Exmouth Gulf Prawn Managed Fishery Harvest Strategy
2014 – 2019
Version 1.1

July 2018
Version Control – Exmouth Gulf Prawn Harvest Strategy

<table>
<thead>
<tr>
<th>Version</th>
<th>Publication Series Title</th>
<th>Change Description</th>
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<tr>
<td>1.0</td>
<td>Fisheries Management Paper No. 265</td>
<td>Original ‘formal’ published harvest strategy with new template.</td>
<td>November 2014</td>
</tr>
<tr>
<td>1.1</td>
<td>Fisheries Management Paper No. 265</td>
<td>Amended to include blue endeavour prawns as a target species with reference levels and control rules. General updates.</td>
<td>February 2018</td>
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</table>

Important disclaimer
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1 BACKGROUND

This fishery-specific harvest strategy has been developed in line with the Department of Primary Industries and Regional Development’s (Department) over-arching Harvest Strategy Policy for Aquatic Resources (Department of Fisheries, 2015) and in consultation with licensees. The broad scope of the Harvest Strategy Policy for Aquatic Resources is consistent with the National Harvest Strategy Guidelines but as well as considering all retained target species, it also incorporates retained non-target species, bycatch\(^1\) and other ecological components to ensure the risks to these elements are managed effectively.

The Exmouth Gulf Prawn Managed Fishery (EGPMF) harvest strategy outlines the long- and short-term fishery-specific management objectives; a description of the performance indicators used to measure performance against these objectives; reference levels for each performance indicator; and associated harvest control rules, which articulate pre-defined, specific management actions designed to maintain each resource at target levels and achieve the management objectives for the fishery. The monitoring and assessment procedures for the collection and analysis of data to underpin the harvest strategy and determine stock status and fishery performance are described.

This document also includes a description of the management measures that have been adopted for the fishery and how the specific operations of the fishery may be adjusted in response to performance against each of the target, threshold and limit reference levels. Consultation and decision making processes, together with compliance measures are also included to ensure stakeholders are provided with a fully transparent description of the key processes that are used to manage the fishery.

2 FISHERY DESCRIPTION

The EGPMF is located in Exmouth Gulf, Western Australia (WA). The fishery commenced in 1963 with 12 boats, with the fleet developing incrementally to a maximum of 23 vessels in 1979. There are currently 15 managed fishery licences, all of which are held by a single licensee. In 2017, the fleet consisted of six boats using quad-rig demersal otter trawl gear. Each boat is equipped with on-board processing and freezing facilities.

The entire fishery covers approximately 3,907 km\(^2\), although permanent closures account for ~30% of the entire fishery area. The permitted trawl area is 2,769 km\(^2\) (i.e. once the permanent fishery closures are accounted for); however, fishing generally only occurs in 30–45% of the permitted trawl area each season. Additionally, part of the Ningaloo (State Waters) Marine Park and the Muiron Islands Marine Management Area overlaps the north-

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\(^1\) Bycatch is described as the part of the catch which is returned to the sea (usually referred to as non-retained or discarded) either because it has no commercial value or because legislative requirements preclude it being retained.
western boundary of the fishery, with trawling only permitted in the general-use zones of either reserve (refer to Figure 1).
The target species of the EGPMF are brown tiger prawns (*Penaeus esculentus*), western king prawns (*P. latisulcatus*) and blue endeavour prawns (*Metapenaeus endeavouri*). These species are short-lived, fast-growing and have variable recruitment, which is primarily environmentally driven. The EGPMF currently has an estimated annual value of $10-20 million (including byproduct) with a catch range around 500 to 1400 tonnes per annum.

The fishery also retains a variety of minor prawn species, including banana (*Penaeus merguiensis*) and coral prawns (various species but primarily *Metapenaeopsis crassissima*), and other species, such as blue swimmer crabs (*Portunus armatus*), squid, cuttlefish (*Sepia* spp.), bugs (*Thenus* spp.) and octopus.

Bycatch levels for the EGPMF are variable, and bycatch is dominated by mixed finfish and invertebrates (Kangas & Thomson 2004). The fishery also has the potential to interact with several groups of endangered, threatened or protected (ETP) species including marine mammals, marine reptiles, protected fish and elasmobranchs. The implementation of bycatch reduction devices (BRDs) in the form of grids and fish escape devices reduces capture of ETPs and some bycatch species.

The EGPMF is subject to an input control management system. Overall effort in the fishery is constrained by a cap on the number of licences / vessels (limited entry), limits on fishing gear (headrope capacity), restrictions on the number of available fishing days each year (seasonal closure) and restricted trawl hours (mainly night-time trawling). Monthly moon closures of at least four days around each full moon and significant permanent and temporary closed areas throughout the fishery also reduce the effective fishing effort. Fishing activity is monitored using the Vessel Monitoring System (VMS).

The EGPMF has been assessed and accredited under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* since 2003 and has export approval until 2025.

The fishery received third party accreditation by the Marine Stewardship Council in October 2015 demonstrating its achievement of high standards in relation to sustainability of fish stocks, the minimisation of environmental impacts and effective management.

### 3 GOVERNING LEGISLATION

The fishery is managed by the Department under the following legislation:

- *Fish Resources Management Act 1994* (FRMA)
- *Fish Resources Management Regulations 1995* (FRMR)
- Managed Fishery Licence condition
• Section 43 Order - *Prohibition on Commercial Fishing (Muiron Islands Marine Management Area) Order 2008*

• Section 43 Order - *Prohibition on Commercial Fishing (Ningaloo Marine Park) Order 2005*

• FRMA Section 7(2) instruments of exemption

• *Environment Protection and Biodiversity Conservation Act 1999 (Export Exemption)*

In 2016 the State passed the *Aquatic Resource Management Act 2016* that will come into effect on 1 January 2019 and replace the FRMA.

### 4 HARVEST STRATEGY

#### 4.1 Fishery Management Objectives

In addition to ensuring the biological sustainability of all captured aquatic resources, the EGPMF harvest strategy includes broader ecological and economic objectives.

