIC ENVIRONMENT

The major markets for the prawns and other by-products are Asian and to a lesser degree local and eastern states. On average, around 70 to 80% of the product from these two fisheries is exported to Asian countries. Estimated annual value (to fishers) varies annually due to the fluctuations in catch. The five-year averages for the two fisheries are $1.3 million of Onslow and $2.9 million for Nickol Bay. For 2001, given the low level of landed catch, the values were only $0.9 million in Onslow and $0.3 million for Nickol Bay.

2.6.3 SOCIAL ENVIRONMENT

Estimated employment for NBPMF in 2001 was 40-50 skippers and crew, with up to 20 people involved in onshore processing in the region.

3. METHODOLOGY

3.1 SCOPE

This application is based upon the ESD report for the ONPMF and NBPMF. The ESD report was generated by assessing "**the contribution of the ONPMF and NBPMF to ESD".** This assessment examined the benefits and the costs of the ONPMF and NBPMF across the major components of ESD (see Table 1). In doing so, it will eventually provide a report on the performance of the fisheries for each of the relevant ecological, economic, social and governance issues associated with these fisheries. Given the timeframes involved, only the criteria required for the "Guidelines for the Ecologically Sustainable Management of Fisheries", which cover mainly the environmental elements of ESD (outlined below in Table 1) were generated for this application.

Table 1 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 ONPMF and NBPMF. 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 two fisheries were determined through an internal workshop for the two fisheries, which utilised information generated through the external workshops held for the Shark Bay Prawn and Scallop Managed Fisheries and the Exmouth Gulf Prawn Managed Fishery (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 ONPMF and NBPMF.

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 fisheries 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 fisheries.

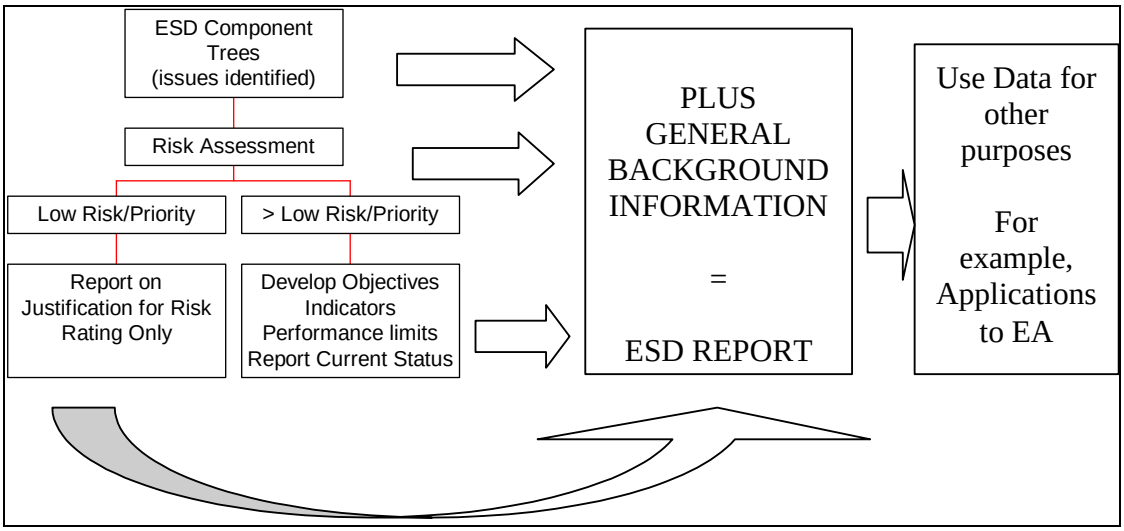


Figure 9 Summary of the ESD reporting framework processes.

3.3 ISSUE IDENTIFICATION (COMPONENT TREES)

The National ESD Reporting Framework has eight major components, which fall into three categories of the "contributions to ecological wellbeing", "contributions to human wellbeing" and the "ability to achieve the objectives" (Table 1). Each of the major components is broken down into more specific sub-components for which ultimately operational objectives can be developed.

To maximize the consistency of the approach amongst different fisheries, common issues within each of the components were identified by the 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 ONPMF and NBPMF by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (see Figure 10).

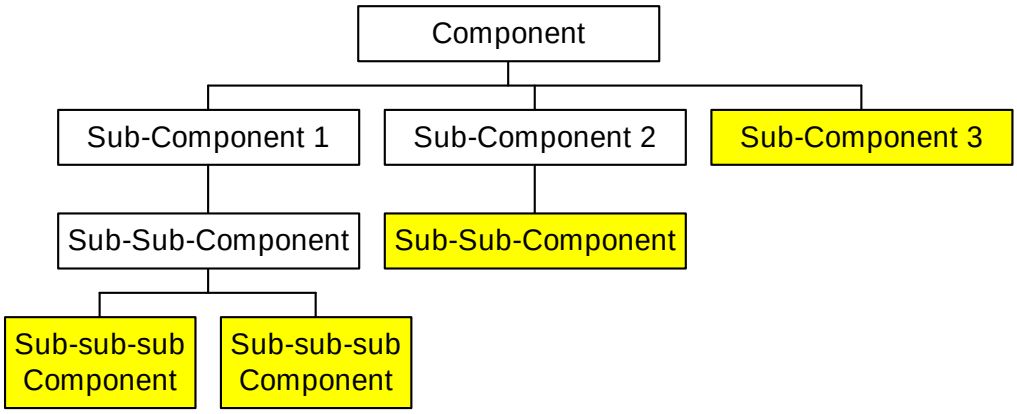


Figure 10 Example of a component tree structure.

The trees for ONPMF and NBPMF were developed at an internal Departmental meeting held in August 2002.

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 these two fisheries with the Western Australian Shark Bay Scallop and Prawn Managed Fisheries as well as the Exmouth Gulf Prawn Managed Fishery (all of which went through the full risk assessment process with two external workshops), only an internal workshop was held for the two fisheries. Consequently, the information collected through the other fisheries risk assessment process was applied and utilised to generate the application for the ONPMF and NBPMF.

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 ONPMF and NBPMF 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 2).

Table 2 Risk ranking definitions.

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

In general, only the issues of sufficient risk (Moderate, High & 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 9 (above).

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

3.5 COMPONENT REPORTS

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

For each of the lowest level sub-components (assessed as being of sufficient risk/priority to address), a detailed assessment of performance is generated. The SCFA Working Group in conjunction with the ESD Reference Group agreed upon a set of 10 standard headings each of which need to be addressed (Table 3). Added to this list a further heading, "**Rationale for Inclusion**", has been added. This specific heading allows the issues raised within the risk assessment process to be explicitly recorded. A full description of each of these headings is located in the WA ESD policy (Fletcher, 2002), which is available on the Department of Fisheries website.

Table 3 The National ESD reporting framework headings used in this report.

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

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

4. ASSESSMENT OF THE ONPMF AND NBPMF MANAGEMENT REGIME AGAINST THE AUSTRALIAN GOVERNMENT GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

4.1 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.

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

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

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

The Department of Fisheries is meeting this guideline through a variety of consultative processes. S64 and S65 of the FRMA define the requirement for procedures that must be undertaken before determining or amending all management plans. More specifically, the current management arrangements for ONPMF and NBPMF were developed through formal consultation with the industry.

The Department of Fisheries arranges annual meetings with industry members regarding both fisheries. These meetings review data from the past seasons harvest and discuss management arrangements. In addition, for the Shark Bay Prawn and Exmouth Gulf Prawn Managed fisheries (two 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 Shark Bay Prawn and Exmouth Gulf Prawn Managed fisheries assessment reports has been incorporated within this report. The issues identified for these two fisheries are very similar to those affecting the OPMF and the NBPMF.

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

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

- Department of Fisheries, WA;
- Western Australian Fishing Industry Council (WAFIC); and
- Industry Representatives.

As was previously mentioned in the above guideline, information generated from the workshop that was conducted for the Shark Bay Prawn Managed Fishery and Exmouth Gulf Prawn Managed Fishery was used in this application. The groups that were involved in those workshops, the generation and review of those two fisheries applications included:

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

As a result, the Department of Fisheries is meeting this objective. See Section 5.4.2.1 Consultation for more information.

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

The Department of Fisheries is achieving this guideline through the ESD Component Reports. These reports (see Section 5 Performance Reports) contain the available objectives, indicators and performance measures for measuring and assessing the effectiveness of the management arrangements for the ONPMF and NBPMF. 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 each 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 a limited entry fishery, seasonal and spatial closures and gear restrictions. As a result, the Department of Fisheries is meeting this guideline. See Sections 5.4.1.1 and 5.4.1.2 for more information.

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

The Department of Fisheries employs operational staff to ensure compliance with the critical aspects of the management arrangements for ONPMF and NBPMF. This includes at-sea patrols to ensure restrictions on gear and other operational rules are being adhered as well as inspections of catches at the point of landing and processing factories. In 2003, the fleet will be monitored by VMS.

If a breach is detected with VMS it is reported to the compliance officers and management officers, who then investigate the offence. If it is warranted, a prosecution brief is formed, if only a breach of a minor provision, then a warning is given.

In 2000-2002, no offences were detected for the ONPMF and NBPMF. The compliance activities during those years focused on gear inspections, licence checks and surveillance of fishing operations. In 2002, there were 3 gear and licence checks and 5 surveillances of fishing operations.

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

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

The Department is meeting this guideline through the annual "State of the Fisheries" report and the five-year review of this document. There is an annual review of the performance of the major aspects for each fishery through the completion of the "State of the Fisheries" report. This is updated and published each year including periodic reviews by the Office of the Auditor General (OAG). It forms an essential supplement to the Department's Annual Report to the WA Parliament with the latest version located on the Departmental website www.fish.wa.gov.au. 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). The reports include the development of objectives, indicators and performance measures for all aspects of each fishery and status reports for those components that are not subject to annual assessment. The Department intends to complete and review externally this full assessment, including examination of the validity of the objectives and performance measures every five years.

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

The Department of Fisheries is meeting this guideline through the development of this report. Capabilities for the assessment, monitoring and avoidance, remedying or mitigating any adverse impacts on the wider marine ecosystem are documented in the "General Environment" Section 5.3. This has been completed through a formal risk assessment analysis of the issues and, where necessary, the development of suitable monitoring programs.

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

The management regime complies with all relevant threat abatement plans for species where there is an interaction and therefore is meeting this guideline. Details are provided in the "non-retained species" section of the ESD report (Section 5.2).

PRINCIPLE 1 OF THE GUIDELINES

OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVEL OF TARGET SPECIES

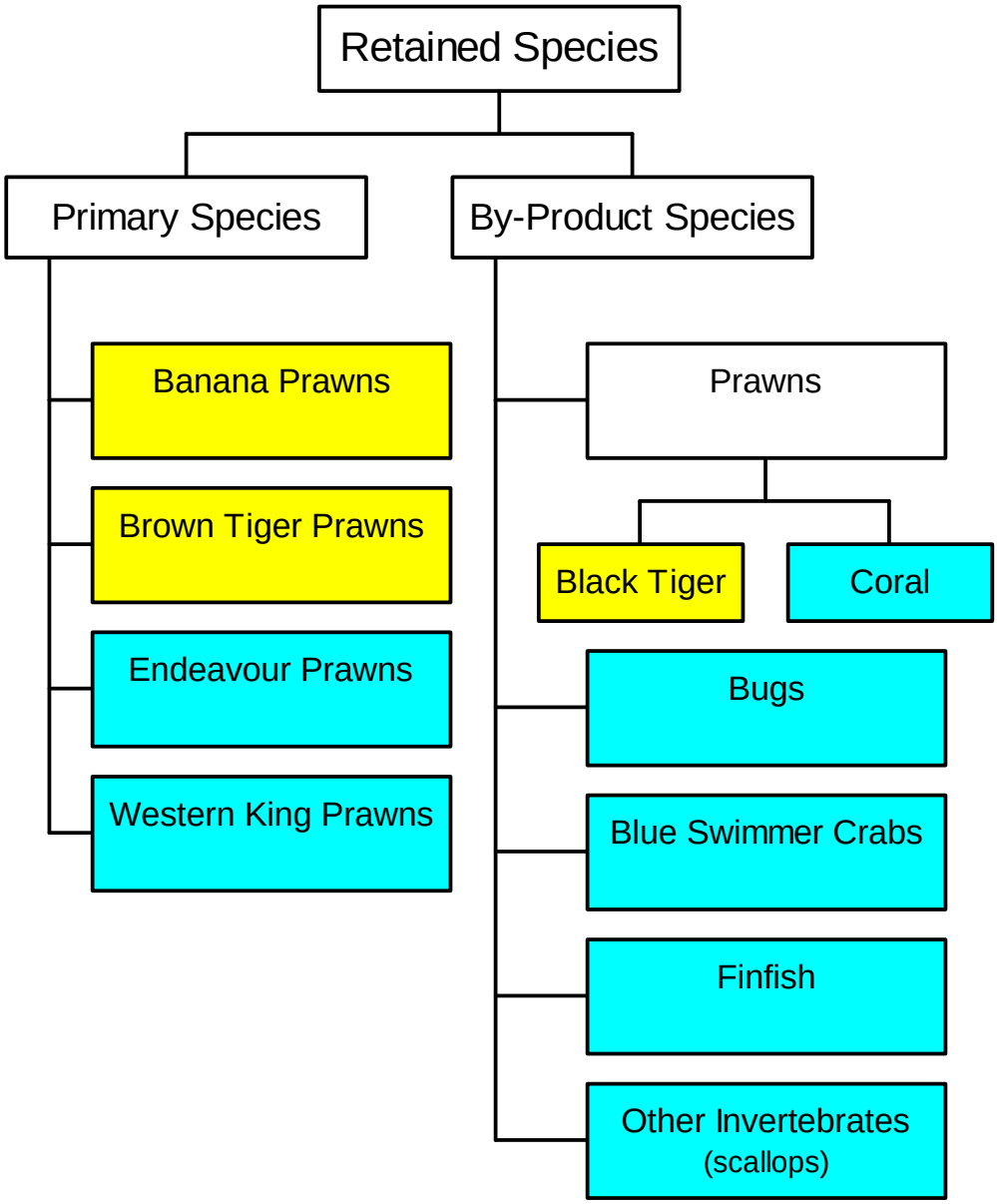
The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.

The component tree detailing the retained species within both fisheries is shown below. Each of the primary species and by-product species retained by both fisheries has been assessed with appropriately detailed reports having been compiled on each of them. Only banana prawns (**Moderate Risk**), brown tiger prawns (**Moderate Risk**) and black tiger prawns (**Moderate Risk**) were of sufficient risk by the fisheries to warrant detailed attention (Section 5.1.1.1, 5.1.1.2 and 5.1.2.2). Although endeavour prawns, western king prawns and coral prawns were all given **Low Risk** rating, full reports were prepared for each due to the importance of these species to the ONPMF and NBPMF (Section 5.1.1.3, 5.1.1.4 and 5.1.2.1).

The by-product species were either classified to be at **Low Risk** or **Negligible Risk** for both fisheries. Full justifications for not specifically assessing these components (i.e. Bugs, Finfish, Crabs and Other Invertebrates) are located in Section 5.1.2. These decisions were largely related to the relatively small quantities taken by the fisheries in comparison to the areas occupied by these species and also the small total catch of these species taken by all fisheries.

An assessment of the current performance for the ONPMF and NBPMF demonstrates that all of the prawn species are being maintained at acceptable levels to maintain ecologically viable stock levels. Thus, in summary:

- The catch trends indicate that there has been no decline in the production levels for brown tiger prawn and king prawn, which is consistent with there being sufficient on-going levels of spawning biomass for both species.
- The catch trends indicate that the production levels for banana and endeavour prawns remain within natural environment levels, which is consistent with the recruitment potential of these species not having been affected by the fishery.
- The level of capture of other by-product species by this fishery is relatively small and therefore does not have a significant impact on their dynamics.



Consequently, these fisheries are meeting the requirement of Objective 1. The information relevant to this principle for these species is detailed below.

Information Requirements

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

Data are collected through a combination of fishery dependent systems to monitor the stock abundance within the fished areas.

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

Monitoring Program	Information Collected	Robustness
CAES returns	Provided on a monthly basis by fishers the total catch of all species landed and effort- days fished. Collected since the 1980s.	Moderate
Voluntary daily logbooks	Daily and shot by shot catch, hours trawled and areas of operation. Limited collection since 1980s.	Moderate
Vessel Monitoring System	Location and speed of vessels. Used by the Department of Fisheries for managing compliance of closures.	High

Assessment

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

The status of the breeding stocks and intra-annual variation for all the major penaeids species are assessed and evaluated every year using a synthesis of information obtained from the fishery. A review of the performance for both fisheries is conducted at least once a year. This review includes an assessment of the total catch by the fishery, the level of effort to take the catch, the distribution of effort, both spatially and temporally across the season and the calculated catch rates. These assessments are reported annually within the State of the Fisheries Report.

For all the primary species, if the performance limits are exceeded the Department of Fisheries has a series of management actions which could be adopted prior to the start of the next season or within a season depending on the situation.

Banana Prawn

Catches are highly variable and mainly related to the amount of rainfall recorded in the region with consecutive high rainfall years providing the optimal conditions for banana prawn recruitment. In Nickol Bay, a broad relationship exists between the summer rainfall (December-March) and the catch of banana prawns in the following season (April-July). This relationship is assessed annually. In years where significant rainfall is recorded the acceptable catch range is 40 to 220 tonnes. In years of very low rainfall, the catch of banana prawns is expected to be 0 to 40 tonnes. The acceptable catch range for banana prawns is 2 to 90 tonnes for the ONPMF. The full performance report is located in Section 5.1.1.1.

Brown Tiger Prawn

For brown tiger prawns, the catches are mostly related to the level of effort on the stocks and the normal environmental fluctuations amongst years. For the last ten years catches have been within the acceptable catch range of 2 to 40 tonnes.

Endeavour Prawn

The endeavour prawn is a by-product species for the two fisheries as this group of species is not specifically targeted by either fishery. Due to its distribution (generally inshore of the main trawl grounds) only a proportion of this stock is vulnerable to the fishery. The controls on fishing effort to protect banana and tiger prawn stocks should afford sufficient protection of the endeavour prawn stocks. The acceptable catch range is between 5 and 20 tonnes and 1 and 10 tonnes for the ONPMF and NBPMF respectively and is based on a ten-year catch range.

Western King Prawn

The catches of western king prawns are mostly related to the level of effort on the stocks and normal environmental fluctuations amongst years. King prawns are the most robust species within these fisheries and hence the rates of fishing that maintain the spawning biomass of the other species (especially tiger prawns) are well below the levels at which there would be any chance of recruitment overfishing affecting this species. The acceptable catch range is 10 to 55 tonnes in the ONPMF and 20 to 70 tonnes in NBPMF. The catches for both fisheries of king prawns have generally been within the acceptable range for the last ten years of the fishery.

The analysis of catch and effort data in the 1980s to the 1990s provides no evidence of a stock-recruitment relationship for king prawns. This indicates that at the current level of effort exerted, which has covered most environmental variations, the king prawn breeding stock is more than sufficient to ensure long-term recruitment potential.

