

**EXMOUTH GULF PRAWN MANAGED FISHERY  
BYCATCH ACTION PLAN  
2014 – 2019  
Version 1.0**

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## **ACKNOWLEDGEMENT**

This document utilises the Bycatch Working Plan (2012 – 2014) for the Commonwealth-managed Northern Prawn Fishery as a template / model on which to base a Bycatch Action Plan for the Exmouth Gulf Prawn Managed Fishery in Western Australia. This approach is in recognition of the long-term consideration of bycatch issues by the Northern Prawn Fishery, as well as the need for efficiencies and consistency in fisheries management in Australia.

The work by contributors to the original (Northern Prawn Fishery) version of this document is duly acknowledged.

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## 1.0 BACKGROUND

*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. Thus, this Bycatch Action Plan (BAP) includes unmarketable finfish and invertebrate species, along with endangered, threatened and protected (ETP) species, such as marine mammals, reptiles and some elasmobranchs.

It is Government policy to minimise bycatch in all commercial fisheries. This BAP details a program of actions to address bycatch issues in the Exmouth Gulf Prawn Managed Fishery (EGPMF), in accordance with the *EGPMF Harvest Strategy 2014-2019*. The focus of this BAP is on developing management responses to ecological risks associated with the fishery and developing management measures to minimise fishery interactions with species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, i.e. ETP species). This will be an ongoing process that will be reviewed at least every five years. Discarding of target species will be broadly approached through monitoring discarding rates.

The EGPMF is currently pursuing third party certification against the Marine Stewardship Council's (MSC) standards. In order to achieve these high standards, the fishery will need to demonstrate how it will address bycatch issues.

This BAP should be read in conjunction with the *EGPMF Harvest Strategy 2014-2019*. The aim of this plan is to:

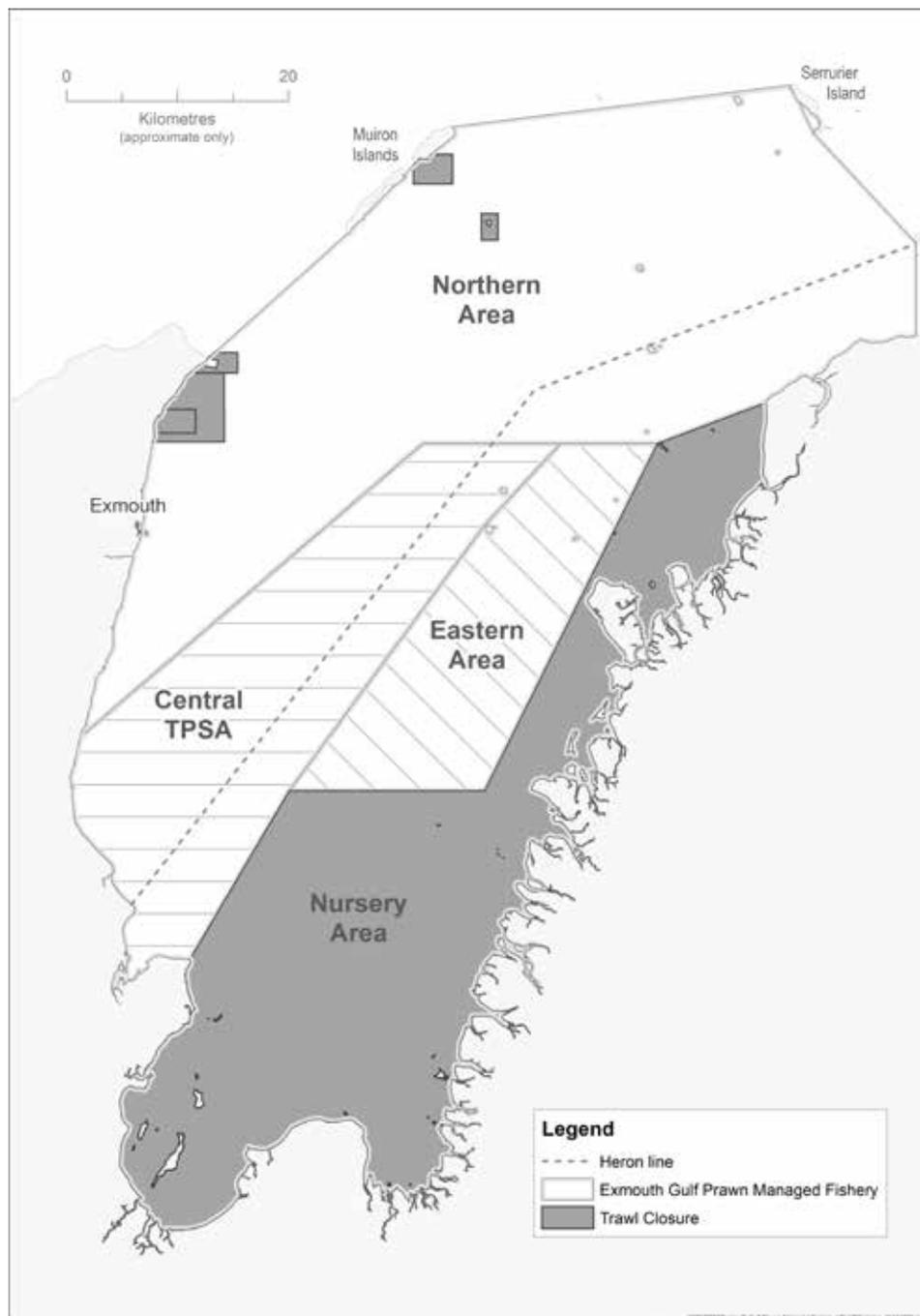
- Develop and implement cost-effective strategies to pursue continual improvement in reducing bycatch;
- Review relative changes in bycatch due to bycatch mitigation and extend information on best practice to industry;
- Develop measures to further reduce interactions with, or impacts on, ETP species;
- Respond to adverse impact on Exmouth Gulf ecology from prawn fishing activity; and
- Develop measures to better utilize what would otherwise be discarded.