##### 4.1.1 Long-term Objectives

The long-term management objectives of the EGPMF are:

**Ecological:**

(i) To maintain spawning stock biomass of each target species at a level where the main factor affecting recruitment is the environment;

(ii) To maintain spawning stock biomass of each retained non-target species at a level where the main factor affecting recruitment is the environment;

(iii) To ensure fishery impacts do not result in serious or irreversible harm to bycatch species populations;

(iv) To ensure fishery impacts do not result in serious or irreversible harm to ETP species populations;

(v) To ensure the effects of fishing do not result in serious or irreversible harm to habitat structure and function; and

(vi) To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Economic:**

(i) To provide industry the opportunity to optimise the economic returns generated by the EGPMF within a sustainable fishery framework.
4.1.2 Short-term Objectives

The short-term operational objectives are to maintain a resource above the threshold level (and, where relevant, close to a target) or rebuild the resource if it has fallen below the threshold (undesirable) or the limit (unacceptable) levels (see Table 1).

4.2 Harvesting and Management Approach

The EGPMF is managed based on a constant escapement harvesting approach through fishery performance reference levels and control rules.

The management activities related to this approach have been developed over time based on a comprehensive understanding of the biology of brown tiger, western king and blue endeavour prawns in Exmouth Gulf. The annual cycle of operation depends on the strength and timing of prawn recruitment and management actions within the season are based on established reference levels primarily related to brown tiger and western king prawns and secondarily for blue endeavour prawns as their distribution overlaps both brown tiger and western king prawn distributions and their protection in turn protects blue endeavour prawns.

For example, when brown tiger recruitment is low, the recruitment level of blue endeavour prawns is also generally below average. Thus, a significant portion of the blue endeavour breeding biomass is also protected by phased area openings and a conservative fishing strategy throughout the year for brown tiger prawns as well as an annual brown tiger prawn spawning closure. This annual closure is implemented in the Central Tiger Prawn Spawning Area (TPSA) and Eastern Area to protect brown tiger prawn spawning stock during the key spawning period (August through October). This closure occurs irrespective of the abundance (kg/hr) of brown tiger prawns however, the closure may be implemented before August if the target catch rate reference level (25 kg/hr) is approached prior to August. Maintaining prawn catch rates at or above this reference level ensures sufficient spawning biomass during the key spawning period. Also, during low brown tiger prawn abundance years there is generally no re-opening of the tiger prawn spawning area (after September) which further protects blue endeavour prawns in these areas.

Additional protection to all species is provided by the large permanent closed nursery areas and full moon period closures.

The fishing season is generally open from April through to early December each year with specific opening and closing dates set according to the lunar phase. After the season opening, the actual commencement date and extent of fishing in particular management areas (see Figure 2) throughout the season is determined based on fishery-independent monitoring (recruitment and spawning stock surveys) and real-time fishery-dependent monitoring (commercial catch rates) as well as focussed ‘industry-based’ surveys of areas that have been kept closed during the season (not permanent closures).
In addition to the in-season closures implemented to achieve ecological objectives, a series of rolling spatial openings and closures within the management areas are implemented to manage fishing effort on smaller prawns to meet the economic objectives of this fishery (see Section 5 Management Measures and Operations).

An overview of the general annual operations in the EGPMF is provided at Appendix 1.

![Diagram of fishery management areas within the EGPMF. TPSA refers to the brown tiger prawn spawning area. The nursery area includes extensive seagrass/algal beds and is permanently closed to trawling.](image)

**Figure 2.** Fishery management areas within the EGPMF. TPSA refers to the brown tiger prawn spawning area. The nursery area includes extensive seagrass/algal beds and is permanently closed to trawling.

### 4.3 Performance Indicators, Reference Points and Control Rules

Suitable indicators (e.g. catch rate, catch levels, percent of area trawled) have been selected to describe performance of the fishery in relation to each ecological management objective, with a set of reference levels established to separate acceptable from unacceptable performance. Where relevant, these levels include:

- A target level (where you want the indicator to be);
- A threshold level (where you review your position); and
• A limit level (where you don’t want the indicator to be).

The associated control rules define what management actions should occur in relation to the limit, threshold or target levels. A summary of the management objectives, performance indicators, reference levels and control rules for each component of the fishery are provided in Table 1.

For the target species, the limit level \( (B_{lim}) \) is considered to be a conservative estimate and for the spawning stock it is set at a point where recruitment impairment (PRI) has, been demonstrated as for brown tiger prawns or at the lower end of the range of historical observations for western king and blue endeavour prawns for which a spawning stock recruitment relationship (SRR) is not as evident. These SRRs are based on standardised fishery-independent surveys of both spawning stock and recruitment, except for the spawning index for western kings prawns in Exmouth which is currently based on commercial catch rates.

The target level we have adopted as the proxy for \( B_{msy} \) to be at least double the \( B_{lim} \) reference point as suggested in the Commonwealth Fisheries Harvest Strategy policy (DAFF 2007) and reiterated in their Draft for Consultation (2017). This was also suggested by a peer reviewer in the MSC Full Assessment of Exmouth Gulf (and Shark Bay) prawn trawl fishery Public Certification Reports.

For retained non-target species, the acceptable catch ranges have been set to reflect the historical catches of these species as follows:

• Minor prawn species (i.e. banana and coral prawns): annual catch ranges based on historical catches during the period 1989 – 1998 (represents a period of stable fishing patterns, management and environmental conditions); and

• All other retained non-target species: annual target catch based on historical catches during the period 1990 – 2010 (as these species are not targeted to set acceptable levels, time period was set to encompass fluctuations in catches for these species).

The habitat performance indicators relate to the extent of the area trawled within the entire fishery area. Exmouth Gulf includes a number of sensitive habitats, which are permanently closed to trawling as part of the nursery area. The limit reference level relates to the extent of fishing within the entire fishery area to account for potential changes in fishing patterns.