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

The distribution for the four primary penaeid species in both fisheries is well documented. In Australia, banana prawns occur from Shark Bay in WA north through Northern Australia to the Tweed River in northern NSW. The brown tiger prawn is generally regarded as an endemic Australian species, it occurs in WA, the Gulf of Carpentaria and Queensland. The endeavour prawn is restricted to Northern Australian waters between northern NSW and Shark Bay in WA. In Australia, the western king prawns occur from SA, WA, Northern Territory, Queensland and down the east coast to northern NSW.

While all of the species have a broad overall distribution across at least the northern half of Australia, largely due to the habitat requirements of their juveniles, they each have a number of separated locations where their abundance is sufficient to allow commercial fishing to occur. Thus, the prawns caught by the ONPMF and the NBPMF can be considered to originate from functionally separate stocks than other

regions where fishing for these species occurs. More information on the distribution for all four prawn species is located within Section 2 Background Information.

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

Within the list of monitoring programs outlined above for the ONPMF and NBPMF, data covering each of the sources of removal are outlined. Given the nature of these fisheries, 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 significant recreational or indigenous fisheries for prawns in Onslow or Nickol Bay. Furthermore, there is a minimal likelihood of a significant level of illegal capture of prawns by the commercial fleet. This will further be improved with the VMS monitoring of the fleet, which begins in 2003.

Sector	Catch Data Collected	Frequency
Commercial	Catch and disposal Record form- daily basis, Fishers monthly returns (CAES), Size frequency information.	Daily or monthly during the season. Limited
Recreational	N/A	N/A
Indigenous	N/A	N/A
Illegal	Estimated from compliance data.	Annually.

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

The history for both these fisheries (around 20 years) combined with the extensive catch and effort data and research that has been collected for these fisheries and other similar fisheries (i.e. Shark Bay Prawn and Exmouth Gulf Prawn) has enabled a very reliable estimate of the sustainable yield to be calculated for both fisheries. These have been translated into the acceptable catch ranges for each species within each fishery.

The management for both fisheries is adaptive and tailored to each primary species to allow for the variability in prawn recruitment and abundances from year to year. As previously mentioned, acceptable catch ranges have been set for the four primary prawn species for each fishery. These acceptable ranges have been established through past catch rates in the fishery, biology of the species (i.e. robustness), and environmental conditions (i.e. amount of rainfall for banana prawns).

Management Responses

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

As previously mentioned, the Department of Fisheries manages the take for all four prawn species through acceptable catch ranges. These acceptable catch ranges are tailored to the particular fishery and prawn species and are based on catch ranges through the history of each fishery, biology of species (i.e. robustness etc) and environmental conditions. The current acceptable ranges will remain until the next major review of the fishery.

Banana Prawn

There are two acceptable catch ranges for banana prawns in NBPMF. This is due to the broad relationship that exists between the summer rainfall and the catch of banana prawns in the following season. In years where significant rainfall is recorded the acceptable catch range is 40 to 220 tonnes. In years of very low rainfall, the catch of banana prawns is expected to be 0 to 40 tonnes. In the ONPMF the acceptable catch range for banana prawns is 2 to 90 tonnes.

Brown Tiger Prawn

The acceptable catch range for brown tiger prawns is the same for both fisheries. The catches of this species are mostly related to the level of effort on the stocks and the normal environmental fluctuations amongst years. For the last ten years catches have been within the acceptable catch range of 2 to 40 tonnes.

Endeavour Prawn

The acceptable catch range is between 5 and 20 tonnes and 1 and 10 tonnes for the ONPMF and NBPMF respectively and is based on a ten-year catch range.

Western King Prawn

The catches of western king prawns are mostly related to the level of effort on the stocks and normal environmental fluctuations amongst years. The acceptable catch range is 10 to 55 tonnes in the ONPMF and 20 to 70 tonnes in NBPMF.

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

A full description of the management arrangements is located in the attached *Onslow Prawn Fishery Management Plan 1991* and the *Nickol Bay Prawn Fishery Management Plan 1991*. A full discussion of the main regulations and their justifications are located in Section 2. The following is a summary of the management arrangements for the two fisheries:

- The fishery is managed through input controls (including number of licenses, restrictions on boat sizes and gear restrictions).
- The annual fishing season has seasonal and area closures that limit the opportunity for fishers to take prawns.
- Compliance policing includes the use of VMS and gear checks.
- Any significant declines in the breeding population either from environmental effects or due to fishing are observed in time to implement appropriate risk management interventions.
- The performance of the fishery is reviewed and reported on annually.

Significant effort is put into ensuring adequate compliance with these regulations. This includes at-sea and land patrols to ensure operational rules are being adhered to. The use of VMS on the vessels will help the Department of Fisheries monitor vessel location and speed thus increasing compliance with closures while decreasing random patrol activities (full details on Compliance activities and their effectiveness are located in Section 5.4.1.3)

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

Full descriptions of the information available and the levels of risk of impact on these by-product species by the ONPMF and NBPMF are located in sections 5.1.2. Only black tiger prawns were rated as being of sufficient risk to require specific ongoing monitoring. The total amount of the other by-product species captured by these fisheries is very small, representing a negligible risk to these species.

While these fisheries catch black tiger prawns less than 1 tonne is landed annually. Furthermore, this species resides inshore and the existing seasonal closures of key inshore areas and the difficulty of trawling in some inshore areas provides significant protection for this species.

Total catch is used to assess the level of exploitation for black tiger prawn stocks. The acceptable catch range of 0 to 2 tonnes was generated from past catches of this species.

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 within these fisheries over the past 20 years have been very effective and there is, therefore, a very high probability that they will continue to achieve the main objective of maintaining the spawning stocks for the four major prawn species caught.

The management responses that are currently in place for the fisheries are very detailed, both for current actions, future actions and if the performance limits are reached/approached (see Section 5.1.1.1 – 5.1.1.4).

The use of catch based performance measures (acceptable ranges) for all four prawn species, enables the Department to respond where changes outside the normal

variations occur to ensure the maintenance of the spawning stock for all four prawn species. If the probability of these performance limits being reached increases, management arrangements can be implemented.

Strategies available to offer further protection to the spawning stock for all four prawn species, if required, would include:

- Further reductions in the total effort expended in the fishery through a reduction in the length of the fishing season or within season closures; and/or introduction of moon closures.
- Additional area closures.

OBJECTIVE 2. RECOVERY OF STOCKS

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

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

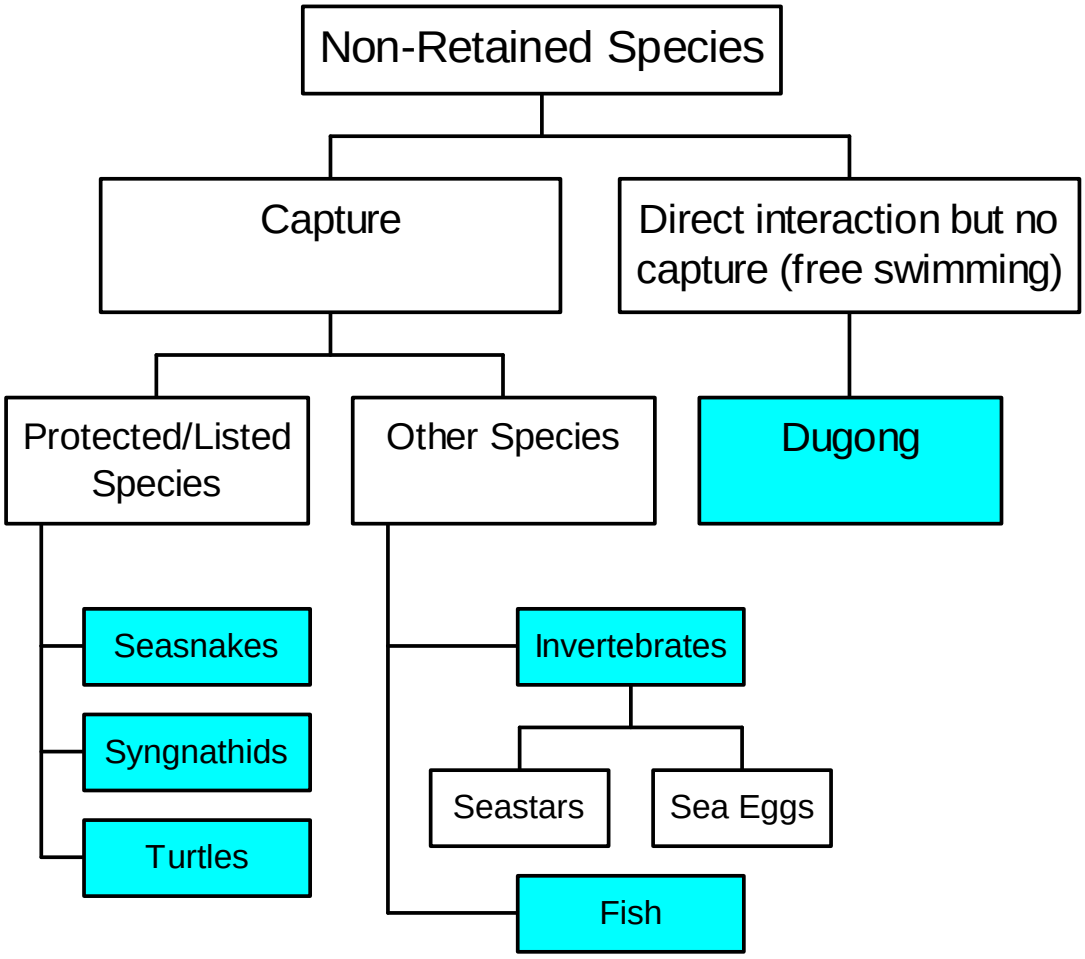
PRINCIPLE 2 OF THE GUIDELINES

OBJECTIVE 1. BYCATCH

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

Six non-retained (bycatch) species/groups were identified in this fishery and are shown below in the component tree. The impacts of the fishery were identified as having a **Negligible Risk** to seasnakes, turtles and dugongs and a **Low Risk** to syngnathids, fish and invertebrates. As a result of the risk ratings accorded to these issues only a brief justification was required (Section 5.2). The threatened and protected species (eg seasnakes, syngnathids, turtles and dugongs) are covered in Objective 2.2; the remaining non-retained species are covered under objective 2.1.

The minimal bycatch issues associated with these fisheries and the negligible to low risks involved demonstrates that the performance of the two fisheries is not threatening any bycatch species, including protected and threatened species. Consequently, it is meeting both objectives 1 and 2 of Principle 2.



Information Requirements

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

There is limited information on the nature and volume of bycatch species for the ONPMF and NBPMF. Information has come from voluntary logbooks for both fisheries and data that have been collected in other similar fisheries such as Shark Bay Prawn Managed Fishery and Exmouth Gulf Prawn Managed Fishery. A Scientific Observer Program, based upon the information collected by the on-board observers, was designed and implemented for two years in 1998 for the Shark Bay Prawn Managed Fishery. The results from this program have been utilised in the assessment for both of these fisheries.

Furthermore, a FRDC funded project to determine biodiversity indicators will collect information of bycatch in trawled and untrawled areas of Onslow/Nickol Bay during 2004/05. It is planned that this project will include actual sampling in the Onslow fishery region in both trawled and untrawled areas during 2004. The results from Onslow and a similar project being done in Exmouth Gulf will be extrapolated for Nickol Bay and a small amount of observer time will be spent in Nickol Bay to identify key species. Once completed, this information will be used in future assessments of the fisheries and for other fisheries in the area.

Assessments

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

A formal risk assessment for the identified non-retained/bycatch species was completed (see Section 5.2 for details on how this was completed). This assessment concluded that the ONPMF and NBPMF were of low risk to fish and invertebrates.

Fish - Summary
ERA Risk Rating (C1 L4 LOW)

Since trawling is a non-selective from of fishing, other species are caught which are not wanted. Due to the low effort levels and relatively small spatial area fished in the ONPMF and NBPMF compared to the overall area where these species probably occur it would most likely be too low to impact bycatch species populations. Furthermore, with the introduction of Fish Exclusion Devices (FEDs) by the end of 2004 it is expected to substantially reduce the catch of some select species. FEDs are any devices fitted within a net and/or any modification made to a net, which allows fish to escape after being taken in the net. In addition, the FRDC project will provide the Department with more information regarding the bycatch species located within trawled grounds and untrawled grounds. Once this project has concluded and the report has been written, this and other issues will be reviewed. For full details see Section 5.2.1.4.

Invertebrates - Summary
ERA Risk Rating (C1 L4 LOW)

Although the trawl gear interacts with the sea bottom where many of these species reside, the configuration of the trawl gear precludes the capture of invertebrate species that live on top of or within the substrate. In addition, the trawl grounds for both fisheries are typically clean sand and mud bottoms and contain few large invertebrates. For full details see Section 5.2.1.5.

Management Responses

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

The combination of the low level of effort, seasonal and area closures and the relatively small area in which the ONPMF and NBPMF operate within greatly reduces the impacts on all of these affected species. Although the Broome Fishery commences from the point where the Nickol Bay fishery boundary ends, the inshore areas are closed to trawling and the fishery is only allowed to operate in a small offshore area. As a result protection is provided from trawling in all of these inshore areas. Furthermore, the Exmouth Gulf Prawn Managed Fishery commences from the western boundary of the ONPMF and although no specific area is permanently closed to trawling near these boundaries very little fishing occurs in these areas. In most years due to the distance required to travel to these areas, the fishery does not fish them (Exmouth fishery is mainly a day-trip fishery).

At the end of 2001, an information package was provided to industry members within both fisheries describing the types of grids being trialled and the preliminary results of these trials in Exmouth Gulf Prawn Managed Fishery and Shark Bay Prawn Managed Fishery. Also information regarding BRDs was exchanged between license holders as industry members also have their own networks and use the same net makers. In 2002, grids were trialled on one side of the nets in both fisheries. BRDs are now compulsory in both fisheries. The grid specifications are as follows:

1. A rigid inclined barrier (installed at an angle not greater than 60° comprising bars that are attached to the circumference of the net which guides animals and/or objects towards an escape opening forward of the grid.
2. An escape opening with the following minimum measurements when measured with the net taut:
    - 75 cm across the widest part of the net
    - a perpendicular measure of 50 cm from the midpoint of the width measure in the above point and
    - a maximum vertical bar clearance spacing of 20 cm.

By the end of the 2004 season, both fisheries will be operating with 100% BRDs (one grid in each net in operation). FEDs will be trialled in the 2004 season in both fisheries which will further reduce the overall bycatch taken, particularly small fish species. After the trial year, it is proposed that both fisheries will be required to operate with FEDs in half of their nets and by the next season FEDs will be required in all operating trawl gear for both fisheries.

Within the next two to three years the Department will be undertaking a biodiversity survey of the bycatch species located within and outside the trawl grounds in Exmouth Gulf and Shark Bay to determine the relative proportion of refuge areas for these bycatch species. Some very limited observer data may be collected during the 2003/04 while the biodiversity project is being conducted.

2.1.4 An indicator group of bycatch species is monitored.

Not applicable on an annual basis. It is proposed to monitor the relative abundance and distribution of these species as part of the five yearly biodiversity surveys

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

Not applicable.

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

As a result of the requirement for this fishery to be operating with BRDs in all nets by 2003 as well as the additional FEDs that will be introduced in 2004, it is likely that there will be a decrease in the level of impact on the non-retained species by the

ONPMF and NBPMF. Nonetheless, as more data becomes available, the suitability of the current performance limits may need to be reviewed. If they are inappropriate and/or the current assumptions are found to be incorrect, appropriate alterations to practices will be taken.

A Bycatch Action Plan will be developed and completed for ONPMF and NBPMF in 2004. This plan will outline the proposals and directions to be taken by these fisheries to deal with these issues, as summarised in this application.

OBJECTIVE 2. PROTECTED/LISTED SPECIES

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

Information Requirements

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

As previously mentioned, there is limited direct information available on the nature and volume of bycatch species for the ONPMF and NBPMF. The current compulsory monthly CAES report does not have a provision for information on bycatch to be recorded. A few licence holders have agreed to fill in voluntary logbooks, which provide the Department with records of protected species caught. Information has come from voluntary logbooks for both fisheries and data that have been collected in other similar fisheries such as Shark Bay Prawn Managed Fishery and Exmouth Gulf Prawn Managed Fishery. The results from this latter program have been utilised in the assessment for both of these fisheries.

Furthermore, an FRDC funded project to determine biodiversity indicators will collect information of bycatch in trawled and untrawled areas of Onslow/Nickol Bay during 2004/05. Once completed, this information will be used in future assessments of the fisheries and for other fisheries in the area.

Assessments

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

A formal risk assessment for the identified non-retained/bycatch species was completed (see Section 5.2 for details on how this was completed). This assessment concluded that the ONPMF and NBPMF were of negligible risk to seasnakes, turtles and dugongs and low risk to syngnathids. All the issues below will be reviewed following the completion of the FRDC project in 2004/05, which will collect information of bycatch in trawled and untrawled areas of Onslow/Nickol Bay.

Capture

Seasnakes - Summary
ERA Risk Rating (C0 L5 NEGLIGIBLE)

While it is known that both fisheries catch seasnakes, the amount caught is unknown. Anecdotal evidence from other trawl fisheries in WA suggests that caught seasnakes are alive and aggressive. Data from an observer program in Shark Bay Prawn Managed Fishery found the 194 seasnakes were caught from 916 trawls. Of the seasnakes caught, 99% of the individuals were returned alive. The full rationale for the negligible risk rating for this issue is documented in Section 5.2.1.1.

Syngnathids - Summary
ERA Risk Rating (C1 L2 LOW)

Syngnathids are incidentally caught by the ONPMF and NBPMF but the amount is unknown. Trawling occurs over areas that are mostly unfavourable to syngnathids such as mud and sand habitat types. As a result, the interaction between the trawlers and the species is likely to be low. In addition, observer data from the Shark Bay Prawn Managed Fishery suggested that very low numbers of syngnathids are caught, in the order of 1 per night across the entire fleet. For further information see Section 5.2.1.2.

Turtles – Summary
ERA Risk Rating (C0 L5 NEGLIGIBLE)

From the logbook entries, two turtles have been identified as being caught in the NBPMF, the Pacific ridley and loggerhead turtles. In ONPMF there has been one entry of turtles being caught but no species was identified. The logbook information indicated there was only one turtle that was not returned alive after being captured. BRDs incorporating grids and turtle exclusion hatches are being introduced into both fisheries. By the commencement of the 2003 season both fisheries were operating with BRDs in all of the nets in operation thereby minimising the risk to turtles. See Section 5.2.1.3 for further information.

Direct Interaction but no Capture

Dugongs – Summary
ERA Risk Rating (CO L1 NEGLIGIBLE)

There has been no evidence or report of a dugong being captured or interacted with by either fishery. The ONPMF and NBPMF operate mostly over sand and mud habitat types while the preferred habitat of the dugong is seagrass. Due to the separation of the trawling activities and dugong habitat (seagrass) there is a very little likelihood of interaction between the two (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 these fisheries as they operate on sand and mud bottoms.