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## 2.0 FISHERY DESCRIPTION

The EGPMF is located in Exmouth Gulf, Western Australia (WA). The fishery is managed by the state of WA through the Department of Fisheries (the Department) and currently consists of 15 managed fishery licences, all of which are held by a single licensee. In 2013, the fleet consisted of six Licenced Fishing Boats, each using a four-net demersal otter trawl configuration referred to as a quad-rigged prawn trawl system.

The entire fishery covers approximately 3 907 km<sup>2</sup>, although permanent closures account for ~ 30 % of the entire fishery area (refer to Figure 1). The permitted trawl area is 2 769 km<sup>2</sup> (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 as a consequence of manipulation of fishing activity within areas to maximise catch value and minimise risk of overfishing.



**Figure 1.** Fishery management areas within the EGPMF. TPSA refers to the tiger prawn spawning area. The nursery area includes extensive seagrass beds and is permanently closed to trawling

The primary target species of the EGPMF are brown tiger and western king prawns (*Penaeus esculentus* and *P. latisulcatus*, respectively), however, significant catches of endeavour prawns (*Metapenaeus endeavouri*) are also landed during the fishing season. 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 more than \$ 7 million (including byproduct) with a historic catch range of 721 to 1410 tonnes per annum.

The fishery also retains a variety of smaller prawn species, including banana (*Penaeus merguensis*) 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 ETP species including marine mammals, marine reptiles, protected fish and listed elasmobranchs.

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 a Vessel Monitoring System (VMS).

Further details can be found in the *EGPMF Harvest Strategy 2014-2019*.

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### **3.0 SUMMARY OF BYCATCH RESEARCH AND MITIGATION IN EXMOUTH GULF**

The Department, in association with the EGPMF industry, has responded to environmental issues by employing a program of bycatch reduction and assessment of biodiversity impacts for many years.

Previous monitoring and research shows that the EGPMF interacts with a range of marine animals including numerous species of teleost fish, epibenthic invertebrates and a number of ETP species (Kangas & Thomson 2004; Kangas et al. 2007; Fletcher & Santoro 2013). The goal is to return these species alive (and in good health) to the water following capture, however, some species are more robust than others and consequently some are returned dead or in poor condition. Survival rates of returned fish are thought to be low, but are high for many invertebrates (e.g. crustaceans; Kangas et al. 2007). Predatory fish feeding on discards may also have a marked impact on survival rates. The introduction of Fish Quip sorting and processing equipment (hoppers) on the trawlers in 2002 had a substantial impact on the number of non-target species returning to the water alive.

Note that in this BAP, the primary bycatch categories are distinguished as (i) non-ETP discards (i.e. “bycatch”) and (ii) ETP species.

#### **3.1 Non-ETP Bycatch**

Bycatch (discarded non-ETP species) levels for the EGPMF are variable, with a bycatch to target species catch ratio of between 2 – 5:1 (Kangas et al. 2007). Bycatch is comprised of mixed finfish and invertebrates (Kangas & Thomson 2004), with few bycatch species of importance to other fishing sectors.

Although there is not a recent estimate of the volume of fish and invertebrates discarded by the EGPMF, the sustainability of these species has been assessed through the ecological risk assessment (ERA) process (see Section 3.3.4), and none were assessed as being at high risk. This result was informed by detailed experimental study of the impacts on biodiversity of trawling in Exmouth Gulf (Kangas et al. 2007). This study found no significant difference between trawled and untrawled sites with respect to fish and invertebrate abundance, species richness, evenness or diversity.

## 3.2 ETP Species

The EGPMF has the potential to interact with several groups of ETP species, including cetaceans, marine turtles, sea snakes, listed elasmobranchs, and syngnathids and solenostomids (sea horses and pipefish). When landed, these species are dealt with in an appropriate fashion, ranging from ensuring unconscious turtles are revived first before returning them to the water, to a more rapid return to the water for more sensitive species. Occasionally sawfish and other dangerous species are euthanized if they are tangled in the gear and represent a threat to crew trying to untangle them.