A review of management arrangements is triggered if annual (or in-season) evaluation against the operational (short-term) objectives indicates the potential need (i.e. when the threshold level is breached) for a management response. This means that a precautionary approach is taken and potential issues are recognised and addressed in a timely manner prior to the following fishing season or during the current season, to meet operational and long-term management objectives.
As mentioned above, control rules outline when a management response may be required. Examples of these management responses include modifying spatial and temporal fishing arrangements (i.e. making adjustments to the timing and spatial extent of areas open and closed to fishing during the season), review of season start and close dates (i.e. overall season length and structure) and the extent of moon closures. Survey data collected from the fishery-independent and fishery-dependent monitoring programs are analysed on a monthly basis and used to refine the control rules outlined in Table 1.

An overview of the decision-making process by which this occurs is provided in Section 5.
Table 1. Summary of the Exmouth Gulf Prawn Managed Fishery Harvest Strategy. Note that the ecological objectives are separated into (i) stocks of target species, (ii) stocks of retained non-target species, (iii) bycatch, (iv) endangered, threatened or protected (ETP) species, (v) habitat and (vi) ecosystem. Note the reference levels essentially prescribe the operational objective which is to maintain each resource above the threshold level. * indicates decisions made prior to season opening and provided to fishers as part of annual season arrangements.

<table>
<thead>
<tr>
<th>Component</th>
<th>Management Objectives</th>
<th>Species</th>
<th>Performance Indicators</th>
<th>Reference Levels</th>
<th>Control Rules</th>
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<tbody>
<tr>
<td>In-season Operations</td>
<td></td>
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<tr>
<td>Target Species</td>
<td>Ecological:</td>
<td>Brown tiger, blue</td>
<td>Catch rate of brown tiger prawns from combined recruitment surveys</td>
<td>Target: Mean catch rate is ≥ 40</td>
<td>If the target level is met, fishing may commence in the Central TPSA and Eastern Area.</td>
</tr>
<tr>
<td></td>
<td>To maintain spawning stock biomass of each target species at a level where the main factor affecting recruitment is the environment.</td>
<td>endeavour &amp; western king prawns</td>
<td></td>
<td>Threshold: Mean catch rate is &lt; 40 and ≥ 10 kg/hr.</td>
<td>Review options for fishing and consult with industry regarding the timing and spatial extent of fishing operations (also influenced by prawn size).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brown tiger prawns</td>
<td></td>
<td>Limit: Mean catch rate is 10 kg/hr.</td>
<td>If the catch rate is at or below the limit, no fishing occurs in the Central TPSA and Eastern Area.</td>
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<td></td>
<td>Fishing season opens; however, fishing may only occur in areas where March and/or April recruitment surveys are not undertaken until all recruitment surveys are completed (see ‘Commencement of Fishing in Management Areas’ below).</td>
</tr>
<tr>
<td>Component</td>
<td>Management Objectives</td>
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<td>Performance Indicators</td>
<td>Reference Levels</td>
<td>Control Rules</td>
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<tr>
<td>Western king prawns</td>
<td></td>
<td></td>
<td>1. Size of western king prawns in April recruitment survey</td>
<td><strong>Target:</strong> 50% of western king prawns are larger than 21/30 grade(^2) AND mean catch rate is ≥ 30 kg/hr.</td>
<td>If the target level is met, fishing can commence in the Northern Area.</td>
</tr>
<tr>
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<td></td>
<td>2. Catch rate of western king prawns from April recruitment survey</td>
<td><strong>Threshold:</strong> Mean catch rate is &lt; 30 and &gt; 15 kg/hr.</td>
<td>Review options for delaying fishing or modifying the spatial extent of fishing operations within the northern area.</td>
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<td></td>
<td><strong>Limit:</strong> Mean catch rate of western king prawns is 15 kg/hr.</td>
<td>If the catch rate is at or below the limit, no fishing occurs in the Northern Area unless additional surveys indicate that catch rates have improved.</td>
</tr>
<tr>
<td>Brown tiger, western king &amp; blue endeavour prawns</td>
<td></td>
<td>Commercial catch rate of brown tiger prawns in the Central TPSA</td>
<td>Mean commercial catch rate is ≤ 25 kg/hr for two consecutive nights.</td>
<td></td>
<td>Central TPSA and Eastern Area are closed to fishing prior to the August spawning closure.</td>
</tr>
</tbody>
</table>

\(^2\) Count per pound – historical standard for size grading.
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<tr>
<th>Component</th>
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</thead>
<tbody>
<tr>
<td>Central TPSA and Eastern Area Closure*</td>
<td></td>
<td>August lunar phase</td>
<td>Start of August moon closure.</td>
<td>Central TPSA and Eastern Area are closed to fishing.</td>
<td></td>
</tr>
<tr>
<td>Re-opening of Central TPSA and Eastern Area (following spawning closure)</td>
<td></td>
<td>Catch rate of brown tiger prawns in the Central TPSA during first two spawning stock surveys in August and September</td>
<td>Mean catch rate is &gt; 25 kg/hr.</td>
<td>The Central TPSA and Eastern Area may re-open to fishing.</td>
<td>The Central TPSA and Eastern Area do not re-open this time (re-assess opening after October survey).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Catch rate of brown tiger prawns in the Central TPSA during October spawning stock survey</td>
<td>Mean catch rate is ≤ 25 kg/hr.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Catch rate of blue endeavour prawns in the Central TPSA during August and September spawning stock survey</td>
<td>Mean catch rate is &lt; 4.5 kg/hr.</td>
<td>Re-open the Central TPSA and Eastern Area on 1 November if catch rate is &gt; 19 kg/hr subject to consultation. If catch rate &gt; 25 kg/hr then Central TPSA and Eastern Area may re-open to fishing at an earlier date.</td>
<td>The Eastern Area does not re-open*.</td>
</tr>
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</table>

