

**FINAL APPLICATION TO AUSTRALIAN
GOVERNMENT DEPARTMENT OF THE
ENVIRONMENT AND HERITAGE ON THE
KIMBERLEY PRAWN MANAGED FISHERY**

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

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

JUNE 2004



Department of Fisheries
Government of Western Australia



*DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA
LOCKED BAG 39, CLOISTERS SQUARE WA 6850*

TABLE OF CONTENTS

TABLE OF CONTENTS	2
TABLE OF FIGURES	4
TABLES	5
1. INTRODUCTION TO THE APPLICATION	6
1.1 DESCRIPTION OF INFORMATION PROVIDED	6
1.2 OVERVIEW OF APPLICATION	7
2. BACKGROUND TO THE KPMF	8
2.1 DESCRIPTION OF THE FISHERY	8
2.2 BIOLOGY OF BANANA PRAWNS.....	13
2.3 BIOLOGY OF BROWN TIGER PRAWNS	13
2.4 BIOLOGY OF ENDEAVOUR PRAWNS	15
2.5 MAJOR ENVIRONMENTS	16
2.5.1 Physical Environment	16
2.5.2 Economic Environment	16
2.5.3 Social Environment.....	16
3. METHODOLOGY	17
3.1 SCOPE	17
3.2 OVERVIEW	17
3.3 ISSUE IDENTIFICATION (component trees)	18
3.4 RISK ASSESSMENT/PRIORITISATION PROCESS	19
3.5 COMPONENT REPORTS	20
4. ASSESSMENT OF THE KPMF MANAGEMENT REGIME AGAINST THE AUSTRALIAN GOVERNMENT GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES	22
4.1 GENERAL REQUIREMENTS OF THE GUIDELINES	22
PRINCIPLE 1 OF THE GUIDELINES	26
OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVEL OF TARGET SPECIES	26
OBJECTIVE 2. RECOVERY OF STOCKS	34
PRINCIPLE 2 OF THE GUIDELINES	35
OBJECTIVE 1. BYCATCH	35
OBJECTIVE 2. PROTECTED/LISTED SPECIES.....	38
OBJECTIVE 3. GENERAL ECOSYSTEM.....	40
OVERVIEW TABLE	45
5. PERFORMANCE REPORTS	47
5.1 RETAINED SPECIES	47
5.1.1 PRIMARY SPECIES.....	47
5.1.1.1 Banana Prawns.....	47
5.1.1.2 Brown Tiger Prawns	51
5.1.1.3 Endeavour Prawns	54

5.1.2 BY-PRODUCTS	57
5.1.2.1 Coral Prawns	57
5.1.2.2 Black Tiger Prawns	60
5.1.2.3 Western King Prawns	62
5.1.2.4 Bugs	62
5.1.2.5 Fish.....	63
5.1.2.6 Squid	63
5.1.2.7 Other Invertebrates.....	65
5.2 NON-RETAINED SPECIES	66
5.2.1 CAPTURED IN NETS	66
5.2.1.1 Protected/Listed Species Seasnakes.....	66
5.2.1.2 Protected/Listed Species Syngnathids	67
5.2.1.3 Protected/Listed Species Turtles.....	67
5.2.1.4 Fish.....	68
5.3 GENERAL ENVIRONMENT.....	69
5.3.1 IMPACTS FROM REMOVAL OF OR DAMAGE TO THE ENVIRONMENT	69
5.3.1.1 Trophic Interactions	69
5.3.1.2 Impacts to Benthic Biota – Sand and Mud	70
5.3.2 ADDITION/MOVEMENT OF BIOLOGICAL MATERIAL.....	71
5.3.2.1 Discarding/Provisioning	71
5.4 GOVERNANCE	73
COMPONENT TREE FOR THE GOVERNANCE OF THE KPMF.....	73
5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT	73
5.4.1.1 Management Effectiveness (Outcomes)	73
5.4.1.2 Management Arrangements	76
5.4.1.3. Compliance	80
5.4.1.4. Allocation Among Users.....	83
5.4.2 DEPARTMENT OF FISHERIES - CONSULTATION.....	83
5.4.2.1 Consultation (including communication)	83
5.4.3 DEPARTMENT OF FISHERIES - REPORTING.....	85
5.4.3.1 Assessment and Reviews	85
5.4.4 DEPARTMENT OF FISHERIES - LEGAL FRAMEWORK	87
5.4.4.1 OCS Arrangements	87
6. REFERENCES.....	88
Appendix 1 Acronyms	90
Appendix 2 – Details of Consequence Tables	91

TABLE OF FIGURES

Figure 1	Boundaries of the KPMF.....	8
Figure 2	Generalised twin otter rig trawl gear (with try gear).....	10
Figure 3	Catch history of prawns in the KPMF from 1980 to 2002.	12
Figure 4	Summary of the ESD reporting framework processes.	18
Figure 5	Example of a component tree structure.	19
Figure 6	Catch history of banana prawns in the KPMF from 1990 to 2002.....	49
Figure 7	Catch history of brown tiger prawns in the KPMF from 1990 to 2002.	52
Figure 8	Catch history of endeavor prawns in the KPMF from 1990 to 2002.	55
Figure 9	Catch history of coral prawns in the KPMF from 1990 to 2002.	58
Figure 10	Component tree for governance.	73

TABLES

Table 1 Main National ESD Reporting Framework Components.....	17
Table 2 Risk ranking definitions.....	20
Table 3 The National ESD reporting framework headings used in this report.....	21
Table 4 Summary of risk assessment outcomes for environmental issues related to the KPMF.....	42
Table 5 Objects of the Fish Resources Management Act 1994.....	77

1. INTRODUCTION TO THE APPLICATION

1.1 DESCRIPTION OF INFORMATION PROVIDED

This is an application to the Australian Government Department of the Environment and Heritage (DEH) to assess the Kimberley Prawn Managed Fishery (KPMF) 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 merguensis*), brown tiger prawn (*Penaeus esculentus*), endeavour prawn (*Metapenaeus endeavouri*) and other relevant by-products of this fishery to remain on 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 this fishery. The application includes:

- Comprehensive background information on the history of the KPMF, the biology of the primary species (banana prawn, brown tiger prawn and endeavour 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 KPMF, 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 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 the fishery. 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 KPMF is not required.

1.2 OVERVIEW OF APPLICATION

The banana prawn, brown tiger prawn and endeavour prawn are the three primary species targeted by the KPMF. The total landings for the 2002 season were 378 t, comprising 239 t of banana prawns, 80 t of tiger prawns, 58 t of endeavour prawns and 1 t of king prawns. The estimated annual value to fishers for 2002 in this fishery was \$4.9 million. The annual values can, however, vary depending on the type of product and the market forces operating at any one time.

The KPMF has been operating under a management regime since 1993 using a comprehensive set of regulations that include limits on vessel numbers, gear controls, boat restrictions, 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 the 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 fishery has resulted in the maintenance of prawn stocks as well as the successful continuation of the fishery.

The KPMF has taken a positive move to minimise wider ecosystem interactions. Trawling is restricted to a relatively short season (12 weeks) and the fleet operates in a relatively small area which is predominately mud and sand habitats. Bycatch reduction devices (BRDs) are currently being phased-in, which will minimise or eliminate the potential for impacts on other species.

Consequently, the management regimes for the KPMF 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 TO THE KPMF

2.1 DESCRIPTION OF THE FISHERY

As defined by the KPMF notice 1993, the boundaries of the fishery are ‘all Western Australian waters of the Indian Ocean lying east of 123°45’ east longitude and west of 126°58’ east longitude’. (Cape Londonderry to Koolan Island) (Figure 1). The total area of the fishery is 37,000 nm² and extends into Commonwealth Waters. In 2002 2,900 nm² was fished (estimated through VMS data). This equates to approx. 8% of the total fishery area being fished.

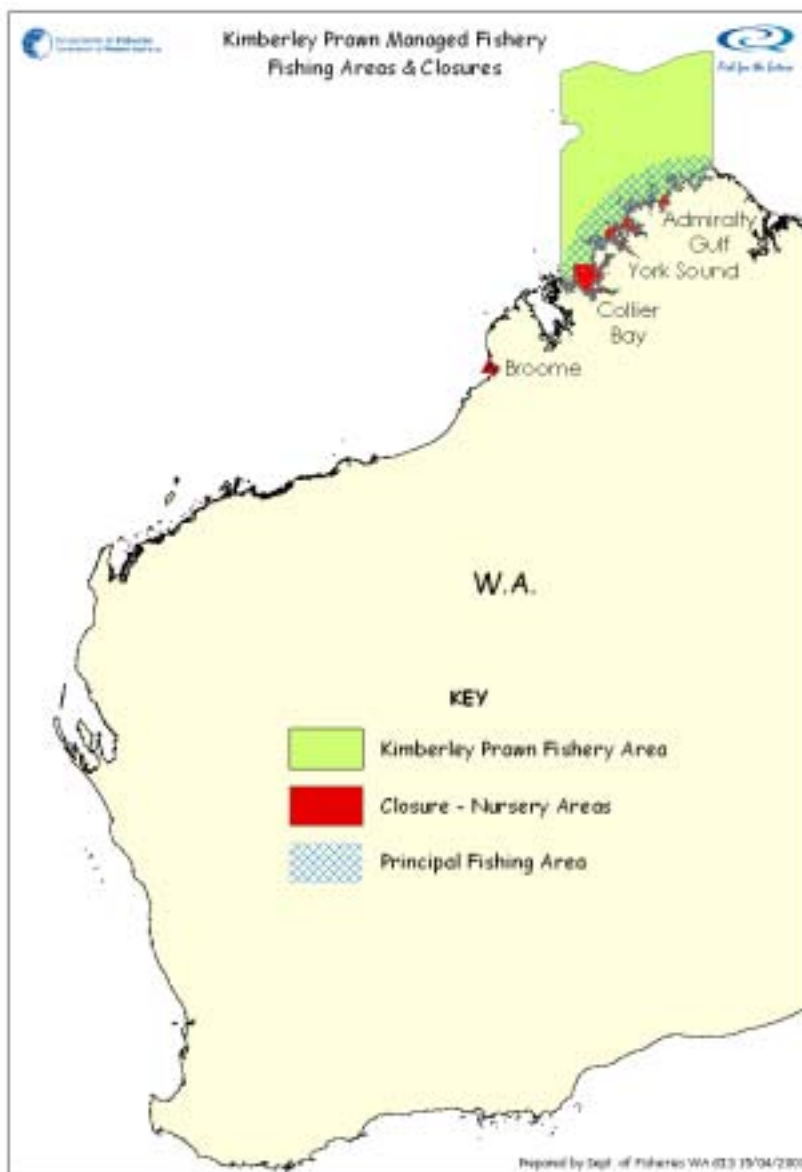


Figure 1 Boundaries of the KPMF.

Whilst a total of 135 boats had access to the KPMF under various licensing arrangements during the 2002 season, in recent years only 20 to 30 boats have actually fished in this fishery.

There are relatively few “*stand alone*” Kimberley-only boats operating in this fishery for the entire fishing season. Boats, which also operate in the Nickol Bay, Onslow and other WA trawl fisheries, also fish the Kimberley area sometimes during the year to complement catches in their local fisheries. Similarly, boats fishing the Northern Prawn Fishery (NPF), which also hold licences for the KPMF, also use this fishery for periods each year. Significantly, the Kimberley Prawn Fishing season is set to mirror the dates used in the NPF.

A meeting was held to discuss future management arrangements for the fishery on 16 December 2002. The main objective was to remove the excessive latent effort in this fishery. It was decided at the meeting to introduce an Effort Pool System for the start of the 2003 season. This Effort Pool System will limit the number of days that can be fished in each part of the season, effectively removing the problem of latent effort in the fishery.

Fishing Methods

The boats licensed in the KPMF are permitted by the management plan to use no more than two demersal otter trawl. The total combined headrope of the permitted nets is not to exceed 58.5 m. The licensees are also permitted to use one ‘try net’ with a headrope not exceeding 5 metres. Otter trawls are so named due to the use of otter boards. The otter boards are attached to the extremities of each net at the opening (Figure 2). The height of the fishing gear is set by the height at the point where they are connected to the otter boards. Forces produced by water flowing over the otter boards open the trawl nets laterally. The lateral spread is vital to the catching efficiency of trawl gear and determines the area swept. Generally, the headrope and ground rope is spread between 60% and 85% of its length. Attached to the footrope is the ground chain. The ground chain travels over the sea floor and disturbs prawns so they rise from the seafloor and into the oncoming net. Low opening nets have the headrope as a lead-ahead, which acts as a net veranda and is set in front of the footrope. This ensures that prawns disturbed by the ground chain do not pass over the headrope and thus maintains the catch efficiency of the nets.

As the KPMF targets banana prawns which may form concentrated aggregations (termed ‘boils’) that may extend from the bottom to the surface, ‘banana’ nets are used which are essentially the same dimensions as two standard nets sewn on top of each other, to create a high opening ‘mouth’. Trawling for banana prawns can occur over 24 hours whereas trawling for other species of prawns usually only occurs at night. Trawl shots in the KPMF fishery generally average between 50 and 100 minutes in duration, depending on the quantity of prawn being caught. During high catches of banana prawns the trawl duration may be even shorter. Trawl depths are generally between 15 and 45 m. While trawling, fishing vessel speed is generally between three and four knots. In the KPMF vessels may be at sea for several months as they travel between distantly located ports in northern and western Australia. The marketable species are sorted into their respective crates, packaged into standard weight boxes (usually 10-12 kg) and snap frozen at sea.