It is a legislative requirement that fishery interactions with species listed under the EPBC Act be avoided and all interactions be reported. In this context, the approach for addressing interactions with ETP species in the EGPMF is to develop measures to mitigate known interactions regardless of their assessed level of risk. The key ETP species groups are as follows:

### *Marine Mammals*

Due to the spatial and temporal closures in place the potential for capture of marine mammals in this fishery is largely diminished. These closed areas provide substantial areas of refuge, particularly over important habitats, such as seagrass.

The move to more efficient quad-rigged gear in 2007 has translated to a reduction in the total length of headrope used in the fishery, which in turn translates to fewer gear interactions between net and ETP species. A similar argument also stands for the voluntary reduction in vessel numbers in 2012 from nine to six.

### *Turtles*

Turtle bycatch mitigation has been successfully addressed with the introduction of the mandatory use of turtle exclusion devices (TEDs / grids) in 2002/03. These grids have shown to be effective in the fishery with a 95 – 100% reduction in turtle bycatch (Kangas & Thomson 2004). Additional benefits include a reduction in the numbers of rays by 56% (Kangas & Thomson 2004). The systems are now very effective at minimising turtle captures.

### *Sawfish*

The use of grids has been shown to reduce the capture of narrow sawfish (*Anoxypristis cuspidata*) in the Northern Prawn Fishery (NPF) by 73% (Brewer et al. 2004). The reduction in sawfish landings following the implementation of grids in the EGPMF in 2007 is unquantifiable since there is no data available on sawfish interaction rates prior to grid implementation. However, anecdotal evidence from long standing skippers/crew suggests a similar level of reduction may have been achieved.

### *Sea snakes*

Fish exclusion devices (FEDs; i.e. a single panel of square mesh located in the top of the net posterior [downstream] to the grid) have been a statutory requirement in the EGPMF since 2002/03. These devices, in combination with grids, have been successful in reducing the incidental capture of sea snakes by as much as 50% during experimental trials in 1995 (Brewer et al. 1998), although later testing indicated only a five per cent reduction (Brewer et al. 2006). Fisheye bycatch reduction devices (BRDs) have also shown very promising results elsewhere, with a 43% reduction being reported in the NPF (Heales et al. 2008). Grids have also been shown to increase sea snake survival in the NPF by reducing the weight of the total (all species) catch in the net (Wassenberg et al. 2001). The results of a study by Milton et al. (2009) in the

NPF suggests that the short shot times (i.e. 60 – 180 minutes) in the EGPMF are also likely to increase the survival of captured sea snakes.

### **3.3 Management Actions and Measures Currently in Place**

Appendix 1 indicates the key management actions that have contributed to reductions in bycatch in the fishery since its commencement. Additional actions, such as closures of critical habitat and seasonal closures, have ensured that the EGPMF has very few ecological risks. The development and undertaking of periodic ERAs help to ensure targeted measures can be developed to address remaining ecological risks in the EGPMF.

#### **3.3.1 Fishing Effort**

Fishing effort in the EGPMF has changed dramatically since the beginning of the fishery in 1963. During the first year of operation, the fishery consisted of 12 boats each towing a single-rigged net to target banana prawns. In 1965, the fishery moved to limited entry, with 15 licences. By 1979, the number of licences had increased to 23, with the all boats towing twin-rigged nets. Between 1984 and 1990, two Voluntary Fishery Adjustment Schemes (VFAS) were introduced, reducing the number of licences to 16. In 1998, boats started trialling quad gear. By 2007, all boats were using quad gear, with the fleet gradually reduced to nine vessels over the 1998 – 2007 period. In 2009, a third VFAS removed one more licence from the fishery. For the 2012 season, the number of fishing boats was reduced from nine to six and has since remained at this level.

Gear controls in place to restrict fishing effort include a maximum headrope capacity, which was set in the EGPMF Management Plan at 395.02 metres (216 fathoms). This headrope allocation was originally used in the twin-rig trawl configuration, with a maximum size equal to two 13.72 metre (7.5 fathoms) nets; however, only 292.6 metres (160 fathoms) was utilised in 2012 – 2014.

Fishing effort is also restricted by the number of available fishing days during the year. Seasonal opening and closing dates were first introduced in the fishery in 1984, with the aim to delay the season opening to fish brown tiger prawns. The fishing season is generally open from April to November and closes each year with an aim of a maximum of 200 fishing nights. Daily trawl hours are also restricted as brown tiger and western king prawns are primarily nocturnal.

In 1985, voluntary closures of three days around the full moon were introduced (moon closures) as a total effort control and to reduce targeting of tiger prawns during these periods of low king prawn catchability. Moon closures currently occur for a minimum of four days around the full moon each month.