*Closure of the Eastern Area after September survey would provide protection to the blue endeavour prawns which occur in this area at the end of the year.
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<tr>
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<tbody>
<tr>
<td>Final closure of Central TPSA</td>
<td>Daily commercial catch rate of brown tiger prawns in the Central TPSA and Eastern Area in September and October, or in November</td>
<td>(Prior to 1 November) Mean daily commercial catch rate of brown tiger prawns (in September/October) is &lt; 25 kg/hr.</td>
<td>The Central TPSA and Eastern Area are closed to fishing.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(1 November onwards) Mean daily commercial catch rate of brown tiger prawns (in November) is &lt; 19 kg/hr.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western king prawns</td>
<td>Size of western king prawns in commercial catches from Northern Area from October onwards</td>
<td>50% or more of western king prawns are 21/30 size grade or smaller.</td>
<td>The Northern Area is closed to fishing.</td>
<td></td>
</tr>
<tr>
<td>Closure of Northern Area</td>
<td>Number of total available fishing nights since the season opening date</td>
<td>Season has been open for a maximum of ~ 200 fishing nights depending on seasonal arrangements and survey results for any one year.</td>
<td>Fishing season closes.</td>
<td></td>
</tr>
<tr>
<td>Brown tiger, western king &amp; blue</td>
<td>Catch rate of brown tiger prawns from spawning stock surveys</td>
<td><strong>Target</strong>: Mean catch rate of brown tiger prawns ≥ 25 kg/hr.</td>
<td>If the target level is met, no change to season management arrangements required for the following season.</td>
<td></td>
</tr>
<tr>
<td>Annual Operations</td>
<td></td>
<td><strong>Threshold</strong>: Mean catch rate of brown tiger prawns is &lt; 25 and &gt; 10 kg/hr.</td>
<td>A review of season management arrangements and monitoring system is triggered to investigate the reasons for the variation, which may trigger changes to the arrangements for the following season.</td>
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*Target Species Ecological: To maintain spawning stock biomass of each target species at a level where the main factor*
<table>
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<tr>
<td></td>
<td>affecting recruitment is the environment.</td>
<td>Brown tiger prawns</td>
<td>Limit: Mean catch rate of brown tiger prawns is 10 kg/hr.</td>
<td>If the catch rate is at or below the limit, a comprehensive review of the fleet’s spatial fishing pattern and catch rates is undertaken to investigate the reasons for the low catch rate in the monitored spawning areas. This will either trigger management actions to limit fishing on that species for the following season if sustainability is considered to be at risk or a change to the monitoring system if it is considered to be inaccurate.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Western king prawns</td>
<td>Target: Mean commercial catch rate of western king prawns is ≥ 25 kg/hr.</td>
<td>If the target level is met, no change to season management arrangements required for the following season.</td>
<td>A review of season management arrangements and monitoring system is triggered to investigate the reasons for the variation, which may trigger changes to management for the following season if sustainability is considered to be at risk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial catch rate of western king prawns in fishing grounds R1 and S2 during August and September.</td>
<td>Threshold: Mean commercial catch rate of western king prawns is &lt; 25 and &gt; 10 kg/hr.</td>
<td>If the catch rate is at or below the limit, a comprehensive review of the fleet’s spatial fishing pattern and catch rates are undertaken to investigate the reasons for the low catch rates. This will either trigger management actions to limit fishing on that species for the following season if sustainability is considered to be at risk or a change to the monitoring system if it is</td>
<td></td>
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<td></td>
<td></td>
<td>Blue endeavor</td>
<td>Catch rate of blue endeavor prawns from spawning stock surveys in fishing grounds Q1 and Q2 during August, September and October surveys.</td>
<td><strong>Target:</strong> Mean catch rate of blue endeavor prawns is ≥ 9 kg/hr. <strong>Limit:</strong> Mean catch rate of blue endeavor prawns is 4.5 kg/hr.</td>
<td>If the target level is met, no change to season management arrangements required for the following season. If the catch rate is at or below the limit, a review of the fleet’s spatial fishing pattern and catch rates is undertaken to investigate the reasons for the low catch rate in the monitored spawning areas. This will either trigger management actions to limit fishing on that species by closing an area of known spawning grounds for the following season if sustainability is considered to be at risk or a change to the monitoring system if it is considered to be inaccurate. A low catch rate will also be considered with the performance indicators for brown tiger prawns given the similar trends in catch.</td>
</tr>
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<tr>
<td>Retained non-target species</td>
<td>Ecological: To maintain spawning stock biomass of each retained species at a level where the main factor affecting recruitment is the environment.</td>
<td>Minor prawn species (i.e. banana and coral prawns)</td>
<td>Annual retained catch of each species</td>
<td><strong>Target:</strong> The annual catch of each species is within an acceptable catch range:</td>
<td>If the target level is met, no changes to management arrangements required.</td>
</tr>
<tr>
<td></td>
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<td>Banana prawns: 0 – 60 t (rainfall-dependent species)</td>
<td></td>
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<td>Coral prawns: 20 – 100 t</td>
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<td></td>
<td><strong>Threshold:</strong> The annual catch of any species is above the acceptable catch range for two consecutive years.</td>
<td>A review is triggered to investigate the reasons for the variation, which may trigger changes to management arrangements for the following season if sustainability is considered to be at risk.</td>
</tr>
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<td></td>
<td><strong>Limit:</strong> The annual catch of any species is above the acceptable catch range for three consecutive years, with no non-stock related reason identified for this variation as part of the threshold review.</td>
<td>Management strategies to further protect the breeding stock will be investigated and may be initiated.</td>
</tr>
<tr>
<td>All other retained non-target species</td>
<td></td>