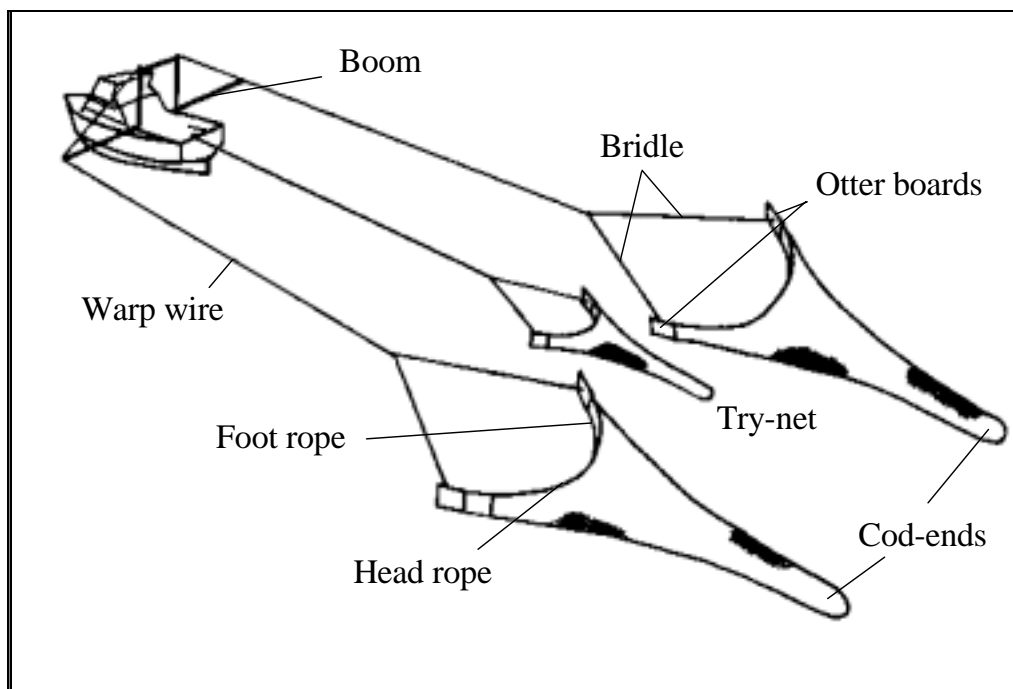


Figure 2 Generalised twin otter rig trawl gear (with try gear).

Management

The Kimberley prawn fishery was declared a managed fishery in 1993 (DoF, 2002). Thus, the *Kimberley Prawn Fishery Management Plan, 1993* is the formal statutory document that dictates the management measures for the fishery.

Management controls for the KPMF are based on limited entry, seasonal and area closures and gear controls. As was previously discussed in 2003 an Effort Pool System was introduced into the fishery to remove the latent effort problem. This is further discussed below. A summary of these input based controls outlined in the Plans for this fishery is as follows:

Number of vessels and limited entry fishery. There are 135 vessels licensed to operate in the fishery.

In order to remove the problem of latent effort in the fishery an “Effort Pool System” was introduced for the beginning of the 2003 season. This system caps the number of days that can be fished in both the first and second part of the season to 600 and 900 days, respectively. Under this system, the days that a fishing vessel spends in the fishery (as recorded by the VMS system) will be deducted from the total effort pool, regardless of whether or not actual fishing is taking place. As this system can be monitored on a daily basis by the VMS system, the Department can monitor the amount of effort in the fishery on a “real time” basis. Therefore, if it looks as though

the total number of days fished may exceed the cap, steps can be taken to close the season.

Seasonal closure. Historically the KPF fishing season has been aligned with the NPF. The season operates during the period from early April until mid to late November, but with an extended mid season closure between May and September. This only results in approximately 12 weeks fishing per year.

As was discussed above, with the introduction of the Effort Pool System and through the use of VMS, the season can be closed if it appears that the effort cap may be exceeded.

Spatial closure. Spatial closures are for nursery areas. These are closed to fishing and include the York Sound, Collier Bay and Admiralty Gulf.

Gear controls. There is a series of gear controls that include restrictions on the number of nets and length of trawl net headrope. In addition, there is a maximum size limit for the mesh of the net, which is 50 mm.

BRD introduction. In 2003, the fishery was required by way of a condition on their managed fishery licence to operate with a BRD in each net. In 2004, the fishery will be required to trial secondary BRDs (i.e. fish exclusion devices (FEDs)) in half of the nets with mandatory use of a secondary BRD in half of the nets in 2005 and full implementation in 2006.

Additionally, a Vessel Monitoring System (VMS) was fully introduced into the fishery in 2002. The VMS enables the Department of Fisheries to monitor a vessel's location and speed with particular attention paid to the surveillance of fishery boundaries.

Target species

In the KPMF, banana prawns *Penaeus merguensis* are the dominant species caught over the long term with total landings ranging from approximately 180 to 450 tonnes (Figure 3). A smaller portion of brown tiger (*Penaeus esculentus*) and endeavour (*Metapenaeus endeavouri*) prawns generally make up the remainder of the prawn catch. The target prawn species and retained by-product species are generally graded and frozen on board.

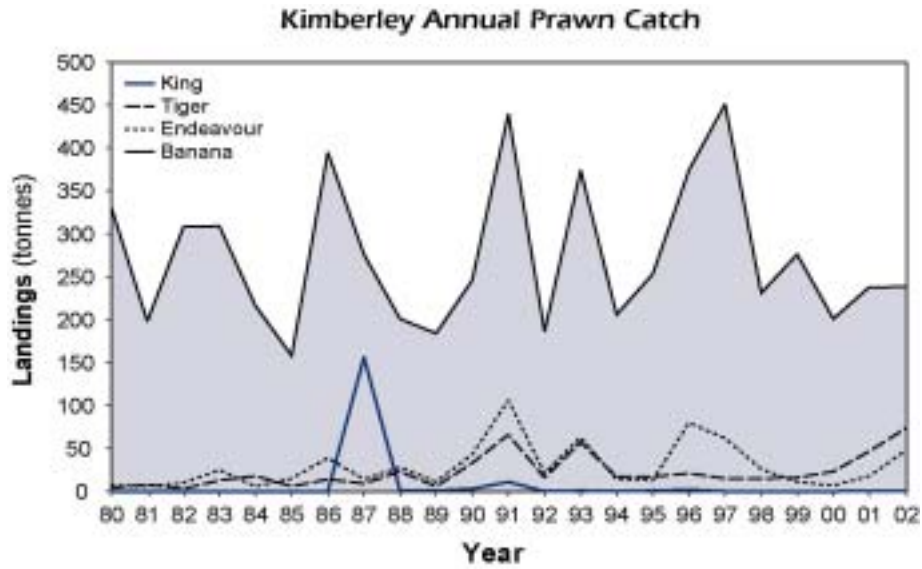


Figure 3 Catch history of prawns in the KPMF from 1980 to 2002.

Research

Research data for monitoring this fishery are provided by Western Australian fishers' monthly returns and by research logbooks collected by the Australian Fisheries Management Authority (AFMA) for NPF boats licensed to operate in the KPMF.

Research assessments (e.g. catch and effort trends) are provided to annual meetings of boat operators and provide the basis for recommending changes to management arrangements each year.

2.2 BIOLOGY OF BANANA PRAWNS

Distribution

The banana prawn, *Penaeus merguensis*, 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. The stock structure for this species is not known however different recruitment patterns have been shown in the Gulf of Carpentaria. This indicates that there are likely to be separated 'stocks' in areas often associated with embayments and river systems. The extent of larval dispersion in the Kimberley area is not known.

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, Kimberley), Northern Territory (the Gulf of Carpentaria, Darwin, Torres Strait), Queensland (Moreton Bay, Yeppoon, Mackay, Bowen and Weipa) (see Kailola *et al.*, 1993 for map).

This species is generally found in coastal waters down to approximately 60m but has been recorded to a depth of 200m (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 20m 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 Kimberley 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 (Crococ 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: protozoa, 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, which 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

This section refers to the blue endeavour prawn that is different from the red endeavour prawn. The application will refer to blue endeavour prawn as endeavour prawn. The endeavour prawn, *Metapenaeus endeavouri*, is a decapod crustacean of the family Penaeidae. *M. endeavouri* is restricted to northern Australian waters between northern New South Wales and Shark Bay in Western Australia. (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 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 MAJOR ENVIRONMENTS

2.5.1 PHYSICAL ENVIRONMENT

The Kimberley region experiences tropical weather conditions with hot, wet summers and dry, warm winters. The waters of the Kimberley experience some of the largest tidal variation in the world with waters rising up to 9 metres. The Kimberley coastline is characterised by mangrove lined embayments and inlets and rock gorges and headlands. Due to the large tidal flow there is very little structure or growth on the seabed and the area is characterised by thick, soft, muddy bottoms.

2.5.2 ECONOMIC ENVIRONMENT

The majority of banana prawns are marketed overseas or on the domestic market. The fishery has an average annual value to fishers of around \$3.5-5.5 million depending on variable catch levels, market price and exchange rates. The Fishery represents a substantial contribution to the regional economy of the Kimberleys.

2.5.3 SOCIAL ENVIRONMENT

Estimated employment for the year 2002 was 120 skippers and crew and would employ other people directly in processing and administration with some other jobs as an indirect activity (Engineering, Equipment Supplies etc).

3. METHODOLOGY

3.1 SCOPE

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

Table 1 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 KPMF. It was based upon the National ESD Reporting Framework, which is outlined in detail in the WA ESD policy paper (Fletcher, 2002) and in the “*How to Guide*” (Fletcher *et al.*, 2002) located on the website (www.fisheries-esd.com):

1. The issues that needed to be addressed for the fishery were determined through an internal workshop for the fishery, which utilised information generated through the external workshops held for the Shark Bay Prawn 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 KPMF.

2. A risk assessment/prioritisation process was completed that objectively determined, which of these identified issues was of sufficient significance to warrant specific management actions and hence a report on performance. The justifications for assigning low priority or low risk however were also recorded.
3. An assessment of the performance for each of the issues of sufficient risk to require specific management actions was completed using a standard set of report headings where operational objectives, indicators and performance measures, management responses etc were specified.
4. An overview assessment of the fishery was completed including an action plan for activities that will need to be undertaken to enable acceptable levels of performance to continue or, where necessary, improve the performance of the fisheries.

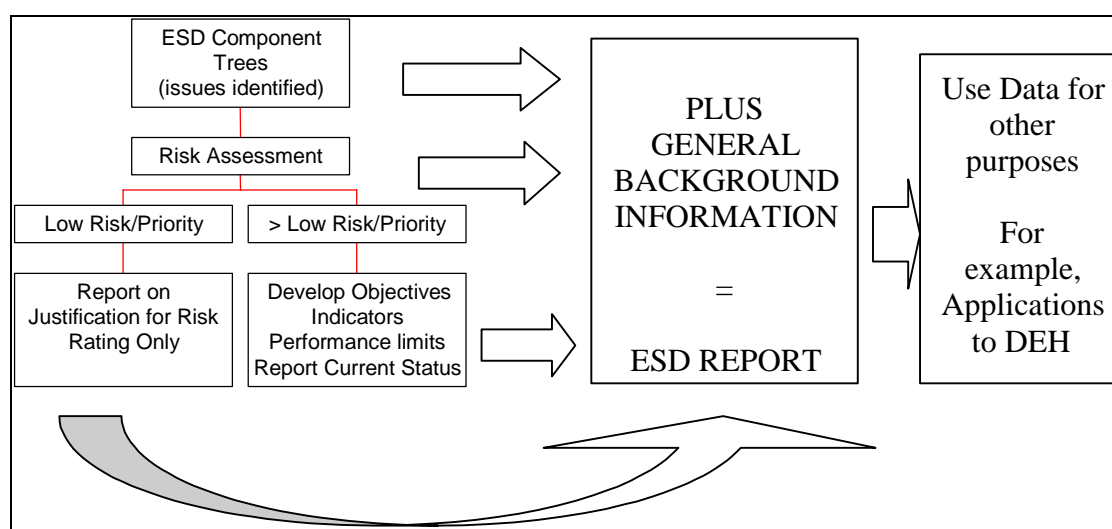


Figure 4 Summary of the ESD reporting framework processes.

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 KPMF by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (see Figure 5).

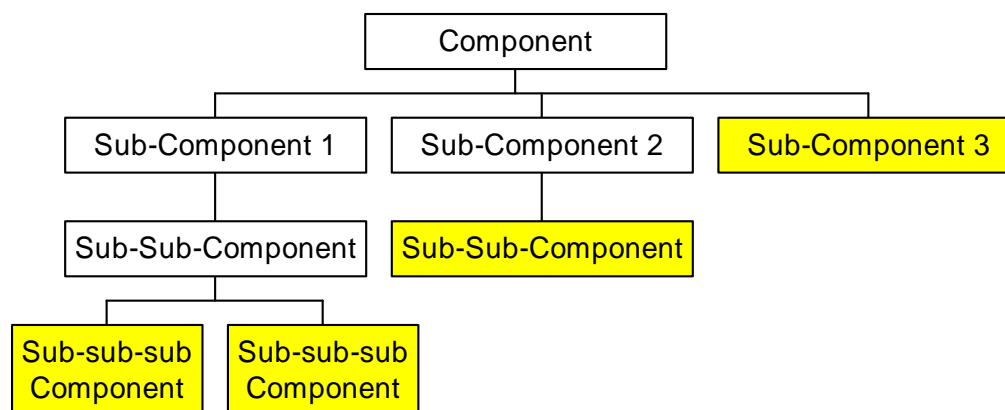


Figure 5 Example of a component tree structure.