#### **3.3.2 Temporal and Spatial Closures**

Since 1978 a system of spatial and temporal closures has been used in the management of the EGPMF. The initial nursery area (permanently closed to trawling) for the target species was extended in 1986 and again in 1990, and now it covers vast inshore seagrass areas (see Figure 1) used by turtles as feeding grounds and acts as a significant refuge for syngnathids and solenostomids.

A number of management areas have also been introduced throughout the history of the fishery (i.e. the Central Tiger Prawn Spawning Area [TPSA], the Eastern Area and the Northern Area). These areas are opened or closed throughout the season depending on commercial catch rates and size of prawns.

Apart from managing target species in the EGPMF, the spatial and temporal management regime in the fishery has significantly reduced the area and time available for fishing, thereby affording additional protection to benthic habitats and as a result providing sanctuary for a number of vulnerable species.

### **3.3.3 Gear Controls**

Gear controls in place that are linked to bycatch reduction include

- a maximum ground chain link diameter (10 mm) to address the impact the chain has on benthic habitat and non-target species,
- a maximum otter board height to restrict the vertical net opening and facilitate escapement of non-target species over the top of the net,
- a maximum board length to address shoe contact with the benthic habitat and non-target species,
- the use of a Texas drop chain arrangement to promote passage of unwanted flora and fauna underneath the net,
- the mandatory use of TEDs (grids) in all nets, and
- the mandatory use of FEDs (square mesh panels) in all nets.

A significant amount of resources have been invested in bycatch reduction. In 2002/03 several BRDs were implemented in the fishery, namely grids and FEDs. In 2005, representatives from the United States State Department (National Marine Fisheries Service - NMFS) assessed the grid arrangement used in Exmouth Gulf and found it to be compliant with the US TED (grid) regulations in place at the time. Re-assessment by the NMFS occurred in August 2014 and a number of concerns were raised:

- The relatively small size of the grids, especially with the larger 8 fathom nets,
- The presence of an internal netting ramp upstream of the grid, and
- The absence of sufficient buoyancy in the form of floats.

The operator in the EGPMF has agreed to address these by April 2015.

## **3.4 Ecological Risk Assessment Process**

To assess the impacts of fishing on all parts of the marine environment, including the sustainability risks of target, byproduct, bycatch, ETP species, habitats and the ecosystem, the Department has supported the development of the ERA processes for the EGPMF. This work has been undertaken to ensure the EGPMF is able to respond by managing impacts on species that are likely to be at risk from the fishery, including avoiding the capture of ETP species where possible. 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.

### **3.4.1 2001 Ecological Risk Assessment**

Issues specific to the EGPMF were identified during an open consultative process involving all stakeholder groups in June 2001. 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 during the workshop was consistent with the Australian

Standard AS/NZS 4360:1999, using a combination of the level of consequence and the likelihood to produce an estimated level of risk associated with the issues in question. Issues of sufficient risk (i.e. Moderate, High or Extreme) were considered to require specific management actions, with a full performance report completed for each issue (see Kangas et al. 2006).

An internal workshop review of the 2001 ERA was undertaken in 2008. As a number of key changes had taken place in the fishery since 2001, the aims of the internal risk assessment workshop were to revisit the risk ratings identified in 2001 and determine whether they were still relevant or whether they required amendment. In addition, any possible new risks were identified. A summary of the 2008 outcomes is provided in Appendix 2.

The annual *Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher & Santoro 2013) reports on the evaluation of performance of the fishery against these sets of ‘agreed’ objectives and performance measures. Outcomes from the annual internal reviews are reported to the relevant Commonwealth Authority as part of the requirements for EPBC export approval (Section 4.1).

### 3.5 Monitoring

Bycatch monitoring currently occurs in two ways:

- Research: Fishery-independent surveys, and
- Industry: Fishery-dependent daily logbooks, which include details on interactions with ETP species.

#### 3.5.1 Research Projects

The collaboration between management, industry and research over the past few decades has led to a reduced impact of fishing on ETP species, as well as other bycatch, in the EGPMF. The EGPMF have supported the development and funding of numerous research projects (Table 1) to provide assessments of the sustainability of non-target species and continue to develop and evaluate BRDs.

Industry is currently striving to maximise the economic return from the fishery and increase the efficiency of fishing operations. As with other trawl fisheries, a major component of this is to reduce the capture of non-target species, to reduce processing and sorting time and to increase the quality of target product.

In 2009 the EGPMF was evaluated against key fishery management parameters and found to be Australia’s most well managed fishery; included in these parameters were the ability to respond to adverse trends in both target and non-target species’ sustainability (Anon. 2009).