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 current status of at least two BRDs required in 2003 for these fisheries, it is expected that the quantity and likelihood of captures of all these species/groups will be minimised and likely reduced.

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 for the ONPMF and NBPMF with protected species and the introduction of BRDs and FEDs in the coming seasons, it is more than likely that the current situation of having only negligible impacts on these species will continue. Nonetheless, as 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 the practices will be taken.

As previously mentioned, a Bycatch Action Plan that incorporates and deals with the issues identified in this application will be completed in 2004. This plan will outline the proposals to deal with these issues, as summarised in this application.

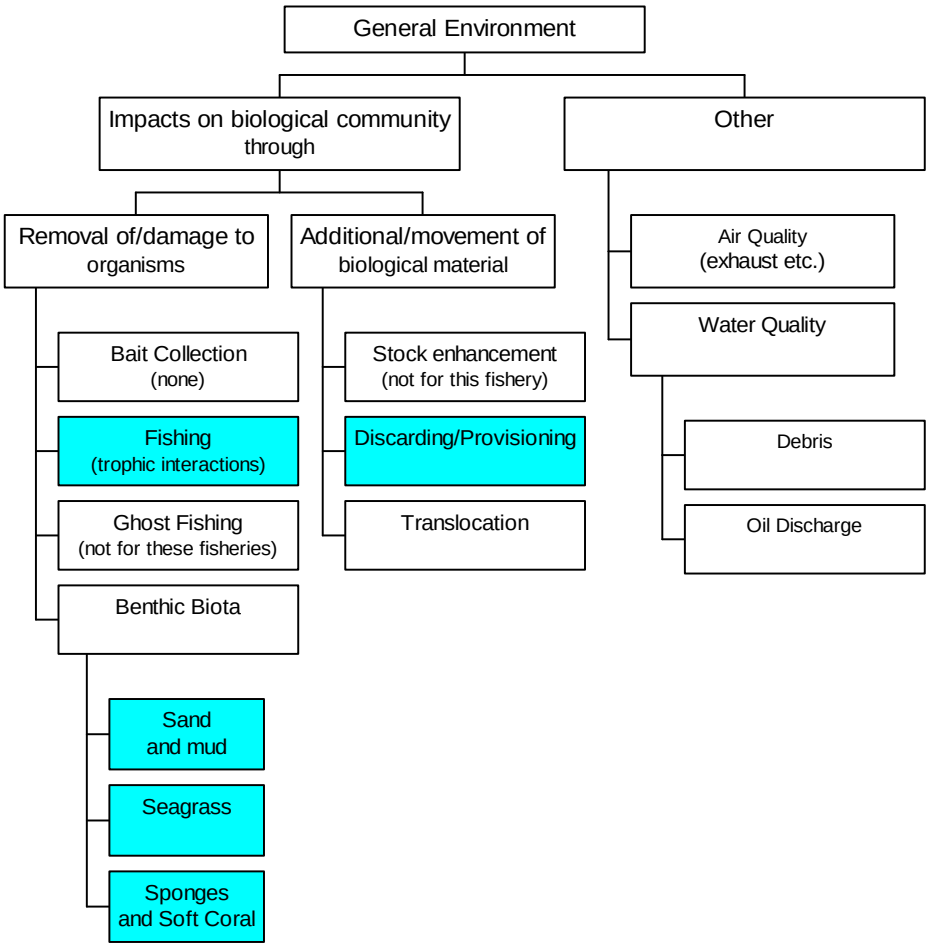
OBJECTIVE 3. GENERAL ECOSYSTEM

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 which were identified for the ONPMF and NBPMF are shown below in the component tree. A risk assessment process subsequently assessed each of these issues with the information relating to each issue detailed in Section 5.3.

Of the five issues identified for the ONPMF and NBPMF, two were of **Low risk** (trophic interactions and impacts to benthic biota – sand and mud) the other three were rated as **Negligible Risk** (impacts to benthic biota –seagrass, impacts to benthic biota – soft coral and sponges and discarding/provisioning). Consequently, the

current performance for the ONPMF and NBPMF is meeting Objective 3 and this acceptable performance is likely to at least continue or improve in the future.



Information Requirements

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

Appropriate levels of information have been obtained for most of the issues identified, which has allowed a sensible assessment of the level of risk to be made. This information includes data collected, which is directly related to the ONPMF and NBPMF- in terms of levels of catch and effort, gear designs, and understanding of spatial and temporal closures. There are also a number of publications that provide valuable information on trophic interactions in addition to the research that the Department of Fisheries has undertaken and is currently working on within other similar fisheries.

The biodiversity surveys will provide additional information on these issues.

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

Table 4 Summary of risk assessment outcomes for environmental issues related to the ONPMF and NBPMF.

ISSUES	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Removal of/damage to organisms:			
Trophic Interactions	Low	The total tonnage of material removed by this fishery is relatively small. Most prawn predators are opportunistic due to the natural variability of the prawn populations. There are no known obligate prawn predators, which are likely to be impacted upon by the removal of adult-sized prawns. The management of area and seasonal closures ensure that an adequate spawning stock of all species of prawns survive to reproduce recruits for the subsequent season. The use of BRDs and FEDs in the fisheries will further reduce the amount of bycatch species being taken from the ecosystem.	5.3.1.1
Impacts to Benthic Biota – Sand and Mud	Low	The ONPMF and NBPMF only operate within a very limited area of the total licensed fishing zone (approx. 5%). Studies of actual impacts from prawn trawling suggest only minimal impacts to infaunal communities. The	5.3.1.2

		combination of the small area of operation and minimal impact within this area makes this a Low Risk.	
Impacts to Benthic Biota – Seagrass	Negligible	Trawlers actively avoid this habitat due to the entanglement caused by seagrass caught in the net. The full introduction of BRDs will further encourage trawlers to avoid seagrass areas because the grids are highly susceptible to clogging.	5.3.1.3
Impacts to Benthic Biota – Soft Coral and Sponges	Negligible	Most trawlers do not target coral/sponge habitat due to the damage and danger that results from trawling in such areas. Prawns occur in high densities over sandy and muddy habitats therefore trawlers target those habitat types.	5.3.1.4
Addition/Movement of biological material:			
Discarding/Provisioning	Negligible	Introduction of BRDs and FEDs will reduce the amount of bycatch generated in both fisheries, which in turn reduces the amount of discards by each fishery.	5.3.2.1

Management Response

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

The most important management methods required to ensure that there is minimal impact on the broader ecosystem include maintaining significant biomass levels of prawns and other by-product species. In most cases, this serves to achieve both objectives of having a sustainable fishery and minimising the potential for any trophic interactions. Other management measures such as gear restrictions, spatial and seasonal closures, limiting the number of operating vessels, and future research also further minimise the potential for general ecosystem impacts.

With the proposal of future studies to be conducted to determine the biodiversity of bycatch species within trawled and untrawled grounds and the introduction of the

VMS an increase of information will be generated to more accurately assess these issues.

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

None of the issues identified for this category were of sufficient risk to require specific target levels as they are effectively covered by the other management arrangements and trigger points. If future studies prove that risk to any of these issues has increased a review will take place and management will implemented.

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

The risk assessment identified that under current management arrangements there have been minimal or negligible impacts from the ONPMF and NBPMF on the broader ecosystem even after around 20 years of fishing. It is, therefore, highly likely that these fisheries will continue to meet the objectives of having only acceptable levels of impact. If future studies indicate that further management is required for one or more of the various habitat types and the bycatch species, then appropriate actions will be developed.

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 Banana Prawn	Yes	Annual catch	Nickol Bay (NB)- 40-220 tonnes in years of significant rainfall; 0 to 40 tonnes in years of very low rainfall Onslow (ON)- 2 to 90 tonnes	Acceptable	NB- Medium ON- Low	1.1.1 – 1.1.7	Continue and improve current monitoring, management and assessment arrangements
5.1.1.2 Brown Tiger Prawn	Yes	Total catch	NB- 2 to 40 tonnes ON- 5 to 40 tonnes	Acceptable	Low	1.1.1 – 1.1.7	Continue and improve current monitoring, management and assessment arrangements
5.1.1.3 Western King Prawns	Yes	Total catch	NB- 20 to 70 tonnes ON- 10 to 55 tonnes	Acceptable	Low	1.1.1 – 1.1.7	Continue current monitoring, management and assessment arrangements
5.1.1.4 Endeavour Prawns	Yes	Total catch	NB- 5 to 20 tonnes ON- 1 to 10 tonnes	Acceptable	Low	1.1.1 – 1.1.7	Continue current monitoring, management and assessment arrangements
5.1.2.1 Coral Prawns	Yes	Total catch	NB- 1 to 15 tonnes ON- 4 to 20 tonnes	Acceptable	Medium	1.1.8	Continue current monitoring, management and assessment arrangements
5.1.2.2 Black Tiger Prawns	Yes	Total catch	NB & ON- 0 to 2 tonnes each	Acceptable	Medium	1.1.8	Continue current monitoring, management and assessment arrangements
5.1.2.3 Bugs	No- Low Risk	N/A	N/A	N/A	N/A	1.1.8	Review Risk at Next Major Assessment
5.1.2.4 Other Invertebrates	No- Negligible Risk	N/A	N/A	N/A	N/A	1.1.8	Review Risk at Next Major Assessment

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	DEH Guidelines Covered	Actions
RETAINED SPECIES (cont.)						1.1 – 1.8	
5.1.2.5 Crabs	No- Negligible Risk	N/A	N/A	N/A	N/A	1.1.8	Review Risk at Next Major Assessment
5.1.2.6 Fish	No- Negligible Risk	N/A	N/A	N/A	N/A	1.1.8	Review Risk at Next Major Assessment
NON-RETAINED SPECIES (Component Tree)						2.1 and 2.2	
5.2.1.1 Seasnakes	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 Turtles	No – Negligible Risk	N/A	N/A	N/A	N/A	2.2.2 – 2.2.6	Review Risk at Next Major Assessment
5.2.1.4 Fish	No – Low 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- Low 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 Dugongs	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 and Mud Communities	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 Seagrass	No – Negligible Risk					2.3.1 – 2.3.5	Review Risk at Next Major Assessment

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	DEH Guidelines Covered	Actions
GENERAL ENVIRONMENT (cont.)						2.3	
5.3.1.4 Impacts to Soft Coral and Sponges	No-Negligible Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Review Risk at Next Major Assessment
5.3.2.1 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. PERFORMANCE REPORTS

5.1 RETAINED SPECIES

COMPONENT TREE FOR RETAINED SPECIES OF THE ONSLOW AND NICKOL BAY PRAWN MANAGED FISHERIES

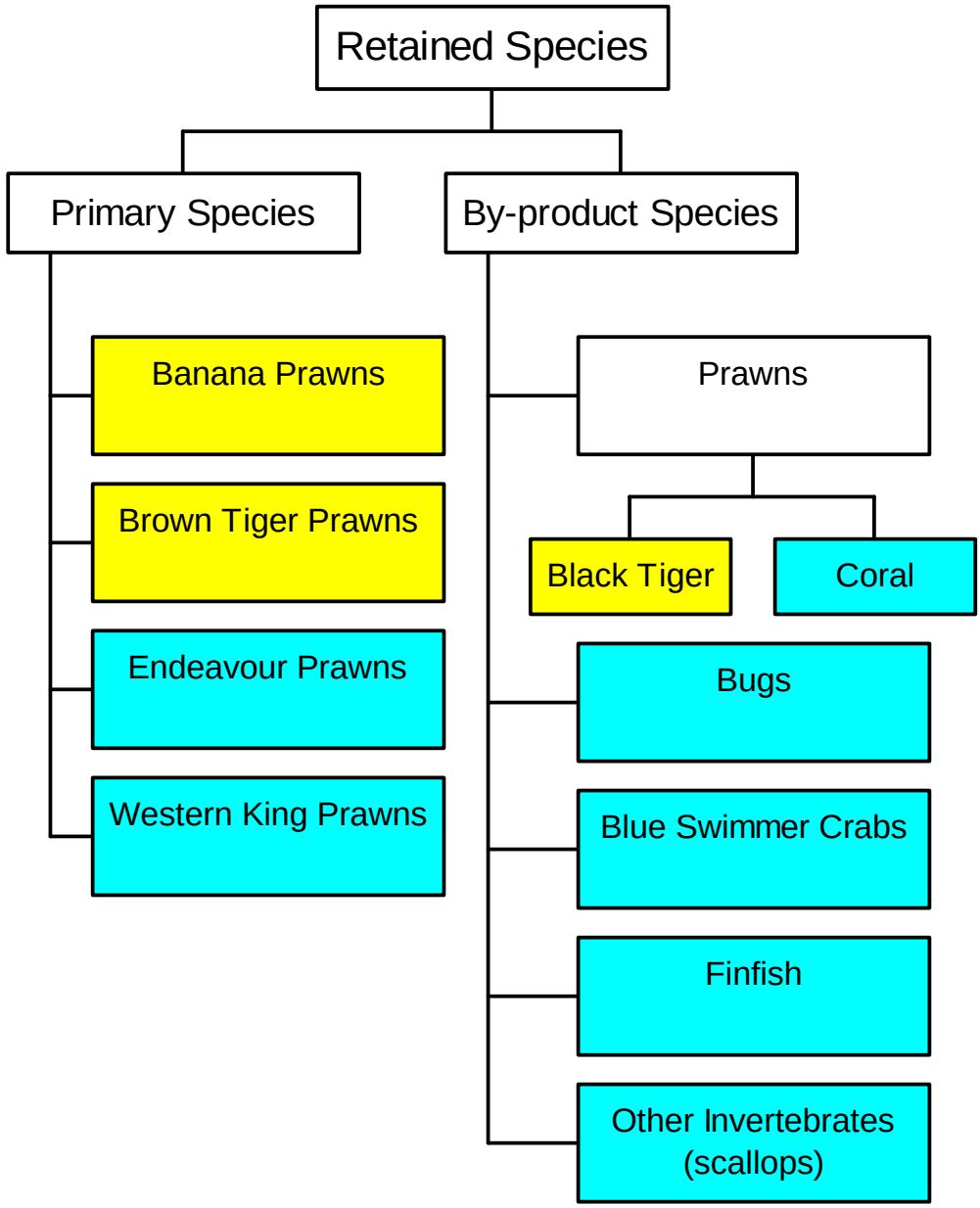


Figure 11 Component tree for the retained species.
Yellow boxes indicate that the issue was considered high enough risk at the internal workshop to warrant having a full report on performance. Blue boxes indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.1.1 PRIMARY SPECIES

5.1.1.1 BANANA PRAWNS

Rationale for Inclusion

Banana prawns are the major target species for the NBPMF and a primary species for the ONPMF.

ERA Risk Rating: Impact on breeding stock (C2 L5 MODERATE)

The normal dynamics of this species which regularly undergoes large fluctutaitons in abundance suggests that it is not likely to be severely impacted by the fishery. The potential consequence of fishing on banana prawns was, however, ranked as 'moderate' (2) as this species is the main target species in high abundance years and is known to aggregate. Due to the higher risk associated with this species a precautionary approach is taken in assigning a 'moderate' level of potential consequence. It was considered that this 'moderate' consequence could occur 'occasionally'. This resulted in an overall risk ranking of Moderate.

Operational Objective

To ensure there is sufficient breeding stock to continue recruitment at levels that will replenish what is taken by fishing, predation and other environmental factors by maintaining the spawning stock of banana prawns at or above a level that minimises the risk of recruitment overfishing.

Justification:

Maintaining the potential productivity of the banana prawn stock by ensuring that recruitment levels are only affected by environmental fluctuations not by the level of spawning stock.

Indicator

The annual catch of banana prawns.

Performance Measure

Nickol Bay- In years where significant rainfall is recorded the acceptable catch range is 40 to 220 tonnes. In years of very low rainfall, the catch of banana prawns is expected to be 0 to 40 tonnes.

Onslow- The acceptable catch range for banana prawns is 2 to 90 tonnes.

Justification:

Catches of banana prawns are highly variable and related to the amount of rainfall recorded in the region with consecutive high rainfall years providing the optimal conditions for banana prawn recruitment. In Nickol Bay, a broad relationship exists

between the summer rainfall (December–March) and the catch of banana prawns in the following season (April to July; Figure 12). Thus, a very high catch of 467 tonnes was observed in 2000 as a result of very high rainfall. This relationship is assessed annually.

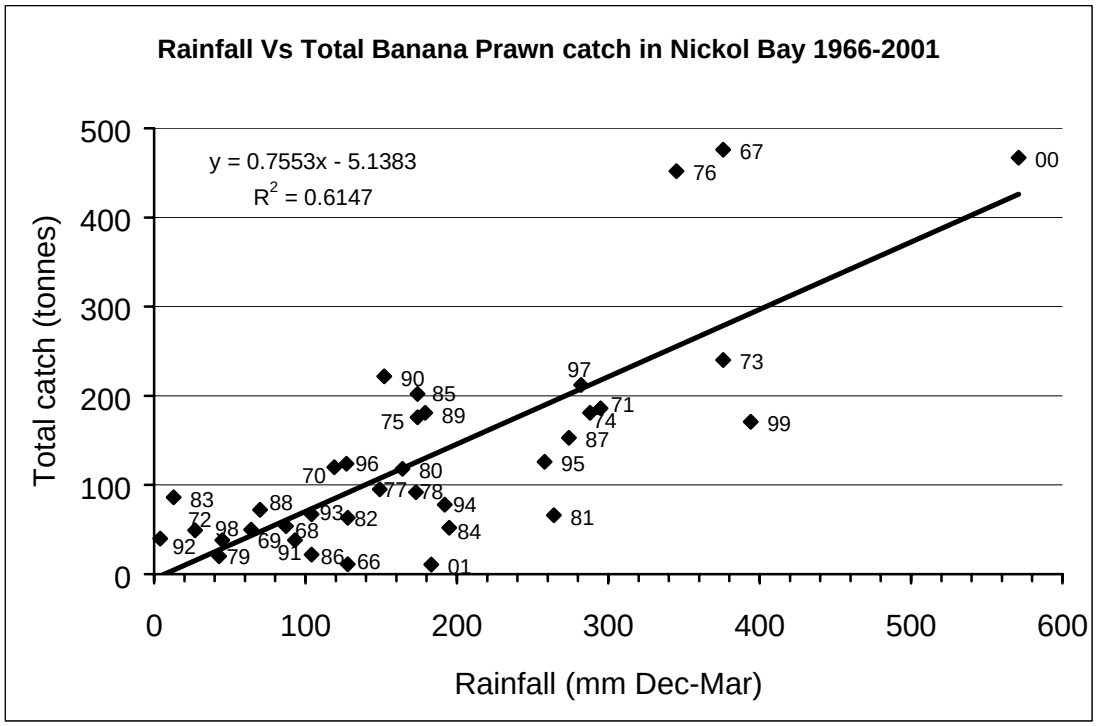


Figure 12 Relationship between rainfall in the December to March period and the commercial catch of banana prawns in the NBPMF the following year.