The trees for KPMF 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 this fishery 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 fishery. Where relevant, the information collected through the other fisheries risk assessment processes was applied and utilised to generate the application for the KPMF.

An estimate of the consequence level for each issue was made by the group at this internal workshop. The levels used were from 0-5, with 0 being negligible and 5 being catastrophic/irreversible (see Appendix 2 for details of consequence tables). The assessment of the which level was chosen 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 KPMF 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	Risk level	Risk Rank	Likely Management Response	Reporting
Negligible	0	0	Nil	Short Justification Only
Low	1-6	1	None Specific	Full Justification needed
Moderate	6-12	2	Specific Management Needed	Full Performance Report
High	13-19	3	Possible increases to management activities needed	Full Performance Report
Extreme	>19	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 report completed. 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. Consequently, the rationale for classifying issues as low risk or even negligible risk also needs to be documented and form 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 4 (above).

3.5 COMPONENT REPORTS

Only the issues of sufficient risk or priority that require specific management actions have a full performance report completed (which form section 5 of this application). Nonetheless, the rationale for classifying issues as low risk/priority were also

documented and forms part of the report so that stakeholders can see where all the identified issues have finished.

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

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

- | |
|---|
| <ol style="list-style-type: none">1. Rationale for Inclusion2. Operational Objective (+ justification)3. Indicator4. Performance Measure (+ justification)5. Data Requirements6. Data Availability7. Evaluation8. Robustness9. Fisheries Management Response<ul style="list-style-type: none">-Current-Future-Actions if Performance limit is exceeded10. Comments and Action11. External Drivers |
|---|

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

4. ASSESSMENT OF THE KPMF 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 or viewed on their website.

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

Finally, once completed, the full ESD Report for the KPMF 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 the KPMF were developed through formal consultation with the industry.

The Department of Fisheries arranges annual meetings with industry members regarding the fishery. These meetings review data from the past seasons harvest and discuss management arrangements.

The KPMF does not have a formal MAC but the Joint Trawl MAC for the three major trawl fisheries in WA (Exmouth Gulf, Shark Bay Prawn and Shark Bay Scallop) has a conservation representative. The decisions made in this MAC flow through to the minor trawl fisheries such as the KPMF.

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 fisheries are very similar to those affecting the KPMF.

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 has 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 the workshop, generation and review of those two fisheries applications included:

- Department of Fisheries, WA;
- Department of Environment, WA;
- Department of Conservation and Land Management;
- Department of Environment and Heritage;
- The trawling industry;
- WAFIC;
- Recfishwest;
- 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 KPMF. For some components, the objectives, indicators and performance measures are well established and the data are available to demonstrate levels of performance over time. For other components, the objectives, indicators and performance measures have only just been developed and/or the necessary data collection is only just being initiated. The status of this information is documented within each of the individual component reports within the National ESD Reporting Framework in Section 5.1-5.4.

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

The FRMA and specifically the management plan for the fishery provides the legislative ability to control the level of harvest within this fishery. This is achieved through the use of a sophisticated and effective combination of input 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 2.1, 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 the KPMF. This includes at-sea patrols to ensure restrictions on gear and other operational rules are being adhered to as well as inspections of catches at the point of landing and processing factories. In 2002, Vessel Monitoring System (VMS) was introduced into the fishery thus making it possible for the Department to monitor the fleet. It is required that VMS be turned on at all times during operation. Any alert from VMS is responded to as soon as possible.

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 it is only a breach of a minor provision, then a warning is given.

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 the fishery through the completion of the “State of the Fisheries” report. This is updated and published each year including periodic reviews by the Office of the Auditor General (OAG). It forms an essential supplement to the Department’s Annual Report to the WA Parliament with the latest version located on the Departmental website www.fish.wa.gov.au. 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 the 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.

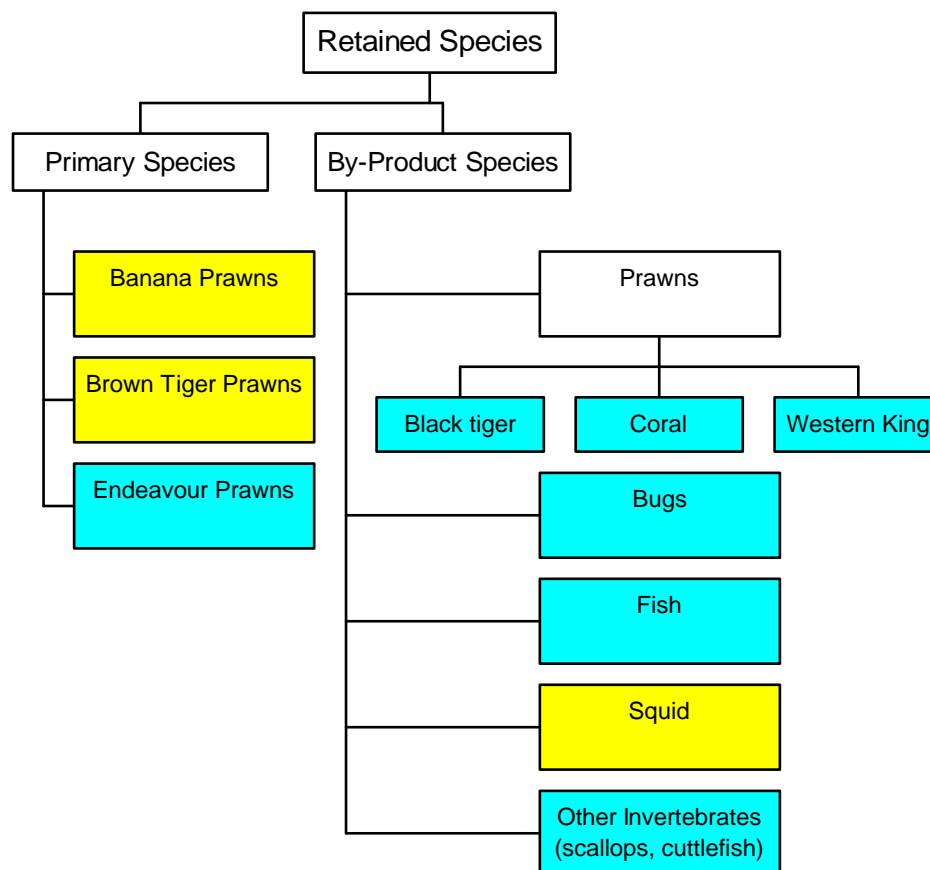
Require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy.

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). In addition, once the assessment for this fishery is completed the Department of Fisheries will develop a Bycatch Action Plan based upon the information presented in this application.

PRINCIPLE 1 OF THE GUIDELINES

OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVEL OF TARGET SPECIES

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



The component tree detailing the retained species within the fishery is shown above. Each of the primary species and by-product species retained by the fishery 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 squid (**Moderate Risk**) were of sufficient risk by the fishery to warrant detailed attention (Section 5.1.1.1, 5.1.1.2 and 5.1.2.6). Although endeavour prawns, coral prawns and black tiger prawns were all given a **Low Risk** rating, full reports were prepared for each due to the importance of these species to the KPMF (Section 5.1.1.3, 5.1.2.1 and 5.1.2.2).

The rest of the by-product species (Western king prawns, bugs, fish and other invertebrates) were all classified to be at **Negligible Risk** by the fishery. Full justifications for not specifically assessing these components are located in Section 5.1.2. These decisions were largely related to the relatively small quantities taken by

the fishery 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 KPMF 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 banana prawns, the main target species for this fishery, which is consistent with there being sufficient on-going levels of spawning biomass for this species.
- The catch of brown tiger prawns and endeavour prawns and the main by-product species remain within natural environment levels, which is consistent with the recruitment potential of these species having not 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, this fishery is meeting the requirement of Principle 1. The information relevant to this principle for these species is detailed below.

Information Requirements

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

Data are mainly collected through fishery dependent systems to monitor the stock abundance within the fished areas. Due to the low risk to the stocks, the limited funding and the logistic difficulties (because the boats stay out at sea for up to several weeks and depart from Darwin) the Department does not intend to implement any fishery independent research or monitoring in the fishery.

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
Catch and Effort Statistics Systems (CAESS) 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 1990s.	Moderate

VMS	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 including VMS data and industry feedback obtained from the fishery. A review of the performance for the fishery is conducted at least once a year. This review includes an assessment of the total catch by the fishery, the level of effort to take the catch, the distribution of effort, both spatially and temporally across the season and the calculated catch rates. 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 upon 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. As banana prawns are the main target species, the catch by the fishery is a reasonable estimate of the relative abundance of the potential spawning prawns available the previous year. The acceptable catch range for banana prawns is between 200 and 450 tonnes for the KPMF. The full performance report is located in Section 5.1.1.1.

Brown Tiger Prawn

The brown tiger prawn is the minor target species for the KPMF. This species has been shown to be vulnerable to overfishing in other fisheries such as Exmouth Gulf and Shark Bay (where it is a primary target species). 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. For brown tiger prawns, the catches are mostly related to the level of effort on the stocks and the normal environmental fluctuations amongst years. The acceptable catch range for brown tiger prawns in the KPMF is between 15 and 60 tonnes.

Endeavour Prawn

The endeavour prawn is a primary species for the fishery as this group of species is although the fishery does not specifically target it. 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 7 and 80 tonnes in the KPMF and is based on a ten-year catch history.

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

The distribution for the three primary penaeid species in the KPMF 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.

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 KPMF can be considered to originate from functionally separate stocks than other regions where fishing for these species occurs. This supports the current management strategy for these species as regional populations are being treated as separate stocks for fishery management purposes. More information on the distribution for all three 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 KPMF, data covering each of the sources of removal are outlined. Given the nature of this fishery, only the estimates of removals by the commercial sector are required and these are collected on a monthly basis during the fishing season. There are no significant recreational or indigenous fisheries for prawns in the Kimberley area. Furthermore, there is a minimal likelihood of a significant level of illegal capture of prawns by the commercial fleet. This has further been improved with the VMS monitoring of the fleet, which began in 2002.

Sector	Catch Data Collected	Frequency
Commercial	Catch and disposal Record form- daily basis, Fishers monthly returns (CAES).	Monthly during the season.
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 this fishery (around 20 years) combined with the catch and effort data and research that has been collected for this fishery 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 the KPMF. These have been translated into the acceptable catch ranges for each species within the 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 monitors the status of the stocks for all three 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 the 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, which is likely to be in five years time.

Banana Prawn

The acceptable catch range for banana prawns is 200 to 450 tonnes. As previously mentioned, 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. Investigations have shown a promising relationship between early season rainfall (January and February) and the subsequent catch of banana prawns. This is allowing a more precise prediction of the catches for the following year to be made.

Brown Tiger Prawn

The catches of this species are mostly related to the level of effort on the stocks and the normal environmental fluctuations amongst years. The acceptable catch range is 15 to 60 tonnes.

Endeavour Prawn

The acceptable catch range is between 7 and 80 tonnes and is based on a ten-year catch history.

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 *Kimberley Prawn Fishery Management Plan*. A full discussion of the main regulations and their justifications are located in Section 2. The following is a summary of the management arrangements for the fishery:

- The fishery is managed through input controls (including number of licenses, restrictions on boat sizes and gear restrictions).
- The annual fishing season has a seasonal closure that limits the opportunity for fishers to take prawns.
- Compliance policing includes the use of VMS and gear checks.
- The fishery is required to operate with BRDs (turtle exclusion devices).
- The performance of the fishery is reviewed and reported on annually.

In 2003, the Department introduced an Effort Pool System to remove the problem of latent effort. This system caps the number of days that can be fished in both the first and second part of the season to 600 and 900 days respectively. Under this system, the days that a fishing vessel spends in the fishery (as recorded by the VMS system) will be deducted from the total effort pool, regardless of whether or not actual fishing is taking place. As this system can be monitored on a daily basis by the VMS system, the Department can monitor the amount of effort in the fishery in a “real time” basis. Therefore, if it looks as though the total number of days fished may exceed the cap, steps can be taken to close the season.

The Department has shown its ability to act in controlling the level of take when it closed the fishery early for the 2003 season. The Effort Pool System was first introduced and operational in 2003. In the second half of the 2003 season the cap of 900 days was reached and therefore the Department closed the fishery early.

Furthermore, 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.

Significant effort is put into ensuring adequate compliance with these regulations. This includes at-sea patrols to ensure closed season and areas, as well as 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 KPMF are located in sections 5.1.2. Only squid was rated as being of sufficient risk to require specific ongoing monitoring. Even though the

black tiger prawns and coral prawns were rated as a **Low risk** full performance reports were developed for these species. The total amounts of the other by-product species captured by this fishery is very small representing a negligible risk to these species.

Coral Prawn

The fishery does not target this species group and due to the mesh size, selectivity and distribution only a small proportion of the stocks are vulnerable and retained by the fishery. Nonetheless, in some years a reasonable number is caught. The acceptable catch range of 0 to 6 tonnes is based upon the 10-year catch history and is largely used to indicate if there has potentially been some change in targeting by the fleet. Due to the lower catchability of this species group the upper range is considered to be more important because it signifies the potential increase in targeting of this species.