<td>Annual retained catch of each species</td>
<td><strong>Target:</strong> The annual catch of each species is:</td>
<td></td>
<td>If the target level is met, no changes to management arrangements required.</td>
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<td></td>
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<td>Bugs: ≤ 15 t</td>
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<td>Blue swimmer crabs: ≤ 40 t</td>
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<td>Cuttlefish: ≤ 25 t</td>
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<td>Octopus: ≤ 5 t</td>
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<td>Squid: ≤ 80 t</td>
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<td></td>
<td><strong>Threshold:</strong> The annual catch of any species is &gt; 25% above the target level for three consecutive years.</td>
<td>A review is triggered to investigate the reasons for the variation, which may trigger additional assessment of the risks to sustainability.</td>
</tr>
<tr>
<td>Component</td>
<td>Management Objectives</td>
<td>Species</td>
<td>Performance Indicators</td>
<td>Reference Levels</td>
<td>Control Rules</td>
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<tr>
<td>Bycatch</td>
<td>Ecological:</td>
<td>All bycatch species</td>
<td>1. Periodic Risk Assessments</td>
<td>Limit: The annual catch of any species is &gt; 50% above the target level for two consecutive years.</td>
<td>An assessment of the risks to the relevant species will be undertaken, which may trigger additional management actions for the following season if sustainability is considered to be at risk.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>2. Annual management arrangements in place</td>
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<td>3. Extent of area trawled annually</td>
<td>Target: Extent of trawling remains &lt; 50% of the permitted trawl area; BRD use remains at 100%; and</td>
<td>If target level is met, no management action required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Extent of use and type of BRDs used</td>
<td>Fishery impacts expected to generate an acceptable risk level (i.e. moderate risk or lower).</td>
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<tr>
<td></td>
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<td></td>
<td>Threshold: A potentially material change to risk levels is identified; or Extent of trawling exceeds 50% of the permitted trawl area.</td>
<td>A review of the risk levels is completed.</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Limit: Fishery impacts are now considered to be at an unacceptable risk level (i.e. high risk or above).</td>
<td>Appropriate management strategies to reduce the risk will be investigated and may be initiated.</td>
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<tr>
<td>ETP Species</td>
<td>Ecological:</td>
<td>All ETP species</td>
<td>1. Periodic Risk Assessments</td>
<td>Target: Extent of trawling remains &lt; 50% of the permitted trawl area; BRD use remains at 100%; and</td>
<td>If target level is met, no management action required.</td>
</tr>
<tr>
<td></td>
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<td>2. Annual amount of interactions and return status from daily logbooks</td>
<td>Fishery impacts expected to generate an acceptable risk level (i.e. moderate risk or lower).</td>
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<td></td>
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<td>3. Annual management arrangements in place</td>
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<td>4. Extent of area trawled annually</td>
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<td></td>
<td>5. Extent of use and type of BRDs</td>
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<tr>
<td>Component</td>
<td>Management Objectives</td>
<td>Species</td>
<td>Performance Indicators</td>
<td>Reference Levels</td>
<td>Control Rules</td>
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<tr>
<td>Habitat</td>
<td>Ecological:</td>
<td></td>
<td></td>
<td>Threshold: A potentially material change to risk levels is identified; or Extent of trawling exceeds 50% of the permitted trawl area.</td>
<td>A review of the risk levels is completed.</td>
</tr>
<tr>
<td></td>
<td>To ensure the effects of fishing do not result in serious or irreversible harm to habitat structure and function.</td>
<td>All habitats within Exmouth Gulf</td>
<td>1. Extent of area trawled annually 2. Periodic Risk Assessments 3. Annual management arrangements in place</td>
<td>Limit: Fishery impacts are now at an unacceptable risk level (i.e. high risk or above).</td>
<td>Appropriate management strategies to reduce the risk will be investigated and may be initiated.</td>
</tr>
<tr>
<td>Ecosystem</td>
<td>Ecological:</td>
<td></td>
<td></td>
<td>Target: The total area trawled is &lt; 50% of the permitted trawl area.</td>
<td>If target level is met, no management action required.</td>
</tr>
<tr>
<td></td>
<td>To ensure the effects of fishing do not result in serious or irreversible harm</td>
<td>All species and habitats within Exmouth Gulf</td>
<td>1. Periodic Risk Assessments 2. Annual management arrangements in place 3. Extent of area trawled annually 4. Annual catch of all retained species</td>
<td>Threshold: The total area trawled is &gt; 60% of the permitted trawl area; or There is an increase in the level of risk to sensitive habitat types from fishery activities.</td>
<td>A review is triggered to investigate the reasons for the variation and any appropriate management actions.</td>
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<tr>
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<td>Limit: The total area trawled is 70% of the entire fishery area; or Fishery impacts on sensitive habitat types are now at an unacceptable risk level (i.e. high risk or above).</td>
<td>Appropriate management strategies to reduce the area trawled or the risk level will be investigated and may be initiated.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Target: Fishery impacts on components (target species, bycatch species, ETP species and habitats) are all maintained at acceptable levels</td>
<td>Threshold: More than one component is not at an acceptable level</td>
<td>No management action required.</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>A review of the risk levels is completed.</td>
</tr>
<tr>
<td>Component</td>
<td>Management Objectives</td>
<td>Species</td>
<td>Performance Indicators</td>
<td>Reference Levels</td>
<td>Control Rules</td>
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</tr>
<tr>
<td>to ecosystem processes.</td>
<td>All retained species</td>
<td>Industry submissions to the Department</td>
<td>state due to fishing impacts</td>
<td>Appropriate management strategies to reduce the risk will be investigated and may be initiated.</td>
<td></td>
</tr>
</tbody>
</table>