Data Requirement for Indicator (and Availability)

Data Required	Availability
Catch utilising commercial catch and effort information provided through compulsory monthly CAES returns.	Yes; since the mid 1960s. Improved data recording since the 1980's.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1980s.

Evaluation

Summary: There are similar patterns for the variations in annual catch of banana prawns at both locations. These variations are quite large with a higher abundance of banana prawns occurring under optimal environmental conditions.

The current analysis (Figure 13 & 14) of the banana prawn catches indicates that the breeding stock is at acceptable levels at Onslow. However, the catch of banana prawns at Nickol Bay for the last 2 years (2000 and 2001) has been either above or below the acceptable catch range. If the catch of banana prawns at

Nickol Bay does not return to the acceptable catch range in 2002, specific action will be taken. The catch of banana prawns for 2002 for the NBPMF is within the acceptable catch range for a year of low rainfall.

Onslow

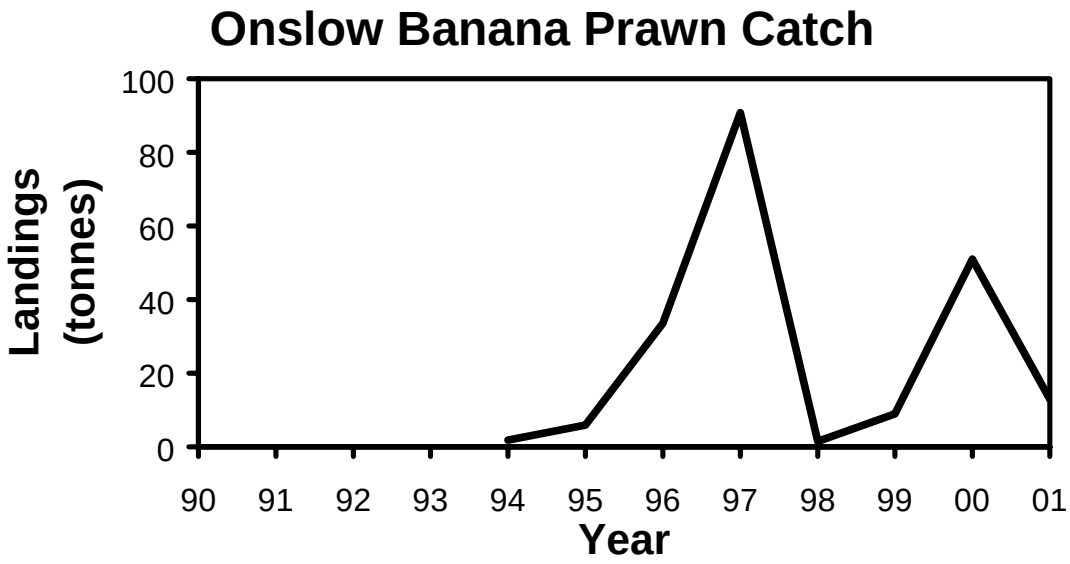


Figure 13 Catch of banana prawns in the ONPMF.

The Onslow fishery caught a total of 13 tonnes of banana prawns in 2001 (Figure 13). The banana prawn catches were within the acceptable range for 2001, although low compared to 2000, which was above average for the fishery. This decline in banana prawn catch occurred in spite of moderate rainfall; however, the rain was not associated with any cyclones, which increase water turbidity and reduce predation. Work continues on assessing the relationship between summer rainfall and banana prawn catches from Area 1 of this fishery in the hope that a more predictive assessment can be developed.

Nickol Bay

The catch of banana prawns in the last five years has varied significantly. This level was within the acceptable range during 1997-99 but the very high catch of 467 tonnes in 2000 (Figure 14) and a very low catch in 2001 were both outside of these ranges. Newly released data for the catches in this fishery for 2002 shows that the catch of banana prawns has returned to being within the acceptable catch range for a year of low rainfall. In 2002, 22 tonnes of banana prawns were caught.

During 2001, boats licensed to fish in the NBPMF recorded only 289 days of fishing. This was approximately 60% down on the average number of fishing days recorded in the last four years, as the fleet left early to go to alternative fisheries in response to the very low abundance of banana prawns.

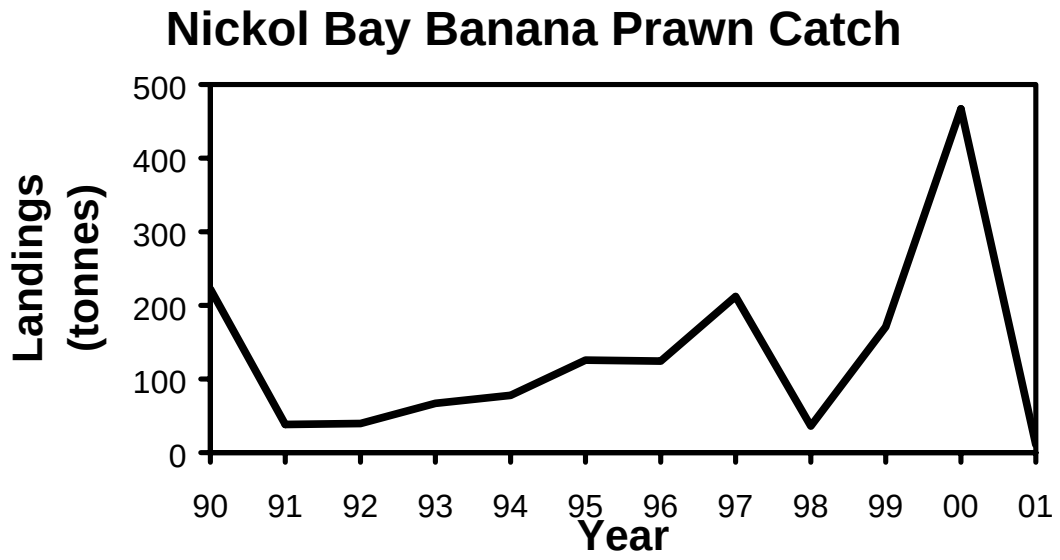


Figure 14 Catch of banana prawns in the NBPMF.

The catches in 2001 did not fit the rainfall-catch relationship with only 11 tonnes taken rather than the 80-190 tonnes forecast. A possible explanation is that although the rainfall recorded during the period was moderate, it was not associated with any cyclone event that would increase water turbidity. The absence of turbidity may have increased predation rates. With the exceptionally low catch following a high stock level seen in 2000, the breeding stock levels should not have been a factor in 2001, but may become a constraint with the forecast low catch for a second consecutive year.

Robustness:

Nickol Bay **- Medium**

Long time-series of catch and effort information provided by 100% of commercial fishers. As banana prawns are the main target species, the catch of the fishery is a reasonable estimate of the relative abundance of the potential spawning prawns available the previous year.

Onslow **- Low**

Banana prawns are not a major target species in this region; therefore some of the variation in catches may reflect influences other than the change in their relative abundance. Given general fisher behaviour, this is more likely to amplify any declines in abundance so the indicator is probably more precautionary.

Fisheries Management Response

Current: To ensure maintenance of the required level of breeding stock:

1. The fishery is managed through input controls.
2. The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity to fishers to take prawns.

3. Compliance policing includes gear checks and VMS from 2003.
4. Monitoring of improvements in technology that may increase fishing efficiency. These are considered at every major review.

Future: To maintain status quo.

Actions if Performance Limit is Exceeded: The following strategy will be adopted prior to the beginning of the next season in the event that the performance limits are exceeded:

1. Find out why the acceptable catch range has not been met or is significantly over the acceptable range. Evaluate if there has been a shift in targeting of banana prawns that can explain the variation. If:

    a) Lowered catch levels are due to effort reduction then no action to be taken.
    b) An increase is due to a one-off environmental fluctuations then no action will be undertaken.
    c) There is a significant increase, or an increasing trend over three years in the catch of banana prawns, strategies to further protect the breeding stock by further reducing the total effort expended in the fishery (including a reduction in the length of fishing season or within season closures) will be investigated. These actions can be initiated within a season or prior to the beginning of the next season.

Comments and Actions

The use of VMS for analysing effort distribution will commence in 2003. Four to five vessels have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for both fisheries.

External Drivers

Banana prawns usually dominate the catch from Nickol Bay. The catch of this species is positively correlated with rainfall in the months December to March. With only 7 mm of rainfall recorded for this period during 2001/02 and the low catches observed in 2001, very low landings (1–40 tonnes) of banana prawns are forecast for 2002.

Every boat in the NBPMF has a licence to operate in at least one other fishery. Those fisheries include the Abrolhos Islands and Mid-west Trawl Managed Fishery, the Shark Bay Scallop Managed Fishery, the Onslow Prawn Managed Fishery, the PFTIMF and the Kimberley Prawn Managed Fishery. As such, the fishing effort in the NBPMF is dependent on management measures in place elsewhere, and on the catch rates available in these other fisheries. Trawling for finfish in the PFTIMF has encouraged the construction of larger boats with greater fishing power than would otherwise have been supported by fishing prawns alone. In recent years, however, concern about over-exploitation in the Pilbara Fish Trawl Fishery has led to time quotas and other restrictions. The impact of these restrictions has forced some of these larger fishing vessels to return to the NBPMF and other fisheries for which they have licences. These vessels, however, are not economically viable in the NBPMF in low

banana prawn years and leave the fishery early, leading to highly variable effort in the fishery.

5.1.1.2 BROWN TIGER PRAWNS

Rationale for Inclusion:

Brown tiger prawns are target species for the ONPMF and NBPMF and have been shown to be vulnerable to overfishing in other fisheries such as Exmouth Gulf and Shark Bay.

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

The potential consequence of fishing on brown tiger prawns was ranked as 'severe' (3). Compared to the exploitation of other prawn species in the ONPMF and NBPMF, this is a relatively high potential consequence rating. This level was selected because recruitment of tiger prawns is much more dependent on spawning stock size than other prawn species and there is some ability to overfish them. It was considered 'possible' that this 'severe' consequence could occur, given that a stock depletion event has occurred for this species in the past in other fisheries. This resulted in an overall risk ranking of Moderate.

Operational Objective

To ensure there is sufficient breeding stock to continue recruitment at levels that will replenish what is taken by fishing, predation and other environmental factors by maintaining the spawning stock of tiger prawns at or above a level that minimises the risk of recruitment overfishing.

Justification:

Although no SRR analysis has been developed for tiger prawns stocks in Onslow or Nickol Bay, there will be a level of reduction in stock (and therefore the level of egg production) when recruitment levels are adversely impacted. This phenomenon is defined as recruitment overfishing. Therefore, as a minimum, the breeding stock (or levels of egg production) should be maintained at levels above where these adverse impacts are likely to occur.

Indicator

The total catch, taking into consideration the effective effort of vessels operating, is used to assess the level of exploitation of tiger prawn stocks in each fishery.

Performance Measure

Given no major change in effort, the status of the tiger prawn stock is assessed by whether catches remain within the acceptable catch range of:

***Onslow*-** 5 to 40 tonnes.

***Nickol Bay*-** 2 to 40 tonnes.

Justification:

There is a long time series of catch and effort information for this species in these fisheries. The current catch and effort levels are considered adequate to maintain breeding stocks because the tiger prawn stocks are distributed in discrete areas and not all areas of tiger prawn stocks are necessarily fished each year. Particularly in the Nickol Bay fishery, banana prawns are the main target species and tiger prawns are not specifically targeted.

Technology effort creep is indirectly considered through information gathered on technology or gear modifications or spatial effort changes (via VMS). Some extrapolation may be made from other fishery such as Shark Bay Prawn Managed Fishery.

At current effort levels and with variations in environmental conditions sufficient breeding stock will be available to ensure sufficient recruitment in the future.

Data Requirement for Indicator (and Availability)

Data Required	Availability
Catch utilising commercial catch and effort information provided through compulsory monthly CAES returns.	Yes; since 1980s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1980s.

Evaluation

Summary: The current analysis of the tiger prawn fishery breeding stock is that the indicator is within the agreed reference range for acceptable catches in both of these fisheries. Consequently, the current performance of the fishery should be maintaining sufficient levels of spawning biomass of tiger prawns to meet the agreed objectives.

The landings for the 2001 season in Onslow were 28 tonnes of tiger prawns (Figure 15). The ONPMF is a small fishery in which tiger and king prawns have been the dominant species caught over the long term with total landings ranging from approximately 60 to 130 tonnes. The catches during 2001 continued to be average levels for tiger prawns and within the acceptable catch range of 5 to 40 tonnes.

The total landings for the 2001 season were only 2 tonnes of tiger prawns (Figure 16). The level of fishing effort in 2001 was, however, approximately 60% down on the average of the last four years in response to the very low abundance of banana prawns (see above). The NBPMF operates predominantly by specifically targeting schools of banana prawns, consequently the catch of tiger prawns are mostly related to the level of effort on these other stocks set against the normal environmental fluctuations amongst years.

Onslow

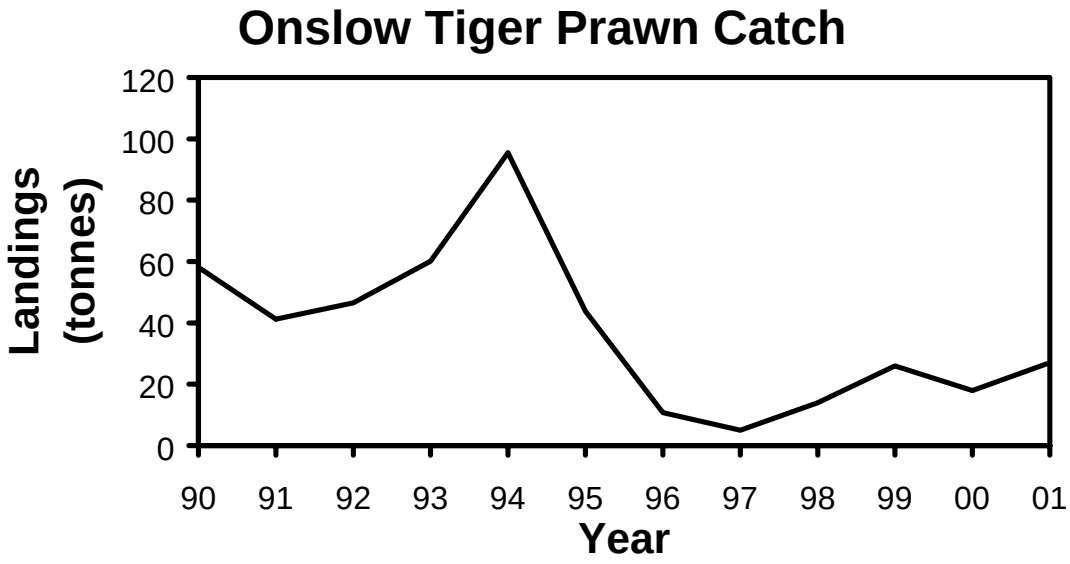


Figure 15 Catch of tiger prawns in the ONPMF.

Nickol Bay

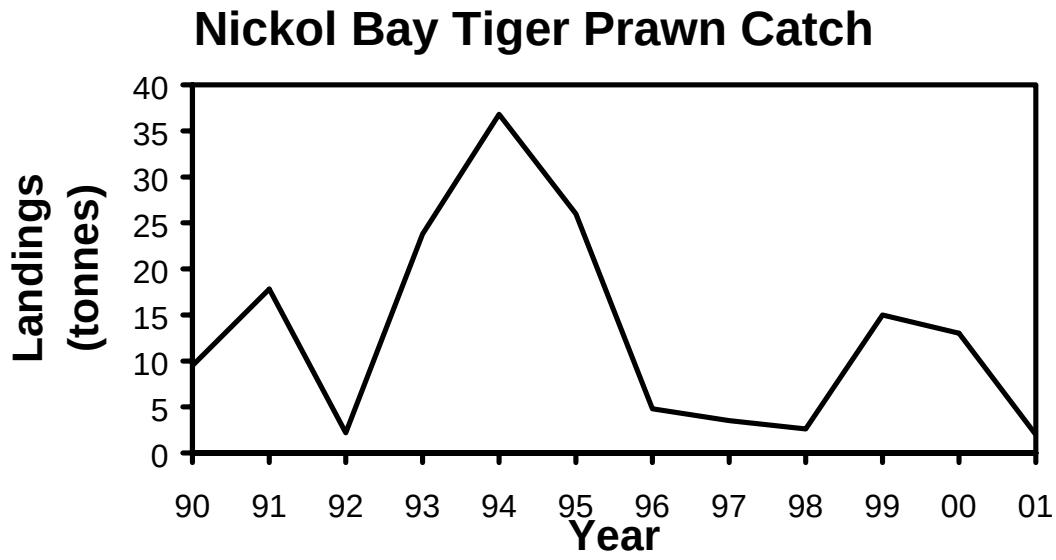


Figure 16 Catch of tiger prawns in the NBPMF.

Robustness:

Low

Whilst there is a long time-series of catch and effort information provided by 100% of commercial fishers, the targeting of this fishery is not directed to tiger prawns hence reductions may be associated with less effort being placed in this fishery due to the abundance of the main target species – banana prawns.

Fisheries Management Response

Current: To ensure maintenance of the required level of breeding stock:

1. The fishery is managed through input controls.
2. The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity to fishers to take prawns.
3. Compliance policing includes gear checks and VMS from 2003.
4. Monitoring of improvements in technology that may increase fishing efficiency.

Future: Not applicable.

Actions if Performance Limit is Exceeded: The following strategy will be adopted in the event that the performance limits are exceeded:

1. Find out why the acceptable catch range has not been met or is significantly over the acceptable range. Evaluate if there has been a shift in targeting of brown tiger prawns that can explain the variation. If:

    a) Lowered catch levels are due to effort reduction then no action to be taken.
    b) An increase is due to a one-off environmental fluctuations then take no action.
    c) There is a significant increase, or an increasing trend over three years in the catch of brown tiger prawns, strategies to further protect the breeding stock by further reducing the total effort expended in the fishery (including a reduction in the length of fishing season or within season closures) will be investigated. These actions could be initiated within the season or prior to the beginning of the next season.

Comments and Actions

The use of VMS for analysing effort distribution will commence in 2003. Four to five vessels have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the ONPMF and NBPMF.

External Driver Checklist

Environmental factors such as: climatic changes, ocean currents and sea-surface temperatures are known to affect the levels of recruitment of prawns and are therefore likely to impact on the level and productivity of breeding stock. High rainfall years (often associated with cyclones) provide higher banana prawn abundances. The most significant risk factors in the context of external drivers are probably cyclonic activity and significant environmental pollution (i.e. oil or chemical spills in key breeding areas) or habitat degradation.

5.1.1.3 WESTERN KING PRAWNS

Rationale for Inclusion:

King prawns are a target species of the ONPMF and NBPMF.

ERA Risk Rating: Impact on exploitable biomass (C1 L6 LOW)

The potential consequence of fishing on western king prawns was ranked as 'minor' (1) due to the relatively lower vulnerability of king prawns to fishing compared to the other species. It was considered 'likely' that this 'minor' consequence could occur. This resulted in an overall risk ranking of Low.