Black Tiger Prawns

This species is a by-product species for the fishery. Very small quantities are caught in the fishery with generally less than half a tonne recorded as being landed annually. As this is an inshore species 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. The acceptable catch range for the black tiger prawn is between 0 and 1 tonnes.

Western King Prawns

The KPMF retains western king prawns as a by-product species. Generally less than 5 tonnes of king prawns are recorded as landed annually.

Bugs

This fishery retains bugs as a by-product species. Generally less than 5 tonnes of bugs are recorded as landed annually.

Fish

Currently the fishery retains less than one tonne of mixed finfish species annually as by-product. With the introduction of FEDs in 2004/2005 it is likely that this further reduce the amount of fish taken by this fishery.

Squid

This species or group of species experienced high catch levels between 1993 and 1995 followed by low catches since 1995 to the present. The continued low catch levels may be due to overfishing during this period or poor environmental factors in recent years. In 2002, squid landings were 18.7 tonnes.

Monitoring of the trend in squid landings in the next few years is required and will be undertaken by the Department. The Department is developing a pre-proposal to gain funding through FRDC to gain better biological and distributional information of

squid abundance and species composition from Kimberley to Shark Bay. Following the collection of more data on squid catches and biology the Department will develop an acceptable catch range.

Other Invertebrates

Other invertebrates, which include scallops, octopus and cuttlefish, are retained as by-product in this fishery. Generally less than half a tonne of any of these species are recorded as landed annually.

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

Management actions taken within the KPMF over the past 20 years have been 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 three major prawn species caught.

The management responses that are currently in place for the fishery are very detailed, both for current actions, future actions and if the performance limits are reached/approached (see Section 5.1.1.1 – 5.1.1.3).

The use of catch based performance measures (acceptable ranges) for all three prawn species, enables the Department to respond where changes outside the normal variations occur to ensure the maintenance of the spawning stock for all three primary 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 three 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.

The Department has shown its commitment to effectively managing this fishery and ensuring that the management objectives are achieved by the recent introduction of an Effort Pool System to remove the latent effort in the fishery. As was explained in Guideline 1.1.7 the introduction of the Effort Pool System combined with VMS enables the Department to monitor the amount of effort in the fishery on a real time basis. As a result, the Department is able to close the season early if it looks as though the total number of days fished may exceed the cap. This system will be trialed for a few years after which a review will take place to ensure that it is effectively dealing with the latent effort in the fishery.

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 this fishery that are currently below the defined reference points/limits. Therefore 1.2.1 and 1.2.2 are not applicable.

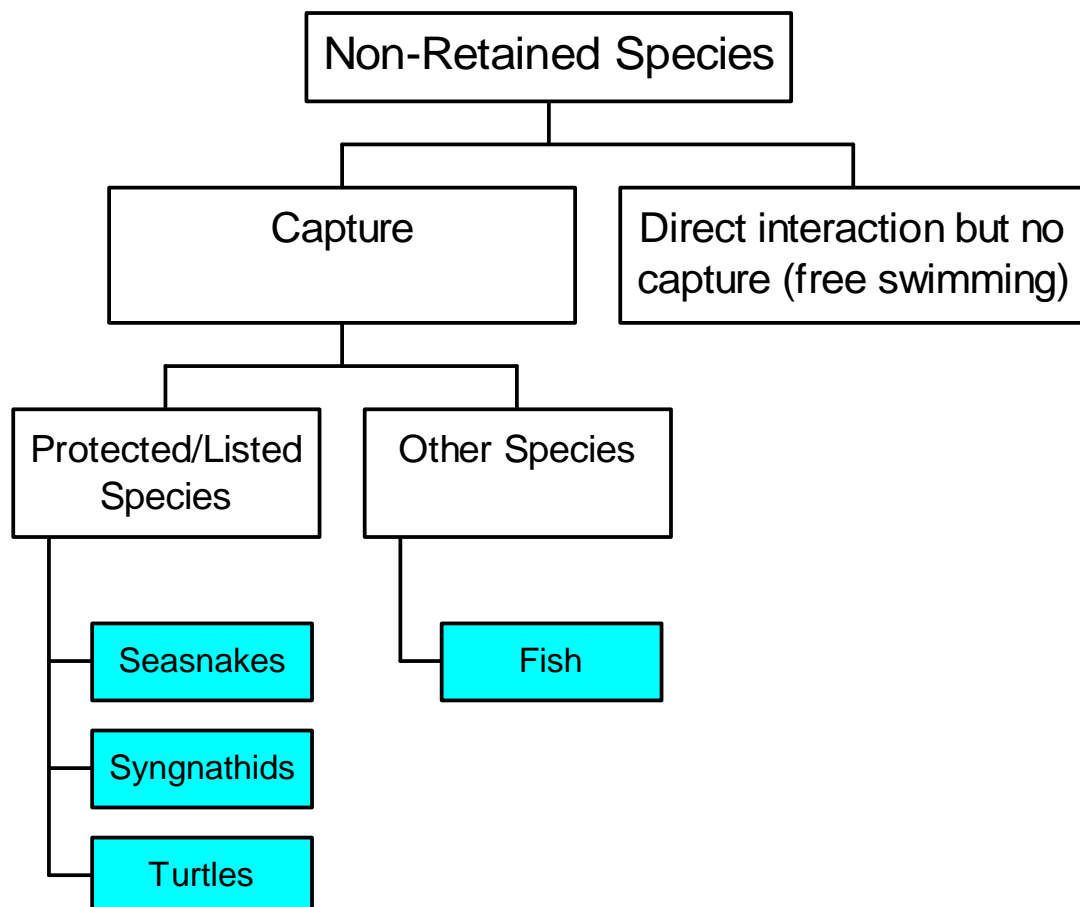
PRINCIPLE 2 OF THE GUIDELINES

OBJECTIVE 1. BYCATCH

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

Four 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 and turtles and a **Low Risk** to syngnathids and fish. 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 (e.g. seasnakes, syngnathids and turtles) are covered in Objective 2.2; the remaining non-retained species are covered under objective 2.1.

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



Information Requirements

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

There is limited information on the nature and volume of bycatch species for the KPMF. Information has come from voluntary logbooks for the fishery and data that has been collected in other similar fisheries such as Shark Bay Prawn Managed Fishery and Exmouth Gulf Prawn Managed Fishery. The current CAESS compulsory forms allow fishers to record target and by-product species but not bycatch species. 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 this fishery.

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 fishery independent 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 this fishery. Once completed, this information will be used in future assessments of the fishery 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 KPMF were of low risk to fish and invertebrates.

Fish - Summary

ERA Risk Rating (C1 L4 LOW)

Since trawling is a non-selective form of fishing, other species are caught which are not wanted. Due to the relatively small spatial area fished (approx. 8%) in the KPMF 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 trialling of FEDs in 2004 and implementation during 2005/06 it is expected to substantially reduce the catch of some mobile fish species. 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 5.2.2.1.

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 seasonal and area closures and the relatively small area in which the KPMF operates within greatly reduces the impacts on all of these affected species.

At the end of 2001, an information package was provided to industry members within the fishery describing the types of grids being trialed and the preliminary results of these trials in Exmouth Gulf Prawn Managed Fishery and Shark Bay Prawn Managed Fishery. Also information regarding BRDs (grids) was exchanged between license holders as industry members also have their own networks and use the same netmakers. In 2002, grids were trialed on one side of the nets in the fishery. BRDs (grids) are now compulsory in the fishery. These 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.

These grid specifications are operational in all the WA prawn trawling fisheries but are different to the Northern Prawn Fishery requirements. Since the bar spacing is bigger for the WA fisheries the Northern Prawn Fishery boats are able to use their existing grids and are therefore compliant within the WA grid specifications.

By the end of the 2004 season, this fishery will be operating with 100% BRDs (one grid in each net in operation) and trialing FEDs (2004/05) which will further reduce the overall bycatch taken, particularly small fish 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. At present square mesh panels are being trialed in Shark Bay Prawn and Exmouth Gulf Prawn fisheries.

Within the next two years the Department will be undertaking a biodiversity survey of the bycatch species located within and outside the trawl grounds for the Exmouth Gulf, Shark Bay Prawn and Onslow Prawn Managed Fisheries to determine the relative proportion of refuge areas for these bycatch species. The information collected through these projects will be used in the management of this fishery.

2.1.4 An indicator group of bycatch species is monitored.

Not applicable on an annual basis.

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 2005/06, it is likely that there will be a decrease in the level of impact on the non-retained species by the KPMF. 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.

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 KPMF. The current compulsory monthly CAESS report does not have a provision for information on bycatch to be recorded. Information has come from voluntary logbooks for the fishery and data that has 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 of this fishery.

Furthermore, a FRDC funded project to determine biodiversity indicators will collect information of bycatch in trawled and untrawled areas of Shark Bay Prawn, Exmouth Gulf Prawn and Onslow Prawn Managed fisheries during 2004/05. Once completed, this information will be used in future assessments of this fishery 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 KPMF were of negligible risk to seasnakes and turtles 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 the Shark Bay Prawn, Exmouth Gulf Prawn and Onslow Prawn Managed Fisheries.

Seasnakes - Summary

ERA Risk Rating (C0 L5 NEGLIGIBLE)

While it is known that the fishery catches 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 KPMF 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.

Turtles – Summary

ERA Risk Rating (C0 L5 NEGLIGIBLE)

Through logbook entries, four species of turtles have been identified as being caught in the KPMF, the Olive ridley, Green, Flatback and Hawksbill turtles. In 1998 a total of 22 turtles were caught and released alive, one Flatback turtle was released dead. In 1999 a total of 21 turtles were released alive and 2 Pacific Ridley turtles were released dead. This was followed by a large drop in the number of turtles recorded as being caught in the KPMF in 2000. The only record was of one Flatback turtle being caught and released alive. In 2001 no turtles were recorded being caught. The drop in numbers of turtles being caught coincides with the implementation of BRDs within the fishery. By the commencement of the 2003 season the fishery will be operating with BRDs in all of the nets in operation. This should eliminate this risk.

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 this fishery as it operates on muddy 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 one BRD and two required in 2003 for this fishery, 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.

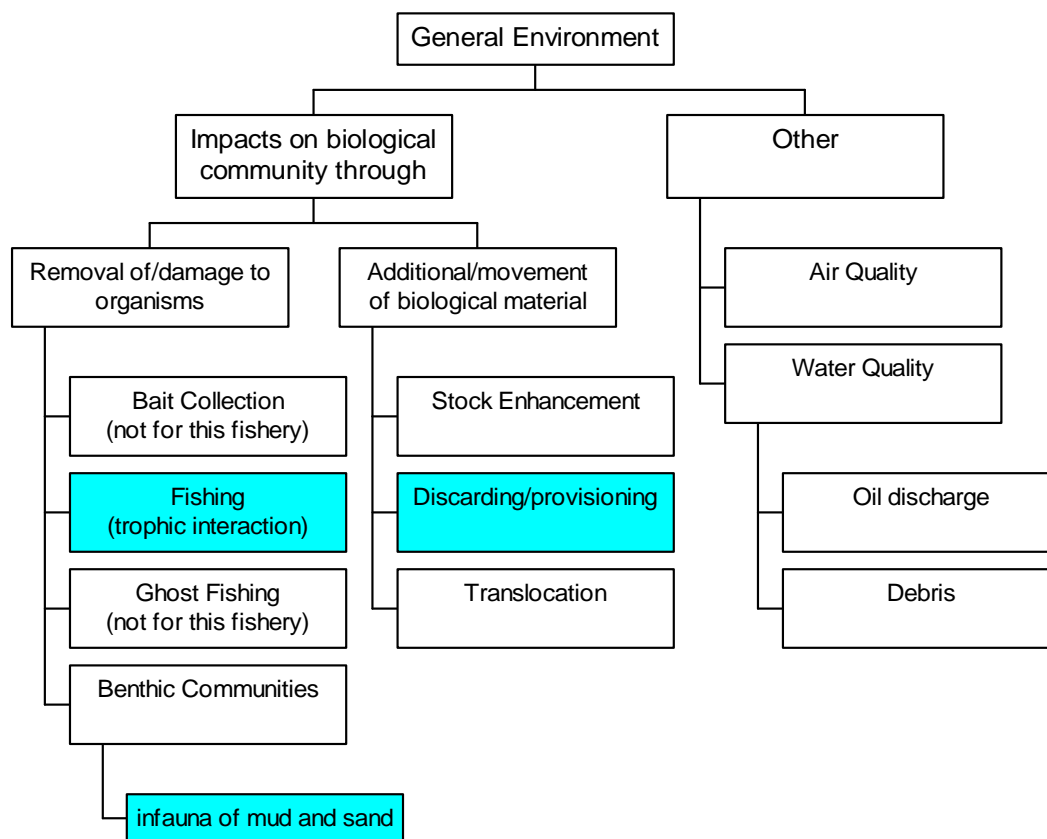
Given the relatively low levels of interactions for the KPMF with protected species and the introduction of BRDs and FEDs in the coming seasons, it is more than likely that the current situation of having only negligible impacts on these species will continue. The Department of Fisheries will be investigating mechanisms that will allow fishers to identify and record all interactions with protected/listed species. 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.