**Table 1.** Summary of bycatch research undertaken in the EGPMF

Project Description	Timeframe	Publications
The use of BRDs (grids and square mesh panels) to reduce trawl bycatch, ETP species interactions and improve the quality of retained species catch	2000 2000 – 2003	Broadhurst et al. 2002 Kangas & Thomson 2004
Sampling of bycatch species composition	2000 – 2003	
Impact of trawling on faunal abundance and assemblages within Exmouth Gulf	2002 – 2003	Kangas et al. 2007

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## 4.0 ISSUE IDENTIFICATION

In addition to the issues identified as part of the 2001 ERA and subsequent internal review, other issues that may require directed action have also been identified as part of the export approval process under the EPBC Act and the MSC pre-assessment process.

### 4.1 Assessment under the EPBC Act

The EPBC Act requires the Australian Government to assess the environmental performance of state export fisheries. This includes an independent evaluation of the performance of fisheries including assessments relating to impacts on protected marine species (under Part 13 of the Act) and for the purpose of export approval (under Part 13A of the Act). The assessments are conducted against the *Guidelines for the Ecologically Sustainable Management of Fisheries* (2nd edition; Commonwealth of Australia [CoA] 2007), which outline specific principles and objectives to ensure a strategic and transparent way of evaluating the ecological sustainability of fishery management arrangements.

EPBC Act export decisions relate to the approval of a Wildlife Trade Operation (WTO) by the Australian Government Minister of the Environment (or their delegate). A declaration of an approved WTO only applies during a particular period, or while certain circumstances apply, and may specify additional or new conditions or revoke or vary existing conditions to the declaration. EPBC Act export decisions also relate to the amendment of the List of Exempt Native Species (LENS). The LENS identifies Australian native species (or specimens) that are exempt from the export regulations of the Act. This means that items on the list may be allowed to be exported without a permit (i.e. WTO).

The EGPMF has been assessed for export approval under the provisions the EPBC Act (Part 13A) and has been found to meet the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* in 2003, 2008 and 2013<sup>1</sup>. The management regime of the EGPMF has subsequently been accredited under Part 13A of the EPBC Act, accompanied by an amendment to the LENS to allow export of product from the EGPMF for a period of five years, until 8 February 2018.

Five recommendations were provided as part of the most recent accreditation, focussing on ensuring the continuation of good management practices in the fishery. Two of these recommendations related to bycatch:

1. WA Department of Fisheries to investigate measures to improve protected species interaction reporting, including species-level identification, with particular attention to sea snake species; and
2. WA Department of Fisheries to conduct appropriate ongoing research and / or monitoring to determine whether the actions undertaken in the Bycatch Action Plan Matrix (provided in Appendix 3) are sufficient to minimise risk to bycatch species in the fishery.

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<sup>1</sup> More information on EPBC export approval and the associated EGPMF documentation is available at: <http://www.environment.gov.au/topics/marine/fisheries/wa-exmouth-gulf-prawn>

## 4.2 Marine Stewardship Council (MSC) Pre-assessment

The EGPMF underwent MSC pre-assessment as part of the Gascoyne Coast Bioregion in 2013. Potential (Principle 2) issues highlighted for the fishery included:

1. A lack of on-going monitoring of bycatch data to support risk assessments. This included the need for more recent data and regular collection / monitoring of bycatch information and a review of the Bycatch Action Plan Matrix (2010).
2. Limited information on the impact of the fishery on sea snake and sawfish populations in Exmouth Gulf. This included the need for species-level identification, quantitative estimates of mortality, information on local population abundances and research on mitigation measures for sea snakes.

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## 5.0 BYCATCH ACTION PLAN 2014 - 2019

This EGPMF BAP is designed to address risks to non-target species identified in the most recent EPBC assessment (WTO export approval) and the 2013 MSC pre-assessment. A key issue raised was the uncertainty regarding recording of information on bycatch (including ETP species) and the need to re-examine the biodiversity of the broad suite of discarded non-target species. Consequently, the key elements of this BAP involve:

1. A Bycatch Monitoring Program (BMP) to improve reliability of reporting of bycatch by the fishery;
2. A research program to re-examine biodiversity of the bycatch in Exmouth Gulf and to improve species identification in the BMP; and
3. Better reporting of interactions with sea snakes and sawfish, focussing on species identification and indication of condition status.

A summary of the EGPMF BAP activities and timelines for implementation is provided in Table 2.

### 5.1 Bycatch (Non-retained) Monitoring Program

The BMP is an ongoing collaborative program between the Department and the commercial fishing industry. The key objectives of the BMP are to:

- Use the results of ongoing monitoring programs to determine if the results from previous assessments remain relevant; and
- Develop protocols to improve consistency of reporting of all ETP species interactions in the fishery.

The information collected on bycatch and ETP species interactions will be used to assess whether the risk to Exmouth Gulf marine communities potentially posed by the fishery are acceptable or not.

Monitoring of bycatch species will be conducted through a combination of sampling methods in order to provide the most cost-effective approach to assess the sustainability of all major bycatch groups, including:

- Logbook reporting of all ETP species, with particular emphasis on improved reporting of sea snake and sawfish interactions and return status of all animals;
- Fishery-independent monitoring of ETP species interactions to validate crew reporting;

- Fishery-independent surveys to collect bycatch (non-retained) species composition data every three years; and
- Crew-member observer program (CMOP) as an ongoing data collection system requires investigation.