Operational Objective

To maintain the catch of king prawns at acceptable levels.

Justification:

There has not been a situation where a fishery has caused a decline in spawning biomass to a point where recruitment overfishing of a king prawn stock has occurred. King prawns are the most robust species within this fishery hence the rates of fishing that maintain the spawning biomass of the other species (especially tiger prawns) are well below the levels at which there would be any chance of recruitment overfishing affecting this species.

Indicator

The total catch, taking into consideration the effective effort of vessels operating, is used to assess the level of exploitation of king prawn stocks in Onslow and Nickol Bay.

Performance Measure

Given no major change in effort, the status of the king prawn stock is assessed by whether catches remain within the acceptable catch range of:

Onslow – 10 to 55 tonnes.
Nickol Bay - 20 to 70 tonnes.

Justification:

There is a long time series of catch and effort information for these fisheries. Production levels from the 1980's to the 1990's provide no evidence of a SRR for king prawns.

Technology effort creep is indirectly considered through information gathered on technology or gear modifications or spatial effort changes (via VMS). Some

extrapolation may be made from other fishery such as Shark Bay Prawn Managed Fishery.

The current catch and effort levels are therefore considered adequate to maintain breeding stocks. This indicates that at current effort levels and with variations in environmental conditions sufficient breeding stock will be available to ensure sufficient recruitment in the future. Furthermore, the introduction of seasonal and area closures have provided restrictions on the overall fishing effort, which increases the protection of the breeding stocks for king prawns.

Data Requirements for Indicator

Data Required	Availability
Catch utilising commercial catch and effort information provided through compulsory monthly CAES returns.	Yes; since the mid 1980s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since the mid 1980s.

Evaluation

Summary: The current analysis (Figure 17) indicates that the catch of king prawn is within the acceptable range for the ONPMF. Consequently, the current performance of the fishery for maintaining a sufficient level of spawning biomass is meeting the agreed objective.

For NBPMF, the catch of 8 tonnes in 2001 (Figure 18) was below the acceptable range (20 to 70 tonnes) but this was mostly due to the 60% reduction in the level of fishing effort used in the fishery during 2001 because of the lack of banana prawns.

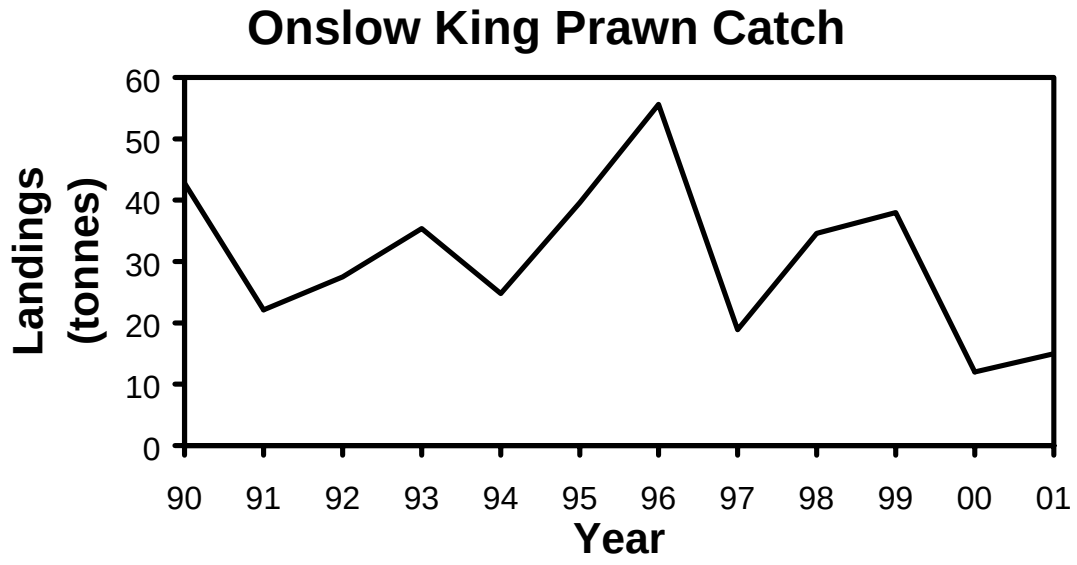


Figure 17 Catch of king prawns in the ONPMF.

Onslow

The king prawn catch has remained stable, indicating that environmental effects such as cyclonic activity (producing heavy rainfall) have little effect on the abundance of this stock. The landings for Onslow in the 2001 season included 15 tonnes of king prawns (Figure 17). This catch whilst at the lower end is still within the acceptable range of this species.

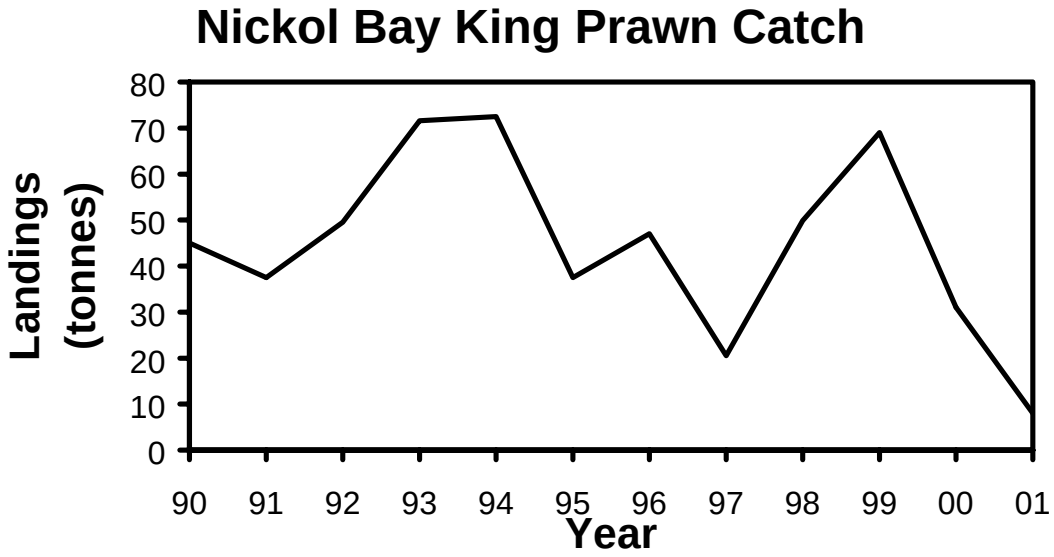


Figure 18 Catch of king prawns in the NBPMF.

Nickol Bay

The catches of king prawns are mostly related to the level of effort on the stocks and, to a lesser degree, the normal environmental fluctuations amongst years. Consequently, the catches have generally been within the acceptable range for the last ten years in this fishery. The landings of king prawns in the 2001 season were, however, only 8 tonnes (Figure 18). This is less than the acceptable range of 20 to 70 tonnes but the level of fishing effort was 60% lower than the average for the past 4 years. This may also reflect lower recruitment levels for king prawns in 2000 due to less favourable environmental conditions (excessive rain).

It is anticipated that the king prawn catches should return to the acceptable catch range in 2002 as low rainfall has again been experienced.

Robustness:

Low

Long time-series of catch and effort information provided by 100% of commercial fishers but these fisheries do not target king prawns. But the low risk for this species does not require a highly robust indicator.

Fisheries Management Response

Current: To ensure maintenance of the required level of breeding stock:

1. The fishery is managed through input controls (including number of boats, power of vessel, controls on net design and other gear restrictions).
2. The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity to fishers to take prawns.
3. Improvements in technology that may increase fishing efficiency are monitored.
4. Any significant declines in the breeding population either from environmental effects or due to fishing are observed in time to implement appropriate risk management interventions.

Future: Compliance policing will include use of VMS and gear checks.

Actions if Performance Limit is Exceeded: The following approach is used when the performance limit is exceeded:

1. Find out why the acceptable catch range has not been met. Evaluate if there has been a shift in the targeting of king prawns that can explain the variation. If:

    a) The lowered catch levels are due to effort reduction then no action to be taken.
    b) There is a drop in the relative abundance of king prawns, the strategies available to offer further protection to the breeding stock which can be initiated within the season or prior to the beginning 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 season closures; and/or introduction of moon closures.
        - Additional area closures.

The ability to implement these strategies is provided for within the FRMA.

Comments and Actions

The use of VMS for analysing effort distribution will commence in 2003. Four to five vessels have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the Onslow and Nickol Bay fisheries.

External Drivers

Environmental factors such as: climatic changes, ocean currents, cyclones and sea-surface temperatures are known to affect the levels of recruitment of prawns. This may impact on the level and productivity of breeding stock although to a lesser extent for king prawns than the other species. Fishers report that there can be an indirect, short-term impact on the distribution of king prawns when heavy rainfall inland and subsequent river flooding appear to disperse the stock, affecting overall catches.

5.1.1.4 ENDEAVOUR PRAWNS

Rationale for Inclusion:

Endeavour prawns are caught as by-product species in the ONPMF and NBPMF. These species are not targeted but are caught in reasonable numbers in most years.

ERA Risk Rating: Impact on exploitable biomass (C2 L3 LOW)

The potential consequence of fishing on endeavour prawns was ranked as 'moderate' (2). This species is generally found inshore of where the fishery operates and hence is not very vulnerable to the fishery. It was, therefore, considered 'unlikely' that this 'moderate' consequence could occur. This resulted in an overall risk ranking of Low.

Operational Objective

Ensure that the catch remains within a range that indicates the species is being subjected to relatively low exploitation. This would result in minimal risk to the breeding stock.

Justification:

Endeavour prawns are a by-product species of the ONPMF and NBPMF and therefore are not specifically targeted by either of the fisheries. Due to the distribution of this species, which are generally inshore of the main trawl grounds, only a proportion of this stock is vulnerable to the fishery. Hence, if there is no increase in exploitation, there can be little risk to these stocks.

Indicator

Total Catch.

The total catch is used to assess the level of exploitation of endeavour prawn stocks.

Performance Measure

Catch should remain within an acceptable range of:

Onslow- 5 to 20 tonnes.
Nickol Bay- 1 to 10 tonnes.

Justification:

The acceptable catch ranges are based upon the 10-year catch history in each of these fisheries and are largely used to indicate if there has potentially been some change in targeting by the fleets.

Data Requirements for Indicator

Data Required	Availability
Catch utilising commercial catch and effort information provided through compulsory monthly CAES returns.	Yes; since 1980s for Onslow and since 1995 for Nickol Bay.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1980s

Evaluation

Summary: The current analysis for catches of endeavour prawns indicates that the catch has generally been within the acceptable catch range for this species. The controls on fishing effort to protect banana and tiger prawn stocks along with the areas of operation should enable sufficient protection for the endeavour prawn stocks.

The landings in the 2001 season for the ONPMF included 7 tonnes of endeavour prawns (Figure 19). This was within the acceptable range for this fishery.

Only 1 tonne of endeavour prawns were taken by the NBPMF in 2001 (Figure 20). Despite the 60% drop in effort, this was the same catch as in 2000 and it is within the acceptable range for this species in this area.

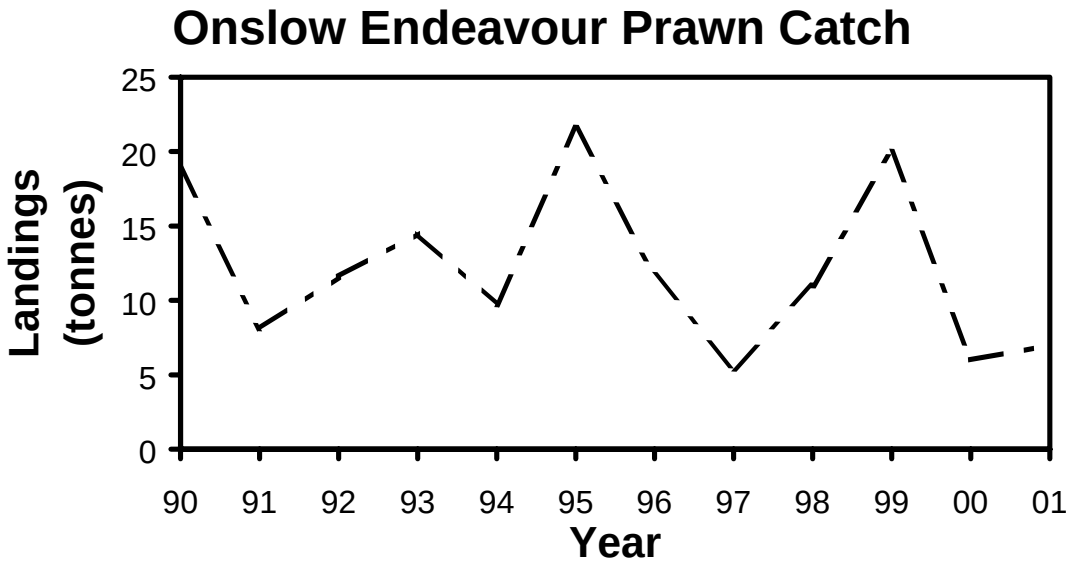


Figure 19 Catch of endeavour prawns in the ONPMF.

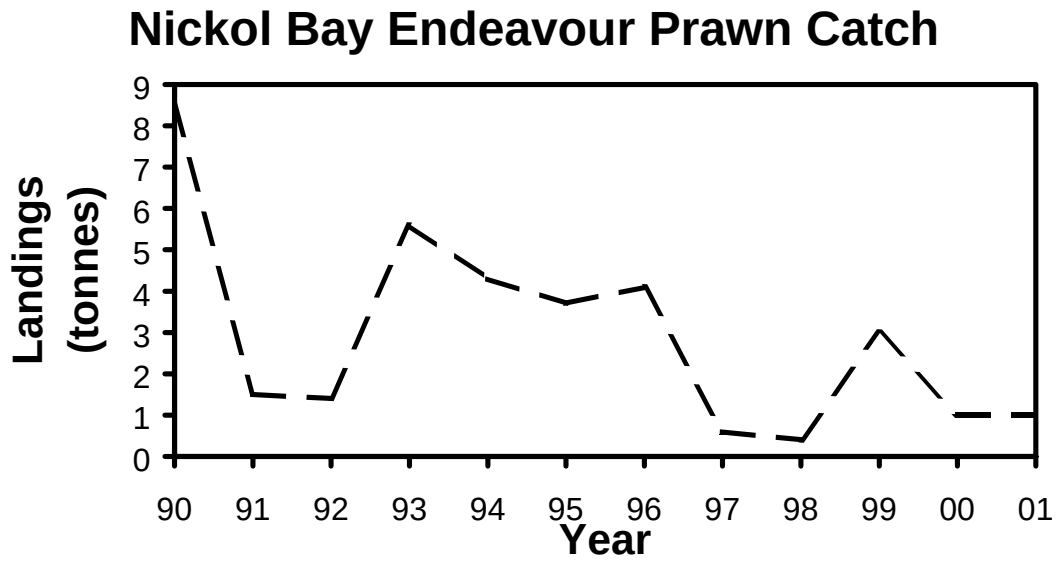


Figure 20 Catch of endeavour prawns in the NBPMF.

Robustness

Low

Long time-series of catch and effort information provided by 100% of commercial fishers.
Catch may not be a good index of abundance due to non-targeting of the species.

Fisheries Management Response

Current: Management strategies are in place to protect banana and tiger prawns stocks, which also ensure the maintenance of the required level of breeding stock for endeavour prawns. These strategies include:

1. The fishery is managed through input controls (see above for details).
2. The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity for fishers to take endeavour prawns.

Future: Compliance policing will include the use of VMS from 2003 and gear checks.

Actions if Performance Limit is Exceeded: The following strategy will be adopted in the event that the performance limits are exceeded:

1. Find out why the acceptable catch range has not been met or is significantly over the acceptable range. Evaluate if there has been a shift in targeting of endeavour prawns that can explain the variation. If:

a) The lowered catch levels are due to effort reduction then no action to be taken.
b) An increase is due to an one-off environmental fluctuations then no action will be taken.
c) If there is a significant drop/increase, or a declining/increasing trend over three years in the relative abundance of endeavour prawns, strategies to further protect the breeding stock through further reducing the total effort expended in the fishery (including a reduction in the length of fishing season or within season closures) will be investigated. These actions can be initiated within the season or prior to the beginning of the next season.

The ability to implement these strategies is provided for within the FRMA.

Comments and Actions

The use of VMS for analysing effort distribution will commence in 2003. Four to five vessels have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the ONPMF and NBPMF.

External Drivers

Environmental factors such as: climatic changes, ocean currents, cyclones and sea-surface temperatures are known to affect the levels of recruitment of prawns and are therefore likely to impact on the level and productivity of breeding stock. The most significant risk factors in the context of external drivers are probably cyclonic activity and significant environmental pollution (i.e. oil or chemical spills in key breeding areas) or habitat degradation.

5.1.2 BY-PRODUCTS

5.1.2.1 CORAL PRAWNS

Rationale for Inclusion:

Coral prawns (*Metapenaeopsis* spp.) are caught as a by-product species in the ONPMF and NBPMF. Although, in general the fishery does not target this species they are still caught in reasonable numbers from year to year. If higher market prices for coral prawns occur, this may increase the level of targeting of this species, particularly in the ONPMF.

ERA Risk Rating: Impact on breeding stock (C1 L6 LOW)

The potential consequence of fishing on coral prawns was ranked as ‘minor’ (1). It was considered ‘likely’ that this ‘minor’ consequence could occur. This resulted in an overall risk ranking of LOW.

Operational Objective

Assessing whether coral prawns are remaining a by-product species not a target species.

Justification:

Coral prawns are a by-product species of the ONPMF and NBPMF and not generally targeted by either fishery. Coral prawns are a small species therefore many of them fall through the cod-end mesh and are not retained. Due to the mesh size, selectivity and distribution only a small proportion of the stocks are vulnerable to the fishery

Indicator

Catch of coral prawns.

Performance Measure

Catch should remain within an acceptable range of 4 to 20 tonnes for ONPMF and 1-15 tonnes (ten-year catch range) fro NBPMF.

Justification:

The acceptable catch ranges are based upon the 10-year catch history in each of these fisheries and are largely used to indicate if there has potentially been some change in targeting by the fleets. If there was a longer term increase in catch this could represent a change in targeting practices by the fishery and trigger a reassessment of the risk.

Data Requirements for Indicator

Data Required	**Availability**
Catch utilising commercial catch and effort information provided through compulsory monthly CAES returns.	Yes; since 1990s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1990s.

Evaluation

Summary: The current analysis (Figure 21) indicates that the coral prawn fishery is within the acceptable catch range and the fishery therefore is meeting the objective.

The catches of coral prawn stocks for only the past five years have remained within the acceptable catch range for this species in both the ONPMF and NBPMF.