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 KPMF 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 three issues identified for the KPMF, two were of **Low risk** (trophic interactions and impacts to benthic biota – mud and sand) the other one was rated as a **Negligible Risk** (discarding/provisioning). Consequently, the current performance for the KPMF 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 KPMF- 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 KPMF (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 KPMF.

ISSUES	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Removal of/damage to organisms:			5.3.1
Trophic Interactions	Low	<p>The total tonnage of material removed by this fishery is relatively small. Most prawn predators are, therefore, opportunistic due to the high levels of natural variability of prawn populations, especially banana prawns.</p> <p>There are no known obligate prawn predators, which are likely to be impacted upon by the removal of adult-sized prawns.</p> <p>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.</p> <p>The use of BRDs and FEDs in the fishery will further reduce the amount of bycatch species being taken from the ecosystem.</p>	5.3.1.1
Impacts to Benthic Biota – Mud and Sand	Low	<p>The KPMF operates over a very limited sector, approx. 8% of the licensed area. There are extreme tidal ranges (9 m), heavy mud substrates and high turbidity in this area.</p> <p>Studies of actual impacts from prawn trawling suggest only minimal impacts to these types of infaunal communities. The combination of the small area of operation and minimal impact within this area means that this fishery is likely to have minimal</p>	5.3.1.2

		impacts on these benthic habitats and is therefore a Low Risk.	
Addition/Movement of biological material:			5.3.2
Discarding/Provisioning	Negligible	Introduction of BRDs and FEDs will reduce the amount of bycatch generated in the fishery, which in turn reduces the amount of discards by the 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 there will be an increase of information 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 be 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 KPMF on the broader ecosystem even after around 20 years of fishing. It is, therefore, highly likely that this fishery will continue to meet the objectives of having 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 presented in the report.

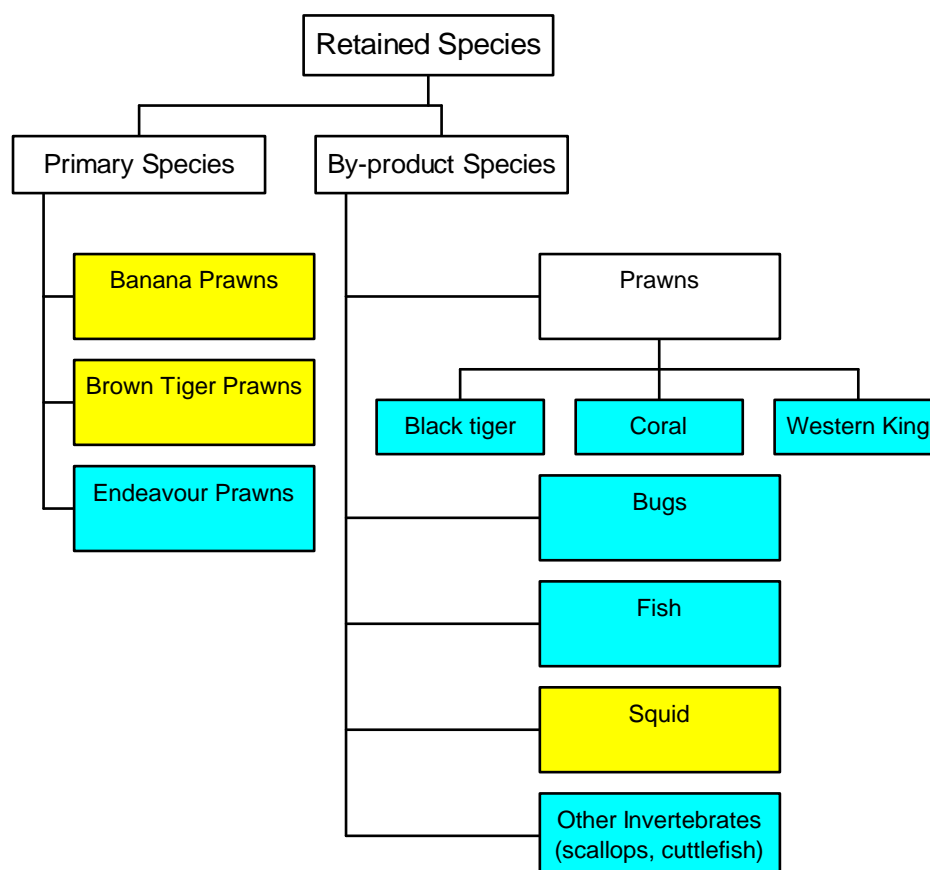
Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	DEH Guidelines Covered	Actions
RETAINED SPECIES (Component Tree)						1.1	
5.1.1.1 Banana Prawns	Yes	Annual catch	Within acceptable catch range of 200 to 450 tonnes.	Acceptable	Medium-Low	1.1.1 – 1.1.7	Continue and improve current monitoring, management and assessment arrangements.
5.1.1.2 Brown Tiger Prawns	Yes	Total catch	Given no major change in effort, catches to remain within acceptable range of 15-60 tonnes.	Acceptable	Low	1.1.1 – 1.1.7	Continue and improve current monitoring, management and assessment arrangements.
5.1.1.3 Endeavour Prawns	Yes-although Low Risk	Total catch	Within acceptable catch range of 7-80 tonnes.	Acceptable	Low	1.1.1 – 1.1.7	Continue and improve current monitoring, management and assessment arrangements.
5.1.2.1 Coral Prawns	Yes-although Low Risk	Total catch	Within acceptable catch range of 0-6 tonnes (ten-year catch range).	Acceptable	Medium	1.1.8	Continue and improve current monitoring, management and assessment arrangements.
5.1.2.2 Black Tiger Prawns	Yes-although Low Risk	Total catch	Within acceptable catch range of 0-1 tonnes.	Acceptable	Medium-Low	1.1.8	Continue and improve current monitoring, management and assessment arrangements.
5.1.2.3 Western King Prawns	No-Negligible Risk	N/A	N/A	N/A	N/A	1.1.8	Review Risk at Next Major Assessment.
5.1.2.4 Bugs	No-Negligible Risk	N/A	N/A	N/A	N/A	1.1.8	Review Risk at Next Major Assessment.
5.1.2.5 Fish	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 (continued)						1.1.1 – 1.1.8	
5.1.2.6 Squid	Yes	Total catch	An acceptable catch range will be implemented as more data is obtained from the fishery.	Acceptable	Low	1.1.8	Continue and improve current monitoring, management and assessment arrangements
5.1.2.7 Other Invertebrates	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 & 2.2	
5.2.1.1 Seasnakes	No-Negligible Risk	N/A	N/A	N/A	N/A	2.2.1 – 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	2.2.1 – 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	2.2.1 - 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.
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 Impact to Sand and Mud	No- Low Risk	N/A	N/A	N/A	N/A	2.3.1 – 2.3.5	Continue management through assurance and compliance with VMS.
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 KPMF



Yellow boxes indicate that the issue was considered high enough risk at the August 2002 Risk Assessment Workshop to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.1.1 PRIMARY SPECIES

5.1.1.1 BANANA PRAWNS

Rationale for Inclusion:

Banana prawns are the major target species for KPMF.

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

The normal dynamics of this species which regularly undergoes large natural fluctuations 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

The acceptable catch range for banana prawns is 200 to 450 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.

Data Requirement for Indicator (and Availability)

Data Required	Availability
Catch utilising commercial catch and effort information provided through compulsory monthly CAESS returns and AFMA research logbooks.	Yes; since the 1980s.
Voluntary WA daily logbooks are completed by a few of the boats.	Limited; since late 1990s

Evaluation

Summary: Banana prawn catches are variable with a higher abundance of banana prawns occurring under optimal environmental conditions. The catch in 2002 season was 239 tonnes, which is within the acceptable catch range for this species. Therefore, the current analysis (Figure 6) of the banana prawn catches at current effort levels indicates that the breeding stock is within acceptable levels in the Kimberley.

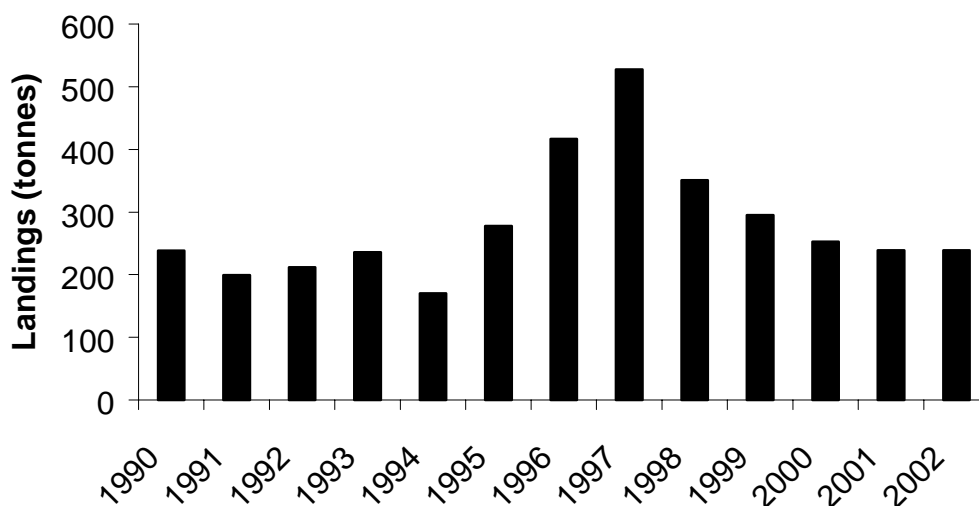


Figure 6 Catch history of banana prawns in the KPMF from 1990 to 2002.

The landings for banana prawns in 2002 was 239 t which is similar to levels over the past 15 years (Figure 6). This banana prawn catch was also within the projected catch range (200–380 t) for the year calculated using the preliminary relationship between summer rainfall and catches.

These investigations have shown a promising relationship between early season rainfall (January and February) and the subsequent catch of banana prawns. Rainfall during the period January–February 2003 was 645 mm at Derby and 610 mm at Kalumburu, which indicates that banana prawn catches for 2003 should be in the range of 240–370 t. Investigations on refining this rainfall–catch relationships are continuing.

Robustness: Medium - Low

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.

Fisheries Management Response

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

- The fishery is managed through input controls.
- The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity to fishers to take prawns.
- Compliance policing includes gear checks and VMS from 2002.
- Monitoring of improvements in technology that may increase fishing efficiency.

Future: To reduce the current level of latent effort in the fishery in the next few years.

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:

- 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 or activation of latent effort 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 fluctuation 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.

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. A few skippers have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the Kimberley fishery.

External Drivers

The relationship between summer rainfall and the catch of banana prawns is being investigated further. As banana prawns usually comprise the majority of the prawn catch from this fishery, this correlation will assist fishers and managers to make the best use of the fishery.

Significant risk factors in the context of external drivers are cyclonic activity and significant environmental pollution (i.e. oil or chemical spills in key breeding areas) or habitat degradation.

5.1.1.2 BROWN TIGER PRAWNS

Rationale for Inclusion:

Brown tiger prawns are the minor target species for the KPMF 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 KPMF, 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 stock-recruitment relationship (SRR) analysis has been developed for tiger prawns stocks in the Kimberley, 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 the KPMF.

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 15-60 tonnes.

Justification:

There is a time series of catch and effort information for this species in this fishery. 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.

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 CAESS returns.	Yes; since 1980s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1990s

Evaluation

Summary: The tiger prawn catch was the highest on record (80 t) and was therefore slightly higher than the acceptable catch range for this species (15–60 t). However this catch was a result of improved recruitment (rather than targeting). Consequently, the current performance of the fishery should be maintaining sufficient levels of spawning biomass of tiger prawns to meet the agreed objectives.

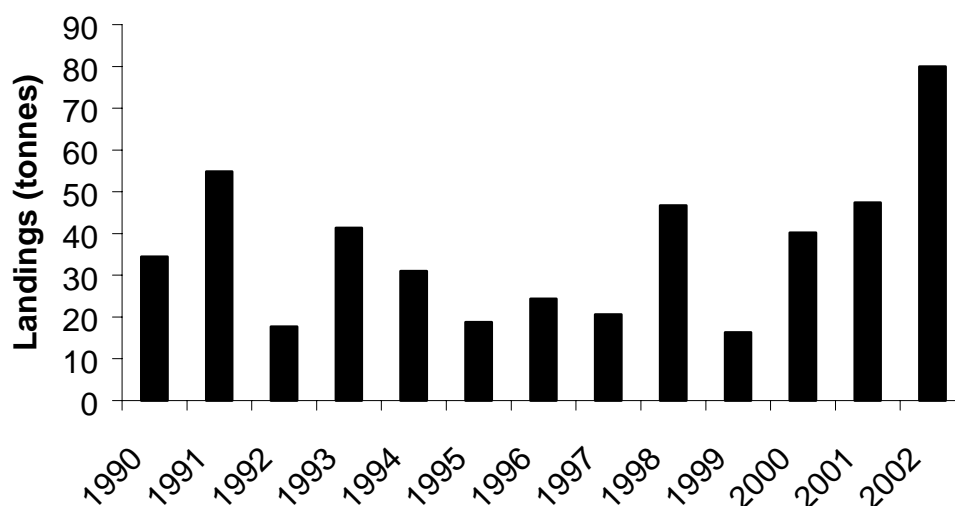


Figure 7 Catch history of brown tiger prawns in the KPMF from 1990 to 2002.