**Economic:**

- **Target and non-target retained species**
  - **Economic:** To provide industry the opportunity to optimise the economic returns generated by the EGPMF within a sustainable fishery framework.
  - **Target:** No impediments to industry optimising efficiency identified and raised.
  - **Threshold:** Impediments to industry optimising efficiency identified and raised.
  - **Limit:** Industry reports that the fishery has failed to meet economic objectives, notwithstanding that sustainability objectives have been met.

- **Target:** No impediments to industry optimising efficiency identified and raised.
- **Threshold:** Impediments to industry optimising efficiency identified and raised.
- **Limit:** Industry reports that the fishery has failed to meet economic objectives, notwithstanding that sustainability objectives have been met.

- No management action required.
- Consider proposals from industry to improve their economic efficiency that do not adversely affect meeting the sustainability objectives.
- Report on the economic conditions of the industry and why economic objectives cannot be met.
4.4 Monitoring and Assessment Procedures

4.4.1 Monitoring

The multi-species nature of this fishery requires the levels of harvest for each prawn species stocks to be carefully monitored to achieve the overall maximum sustainable catch.

4.4.1.1 Fishery-Independent Monitoring

Fishery-independent trawl surveys are undertaken in Exmouth Gulf each year to monitor the recruitment and spawning stock levels of brown tiger, western king and blue endeavour prawns. Monitoring is conducted by Departmental staff using commercial fishing boats, with the intention to use the same boat(s) throughout the year for all surveys. These operate under a Service Level Agreement between the Department and the licensee.

The timing of surveys and the sites sampled have been determined based on the understanding of the biology and movement patterns of the brown tiger and western king prawns in Exmouth Gulf, historical fishing patterns, early research surveys and the natural topography of the Gulf. These sites also encompass a significant proportion of the distribution of blue endeavour prawns and a current PhD research project on blue endeavour prawns will further document the spatial overlap of the blue endeavour with the brown tiger and western king prawn grounds.

At each survey site, the actual catch of each prawn species and their size grade is recorded, and a representative sample of each species is collected from each trawl to provide information on size composition and sex ratios. During spawning stock surveys (see below), data are also collected on the reproductive stage of female prawns in the survey catch.

Recruitment surveys

Recruitment surveys are undertaken in Exmouth Gulf each year during March and April (around the quarter moon periods) to monitor the annual recruitment of brown tiger, western king and blue endeavour prawns to the fishery area. These surveys cover the fishing grounds adjacent to and within the permanent nursery area closure, where brown tiger prawn recruits migrate around this time, and within the Northern Area, where western king prawns occur around this time (refer to map of survey areas in Appendix 2). Both the brown tiger and western king prawn survey sites also contain blue endeavour prawns and the abundance at these combined sites are used to construct a recruitment index for blue endeavour prawns.

At each survey site, catch rates and size structure information (grades and length frequencies) are collected for brown tiger, western king and blue endeavour prawns. The mean catch rate data for each of the target species from the recruitment surveys\(^4\) are used as indices of

\(^4\) Only catch rates from the P2 and Q3 survey sites are included in the brown tiger prawn recruitment index, as these areas have been found to best reflect the levels of recruits moving onto the trawl grounds from the closed nursery areas. Catch rates from P2, Q1 and Q2 and the Northern Area is used for the blue endeavour prawn index.
recruitment strength and provide an indication of likely catch ranges for the season. This information is also used to inform the timing of the rolling openings of the defined management areas within the fishery for the fishing season.

**Spawning stock surveys**

The spawning stock surveys monitor the annual spawning stock biomass of brown tiger and blue endeavour prawns in the fishery area. Spawning stock surveys are undertaken in the key brown tiger prawn spawning area (Central TPSA; refer to map of survey areas in Appendix 2) in August, September and October each year where blue endeavour prawns also occur. Since 2016, a spawning stock survey has also been conducted in western king prawn grounds during August and September which also records the abundance of brown tiger and blue endeavour prawns within these grounds.

The mean catch rates of each species from the surveys (for each of the months undertaken) are used to assess the annual performance of the fishery and may provide an early indicator of how to manage the stocks in the forthcoming season. The brown tiger prawn catch rate information from the first two surveys is also used to determine if the Central TPSA and Eastern Area will re-open to fishing following the spawning period closure. If the catch rates for brown tiger prawns are adequate to allow reopening of the central TPSA and Eastern Area, then the catch rates of endeavour prawns are also assessed to see if the Eastern Area can reopen.

4.4.1.2 *Fishery-Dependent Monitoring*

**Logbooks**

Fishers are required to report all retained (target and non-target) species catches, effort, any ETP species interactions and fishing location (detailed shot-by-shot longitude and latitude) in statutory daily logbooks, which have been in place since the fishery began in the 1960s. These logbooks are used to provide information on the daily catch (kg) and grade categories of each target species and effort (hours trawled) expended in specific fishing areas.

Verification of catches recorded in logbooks has been undertaken against processor returns, which are submitted to the Department by the processor on a monthly basis.

**Compliance Monitoring**

The Department uses the Vessel Monitoring System (VMS) to monitor all fishing activities in the fishery as part of its compliance plan (see Section 5.2) and to determine the spatial extent of the fishery.
4.4.2 Assessing Ecological Impacts of the Fishery

4.4.2.1 Target species stock assessment

The stock status of brown tiger and western king prawns in Exmouth Gulf is assessed primarily on the basis of inter-annual and within-season trends in spawning stock abundance, recruitment levels and catch whilst the key indicator for blue endeavour prawns is spawning stock abundance. This measure is most appropriate for blue endeavours as recruitment continues well beyond March and April for this species and historically, blue endeavour prawns were only retained when the abundance of brown tiger and western king prawns were low and/or there was specific marketing demand for the species. In the last three years, blue endeavours have been retained more consistently due to improved and regular markets and higher abundance on trawl grounds.

Spawning stock abundance of all prawn species is determined based on fishery-independent catch rates during spawning stock surveys in the specific grounds associated with each species. Spawning stock abundance of western king prawns is also determined based on the commercial catch rate of western king prawns in the R1 and S2 fishing grounds (see Appendix 3) during August and September. This performance indicator has a longer time-series for comparison whilst the fishery-independent measures for western king prawns have only been collected since 2016.

The brown tiger, western king and blue endeavour prawn spawning survey catch rates and the western king prawn commercial catch rates (R1 and S2 areas) are assessed against the annual reference levels in order to determine the success of the season’s arrangements in maintaining an adequate spawning stock biomass of each species.

While it is important to maintain an adequate spawning stock abundance, the actual recruitment is mainly affected by environmental (or other) impacts on mortality and growth. In order to ensure adequate in-season operations, annual recruitment of brown tiger and western king prawns is assessed using the catch rate and prawn size information collected during fishery-independent recruitment surveys during the start of the fishing season.