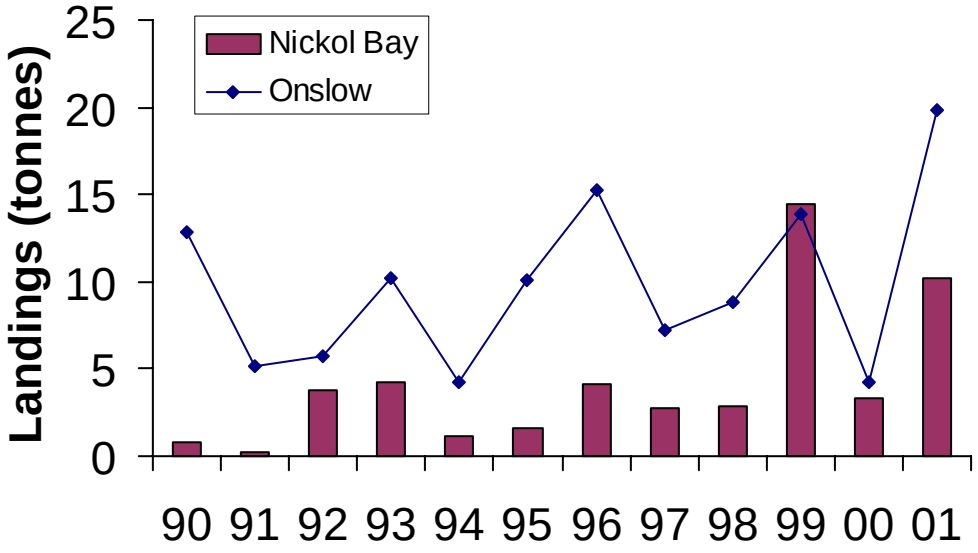


Figure 21 Catch history of coral prawns in the ONPMF and NBPMF (1990 to 2001).

Robustness:

Medium

1. There is a long time-series of catch and effort information provided by 100% of the commercial fishers.
2. Data are aggregated for several species termed coral prawns.
3. Catch may not be an index of abundance due to the practice of discarding when more valuable species are caught in high quantities and selectivity of trawl nets precludes catch of a proportion of individuals. It is however, a reasonable index of targeting.

Fisheries Management Response

Current: To ensure maintenance of the required level of breeding stock:

1. The fishery is managed through input controls.
2. The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity for fishers to take prawns.
3. Compliance policing includes use of VMS from 2003 and gear checks.
4. Monitoring of improvements in technology that may increase fishing efficiency.

Future: It is not anticipated that coral prawns will be targeted by fishers due to the low economic value of this species compared to banana, tiger and king prawns.

Actions if Performance Limit is Exceeded: The following strategy will be adopted in the event that the performance limits are exceeded:

1. Find out why the acceptable catch range has not been met or is significantly over the acceptable range. Evaluate if there has been a shift in targeting of coral prawns that can explain the variation. If:
   a) The lowered catch levels are due to effort reduction then no action to be taken.
   b) If an increase is due to a one-off environmental fluctuation then take no action.
   c) If there is a significant drop/increase, or a declining/increasing trend over three years in the relative abundance of coral prawns, strategies to further protect the breeding stock by further reducing the total effort expended in the fishery (including a reduction in the length of fishing season or within season closures; or moon closures) will be investigated. These actions can be initiated within the season or prior to the beginning of the next season.

The ability to implement these strategies is provided for within the FRMA.

Comments and Actions

The use of VMS for analysing effort distribution will commence in 2003. Four to five vessels have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the ONPMF and NBPMF.

External Drivers

Environmental factors such as: climatic changes, ocean currents, cyclones and sea-surface temperatures are known to affect the levels of recruitment of prawns and are therefore likely to impact on the level and productivity of breeding stock. The most significant risk factors in the context of external drivers are probably cyclonic activity and significant environmental pollution (i.e. oil or chemical spills in key breeding areas) or habitat degradation.

5.1.2.1 BLACK TIGER PRAWNS

Rationale for Inclusion:

Black tiger prawns (*Penaeus* monodon) are caught as a by-product species in the ONPMF and NBPMF. Small quantities of black tiger prawns are caught in these fisheries with generally less than one tonne landed annually. This prawn species is beginning to become important to the aquaculture industry for broodstock.

ERA Risk Rating: Impact on breeding stock (C3 L3 MODERATE)

The potential consequence of fishing on black tiger prawns was ranked as ‘severe’ (3). Compared to the exploitation of other prawn species in the ONPMF and NBPMF, this is a relatively high consequence rating. It was considered ‘unlikely’ under current harvesting patterns that this ‘severe’ consequence could occur. This resulted in an overall risk ranking of **Moderate**.

Operational Objective

To ensure that the targeting of the black tiger prawns does not increase too greatly to potentially impact on their breeding stock.

Justification:

This is an inshore species and it is likely that existing seasonal closures of key inshore areas and the difficulty of trawling in some inshore areas will provide significant protection for this species.

Indicator

The total catch, taking into consideration the effective effort of vessels operating, is used to assess the level of exploitation of black tiger prawn stocks.

Performance Measure

The acceptable catch range is between 0 and 2 tonnes.

Justification:

Given no major change in effort, the status of the black tiger prawn stock is assessed by whether catches remain within these low levels. The high of two tonnes in the acceptable catch range allows for those years with good environmental conditions (i.e. high rainfall) to be incorporated within the acceptable catch range. An increase in catches beyond these levels could indicate greater levels of targeting.

Data Requirement for Indicator (and Availability)

Data Required	**Availability**
Catch utilising commercial catch and effort information provided through compulsory monthly CAESS returns.	Yes; since 1990s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1990s.

Evaluation

Summary: The current analysis (Figure 22) indicates that the black tiger prawn fishery is within the acceptable catch range and the fishery therefore is meeting the objective.

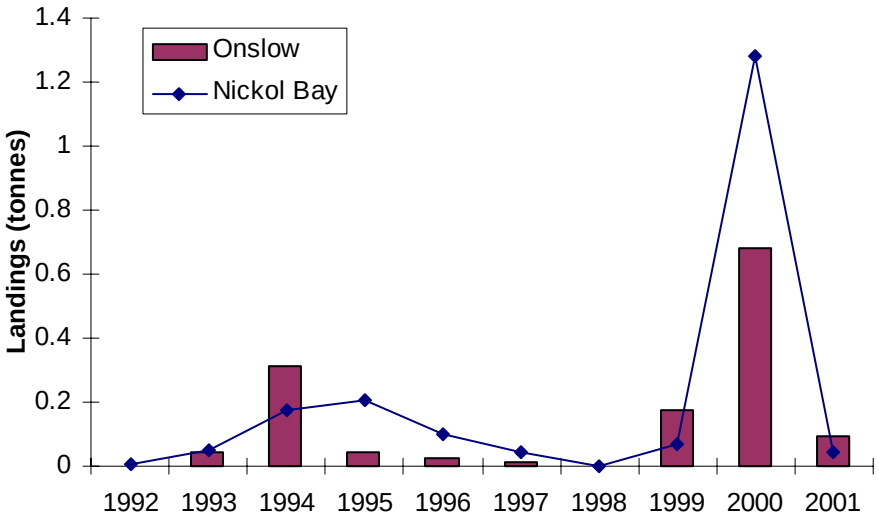


Figure 22 Historical landings of black tiger prawns for the ONPMF and NBPMF (1992 – 2001).

Robustness:

Medium

There is a time-series of catch and effort information provided by 100% of the commercial fishers.

Fisheries Management Response

Current: To ensure maintenance of the required level of breeding stock:

1. The fishery is managed through input controls.
2. The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity for fishers to take prawns.
3. Compliance policing includes use of VMS from 2003 and gear checks.
4. Monitoring of improvements in technology that may increase fishing efficiency.

Future: It is not anticipated that fishers will target black tiger prawns due to their low abundance. However, increased demand may occur for this species as broodstock for aquaculture purposes and will have a high economic value for individual prawns, which could increase the risk for this species.

Actions if Performance Limit is Exceeded: The following strategy will be adopted in the event that the performance limits are exceeded:

1. Find out why the acceptable catch range has not been met or is significantly over the acceptable range. Evaluate if there has been a shift in targeting of black tiger prawns that can explain the variation.
   a) If lowered catch levels are due to effort reduction then no action to be taken.

b) If an increase is due to a one-off environmental fluctuations then take no action.
c) If there is a significant drop/increase, or a declining/increasing trend over three years in the relative abundance of black tiger prawns, strategies to further protect the breeding stock by further reducing the total effort expended in the fishery (including a reduction in the length of fishing season or within season closures; or an introduction of moon closures) will be investigated. These actions can be implemented within the season or prior to the beginning of the next season.
d) If further protection of *P. monodon* stocks was considered necessary in the future it could be achieved by more permanent closures of inshore areas except for tightly regulated collection of broodstock for aquaculture purposes.

The ability to implement these strategies is provided for within the FRMA.

Comments and Actions

The use of VMS for analysing effort distribution will commence in 2003. Four to five vessels have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the Onslow and Nickol Bay fisheries.

External Drivers

There appears to be some correlation between high rainfall years and higher catches for this species.

5.1.2.3 BUGS

Rationale for Inclusion:

The ONPMF retains bugs (*Thenus orientalis*) as a by-product. In 2002, ONPMF retained 8.6 tonnes of bugs, down from approximately 12 tonnes in 2001 (Figure 23). Lesser quantities are retained by the NBPMF. In 2002, NBPMF retained 6.4 tonnes of bugs and in 2001 2.7 tonnes of bugs were retained (Figure 24).

ERA Risk Rating: Impact on breeding stock (C1 L6 LOW)

It was determined 'likely' that the fishery could have a 'minor' impact of the breeding population of bugs in Onslow or Nickol Bay due to the following:

1. Bugs are a minor component of the retained catch for the NBPMF and a significant component of the ONPMF. However it is still considered that the quantities retained is low compared to the extensive population size and wide geographical range of this species; and
2. Bugs have a long larval life and an offshore phase allowing them to disperse widely.

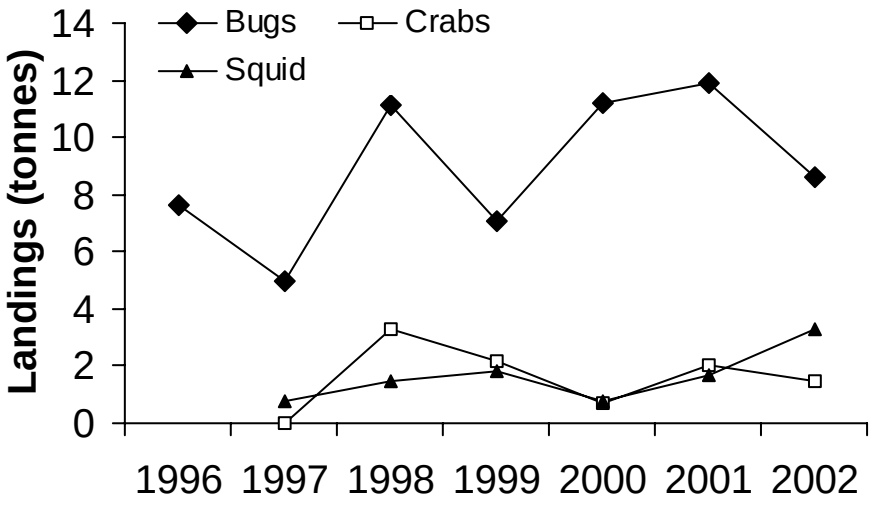


Figure 23 Quantities of by-products retained by ONPMF, 1996-2002.

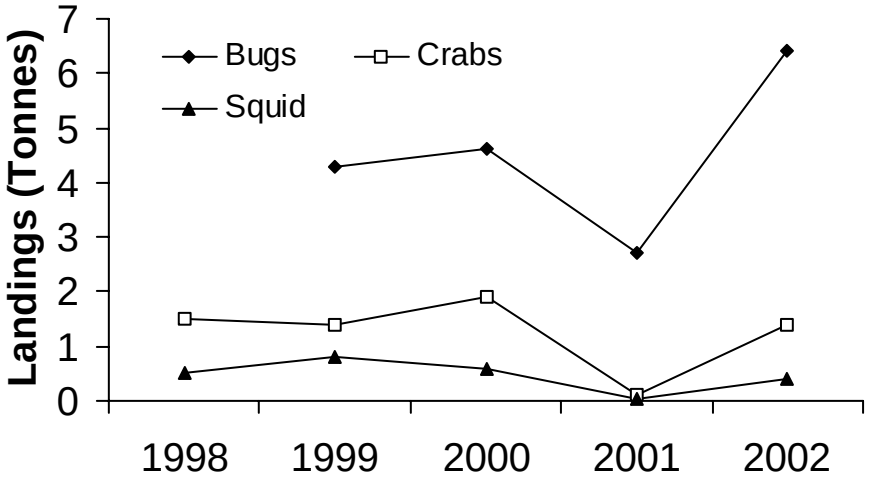


Figure 24 Quantities of by-products retained by NBPMF, 1996-2002.

5.1.2.4 OTHER INVERTEBRATES

Rationale for Inclusion:

Very small quantities (<500 kg per year) of other invertebrate species are also retained and include cuttlefish and octopus. The ONPMF retained 0.6 tonnes of squid in 2002 and the NBPMF retained 0.4 tonnes (Figures 23 and 24).

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

In terms of impact on breeding stock levels of cuttlefish and octopus, the consequence of the ONPMF and NBPMF is considered 'negligible'. This is due to the small and isolated catch in comparison to the extensive population size and distribution of these species along the WA coastline (Dr Fred Wells[1], pers. comm.).

[1] Dr Fred Wells, WA Museum.

5.1.2.5 CRABS

Rationale for Inclusion:

The ONPMF and NBPMF catch and retain small quantities of blue swimmer crabs (*Portunus pelagicus*). Recorded landings for the last few years indicate catches are less than 2 tonne per year for either fishery. In 2002 the ONPMF retained 1.5 tonnes of crabs and the NBPMF retained 1.4 tonnes of crabs (Figures 23 and 24).

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

In terms of impact on breeding stock levels of blue swimmer crab, the consequence of the ONP and NBP fisheries is considered 'negligible' due to the following:

1. This species has a low vulnerability to fishing.
2. In Western Australia blue swimmer crab distribution extends from Albany to the Northern Territory border, and the crabs inhabit a wide range of inshore and continental shelf areas, from the intertidal zone to at least 50m in depth (Fisheries WA, 2002).
3. There is a comparatively limited area where blue swimmer crabs are caught by trawlers. There are extensive refuge areas both north and south along the coast and in deeper waters of the continental shelf that are generally not fished where the blue swimmer crab can be found.
4. The Onslow and Nickol Bay fisheries take only a very small proportion of the total catch of blue swimmer crabs. In the season of 2000/2001 the commercial fisheries around the State took 673 tonnes of blue swimmer crabs.
5. As the legal size at first capture (127 mm) is well above the size at maturity, in all commercial (and recreational) sectors that take blue swimmer crabs, the breeding stock levels are expected to be adequate to maintain stocks (Fisheries WA, 2002).
6. Some crabs are thrown back, particularly undersized individuals. Many of the crabs hauled up in the trawl nets are still alive, and the survival of discarded individuals is generally estimated to be around 85%, based on experimental trawls in Cockburn Sound (Melville-Smith *et. al*, 2001).

5.1.2.6 FISH

Rationale for Inclusion:

Less than one tonne of mixed finfish species are recorded as landed in both the Onslow and Nickol Bay 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.

5.2 NON-RETAINED SPECIES

COMPONENT TREE FOR NON-RETAINED SPECIES IN THE ONPMF AND NBPMF

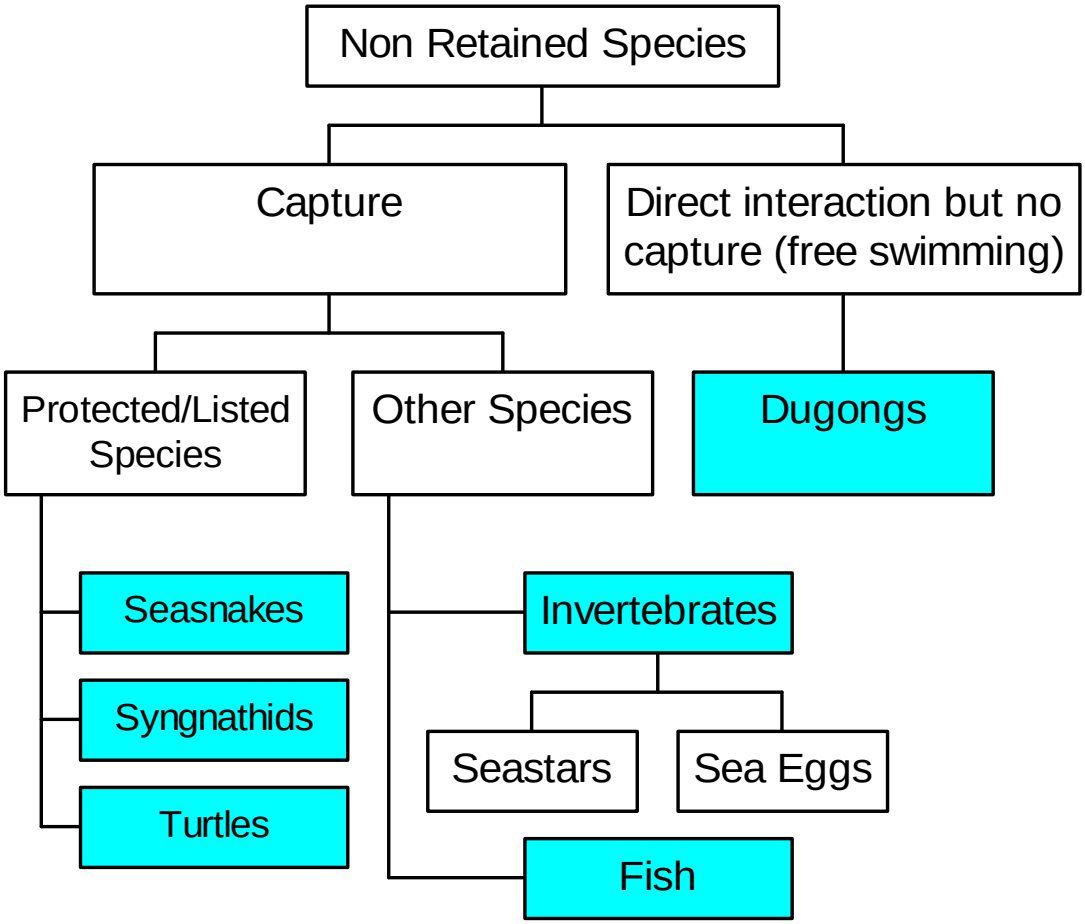


Figure 25 Component tree for the non-retained species.
Yellow boxes indicate that the issue was considered high enough risk at the internal workshop to warrant having a full report on performance. Blue boxes indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.2.1 CAPTURED IN NETS

Limited information exists on the nature and volume of non-retained bycatch in the ONPMF and NBPMF. A FRDC funded project to determine biodiversity indicators will collect information of bycatch in trawled and untrawled areas of Onslow/Nickol Bay during 2004/05.