The landings in the 2002 season for the KPMF included 80 tonnes of tiger prawns (Figure 7). Whilst this value was higher than the acceptable range, it was thought to be due to a good recruitment year for this species rather than an increase in fishing effort or an increase in exploitation rates through changes in targeting.

This increase is seen as a result of a one-off environmental fluctuation and therefore no changes to management will be undertaken this year. Nonetheless the catch of this species in 2003 season will be scrutinized closely to ensure no longer-term trends are beginning.

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. The timing of the fishery affords protection to smaller prawns with added protection to small banana prawns in the first half of the season with area closures.

Fisheries Management Response

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

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

Future: To reduce the current level of latent effort in the fishery in the next few years.

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:

- 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 or an activation of latent effort 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 fluctuation then no action will be undertaken.
 - 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 can be initiated within a 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. A few skippers have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the KPMF.

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 ENDEAVOUR PRAWNS

Rationale for Inclusion:

Endeavour prawns are caught in the KPMF. These species are not targeted but are caught in reasonable numbers in most years and as a result are a primary prawn species caught in the fishery.

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 also found inshore of where the fishery operates and hence is not fully vulnerable in this 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 primary species of the KPMF although the fishery does not specifically target this species. Due to the distribution of this species, which are also 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 7-80 tonnes.

Justification:

The acceptable catch range is based upon the 10-year catch history in this fishery and is largely used to indicate if there has been some change in targeting by the fleets.

Data Requirement for Indicator (and Availability)

Data Required	Availability
Catch utilising commercial catch and effort information provided through compulsory monthly CAESS returns.	Yes; since 1980s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1990s.

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.

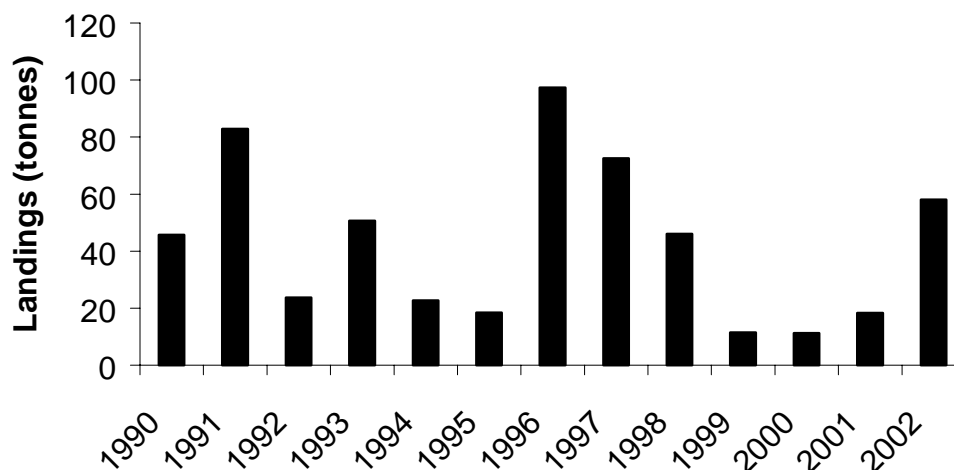


Figure 8 Catch history of endeavor prawns in the KPMF from 1990 to 2002.

The landings in the 2002 season for the KPMF included 58 tonnes of endeavour prawns (Figure 8). This catch is close to the long term mean catch of 43 tonnes for this species and is within the acceptable range for this fishery of 7-80 tonnes.

Robustness:

Low

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 prawn stocks, which also ensure the maintenance of the required level of breeding stock for endeavour prawns. These strategies include:

- The fishery is managed through input controls (see above for details).
- The annual fishing season is for a fixed period (12 weeks) and includes seasonal and area closures limiting the opportunity for fishers to take endeavour prawns.
- Compliance policing will include the use of VMS from 2003 and gear checks.

Future: None.

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:

- 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 or an activation of latent effort 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 fluctuation then no action will be undertaken.
 - c) There is a significant increase, or an increasing trend over three years in the catch of endeavour 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.

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. A few skippers have also agreed to complete voluntary daily logbooks to provide additional spatial catch and effort information for the KPMF.

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 KPMF. 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.

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 KPMF and not generally targeted by the 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. The proportion of coral prawns escaping should remain the same if the mesh size remains the same therefore by monitoring the retention rate of the coral prawns the department can ensure that there isn't an increase in targeting of the species by the fishery.

Indicator

Catch of coral prawns.

Performance Measure

Catch should remain within an acceptable range of 0 to 6 tonnes for the KPMF (ten-year catch range).

Justification:

The acceptable catch range is based upon the 10-year catch and is largely used to indicate if there has potentially been some change in targeting by the fleet. 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 CAESS returns.	Yes; since 1980s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1990s.

Evaluation

Summary: The current analysis (Figure 9) indicates that the coral prawn fishery is within the acceptable catch range and the fishery is, therefore, meeting the objective.

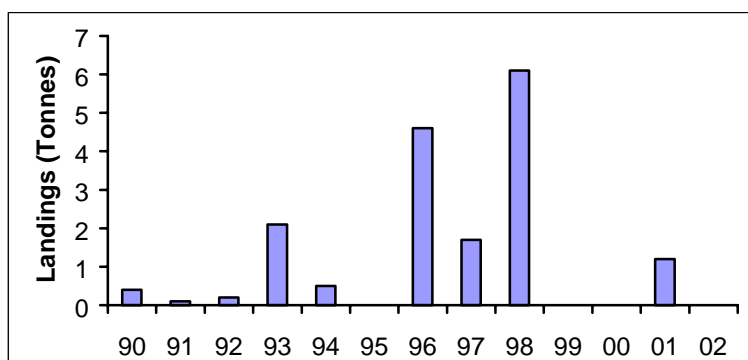


Figure 9 Catch history of coral prawns in the KPMF from 1990 to 2002.

There was no recorded catches of coral prawn in the 2002 season. This is within the acceptable catch range for this species.

**Robustness:
Medium**

- There is a time-series of catch and effort information provided by 100% of the commercial fishers.
- Data are aggregated for several species termed coral prawns.
- 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:

- The fishery is managed through input controls.
- The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity for fishers to take prawns.
- Compliance policing includes use of VMS from 2002 and gear checks.
- 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 prior to the beginning of the next season in the event that the performance limits are exceeded:

- 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) 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 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) will be investigated. These actions can be initiated within a 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.

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.

5.1.2.2 BLACK TIGER PRAWNS

Rationale for Inclusion:

Black tiger prawns are caught as a by-product species in the KPMF. Very small quantities of black tiger prawns are caught in this fishery with generally less than half a tonne recorded as landed annually. Black tiger prawns are starting to become important to the aquaculture industry for broodstock.

ERA Risk Rating: Impact on breeding stock (C4 L1 LOW)

The potential consequence of fishing on black tiger prawns was ranked as 'major' (4). Compared to the exploitation of other prawn species in the fishery, this is a high consequence rating. It was considered 'remote' under current harvesting patterns that this 'major' consequence could occur. This resulted in an overall risk ranking of LOW.

Operational Objective

To ensure that targeting of the black tiger prawns does not increase too greatly to potentially impact on the 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 of 0-1 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. 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 1980s
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1990s

Evaluation

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

Only very small quantities of black tiger prawns have been landed (0-70 kilograms) during the last five years (1997-2001).

Robustness:
Medium - Low

There is a time-series of catch and effort information provided by 100% of the commercial fishers. As low numbers of black tiger prawns are caught, historically they may not have always been reported separately but may be included in the catches of brown tiger prawns.

Fisheries Management Response

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

- The fishery is managed through input controls.
- The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity for fishers to take prawns.
- Compliance policing includes use of VMS from 2002 and gear checks.
- Monitoring of improvements in technology that may increase fishing efficiency.

Future: It is not anticipated that black tiger prawns will be targeted by fishers 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.

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:

- 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. 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 fluctuation then no action will be undertaken.
 - c) There is a significant increase, or an increasing trend over three years in the catch 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) will be investigated. These actions can be initiated within a 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.

External Drivers

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

5.1.2.3 WESTERN KING PRAWNS

Rationale for Inclusion:

The KPMF retains western king prawns (*Penaeus latisulcatus*) as a by-product. Generally less than 5 tonnes of king prawns are recorded as landed annually.

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

The potential consequence of fishing on western king prawns was ranked as 'negligible' (0). It was considered 'likely' under current harvesting patterns that this 'negligible' consequence could occur. This resulted in an overall risk ranking of NEGLIGIBLE.

5.1.2.4 BUGS

Rationale for Inclusion:

The KPMF retains bugs (*Thenus orientalis*) as a by-product. Generally less than 5 tonnes of bugs are recorded as landed annually.

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

The potential consequence of fishing on bugs was ranked as 'negligible' (0). It was considered 'likely' under current harvesting patterns that this 'negligible' consequence could occur. This resulted in an overall risk ranking of NEGLIGIBLE

5.1.2.5 FISH

Rationale for Inclusion:

Less than one tonne of mixed finfish species are recorded as landed in the KPMF annually.

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

The potential consequence of fishing on fish was ranked as 'negligible' (0). It was considered 'likely' under current harvesting patterns that this 'negligible' consequence could occur. This resulted in an overall risk ranking of NEGLIGIBLE.

The level of fish catch by trawl is not likely to have any impact on the stocks. The introduction of FEDs in 2004/05 will further reduce the amount of fish taken by trawl.

5.1.2.6 SQUID

Rationale for Inclusion:

Squid are a by-product of the KPMF. High squid catches were recorded between 1993 and 1995 with more than 400 tonnes recorded as being landed in 1995. Since 1995, low catches (0 to 19 tonnes) have been recorded. The squid caught is most likely a combination of several species commonly found in tropical Australian waters.

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

The potential consequence of fishing on squid was ranked as 'severe' (3). It was considered 'possible' under current harvesting patterns that this 'severe' consequence could occur. This resulted in an overall risk ranking of MODERATE.

Operational Objective

To ensure that targeting of squid does not increase too greatly to potentially impact on their breeding stock.

Justification:

This is a species or group of species that had experienced high catch levels for a short period of time followed by low catches to the present. The continued low catch levels may be due to overfishing historically or poor environmental factors in recent years.

Indicator

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

Performance Measure

Currently, there is no acceptable catch range for the take of squid by this fishery. As more data on squid catches is obtained in this fishery as well as scientific data, an acceptable catch range will be implemented.

Justification:

Given no major change in effort, the status of the squid stock is assessed by whether catches remain within these low levels. The performance measure is set to detect any increase targeting in squid by the fishery. For the past seven years it was considered that poor environmental conditions might have been a factor. As more data is collected on the squid catches in the fishery, the acceptable catch range may be altered to more accurately depict the situation in the KPMF.

Data Requirement for Indicator (and Availability)

Data Required	Availability
Catch utilising commercial catch and effort information provided through compulsory monthly CAESS returns.	Yes; since 1980s.
Voluntary daily logbooks are completed by a few of the boats.	Limited; since 1990s.

Evaluation

Summary: The squid landings for 2002 were 18.7 tonnes. As a result, the current catch of squid in 2002 is acceptable. Even so, monitoring of the trend in squid landings in the next few years is required.

A funding application to FRDC will be developed in 2003 for 2004/05 to 2006/07, which includes a component to provide further information on squid resource distribution and abundance in northern Western Australia including the Kimberley region. If and when this project is approved and conducted the data generated from it may be utilised in this fishery to develop a more explicit indicator and/or performance measure for squid.

Robustness:

Low

There is a time-series of catch and effort information provided by commercial fishers. This data is a combination of WA and AFMA data sets. Squid catches may be comprised of more than one species and the accuracy and level of reporting may not have been consistent historically.

Fisheries Management Response

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

- The fishery is managed through input controls.
- The annual fishing season is for a fixed period and includes seasonal and area closures limiting the opportunity for fishers to take squid.
- Compliance policing includes use of VMS from 2002 and gear checks.
- Monitoring of improvements in technology that may increase fishing efficiency.

Future: It is not anticipated that squid will be solely targeted by fishers due to their low abundance and value.

Actions if Performance Limit is Exceeded: Currently, there are no performance limits as more information regarding squid catches for the fishery is needed to develop robust catch ranges. When the performance limit is developed actions if it is exceeded will be developed.

Comments and Actions

None.

External Drivers

Squid are short-lived species (less than 1 year) and have high recruitment variability. Environmental factors such as: climatic change, ocean currents, cyclones and sea-surface temperatures may affect the levels of recruitment of squid 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.