A quantitative ERA will be used to assess the fisheries-induced risks to selected bycatch and ETP species following the collection of new data. The development and undertaking of ERAs will ensure targeted measures can be developed to address remaining ecological risks in the EGPMF. Risk assessments are to be repeated where new species-specific data may improve the assessment for species already identified as ‘high-risk’ or following any major change to fishing gear or effort distribution patterns. This will ensure accurate and ongoing demonstration of sustainability for all bycatch species. Reference levels, triggers and management actions will be developed as needed based on risk assessment outcomes. Alternative management strategies may also need to be developed for rare species that cannot be robustly assessed using the above BMP.

The BMP will be reviewed periodically and adapted to reduce bycatch while addressing the cost effectiveness of the program and needs of fishery management. This includes the removal or addition of species in the monitoring program according to their revised risk levels and the use of upgraded risk assessment techniques.

## **5.2 Research Program**

The fishing industry have supported the development and funding of research projects to provide assessments of the sustainability of bycatch and reduced captures of ETP species.

The key objectives of the research program are to:

- Improve the understanding of fishery impacts to ETP species (particularly sea snakes);
- Engage with external stakeholders to provide estimates of ETP species’ population size within Exmouth Gulf; and
- Provide support for further BRD development and testing of effectiveness for reducing bycatch.

Previous research in the fishery has focused on reducing the capture of large ETP species, such as sea turtles, through the implementation of grids in trawl nets. However, grids have not been shown to significantly reduce the catch of sea snakes to acceptable levels in this or similar fisheries. Further, there is limited information on sea snake populations within Exmouth Gulf or on the impact of the fishery on these populations. In order to improve understanding, the Department will develop and implement an education program for industry to increase awareness of the importance of sea snake and sawfish protection, promote sensible handling techniques and improve species identification through training in sea snake identification to the species level. This would form part of the implementation of a CMOP.

Additionally, the Department will engage the appropriate agencies to determine if it is feasible to estimate the population of sea snake and sawfish species within Exmouth Gulf in order to improve the risk assessment process and / or determine an estimate of the acceptable level of bycatch in the EGPMF.

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## **6.0 BYCATCH ACTION PLAN REVIEW**

It is recognised that the fishery does change over time and that a review period should be built into the BAP to ensure that it remains relevant. The BAP 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 BAP for the fishery, this document may be subject to further review and amendment as appropriate.

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## **7.0 BYCATCH ACTION PLAN APPROVAL**

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

**Table 2.** Bycatch Action Plan for the EGPMF (2014 – 2019, specific timeframes to be developed in conjunction with industry)