Data collected as part of these annual recruitment surveys are also used to forecast the catch for the season. The actual catch of each species at the end of each season is then compared to this predicted catch and historical catch ranges (for the period 1989 – 1999), when recruitment was not impaired. Although spawning stock abundance is the primary indicator for fishery impacts on stock biomass, fluctuations in the annual catch may provide insight on any environmental factors affecting recruitment that may need to be considered in future season arrangements.

4.4.2.2 Ecosystem Component Assessment

The Department uses a risk-based Ecosystem-Based Fisheries Management (EBFM) framework to assess the impacts of fishing on all parts of the marine environment, including
the sustainability risks of target species, retained non-target species, bycatch, ETP species, habitats and the ecosystem. This framework led to the development of the Ecological Risk Assessment (ERA) processes for the EGPMF. The ERA process has helped to prioritise research, data collection, monitoring needs and management actions for fisheries and ensures that they are managed both sustainably and efficiently.

A formal ERA was undertaken for the EGPMF in 2001, with additional internal workshop reviews of the 2001 ERA in 2008 and 2010. Further details regarding the strategies used to manage and monitor ecological impacts can be found in the *EGPMF Bycatch Action Plan 2014 – 2019*.

The reference levels identified for ecosystem components, i.e. retained non-target species, bycatch, ETP species, habitat and ecosystem process, reflect risk outcomes identified as part of the ERA process. Where quantitative information and monitoring occurs, i.e. catches of retained non-target species and extent of fishing activities, additional performance indicators and reference levels have been identified.

The catches of all retained non-target species and ETP interactions are reported by fishers in daily logbooks and are assessed annually by the Department.

The spatial extent of fishing activities is monitored via logbooks (and VMS), with the extent and intensity of fishing activities throughout Exmouth Gulf assessed on an annual basis.

**5 MANAGEMENT MEASURES AND OPERATIONS**

There are a number of management measures in place in the fishery, which can be altered as needed to ensure the fishery is achieving its objectives (Table 2).

**Table 2. Management measures and instrument of implementation for the EGPMF**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited Entry</td>
<td>A limited number of Managed Fishery Licenses (15) are permitted to operate in the EGPMF.</td>
<td>EGPMF Management Plan</td>
</tr>
<tr>
<td>Effort Restrictions</td>
<td>The fishery currently operates under a maximum headrope capacity restriction of 395.02 metres (216 fathoms).</td>
<td>EGPMF Management Plan</td>
</tr>
<tr>
<td>Gear Controls</td>
<td>Include controls on mesh size (≤ 60 mm) of nets, boat length, size of the ground chain (≤ 10 mm diameter) and the dimensions of the otter boards, including metal shoes.</td>
<td>EGPMF Management Plan</td>
</tr>
<tr>
<td>Bycatch Reduction Devices (BRDs)</td>
<td>The fleet is required to have BRDs in the forms of grids and fish exclusion devices (FEDs), such as square mesh panels, in all standard nets.</td>
<td>MFL Condition</td>
</tr>
<tr>
<td>Annual Closed Season &amp; Cap on Fishing Days</td>
<td>The fishery is closed to fishing between December and April each year, with the aim of a maximum of ~200 total fishing days each year.</td>
<td>EGPMF Management Plan (clause 10 annual notice)</td>
</tr>
</tbody>
</table>
Spatial Closures

The south-eastern area of Exmouth Gulf is permanently closed to trawling activities to preserve seagrass and other sensitive habitats that are essential nursery areas for prawns and other species.

There is a Port Area Closure in place within three nautical miles of Exmouth.

There are permanent trawling closures in place as part of the Ningaloo Marine Park and Muiron Islands Marine Management Area.

Non-statutory rolling spatial closures in the management areas are used throughout the season to contain and direct overall fleet effort, control effort on brown tiger prawns, and provide industry the opportunity to maximise economic returns.

Temporal Closures

Fishing is only permitted between 1800 and 1000 hours the following day, as prawns are nocturnal.

Fishing closures also occur for a minimum of four days around each full moon.

Reporting

Fishers are required to report all retained (target and non-target) species catches, effort, ETP species interactions and fishing location in statutory daily logbooks.

Fishing activities are also monitored via the satellite Vessel Monitoring System (VMS).

5.1 Consultation and Decision-Making Process

In addition to the Western Australian Fishing Industry Council (WAFIC), the peak body for commercial fisheries, the licensee in the EGPMF is directly consulted regarding all decisions relating to the management of the fishery.

The Department works closely with the licensee to develop annual season arrangements that achieve the operational objectives contained in the harvest strategy. In addition, a cooperative, real-time in-season management framework exists between the Department’s Fisheries Science and Resource Assessment Branch and the licensee to implement opening and closing of areas to maximise economic return from the Exmouth Gulf prawn resource within the sustainable management framework.

The Department also holds meetings on an “as needs” basis with the licensee. These meetings could be with the licensee or skippers and include activities such as season arrangement workshops and skipper’s briefings.
5.1.1 Annual Consultation and Decision-Making (Season Arrangements)

Annual seasonal arrangement decisions are based primarily on maintaining sustainable stocks, while providing the opportunity for industry to maximise economic returns from the prawn resource.

The Department consults with industry to discuss the previous season, develop and finalise the forthcoming season’s fishing arrangements including season opening and closing dates, moon closure periods, recruitment and spawning survey dates, closures to meet the ecological objectives and closures to meet the economic objective. The proposed season arrangements are then provided to the Deputy Director General for consideration and approval (with particular relevance to the opening and closing dates for the season).

Statutory aspects of the season arrangements are then outlined in a (statutory) notice in accordance with clause 10 of the EGPMF Management Plan.

5.1.2 In-Season Consultation and Decision-Making

Further to the permanent closures in the EGPMF, spatial closures are in place at the commencement of the season and are opened and closed in-season to control, manage and direct fishing effort. Decisions around in-season spatial areas opening and closing are primarily based on maintaining breeding stocks of brown tiger prawns (i.e. ecological objective), while providing the opportunity for industry to harvest optimum size/value prawns (i.e. economic objective).