5.1.2.7 OTHER INVERTEBRATES

Rationale for Inclusion:

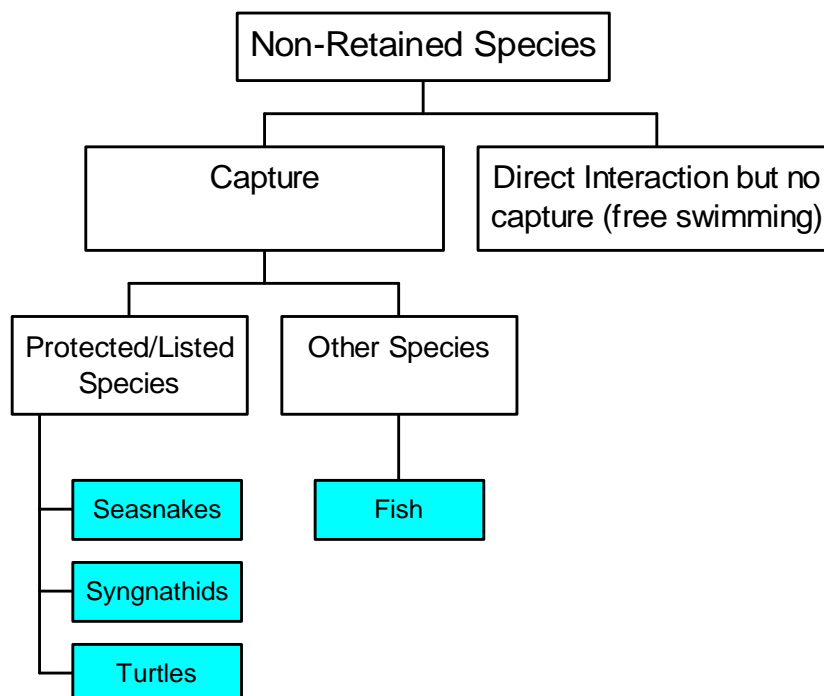
Other invertebrates including scallop, octopus and cuttlefish are retained as by-product in the KPMF. Generally less than half a tonne of any of these species are recorded as landed annually.

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

The potential consequence of fishing on other invertebrates was ranked as 'negligible' (0). It was considered 'likely' under current harvesting patterns that this 'negligible' consequence could occur. This resulted in an overall risk ranking of NEGLIGIBLE.

5.2 NON-RETAINED SPECIES

COMPONENT TREE FOR NON-RETAINED SPECIES IN THE KPMF



Yellow boxes indicate that the issue was considered high enough risk at the August 2002 Risk Assessment Workshop to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.2.1 CAPTURED IN NETS

5.2.1.1 PROTECTED/LISTED SPECIES SEASNAKES

Rationale for Inclusion:

Seasnakes are caught by the KPMF. There are 22 species known to occur in WA. 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:

- 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).
- A study of seasnake survival following capture by trawlers in the Gulf of Carpentaria indicated that 60% of seasnakes survived (Wassenberg et al., 1994).
- 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.

There is no evidence that the impact on seasnakes in this fishery is greater than in these other fisheries for which direct data is available.

5.2.1.2 PROTECTED/LISTED SPECIES SYNGNATHIDS

Rationale for Inclusion:

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

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

The potential consequence of the fishery's 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:

Four species of turtles have been identified as being caught in the KPMF, the Olive ridley (*Lepidochelys olivacea*), Flatback (*Natator depressus*), Hawksbill (*Eretmochelys imbricata*) and Green (*Chelonia mydas*). The Olive ridley turtles are considered endangered under the Commonwealth and the equivalent under State wildlife conservation legislation. The Flatback, Hawksbill and Green turtles are considered a vulnerable 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 KPMF with turtles. In 1998 a total of 22 turtles were caught and released alive, one Flatback turtle was released dead. In 1999 a total of 21 turtles were released alive and 2 Olive ridley turtles were released dead. This was followed by a large drop in the number of turtles recorded as being caught in the KPMF in 2000. The only record was of one Flatback turtle being caught and released alive. In 2001 no turtles were recorded being caught. The drop in numbers of turtles being caught coincides with the implementation of BRDs within the fishery.

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

- BRDs incorporating grids and turtles exclusion hatches are being introduced into the fishery. The Kimberley prawn fleet has been fishing with one standard and one BRD net for the 2001 and 2002 season. The fishery will be operating with 100% BRDs (BRDs in all of the nets in operation) from the commencement of the 2003 season.
- 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 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.

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

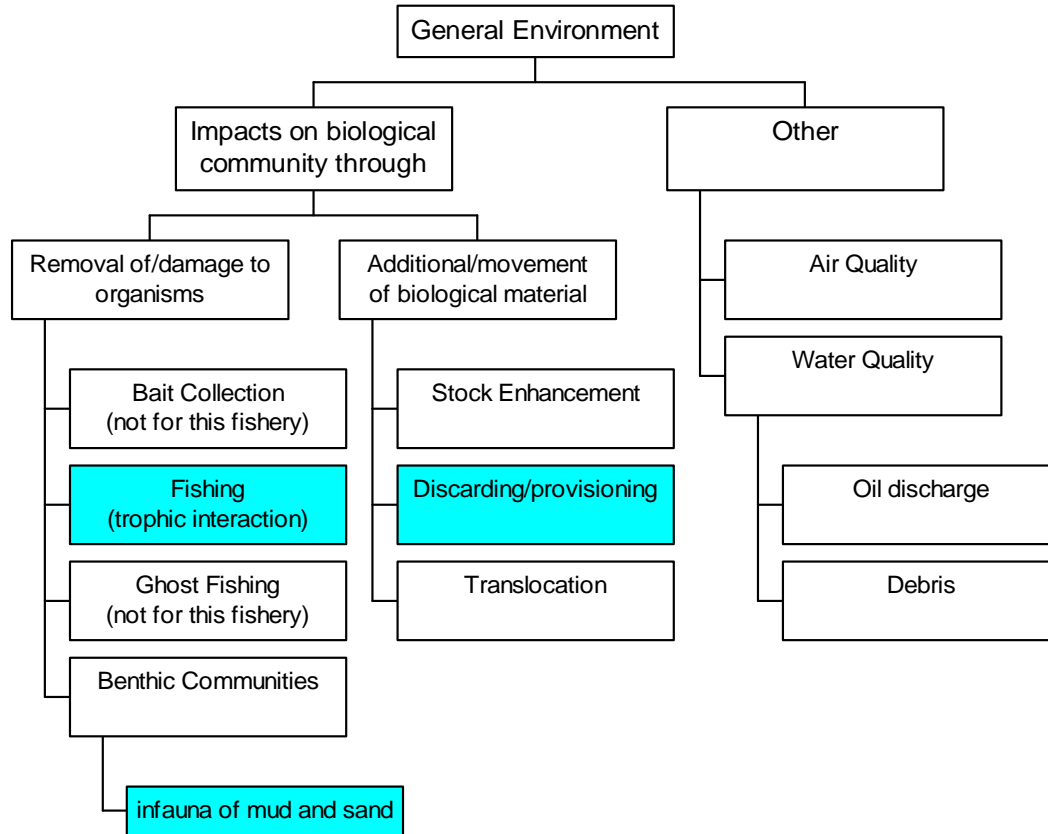
During the risk assessment workshop, the risk to these discarded fish species was considered collectively. The bycatch from the KPMF is typical of tropical trawl fisheries (i.e. up to about 6:1 relative to the target species) but the spatial coverage is very low (approx. 8%) for the fishery. Due to the relatively small spatial area fished (2,900 nm²) compared to the overall area (37,000 nm²) where these species probably occur it would most likely be too low to impact bycatch species populations.

Furthermore, the KPMF will be required to operate with fish exclusion devices by 2006. 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 for the Exmouth Gulf, Shark Bay Prawn and Onslow Prawn Managed Fisheries. The results from these studies will be applied to this fishery.

5.3 GENERAL ENVIRONMENT

COMPONENT TREE FOR THE GENERAL ENVIRONMENT FOR THE KPMF



Yellow boxes indicate that the issue was considered high enough risk at the August 2002 Risk Assessment Workshop to warrant having a full report on performance. Blue boxes indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.3.1 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 breeding stock (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:

- 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.
- 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.
- 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.
- Although no specific research on this subject has been undertaken for this fishery, 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) studied 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

Rationale for Inclusion:

Prawn trawling by the KPMF 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 breeding stock (C1 L3 LOW)

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

- Within the extensive licensed fishing zone for the KPMF, relatively few discrete areas offshore from nursery areas are fished.
- Studies of actual impacts from prawn trawling suggest only minimal impacts to infaunal communities in these circumstances (see Jennings & Kaiser for review).
- Spread in effort is now being monitored with VMS.

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 other 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 the KPMF, but it has been examined in other fisheries. For example:

- 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.
- In Moreton Bay, Queensland, Wassenburg and 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 (Wassenburg 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 (Wassenburg 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 and have a relatively high survival rate.

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

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

- 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.
- This fishery is relatively 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.

The introduction of BRDs and FEDs in the fishery will further reduce bycatch provisioning as the grids and secondary devices will reduce the overall amount of bycatch generated by the fishery and hence a reduction in the amount of discards.

5.4 GOVERNANCE

COMPONENT TREE FOR THE GOVERNANCE OF THE KPMF

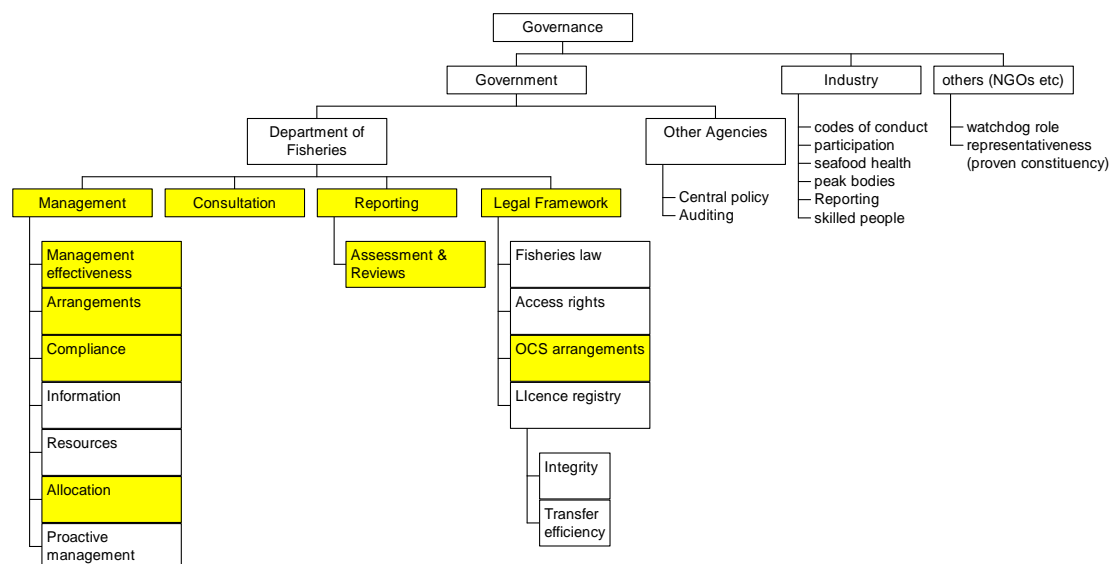


Figure 10 Component tree for governance.

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 KPMF is ultimately measured by assessing the outcomes of various strategies employed to manage this fishery. Entry to this fishery has been limited since the inception of the management plan in 1993. Since the beginning of the 2003 season, and in addition to the entry controls, a cap on total allowable effort (specifically days fished) in the fishery has been implemented. Additionally, there are also temporal (seasonal) and spatial (area) closures, gear controls and restrictions on boat size.

In section 5.1 the catches for individual prawn species and other retained species were discussed and analysed. In this section and in line with general reporting principles only the major target prawn species (i.e., banana, brown tiger and endeavour) will be discussed.

If the annual acceptable catch range of the major prawns species is maintained, then the community's expectation is 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 the major prawn species in the KPMF 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 major prawn species in the KPMF.

Performance Measure

Under the current fishing effort levels, the catch projections for the KPMF are that the total catch of the major prawn species should be within the following ranges (see Section 5.1):

Common Name	Scientific Name	Acceptable Catch Range (tonnes)
Banana prawn	<i>Penaeus merguensis</i>	200-450
Brown tiger prawn	<i>Penaeus esculentus</i>	15-60
Endeavour prawn	<i>Metapenaeus endeavouri</i>	7-80

Justification:

The justification for the individual levels for each major prawn species is located in Section 5.1.

Data Requirements for Indicator

The following data are required for this indicator:

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

Evaluation

Summary: Historical catch and effort information indicate that the acceptable catch range for the major prawn species is being maintained (see Section 5). Therefore, the performance measure has not been triggered and current management strategies appear to be effective in achieving the overall objectives for the fishery.

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 catch of major prawn species also serve to achieve the objective for the maintenance of spawning stock 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 either in terms of 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.

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 analyse data on the area swept by this fishery and individual trawler activity.

Actions if Performance Limit is Exceeded: If the catch were outside the range of 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 behavior then strategies that could offer further protection to the breeding stock will be considered. These strategies which could be employed within the season or at the start of the next season include:

- Further reductions in the total effort expended in the fishery through a reduction in the total allowable effort (specifically days fished).
- Further reductions in the total effort expended in the fishery through a reduction in the length of the fishing season or in the length of one of its two parts.

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 (MPGs) and Policy Statements.

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

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

Table 5 Objects of the Fish Resources Management Act 1994.

Objects
<p>(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.</p> <p>(2) In particular, this Act has the following objects-</p> <ul style="list-style-type: none">(a) to conserve fish and protect their environment;(b) to ensure that the exploitation of fish resources is carried out in a sustainable manner;(c) to enable the management of fishing, aquaculture and associated industries and aquatic eco-tourism;(d) to foster the development of commercial fishing and recreational fishing and aquaculture;(e) to achieve the optimum economic, social and other benefits from the use of fish resources;(f) to enable the allocation of fish resources between users of those resources;(g) to provide for the control of foreign interests in fishing, aquaculture and associated industries;(h) to enable the management of fish habitat protection areas and the Abrolhos islands reserve.

Management arrangements for the commercial take of prawns in area of the KPMF off Western Australia are provided for through a Managed Fishery Licence (MFL).