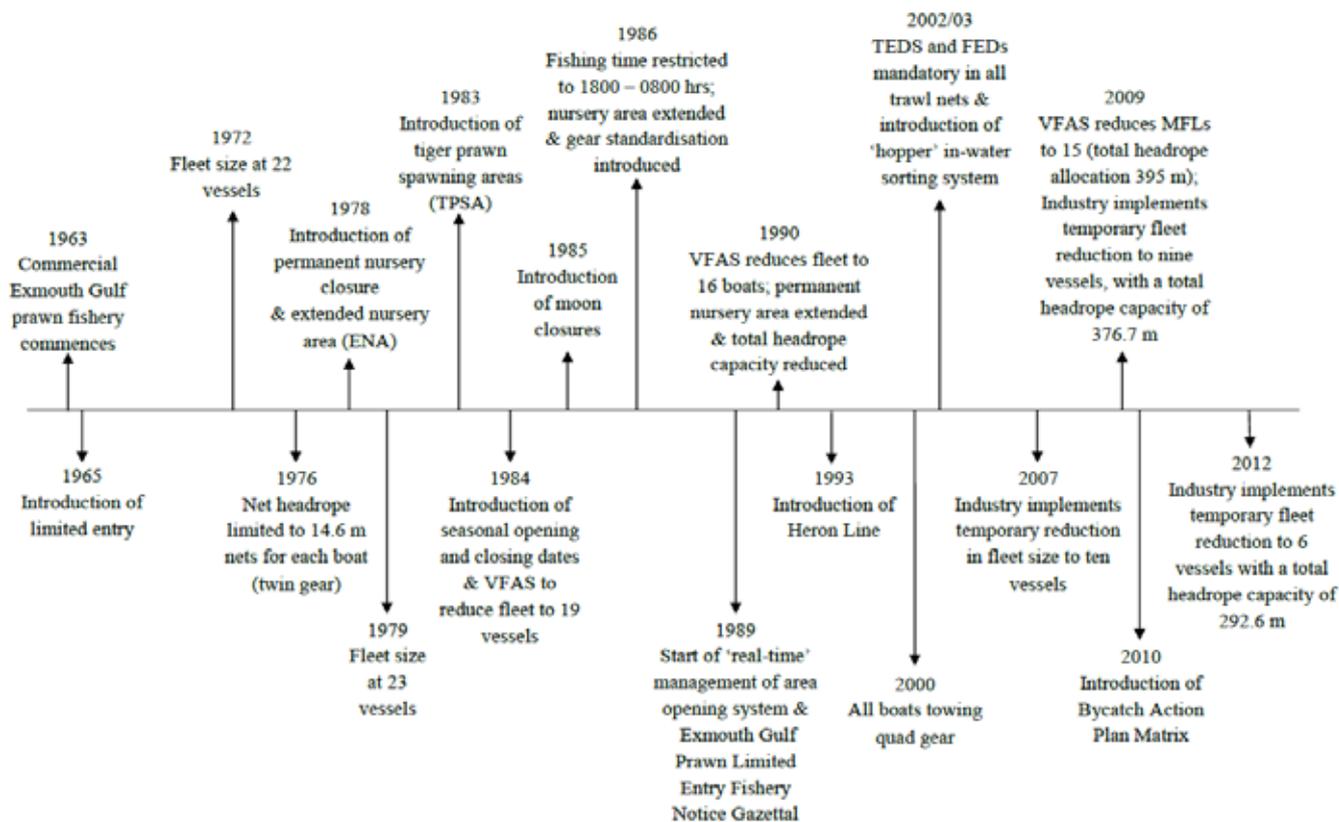
Component	Fishery Objective	Current Information	Current Activities	Issue	Proposed Additional Activities
Bycatch (non-ETP species)	To ensure fishery impacts do not result in serious or irreversible harm to bycatch species populations by (1) reducing bycatch to the extent possible and (2) reducing to an acceptable level the mortality of bycatch that cannot be avoided	Bycatch data (species lists and level of bycatch) from BRD trials in 2000 – 2003.	<ul style="list-style-type: none"> <li>Continue to develop and test the effectiveness of BRDs in reducing bycatch in the fishery</li> <li>Investigate measures to reduce incidental mortality of all bycatch species captured in the fishery</li> </ul>	<p>Lack of on-going monitoring of bycatch data to support risk assessments:</p> <p>(a) Need for more recent data;</p> <p>(b) Need regular collection/monitoring of bycatch information; and</p> <p>(c) Need a review of the effectiveness of the BAP matrix</p>	<p>(a/b) Fishery-independent surveys (i.e. Departmental staff) to collect bycatch (non-retained) species composition data every three years. Investigate crew-member observer program (CMOP) as an ongoing data collection system.</p> <p>(c) Develop a revised Bycatch Action Plan (this document)</p>
ETP species	To ensure fishery impacts do not result in serious or irreversible harm to ETP species populations by (1) reducing interactions to the extent possible and (2) reducing to an acceptable level the mortality of ETP species interactions where they cannot be avoided.	Annual level of interactions as reported by fishers in daily logbooks for ETP species groups; return status also monitored for some species.	<ul style="list-style-type: none"> <li>Continue to develop and test the effectiveness of BRDs in reducing ETP interactions in the fishery</li> <li>Investigate measures to reduce injury and incidental mortality of ETP species captured in the fishery e.g. Witch hat BRD, JW Square mesh grid arrangement, development of a sawfish tranquiliser.</li> </ul>	<p>Limited information on the impact of the fishery on sea snake and sawfish populations in Exmouth Gulf:</p> <p>(a) Need for species-level identification and reporting;</p> <p>(b) Need quantitative estimates of mortality;</p> <p>(c) Need information on local population abundances; and</p> <p>(d) Need research on mitigation measures for sea snakes.</p>	<p>Develop protocols to improve consistency of reporting for all ETP species interactions in the fishery including: (a) species-level identification training for skippers / crew; and (b) independent monitoring to validate crew reporting (e.g. program using cameras or observers)</p> <p>(c) Engage with external stakeholders to provide estimates of ETP species' population sizes within Exmouth Gulf</p> <p>(d) Continue to develop and test the effectiveness of BRDs in reducing ETP interactions in the fishery.</p>
Ecosystem	To ensure the effects of fishing do not result in serious or irreversible harm to ecosystem processes.	Biodiversity and community composition data for trawled and untrawled areas of Exmouth Gulf from 2004.	<p>Fishery impacts monitored at component level (as part of harvest strategy).</p>		<p>Fishery-independent surveys (i.e. Departmental staff) to collect bycatch (non-retained) species composition data every three years.</p>