5.2.1.1 PROTECTED/LISTED SPECIES SEASNAKES

Rationale for Inclusion:

Seasnakes are caught by both the ONPMF and NBPMF. There are 22 species known to occur in Western Australia. Under the EPBC, all species in the family Hydrophiidae and family Laticaudidae are considered protected.

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

A 'negligible' risk rating (indicating that only a brief justification is required) was given to this issue due to the following:

1. Anecdotal evidence from other trawl fisheries in WA suggests that caught seasnakes are alive and aggressive (thought to be an indication of health and lack of damage from the trawl).
2. A study of seasnake survival following capture by trawlers in the Gulf of Carpentaria indicated that 60% of seasnakes survived (Wassenberg *et al.*, 1994).
3. Data from the observer program in the Shark Bay Prawn Managed Fishery found that 194 seasnakes were caught from 916 trawls (924 hours of trawling). Of the seasnakes caught, 99% of the individuals were returned alive.
4. There is no evidence that the impact on seasnakes in these two fisheries is greater than in these other fisheries for which direct data area available.

5.2.1.2 PROTECTED/LISTED SPECIES SYNGNATHIDS

Rationale for Inclusion:

Syngnathids are the collective group that contain organisms such as seahorses, sea dragons and pipefish. Syngnathids are incidentally caught in the ONPMF and NBPMF. Syngnathids are a protected species under the EPBC.

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

The potential consequence of the two prawn trawling operations on breeding levels of syngnathids was considered 'minor'. Anecdotal evidence from the observer program results in the Shark Bay Prawn Managed Fishery has suggested that that fishery catches very low numbers of syngnathids. Furthermore, it is suggested that the occurrence of syngnathids appears to be area specific and often syngnathids may not be caught for many nights in a row. As a result, the 1 syngnathid caught by the Shark Bay Prawn Managed Fishery per night across the whole fleet is more indicative of an average for the season. It was considered unlikely that this level of consequence would result because trawling occurs over areas that are mostly unfavourable to syngnathids. Syngnathids are known to favour seagrass and detached algae communities, which are not normally trawled.

5.2.1.3 PROTECTED/LISTED SPECIES TURTLES

Rationale for Inclusion:

Two species of turtles have been identified as being caught in the NBPMF, the Pacific ridley (*Lepidochelys olivacea*) and Loggerhead turtle (*Caretta caretta*). The Pacific ridley turtles (also known as Olive Ridley) are considered endangered under the Commonwealth and the equivalent under State wildlife conservation legislation. Loggerhead turtles are also considered an endangered species under Commonwealth and the equivalent under State wildlife conservation legislation as a result of the current status of their populations.

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

The Department has only limited information regarding the capture and interaction of the ONPMF and NBPMF with turtles. Turtle interaction information has been provided to the Department by the fleet through logbooks but it is not comprehensive as only 1 to 3 vessels from each fleet has filled it out. Between 1999 and 2002 (before the introduction of BRDs) a total of 3 turtles were recorded as being caught by the ONPMF. For NBPMF a total of 18 turtles were caught between 1999 and 2002. From this information, Pacific Ridley and loggerhead turtles have been identified as being caught in the past and most have been returned alive. The current estimates of loggerhead turtles suggest that there are in excess of 10,000 in the area (Dr. R. Prince[2], pers comm.).

This issue was considered a 'negligible' risk. The determination of this risk was based on the fact that:

1. BRDs incorporating grids and turtles exclusion hatches are being introduced into both fisheries. Both fleets have been fishing with one standard and one BRD net for the 2001 and 2002 season. The fleets for both fisheries will be fishing with 100% BRDs (BRDs in all of the nets in operation) from the commencement of the 2003 season.
2. An on-board observer program run by the Department in the Shark Bay Prawn Managed Fishery over the past 3.5 years has recorded the capture of 15 turtles (not extrapolated for the full fleet at present), which is considered a very low rate of capture over this period. Furthermore, all turtles were caught in the standard (non-BRD) net were released alive.

5.2.1.4 FISH

Rationale for Inclusion:

Trawling contributes to the mortality of several non-commercial fish species that are incidentally caught and die due to the damage and disturbance they experience in the trawl net or from being out of water during the sorting process.

[2] Dr. Robert Prince, Department of Conservation and Land Management.

ERA Risk Rating: Impact on breeding stock (C1 L4 LOW)

During the risk assessment workshop, the risk to these discarded fish species was considered collectively. The bycatch from the ONPMF is typical of tropical trawl fisheries (i.e. up to about 6:1 relative to the target species) but the effort levels and spatial coverage are very low for both fisheries. Due to the low effort levels and relatively small spatial area fished compared to the overall area where these species probably occur it would most likely be too low to impact bycatch species populations.

Furthermore, the ONPMF and NBPMF will be required to operate with fish exclusion devices by the end of 2004. These secondary BRDs will reduce the overall amount of fish species caught and is expected to substantially reduce the catch of some select species.

These assumptions will be tested in the 2004/05 biodiversity surveys.

5.2.1.5 INVERTEBRATES

Rationale for Inclusion:

The trawl gear makes contact with the sea bottom where many of these species reside, requiring an assessment to be made of the significance of this interaction.

ERA Risk Rating: Impact on breeding stock (C1 L4 LOW)

It was considered only 'possible' that the two fisheries were having a minor impact on invertebrate breeding populations. This low ranking is due to the following:

1. The ONPMF is restricted to clean sand and mud bottoms, where trawling has minimal physical impact. The habitat types on the trawl areas for the NBPMF are mud and sand and are not impacted significantly by trawl gear.
2. The NBPMF consists of a small fleet which fishes on a limited number of discrete fishing grounds, making up less than 5% of the coastal habitat with the fishery. Similarly within the extensive licensed fishing zone for ONPMF, relatively few discrete areas offshore from nursery areas are fished (less than 5% of the overall fishery).
3. The trawl gear is configured in a manner that largely precludes the capture of invertebrate species living on or in the substrate. There is a gap of approximately 20 centimetres between the ground chain and the footrope of the net. This is designed to reduce damage to the net through the contact with the ground and specifically serves to minimise the capture of immobile and slow moving benthic organisms (and inanimate objects).
4. Immobile and slow moving benthic species generally pass through the gap between the ground chain and the footrope. By contrast, mobile species (such as prawns) are disturbed by the ground chain and move up into the water column above the footrope and are subsequently caught in the net.
5. Anecdotal evidence suggests that large immobile organisms (such as sponges and other inanimate objects), which do not fit between the gaps, may occasionally become lodged at the ground chain/footrope interface. However, such items fall free once the net is hauled.

6. Gilkinson *et al.* (1988) found that bivalves in the scour paths of the otter boards were displaced into sediment berms, however, of the 42 specimens in the scouring zones, only two showed major damage.
7. As previously mentioned the Department is proposing to conduct a FRDC funded project to determine biodiversity indicators will collect information of bycatch in trawled and untrawled areas of Onslow/Nickol Bay during 2004/05. This survey is likely to provide similar information on the distribution both within and outside trawl areas, of other invertebrate species. This report will be reviewed following the completion of that study.
8. VMS will confirm the levels of coverage of trawling over this region by the fleet.

5.2.2 INTERACTION BUT NO CAPTURE

5.2.2.1 PROTECTED/LISTED SPECIES DUGONGS

Rationale for Inclusion:

Dugongs are a protected species under both State and Commonwealth legislation. They inhabit shallow, tropical waters throughout the Indo-Pacific region. Most of the world's population of dugongs is now found in northern Australian waters between Shark Bay in Western Australia and Moreton Bay in Queensland. The slow breeding rate and long life span mean that dugongs are particularly susceptible to factors that threaten their survival.

ERA Risk Rating: Impact on breeding stock (C0 L1 NEGLIGIBLE)

For the issue of possible interaction of dugongs with the ONPMF and NBPMF it was considered 'remote' that the fisheries may have a negligible impact on the breeding populations due to the following:

1. The habitat types associated with the ONPMF and NBPMF are sand and mud bottoms. Dugongs inhabit seagrass areas where they reside and feed. This results in the separation of the trawling activities and the dugong habitat therefore reducing the likelihood of interaction between the two.
2. The seagrass habitat occurs in nursery areas in both fisheries that are generally closed to trawling.
3. There have been no reports of dugongs being captured or interacted with by these two fisheries.

5.3 GENERAL ENVIRONMENT

COMPONENT TREE FOR THE GENERAL ENVIRONMENT FOR THE ONPMF AND NBPMF

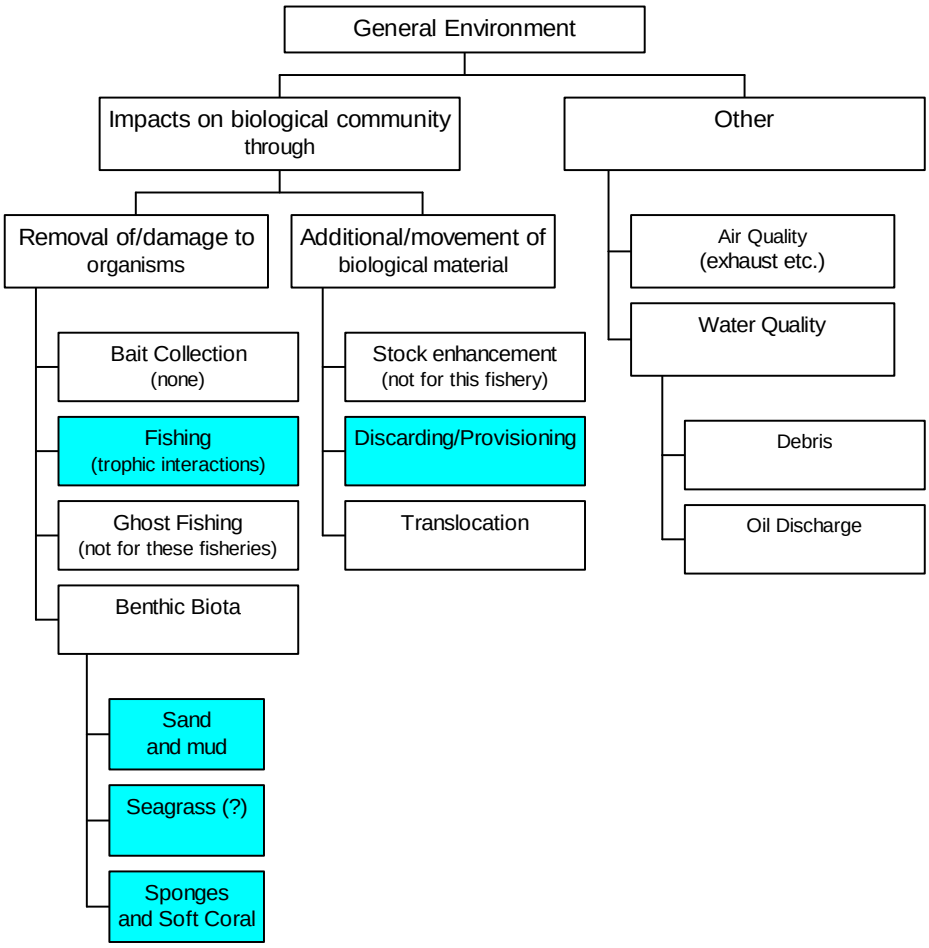


Figure 26 Component tree for the general environment.
Yellow boxes indicate that the issue was considered high enough risk at the internal workshop to warrant having a full report on performance. Blue boxes indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.3.1 IMPACTS FROM REMOVAL OF OR DAMAGE TO THE ENVIRONMENT

5.3.1.1 TROPHIC INTERACTIONS

Rationale for Inclusion:

In recent years, there has been growing concern about the potential impact that reducing the abundance of target, by-product and non-retained species may have on the trophic associations. The risks associated with the potential impacts of the

collective reduction of retained and non-retained species, in terms of trophic interactions therefore require consideration.

ERA Risk Rating: Impact on trophic levels (C1 L3 LOW)

The impact on the environment, by removing the sum of all retained and non-retained species was considered to be unlikely to even cause a minor change to the ecosystem hence it was only a low risk. The information used to come to this conclusion includes:

1. Prawns have a very high natural mortality rate and turnover such that a large percentage of the yearly recruits would already be removed from the system (either from death or predation) by the end of the season regardless of fishing. As a result of the natural variation of prawns being very high, the effect of removing prawns through fishing would be minimal.
2. The management of area and seasonal closures ensure that an adequate spawning stock of all species of prawns survive to reproduce recruits for the subsequent season.
3. There are no known obligate prawn predators, which are likely to be directly impacted upon by the removal of adult-sized prawns. Most prawn predators are opportunistic and/or scavengers and therefore not dependent on any one species. A variety of other small crustacean, invertebrate and fish species living in these areas. Consequently, it is not likely that the commercial take of prawns significantly impacts on the upper trophic levels within the ecosystem.
4. Although no specific research on this subject has been undertaken for these fisheries, several studies around the world have investigated this subject and found that:
    - Following the review of ecosystems impacts of fishing, Jennings and Kaiser (1998) concluded from the current empirical evidence that it is wrong to assume that most predator-prey relationships are tightly coupled and the removal or proliferation of one species, which eats another will result in detectable changes in ecological processes.
    - Greenstreet and Hall (1996) studies periods in the North Sea fishery that were 50 years apart and found little change in community structure of non-target species while the changes in target species were directly caused by fishing.
    - Harris and Poiner (1991) examined changes in the tropical demersal fish community and after 30 years of prawn trawling in the Gulf of Carpentaria found the abundance of benthic associated species had decreased and semi-pelagic increased. Most changes occurred in target and bycatch taxa and there was little evidence of any indirect trophic related effects.

5.3.1.2 IMPACTS TO BENTHIC BIOTA – SAND AND MUD COMMUNITIES

Rationale for Inclusion:

Prawn trawling by ONPMF and NBPMF occurs predominantly over mud and sand habitats. When trawling, ground chains and otter boards make contact with the sea bottom, disrupting organisms within the habitat.

ERA Risk Rating: Impact on habitat and ecology (C1 L3 LOW)

The potential impact on the mud and sand habitats by the ONPMF and NBPMF was considered unlikely to have even a minor consequence (which results in a low risk) due to the following:

1. Within the extensive licensed fishing zone for the ONPMF, relatively few discrete areas offshore from nursery areas are fished (less than 5% of the overall fishery). Similarly, the NBPMF fleet fishes on a limited number of discrete fishing grounds, making up less than 5% of the coastal habitat within the fishery.
2. Studies of actual impacts from prawn trawling suggest only minimal impacts to infaunal communities in these circumstances (see Jennings & Kaiser for review).
3. Any spread in effort will be monitored with VMS in the future.

5.3.1.3 IMPACTS TO BENTHIC BIOTA – SEAGRASS

Rationale for Inclusion:

Benthic seagrass provides an important habitat for some protected species (turtles, syngnathids etc.) in addition to being a significant nursery site for many other marine species. Damage to these habitats needs to be addressed. Benthic seagrass are also particularly vulnerable to damage. It is benthic, and not the detached, seagrass that is considered here.

ERA Risk Rating: Impact on habitat and ecology (C0 L2 NEGLIGIBLE)

In terms of consequence, the potential impact of the ONPMF and NBPMF to the seagrass habitat in Onslow/Nickol Bay was considered 'negligible' due to the following:

1. Most areas of seagrass are in areas that are closed to trawling.
2. Most trawlers actively avoid trawling near seagrass areas as rolls of broken off seagrass get caught in the mouth of the codend causing the net to stop fishing and for the prawns already caught in the net to become entangled and difficult to release.
3. The introduction of BRDs and FEDs will further encourage trawlers to avoid seagrass areas since the grid component for both of the devices is highly susceptible to clogging by seagrass balls.

While the aim of the FRDC funded project for 2004/05 is to determine biodiversity indicators and will collect information of bycatch in trawled and untrawled areas of Onslow/Nickol Bay it will also provide the Department with some information about the different habitat types within the fishing grounds. Upon completion of this project, this issue along with others will be reassessed.

5.3.1.4 IMPACTS TO BENTHIC BIOTA – SOFT CORAL AND SPONGES

Rationale for Inclusion:

Internationally there has been concern about the impact of trawling on hard coral habitats. Soft coral and sponge habitats are also 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, these habitats are vulnerable to physical damage. Furthermore, due to generally slow growth rates of coral and sponge they may be slow to recover.

ERA Risk Rating: Impact on habitat and ecology (C0 L2 NEGLIGIBLE)

The trawl grounds for both fisheries and the vulnerable coral and sponge habitats are largely separated on a geographical and depth basis (given that the target prawn species prefers mud substrate). The trawlers focus their activity in the areas where they will find the target species. The habitat types associated with banana or king prawns are mud and sand with tiger prawns offshore of seagrass beds. Furthermore, it should be noted that it is not in the interests of industry to trawl over hard coral given the damage coral causes to the gear.

5.3.2 ADDITION/MOVEMENT OF BIOLOGICAL MATERIAL

5.3.2.1 DISCARDING/PROVISIONING

Rationale for Inclusion:

The discarding of bycatch results in fish and, to a lesser extent crustaceans, being made available to others organisms that would normally not have access to such a food source. This has the potential to affect the feeding behaviour of some species, particularly predators, and alter the distribution of other species throughout the water column and at the surface. For example, dead fish that sink to the seafloor become available to benthic scavengers such as crabs. These fish would normally be only available, in that level of abundance, to pelagic predators.

Studies on the fate of discards through the trophic structure have not been undertaken in either the ONPMF or NBPMF, but it has been examined in other fisheries. For example:

1. In the Great Barrier Reef Trawl Fishery, a study showed that the majority of the discards were fish and about 40% floated. Most were taken in the daytime by birds, dolphins and sharks (Poiner et al., 1999). Poiner et al. 1999 concluded that because discards were dispersed over the seabed and most

scavengers forage over a restricted area, discards probably did not cause a measurable impact to the seabed.

2. In Moreton Bay, Queensland, Wassenburg & Hill (1987) found that crabs were a dominant scavenger of bycatch from the local 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). It is also thought that larger populations of the blue swimmer crab (Portunus pelagicus) occur in Moreton Bay than would normally exist because of the food provided by trawler discards (Wassenberg and Hill, 1987).

Based on results from the observer program, in the EGP fishery the ratio of discards to retained species is about 2-5:1(weight in terms of small fish, invertebrates and sponges). Of this, about 50% of the fish sink, and most is dead, therefore becoming available to bottom feeders. Most of the crustaceans sink but have a relatively high survival rate.

ERA Risk Rating: Impact to the environment (C0 L3 NEGLIGIBLE)

The impact of the provisioning bycatch discards from the ONPMF and NBPMF was considered 'possible' to be 'minor' risk. This was a result of the following factors:

1. Although many studies have shown that various trophic groups feed on bycatch, few studies have found direct conclusive evidence of a resultant change in trophic structure.
2. These fisheries are very small and the amount of material discarded is therefore not large and therefore very unlikely to have a noticeable impact on other elements of the ecosystem.
3. The introduction of BRDs and FEDs in the fisheries will further reduce bycatch provisioning as the grids and secondary devices will reduce the overall amount of bycatch generated by the both fisheries and hence a reduction in the amount of discards.