The decision-making process is carried out in a similar way each year and is linked to the in-season harvest strategy reference levels and control rules. In-season closures designed to meet both ecological (i.e. closure of the Central TPSA and Eastern Area) and economic objectives (i.e. to manage fishing effort on small prawns) in the EGPMF are currently implemented on a non-statutory basis. If it is identified that an area needs to be closed statutorily, this can be achieved via a legislative instrument (see 5.1.3 below).

Working within a framework whereby ecological objectives will be met, a cooperative framework is applied for decisions predominantly aimed at meeting economic objectives. This consists of non-statutory “openings” and “closings” of the management areas. In this case, determination of actual areas to be fished within the fishery is done through agreement with the licensee. The Department and the licensee collaborate to make decisions regarding the timing and extent of the areas to be fished, with outcomes communicated to all relevant staff (i.e. research, management, compliance and VMS). All of the non-statutory closures and openings are communicated to skippers via email on a daily basis or as required. The closures are monitored by VMS.
5.1.3 Statutory Management Changes

Statutory management changes are facilitated through amendments to legislative instruments, such as the fishery management plan, section 43 orders, exemptions and notices made by the Department’s Deputy Director General (see Table 2 above).

The EGPMF Management Plan identifies those persons (i.e. the licensee) that the Minister must consult with prior to making an amendment. The statutory consultation function is presently conducted by WAFIC on behalf of the Department under a Service Level Agreement.

Notices made by the Chief Executive Officer under clause 10 of the EGPMF Management Plan (generally used to open and close the fishery and various spatial areas) cannot be given effect without prior consultation with licence holders.

There are no statutory provisions as to the consultation requirements relating to amendments to management arrangements for instruments of section 7 exemptions or section 43 orders. In the absence of any statute specifying consultative procedures, the Department has regard for common law principles to afford natural justice to the licensee.

As such, the Department will formally consult with the licensee when making changes to management arrangements via an instrument of exemption or an order.

5.2 Compliance Measures

The primary objective of the Department regarding compliance is to encourage voluntary compliance through education, awareness and consultation activities.

5.2.1 Operational Compliance Plan

The EGPMF has a fishery-specific Operational Compliance Plan (OCP), which is informed and underpinned by a compliance risk assessment conducted for the fishery. The EGPMF OCP has the following objectives:

- to provide clear direction and guidance to officers regarding compliance activities that are required to support effective management of the fishery;
- to provide a mechanism that aids the identification of future and current priorities; and
- to review compliance strategies and their effective implementation.

The OCP is generally reviewed every 1 – 2 years.

5.2.2 Compliance Strategies

Compliance strategies and activities that are used in the fishery include:
• pre-season briefing to masters of licensed fishing boats;
• pre-season inspections of fishing boats;
• inspection in port; and
• at-sea inspection of fishing boats – in the waters of Exmouth Gulf.

Inspections may involve:
• inspection of all nets, BRDs, FEDs, otter boards, VMS and other gear;
• inspection of all authorizations; and
• inspection of freezers and catch on board the boat.

5.2.3 Vessel Monitoring System

Boats operating within the EGPMF must be fitted with a device known as an automatic location communicator (ALC). The ALC is used to track the location of a boat by transmitting information such as the geographical position, course and speed of the boat to VMS compliance officers at the Department.

The use of VMS in the EGPMF allows the Department to carry out real-time monitoring of the EGPMF fleet’s adherence to spatial closures, provides intelligence for investigations and provides information and analysis to research and management branches on vessel activities and patterns.

6 HARVEST STRATEGY REVIEW

It is recognised that the fishery does change over time and that a review period should be built into the harvest strategy to ensure that it remains relevant. The harvest strategy will remain in place for a period of five years, after which time it will be fully reviewed. However, given that this is the first harvest strategy for the fishery, this document may be subject to further review and amended as appropriate.

7 HARVEST STRATEGY APPROVAL

This document has been developed via a consultative process with industry members, approved by the Director General of the Department of Primary Industries and Regional Development and the Minister for Fisheries.

8 REFERENCES


APPENDIX 1: Overview of general annual operations in the EGPMF

EXMOUTH GULF ANNUAL OPERATIONS

Season opening date determined based on prawn biology and migration onto the trawl grounds, with consideration for the lunar phase.

Recruitment surveys undertaken in March and April
Mean catch rate for brown tiger, western king and blue endeavour prawns from surveys used to predict catches for the current season and inform the temporal and spatial extent of rolling area(s) openings using in-season control rules (also dependent on prawn size information).

Central TPSA and Eastern Area closed to fishing when the brown tiger prawn commercial catch rate falls below target level, or at the start of the August moon closure (whichever is first).

Tiger prawn spawning stock surveys undertaken in TPSA during August-October
Mean brown tiger prawn catch rate from the first two surveys used to inform potential re-opening of the TPSA using in-season control rules. Blue endeavour prawn catch rate used to inform potential reopening of the Eastern Area.

Following re-opening of TPSA, daily monitoring of commercial catch rates of brown tiger prawns used to inform closure of the TPSA using in-season control rules.

If, at any time during the fishing season, the majority of western king prawns in commercial catches are small-sized (i.e. >50% size grade 21/30 or smaller), cease fishing in Northern Area.

Season closes as per season arrangements.
APPENDIX 2: Recruitment and spawning stock survey sites in the EGPMF

1. Brown tiger and blue endeavour prawn spawning stock survey sites
2. Western king prawn spawning stock survey sites
3. Brown tiger, blue endeavour and western king prawn recruitment survey sites
APPENDIX 3: Fishing grounds in Exmouth Gulf used for analysis of monthly catch and effort data.

Q1 and Q2 are considered the main brown tiger prawn fishing grounds, whereas R1 and S2 are considered the key fishing grounds for western king prawns. Blue endeavour prawns occur primarily over Q1, P2, P3 and R1 and S2 fishing grounds.