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, MPGs and other management arrangements allow for the timely setting of appropriate effort levels and resource allocation in the fishery.

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

Performance Measure

This should be 100%.

Evaluation

Management arrangements for the KPMF have recently been the subject of significant review resulting in the implementation of a cap on the total allowable effort. Whilst formal evaluation of the management arrangements for the fishery including those introduced at the start of the 2003 season is not yet feasible 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”¹:

1. **An explicit description of the management unit** – The management unit for KPMF is explicitly described at Section 16 of the *Kimberley Prawn Management Plan 1993*. These management arrangements restrict the amount of headrope length allowed in the fishery.
2. **The issues addressed by the plan** –The issues that need to be addressed by the KPMF management arrangements have been examined thoroughly and are documented within the 8 ESD component trees and their reports.
3. **Descriptions of the stocks, their habitat and the fishing activities** – the KPMF major prawn stocks are described in Section 2.2, 2.3 and 2.4, the habitat is described in Section 2.5 and the fishing activities are described in Section 2.1.

¹ “Plan” – includes all management arrangements

4. **Clear operational (measurable) objectives and their associated performance measures and indicators** – These are now located in Section 5 for each of the major issues.
5. **Clearly defined rules, including what actions are to be taken if performance measures are triggered** – For each of these major issues, the management actions that are planned to be taken if performance limits are exceeded are now articulated in Section 5.
6. **Economic and social characteristics of the groups involved in the fishery** – A brief articulation of the economic and social characteristics of the fishery is located in Section 2.5 and there is to be a greater level of detail accumulated during the process of completing the remainder of the ESD components.
7. **Management and regulatory details for the implementation of the actual management plan** – The regulations relating to the KPMF are located in the *Kimberley Prawn Managed Fishery Management Plan 1993*, and the FRMR (A set of which has been provided to DEH).
8. **The reporting and assessment arrangements** – These arrangements are documented in Section 5.4.4.1 and include annual reporting against current agreed performance limits and targets and a five yearly review of these arrangements and assumptions.
9. **How and when reviews of the plan will occur (including consultation mechanisms).** – The FRMA clearly sets out how the process for the review of any management plan must occur. A review of the KPMF management plan and management arrangements is currently underway with a view to developing a more comprehensive set of management arrangements for all Kimberley prawn trawl fisheries.
10. **A synopsis of how each of the ESD issues are being addressed** – A synopsis of ESD issues has been compiled within the Overview Table of this report.

Robustness

High

The management 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 KPMF. Changes have occasionally occurred to address key concerns or issues.

Comments and Actions

The KPMF is managed in a consultative way and responds 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 which 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 and since 2002, the VMS. The ability to conduct at sea compliance patrols on the Kimberley 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 KPMF have conditions regarding BRDs. These conditions have required the installation of BRDs (specifically grids) in at least one of the two nets trawled in the fishery by each licenced boat up to the end of the first part of the 2003 season (May). By the end of 2003 season, BRDs (specifically grids) will be required in both of the nets trawled in the fishery by each licenced boat.

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 KPMF by licensees and the broader fishing community.

Performance Measure

That 100% of VMS polls record vessels within allocated temporal and spatial boundaries in accordance with the VMS provisions of the management plan.

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

The Department has limited compliance resources dedicated to the KPMF fishery (in light of the competing requirements of other fisheries). However, the implementation of VMS in the fishery and the emphasis of the management framework on specific effort restrictions and licencing requirements allows for a relatively small compliance effort required to ensure a high degree of compliance. There have been numerous opportunistic compliance checks (i.e., encounters with KPMF fishing operations by compliance staff in the area chiefly for reasons to do with other fisheries, particularly pearling) on boats operating in the fishery. Indeed, the significant pearling compliance activities in the Kimberley region result in relatively frequent interaction with the KPMF “fleet”.

In the past two years there have been very few offences detected in this fishery by licenced operators and all of the offences reported were judged to be minor (e.g. failure of crew member to produce original personal Commercial Fishing Licence on demand).

Thus current compliance techniques used in this fishery 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 focused 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 port.

With the full introduction of VMS into this fishery in 2002 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, a FRDC project is underway to examine compliance and the relationship between compliance effort and fishery outcomes in the Western Rock Lobster Fishery. This project will provide a foundation 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 KPMF is monitored continuously by VMS, there is little risk of temporal (seasonal) or spatial boundary infringements.

In addition, VMS is used to monitor the days fished by the fleet to ensure that the effort utilised in the fishery does not exceed the cap on fishing days. This program has only been in place since the 2003 season. The VMS officer sends regular reports on the days fished to managers and research staff along with an estimate of the number of days remaining until the effort pool is exhausted. This monitoring is done on a real time basis. Once the system has been in operation for a few years, the Department will be able to assess the successfulness of the Effort Pool System and the use of VMS in monitoring it.

Fisheries Management Response

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

Comments and Actions

The Department will continue to provide high standard compliance service within budgetary and resourcing constraints to the Kimberley based 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, VMS was introduced into the KPMF, 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 the spatial boundaries.

External Driver Check List

- Changes to technology that may facilitate an increase the level of non-compliance.
- Changes to non-Fisheries legislation and/or State/Commonwealth policy agreements (e.g. National Competition Policy) may impact upon the

Department's ability to restrict activities in a way that assist management, which may impact on compliance (e.g. restrictions on processing licenses).

5.4.1.4. ALLOCATION AMONG USERS

Rationale for 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 KPMF 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 KPMF already has a management plan, 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,*

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, the Department holds meetings with the KPMF 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.

In addition, there is a Joint Trawl MAC for the three major trawl fisheries in WA (Exmouth Gulf Prawn, Shark Bay Scallop and Shark Bay Prawn). This MAC has a conservation representative and decisions made through this process normally flow through to the minor trawl fisheries.

Furthermore, the KPMF is based in a extremely remote location and interactions with the community are minimal. The coast line is characterised by sparse community centres thus making it hard to organise meetings and/or involve the community.

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 is taken of the formal consultation procedures.

Evaluation

Consultation on management of the KPMF 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 KPMF 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 KPMF.

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

The reports that are currently developed annually include: the State of the Fisheries Report, the Annual report to the Auditor, the ESD report, and this application to DEH. 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 KPMF 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 than one process to report on the performance of this fishery and in doing so has acted to ensure that the community has access to this information. In addition to this base level reporting, continual development of the management process will see the fishery undergo regular independent audits ensuring that the evaluation of the management arrangements in this fishery is robust.

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

Current Reporting Arrangements for this fishery include:

State of Fisheries

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

Annual Report

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

ESD

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

Reports to Industry

Each year, the status of the resource and effectiveness of current management are presented to industry in a series of meetings in major population centres in the Kimberley 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 would be many opportunities for the appropriateness of the management regime and the results it produces to be reviewed.

External Driver Check List

The assessments provided by independent review bodies and the community.

5.4.4 DEPARTMENT OF FISHERIES - LEGAL FRAMEWORK

5.4.4.1 OCS ARRANGEMENTS

The functional fishing areas for the KPMF are within the State waters boundary. Therefore there are no OCS arrangements to be considered.

6. REFERENCES

- Buckworth, R.C. (1992)** Movements and growth of tagged blue endeavour prawns, *Metapenaeus endeavouri* (Schmitt, 1926) in the Western Gulf of Carpentaria, Australia. *Aust.J.Mar.Freshwater Res.* **43**:1283-1299.
- Courtney, A.J., Dredge, M.C.L. and Masel, J.M. (1989)** Reproductive biology and spawning periodicity of endeavour shrimps *Metapenaeus endeavouri* (Schmitt, 1926) and *Metapenaeus ensis* (de Haan, 1850) from a central Queensland (Australian) fishery. *Asian Fisheries Science* **3**:133-147.
- Crococ, P.C. and Kerr, J.D. (1983)** Maturation and spawning of the banana prawn *Penaeus merguensis* de Man (Crustacea: Penaeidae) in the Gulf of Carpentaria, Australia. *Journal of Experimental Marine Biology and Ecology* **69**:37-59.
- Fisheries WA. (2002)** State of the Fisheries Report, 2000-2001.
- Fletcher, W.J. (2002)** Policy for the Implementation of Ecologically Sustainable Development for Fisheries and Aquaculture within Western Australia. *Fisheries Management Paper*, No. 157.
- Fletcher, W., Chesson, J., Sainsbury, K., Fisher, M., Hundloe, T. and Whitworth, B. (2002)** National ESD Reporting Framework: The “How to Guide” for wild capture fisheries. FRDC 2000/145, Canberra (www.fisheries-esd.com).
- Garcia, S. and Le Reste, L. (1981)** Life cycles, dynamics, exploitations and management of coastal penaeid shrimp stocks. *FAO Fisheries Technical Paper* No. 203.
- Greenstreet, S.P.R. and Hall, S.J. (1996)** Fishing and the ground-fish assemblage structure in the north-western North Sea: an analysis of long-term and spatial trends. *Journal of Animal Ecology* **65**(5):577-598.
- Grey, D.L., Dall, W., and Baker, A. (1983)** A guide to the Australian penaeid prawns. Northern Territory Government Printing Office.
- Hall, N.G. and Penn, J.W. (1979)** Preliminary assessment of effective effort in a two species trawl fishery for Penaeid prawns in Shark Bay, Western Australia. *Rapp. P.V. Reun. Cons. Int. Explor. Mer.* **175**: 147-154.
- Harris, A.N. and Poiner, I.R. (1991)** Changes in species composition of demersal fish fauna of southeast Gulf of Carpentaria, Australia after 20 years of fishing. *Marine Biology* **111**:503-519.
- Jennings, S. and Kaiser, M.J. (1998)** The effects of fishing on marine ecosystems. *Advances in Marine Biology* **34**:201-352.

Kailola, P.J., Williams, M.J., Stewart, P.C., Reichelt, R.E., McNee, A. and Grieve, C. (1993) Australian Fisheries Resources, Bureau of Resource Sciences and the Fisheries Research and Development Corporation, Canberra, pp. 422.

Mulley, J.C. and Latter, B.D.H. (1981) Geographical differentiation of tropical Australian penaeid prawn populations. *Australian Journal of Marine and Freshwater Research* 32:897-906.

Penn, J.W. and Caputi, N. (1985) Stock recruitment relationships for the tiger prawn, *Penaeus esculentus*, fishery in Exmouth Gulf, Western Australia, and their implications for management. In: Rothlisberg, P.C., Hill, B.J. and Staples, D.J. (eds) *Second Australian National Prawn Seminar*. Pp. 165-173 (NPS2: Cleveland, Australia).

Penn, J.W. and Stalker, R.W. (1979) The Shark Bay Prawn Fishery (1970-1976). *Department of Fisheries Wildlife Western Australia Report* 38:1-38.

Poiner, I., Glaister, R., Pitcher, R., Burridge, C., Wassenberg, T., Gribble, N., Hill, B., Blaber, S., Milton, D., Brewer, D. and Ellis, N. (1999) Environmental effects of prawn trawling the far northern section of the Great Barrier Reef Marine Park: 11991-1996. Final report to Great Barrier Reef Marine Park Authority and FRDC. CSIRO, Brisbane.

Somers, I.F., Poiner, I.R. and Harris, A.N. (1987) A study of the species composition and distribution of commercial penaeid prawns of Torres Strait. *Australian Journal of Marine and Freshwater Research* 38:47-61.

Staples, D.J., Vance, D.J., and Heales, D.S. (1985) Habitat requirements of juvenile penaeid prawns and their relationship to offshore fisheries. In: Rothlisberg, P.C., Hill, B.J., Staples, D.J. (eds) *Second Australian National Prawn Seminar*, pp. 47-54. (NPS2: Cleveland, Australia).

Walker, R.H. (1975) Australian prawn fisheries. In: Young, P. (ed) *First Australian National Prawn Seminar*, Australian Government Publishing Service, Canberra, pp. 284-303.

Wassenberg, T.J. and Hill, B.J. (1987) Feeding by the sand crab *Portunus pelagicus* on material discarded by prawn trawlers in Moreton Bay, Australia. *Marine Biology* 95:387-393.

Wassenberg, T.J. and Hill, B.J. (1990) Partitioning of material discarded from prawn trawlers in Moreton Bay. *Australian Journal of Marine and Freshwater Research*. 41:27-36.

APPENDIX 1 ACRONYMS

AFMA	Australian Fisheries Management Authority
BRDs	Bycatch Reduction Devices
CAESS	Catch and Effort Statistics System
DEH	Department of Environment and Heritage
EPA	Environmental Protection Agency
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESD	Ecologically Sustainable Development
FEDs	Fish Exclusion Devices
FRMA	<i>Fish Resources Management Act, 1994</i>
FRMR	<i>Fish Resources Management Regulations 1995</i>
KPMF	Kimberley Prawn Managed Fishery
NPF	Northern Prawn Fishery
OAG	Office of the Auditor General
OCS	Offshore Constitutional Settlement
SRR	Stock-recruitment relationship
VMS	Vessel Monitoring System
WAFIC	Western Australian Fishing Industry Council
WA	Western Australia

APPENDIX 2 – DETAILS OF CONSEQUENCE TABLES

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

<p>Major</p>	<p>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 <i>Recovery period measured in years to decades if stopped.</i></p>
<p>Catastrophic</p>	<p>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 <i>Long-term recovery period will be greater than decades or never, even if stopped</i></p>