5.4 GOVERNANCE

COMPONENT TREE FOR THE GOVERNANCE OF THE ONPMF AND NBPMF

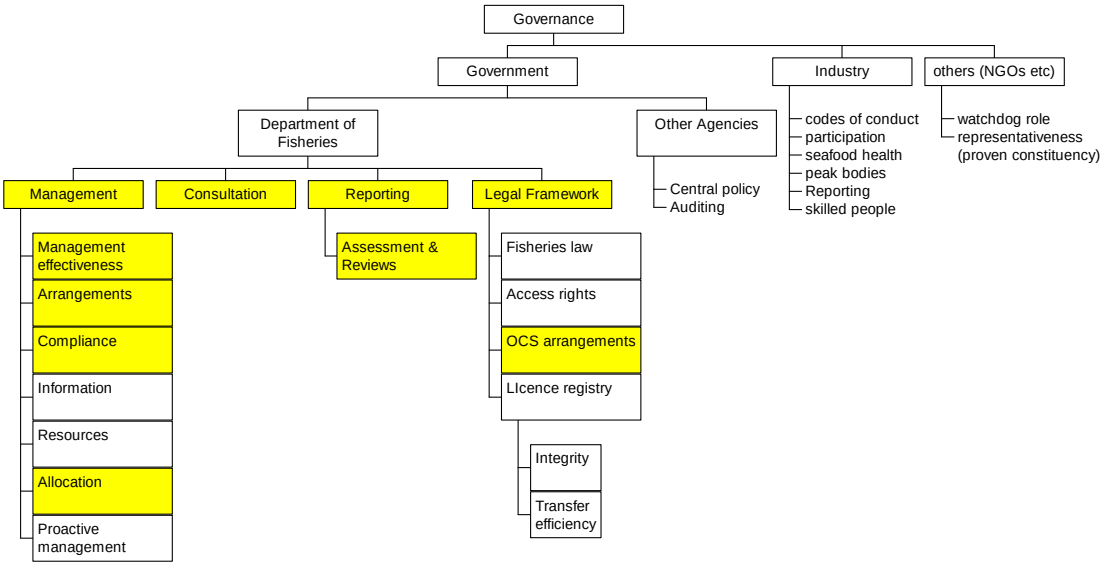


Figure 27 Component tree for governance.
Nb- no generic components have been removed from the tree but only those boxes that are yellow will be reported in this application.

5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT

5.4.1.1 MANAGEMENT EFFECTIVENESS (OUTCOMES)

Rationale for Inclusion:

The effectiveness of management arrangements in the ONPMF and NBPMF is ultimately measured by assessing the outcomes of various strategies employed to manage these fisheries. Effort has been controlled since the inception of the management plans for both fisheries in 1991. Additionally, there are also temporal (seasonal) and spatial (area) closures, gear controls and restrictions on boat size. In sections 5.1.1.1, 5.1.1.2 and 5.1.2.1, the catches for individual prawn species were discussed and analysed, therefore this section will look at the cumulative catch and assess whether current management arrangements are maintaining the total catch for all prawn species within an acceptable range.

If the annual acceptable catch range of prawns is maintained, then the community's expectation that variations in annual catch result only from annual changes in environmental 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 prawns in the ONPMF and NBPMF is maintained within a determined acceptable range on an annual basis.

Justification:

If effective management arrangements are operational in the fishery (including the restrictions on effective effort levels, compliance with the regulations is being maintained effectively, combined with our understanding of the size of the exploitable stock), then the actual total catch for the major prawn species caught should be very close to the total acceptable catch. Any variation outside of the acceptable 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 catch compared to the historical acceptable range for the four major *Penaeus* species in the ONPMF and NBPMF.

Performance Measure

Under the current fishing effort levels, the catch projections for the ONPMF are that the total catch of major *Penaeus* species should be within the range of 60 to 130 tonnes. However within this overall figure, consideration needs to be given to catches at the species level, particularly for banana prawns (see Section 5.1).

Under current effort levels, the acceptable catch range for all four major *Penaeus* species for the NBPMF should be within 90 to 300 tonnes. However, within this overall figure consideration needs to be given to catches at the species level, particularly for banana prawns.

Justification:

The justification for the individual levels for each Penaeus species is located in Section 5.1. The overall acceptable range for all species combined in both fisheries is different from the aggregate of the individual species ranges shown in Sections 5.1-5.4, as the environmental circumstances that benefit banana prawns generally result in decreased catches of the other species in the same year.

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 acceptable catch range for the major prawn species is being maintained. 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 landings for the major Penaeids for the 2000 season in the ONPMF were 87 tonnes, which is within the acceptable range of 60 to 130 tonnes. The 87 tonnes included 12 tonnes of king prawns, 18 tonnes of tiger prawns, 6 tonnes of endeavour prawns and 51 tonnes of banana prawns (Table 5).

In the 2000 season, the NBMPF had a total landing for the major Penaeids of 512 tonnes. While the total landings for the major Penaeids was outside the predicted range of 90 to 300 tonnes, it was still acceptable. Due to the high rainfall in the 1999/2000 summer period, the Department projected that the catch of banana prawns would fall within 300 to 500 tonnes. The banana prawn landings were 467 tonnes for the 2000 season and therefore fell within the range projected. The other prawn landings for the NBPMF for the same season totaled 45 tonnes. This was comprised of 31 tonnes of king prawns, 13 tonnes of tiger prawns and 1 ton of endeavour prawns (Table 6).

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

The management measures imposed to achieve the objective for the total catch (see above) also serve to achieve the objective for the maintenance of spawning stock for the major prawn species caught at or above a level, which minimizes the risk of recruitment over fishing.

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

Year	King	Tiger	Endv	Ban	Total	Other	Corals	Bugs	Days Fished
1985	21.1	12.6	4.2	1.5	39.4	-	-	-	-
1986	24.1	11.9	2.8	0.2	39	-	-	-	-
1987	67.6	69	16.1	0	152.7	-	-	-	-
1988	66.2	49.2	17.6	5.9	138.9	-	-	-	-
1989	36.4	32	19.6	0.7	88.7	-	-	-	-
1990	42.8	58.1	18.9	0.4	120.2	-	12.8	-	-
1991	22.1	41.2	8.1	< 0.1	71.4	-	5.2	-	-
1992	27.5	46.5	11.6	-	85.6	-	5.7	-	-
1993	35.4	60.1	14.5	-	110.0	-	10.2	-	-
1994	24.8	95.5	9.7	1.8	131.8	-	4.3	-	-
1995	39.6	43.8	21.6	5.9	110.9	-	10.1	-	-
1996	55.6	10.7	11.7	33.6	111.6	-	15.3	7.6	-
1997	18.9	5.0	5.4	90.8	120.1	-	7.2	5.0	-
1998	32.6	15.3	11.0	1.5	60.4	-	8.8	11.1	-
1999	38.0	26.0	20.3	9.2	93.5	0.2	13.9	7.1	-
2000	12.2	17.8	6.2	51.3	87.5	-	4.3	11.2	605
2001	15.2	27.3	6.8	13	62.3	-	7.4	11.9	643
2002	39.1	72.6	12.7	1.2	125.6	0	19.8	8.6	919
5YA	23.4	18.3	9.9	33.2	84.8	-	-	9.3	-

Table 5 Total catch (tonnes) of the major prawn species for the ONPMF (landings from monthly CAES returns).

NOTE: Catches from 1990 to present reflect landings from Onslow vessels (Areas I, II and III).

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

Year	King	Tiger	Endv	Banana	Total	Other	Corals	B Tiger	No' of Boats	Days Fished
1985	16.1	1.1	-	201.8	219	4.6	-	-		
1986	53.9	3.2	-	22.3	79.4	5.2	-	-		
1987	135.4	20.9	-	153.3	309.6	11.8	-	-		
1988	55.2	1.6	-	72.4	129.2	12.2	-	-		
1989	29.6	14.3	-	180.8	224.7	21.5	-	-		
1990	45.0	9.5	8.5	222.2	285.2	6.6	0.8	0.8	17	
1991	37.5	17.8	1.5	38.3	95.1	<0.1	0.2	0	14	
1992	49.5	2.2	1.4	39.7	92.8	0.8	3.8	<0.1	9	
1993	71.6	23.8	5.6	66.9	167.9	9.4	4.2	0.1	14	
1994	72.5	36.8	4.3	77.7	191.3	3.9	1.2	0.3	12	
1995	37.5	26.0	3.7	125.8	193.0	3.2	1.6	0.2	12	
1996	47.0	4.8	4.1	124.5	180.4	2.2	4.1	0.2	11	
1997	20.5	3.5	0.6	211.8	236.4	0	2.7	0.1	13	
1998	53.3	1.4	0.5	37.7	92.9	0	2.9	<0.1	13	
1999	69.4	12.9	5.4	171.1	258.8	3.1	14.5	0.2	13	
2000	26.1	13.0	0.6	472.2	511.9	0.1	3.3	1.3	16	985
2001	6.2	1.4	0.6	10.3	18.5	0	10.2	<0.1	11	245
2002	46.7	6.3	1.5	14.0	68.5	0	6.7	<0.1	7	441
5YA	40.0	7.0	1.7	141.1	190.1	0.6	7.5	0.4		

Table 6 Total catch (tonnes) of the major prawn species for the NBPMF (landings from monthly CAES returns).

NOTE: Catches from 1990 to present reflect landings from Nickol Bay vessels.

Actions if Performance Limit is Exceeded: If the catch were outside the range of expected values then a review of the causes would be undertaken. This review would examine why the acceptable 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:

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

Comments and Actions

While the Department has been able to maintain the catch of the major prawn species within acceptable 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, cyclonic activity impacting habitat, ocean currents and sea surface temperatures are known to impact upon recruitment and therefore are likely to impact the level and productivity of prawn breeding stocks.

5.4.1.2 MANAGEMENT ARRANGEMENTS

Rationale for Inclusion:

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

In cases where the current management arrangements were developed under the previous Act (as was the case for the Onslow and Nickol Bay prawn fisheries), 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).

Table 7 Objects of the FRMA 1994.

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.

In particular, this Act has the following objects-

- to conserve fish and protect their environment;
- to ensure that the exploitation of fish resources is carried out in a sustainable manner;
- to enable the management of fishing, aquaculture and associated industries and aquatic eco-tourism;
- to foster the development of commercial fishing and recreational fishing and aquaculture;
- to achieve the optimum economic, social and other benefits from the use of fish resources;
- to enable the allocation of fish resources between users of those resources;
- to provide for the control of foreign interests in fishing, aquaculture and associated industries;
- to enable the management of fish habitat protection areas and the Abrolhos islands reserve.

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 *Onslow Prawn Managed Fishery Management Plan 1991*, and *Nickol Bay Prawn Managed Fishery Management Plan 1991* are both effectively a set of rules for the fisheries and include *inter alia* clauses concerning the spatial boundaries of the fisheries, gear restrictions, temporal closures and transferability arrangements.

Management arrangements for the commercial take of prawns in the Onslow and Nickol Bay areas off Western Australia are provided for through a managed fishery licence.

Operational Objective

In consultation with the industry members and other stakeholders, the Department periodically reviews the legislation, regulations and Ministerial policy guidelines to 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 sustainable exploitation of a natural resource where the potential to harvest the resource could exceed the ability of the resource to replenish itself. The development of rules can restrict the potential to harvest (effort) to an appropriate level, and management arrangements can define processes within which access to the resource can be allocated to competing user groups (including natural ecosystems).

Indicator

The extent to which the FRMA, FRMR, Management Plans, Ministerial Policy guidelines 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

This should be 100%.

Evaluation

Formal evaluation of the management arrangements of the Onslow and Nickol Bay prawn fisheries has been completed. Preliminary investigations suggest that management arrangements for the fishery are adequate in that little potential exists for fishermen to activate inappropriately high levels of effort that could place the target prawn resources at risk.

The performance of current management arrangements can be evaluated on two levels – the micro level, i.e. the relevance of individual clauses/regulations and the role they play; and on the macro level, i.e. the relevance of the plans, endorsements or arrangements as a whole and the role that they play.

Current Performance against each of the areas required within the "plan"[3]:

An explicit description of the management unit – The management unit for Onslow prawn fishery is explicitly described at Section 11 of the *Onslow Prawn Managed Fishery Management Plan 1991*, while the management unit for the Nickol Bay prawn fishery is explicitly described at Section 10 of the *Nickol Bay Prawn Managed Fishery Management Plan 1991*. These management arrangements restrict the amount of headrope length allowed in each Area of the fisheries.

The issues addressed by the plan –The issues that need to be addressed by the Onslow and Nickol Bay prawn management arrangements have been examined thoroughly and are documented within the 8 ESD component trees and their reports.

Descriptions of the stocks, their habitat and the fishing activities – the Onslow and Nickol Bay prawn stocks are described in Section 2.1 and the fishing activities are described in Section 2.2.

Clear operational (measurable) objectives and their associated performance measures and indicators – These are now located in Section 5 for each of the major issues.

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.

Economic and social characteristics of the groups involved in the fishery – A brief articulation of the economic and social characteristics of the fisheries 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.

Management and regulatory details for the implementation of the actual management plan – The regulations relating to the Onslow and Nickol Bay prawn fisheries are located in both the *Onslow Prawn Management Plan, the Nickol Bay Prawn Management Plan*, and the FRMR (A set of which has been provided to EA).

[3] "Plan" – includes all management arrangements

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.

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. A review of the Onslow and Nickol Bay prawn fishery plans and management arrangements is currently underway with a view to developing a more comprehensive set of management arrangements for all Pilbara trawl fisheries.

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 plans and related legislation have provided a diverse but reasonably complete set of fisheries management legislation. The fact that the management arrangements are contained within legislation provides a high degree of stability with respect to how the fisheries are 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 the Onslow and Nickol Bay prawn fisheries. Changes have occasionally occurred to address key concerns or issues.

Comments and Actions

The ONPMF and NBPMF are managed in a consultative way and respond readily to changed circumstances. However, fishers are often resistant to change. This means that before the fishers accept effort- reduction methods, they 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.

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, the VMS. The ability to conduct at-sea compliance patrols on the Pilbara coast is limited because of patrol boat size and availability. However, these fisheries are monitored by VMS, and therefore there is little need for compliance vessels to monitor spatial and temporal boundary infringements, as the vessels position is automatically communicated to the Department's compliance section at all times.

Additionally, all managed fishery licenses within the Nickol Bay and Onslow Prawn fisheries have conditions regarding BRDs. These conditions read as follows:

a) *No fishing for prawns is to be carried out in the Onslow Prawn/Nickol Bay Prawn Managed Fishery Areas during the 2003 fishing season unless all trawl nets have a 'grid' fitted.*

b) *A 'grid' is a device which conforms to the specifications set out in the document entitled "Bycatch Reduction Devices as defined in the Onslow Prawn / Nickol Bay Prawn Managed Fishery" signed by the Executive Director of the Western Australia Department of Fisheries on 4 February 2002.*

Operational Objective

To have sufficiently high levels of compliance with the FRMA, FRMR and various prawn 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.

Degree of understanding and acceptance of rules governing the operation of the Onslow and Nickol Bay prawn fisheries by licensees and the broader fishing community.

Performance Measure

That 100% of VMS polls 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

For the Onslow and Nickol Bay Prawn fisheries zero offences were reported in 2000, 2001 and 2002. Thus current compliance techniques used in these two fisheries are maintaining compliance by the fishers. Sea patrols and radar watches are also conducted on a random basis through the seasons. Compliance operations are mainly focussed on maintaining the integrity of the nursery and closure areas within the fisheries. The compliance staff also conducts annual licence and gear inspections both at sea and at port.

With the introduction of VMS into these fisheries 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.

Currently, there is a FRDC project underway to examine compliance in the Western Rock Lobster Managed Fishery. This project aims to develop data collection, analysis and reporting protocols for all Western Australian recreational and commercial fisheries.

Robustness

Medium

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

Fisheries Management Response

Despite the relatively low levels of compliance work being done in the ONPMF and NBPMF, the Regional Services Branch of the Department continues to gather intelligence on suspected breaches within these two fisheries.

Comments and Actions

The Department will continue to provide high standard compliance service within budgetary and resourcing constraints to the Pilbara prawn trawl fisheries. It is expected that the completion of a compliance risk assessment for the fishery 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 both the Onslow and Nickol Bay prawn fisheries, 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 (National Competition Policy) may impact upon the Department's ability to restrict activities in a way that assist compliance (e.g. processor receivals restrictions).

5.4.1.4 ALLOCATION AMONG USERS

Rationale for Inclusion:

There is no 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 ONPMF and NBPMF is based around a robust consultation and communication process.

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

Section 65 of the FRMA states:

Section 65. Procedure before amending management plan:

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

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

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

(a) required urgently; or

(b) of a minor nature

(4) If –

(a) the Minister amends a management plan; and

(b) the amendment is made without consultation because it is, in the Minister's opinion , required urgently,

(c) 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 late October or early November, the Department holds meetings with the Onslow and Nickol Bay prawn 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.

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 management for the two prawn fisheries 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.

Robustness

High

The 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 ONPMF and NBPMF through regular correspondence and encouraging communications with the fishery manager. Given the remote location of many of the operators, it can be logistically difficult and costly to undertake field trips and plan meeting dates more than once every year.

Comments and Actions

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

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 ONPMF and NBPMF are available for review by external parties. It is also important that the community is sufficiently informed on the status of the fisheries, given that industry are utilising a community resource.

The reports that are currently developed annually include: the State of the Fisheries Report and the report to the Auditor. There is also 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 the two prawn fisheries 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 these fisheries 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 Office of the Auditor General (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 a series of meetings in major population centres in the Pilbara Region and the Perth Metropolitan area.

Robustness

High

Fisheries Management Response

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

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

Comments and Actions

The assessment and review processes already established together with proposed external review processes should ensure that there will 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 functional fishing areas for the ONPMF and NBPMF are within the State waters boundary. Therefore there are no OCS arrangements to be considered.

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APPENDIX 1 ACRONYMS

BRDs	Bycatch Reduction Devices
CAES	Catch and Effort Statistics System
DEH	Australian Government Department of the Environment and Heritage
ED	Executive Director of the Department of Fisheries
EPA	Environment Protection Agency
EPBC	Environment Protection and Biodiversity Conservation Act 1999
ESD	Ecologically Sustainable Development
FEDs	Fish Exclusion Devices
FRDC	Fisheries Research and Development Corporation
FRMA	Fisheries Resources Management Act 1994
FRMR	Fisheries Resources Management Regulations 1995
GIS	Geographic Information System
NBPMF	Nickol Bay Prawn Managed Fishery
NSW	New South Wales
OAG	Office of the Auditor General
OCS	Offshore Constitutional Settlement
ONPMF	Onslow Prawn Managed Fishery
PFTIMF	Pilbara Fish Trawl Interim Managed Fishery
SA	South Australia
VMS	Vessel Monitoring System
WA	Western Australia
WAFIC	WA Fishing Industry Council

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 *c) 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. d) **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*