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## 8.0 REFERENCES

- Anonymous (2009). Evaluating the Performance of Australian Marine Capture Fisheries. A Report to the FRDC – Resource Working Group. Final Report.
- Brewer, D., Rawlinson N., Eayrs, S., Burridge, C. (1998). An assessment of bycatch reduction devices in a tropical Australian prawn trawl fishery. *Fisheries Research* 36: 195-215.
- Brewer, D.T., Heales, D.S., Eayrs, S.J., Taylor, B.R., Day, G., Sen, S., Wakeford, J., Milton, D.A., Stobutzki, I.C., Fry, G.C., van der Velde, T.D., Jones, P.N., Venables, B., Wang, W., Y-G Dell, Q., Austin, M., Gregor, R., Pendrey, R., Hegerl, E., Carter, D., Nelson, C., Nichols, J., Gofton, T. (2004). Assessment and improvement of TEDs and BRDs in the NPF: a co-operative approach by fishers, scientists, fisheries technologists, economists and conservationists. Final Report on FRDC Project No. 2000/173. Cleveland: CSIRO. 412 pp.
- Brewer, D.T., Heales, D.S., Milton, C., Dell, Q., Fry, G., Venables, B., Jones, P. (2006). The impact of turtle excluder devices and bycatch reduction devices on diverse tropical marine communities in Australia's northern prawn trawl fishery. *Fisheries Research* 81: 176-188.
- Broadhurst, M.K., Kangas, M.I., Damiano, C., Bickford, S.A., Kennelly, S.J. (2002). Using composite square-mesh panels and the Nordmøre-grid to reduce bycatch in the Shark Bay prawn-trawl fishery, Western Australia. *Fisheries Research* 58: 349-365.
- Commonwealth of Australia (CoA). (2007). Guidelines for the Ecologically Sustainable Management of Fisheries. 18 pp. Accessed 12 March 2013 from: <http://www.environment.gov.au/coasts/fisheries/publications/pubs/guidelines.pdf>
- Fletcher, W., Santoro, K. (2013). *Status reports of the fisheries and aquatic resources of Western Australia 2012/13: the state of the fisheries*. Perth: Department of Fisheries WA.
- Heales, D.S., Gregor, R., Wakeford, J., Wang, Y.G., Yarrowe, J., Milton, D.A. (2008). *Tropical prawn trawl bycatch of fish and seasnakes reduced by Yarrow Fishery Bycatch Reduction Device*. *Fisheries Research* 89: 76-83
- Kangas, M., Morrison, S. (2013). Trawl impacts and biodiversity management in Shark Bay, Western Australia. *Marine and Freshwater Research* 64: 1135-1155.
- Kangas, M., Thomson, A. (2004). Implementation and assessment of bycatch reduction devices in the Shark Bay and Exmouth Gulf trawl fisheries. Final Report on FRDC Project No. 2000/189. Perth: Department of Fisheries WA. 70 pp.
- Kangas, M., Chandrapavan, A., Hetzel, Y., Sporer, E. (2012). Minimising gear conflict and resource sharing issues in the Shark Bay trawl fisheries and promotion of scallop recruitment. Perth: Department of Fisheries WA.
- Kangas, M., McCrea, J., Fletcher, W., Sporer, E., Weir, V. (2006). Exmouth Gulf Prawn Fishery. ESD Report No. 1. Perth: Department of Fisheries WA. 128 pp.
- Kangas, M.I., Morrison, S., Unsworth, P., Lai, E., Wright I., Thomson, A. (2007). Development of biodiversity and habitat monitoring systems for key trawl fisheries in Western Australia. Final Report on FRDC Project No. 2002/038. Fisheries Research Report No. 160. Perth: Department of Fisheries WA. 333 pp.
- Milton, D., Fry, G., Dell, Q. (2009). Reducing impacts of trawling on protected sea snakes: bycatch reduction devices improve escapement and survival. *Marine and Freshwater Research* 60: 824-832.
- Pender, P.J., Willing, R.S., Cann, B. (1992). NPF bycatch as a valuable resource? *Australian Fisheries* 51(2): 30-31.
- Wassenberg, T.J., Milton, D.A., Burridge, C.Y. (2001). Survival rates of sea snakes in the bycatch of trawlers targeting tiger and endeavour prawns on the northern Australian continental shelf. *Marine and Freshwater Research* 51: 155-164.

## APPENDIX 1: KEY MANAGEMENT CHANGES IN THE EGPMF



Timeline of key management and operational changes in the EGPMF. Note that the management plan for this fishery currently permits a fleet of 15 vessels, with the primary means of constraining capacity being the limit on total headrope length to 395 m

## APPENDIX 2: ECOLOGICAL RISK ASSESSMENT (INTERNAL REVIEW) OUTCOMES 2008

### 2. KEY CHANGES TO THE RISKS OF TARGET, BYPRODUCT, BYCATCH (INCLUDING PROTECTED SPECIES) AND THE MARINE ENVIRONMENT IN THE EXMOUTH GULF PRAWN MANAGED FISHERY

Table 1 provides a summary of the key changes to the risk ratings identified during the workshop. Justification and additional comments are outlined below. Where the risks have remained unchanged, please refer to the justification and performance reports in the initial application to DEW (this can be found at [www.environment.gov.au](http://www.environment.gov.au)).

**Table 1.** Summary of the key changes to the risk ratings in the Fishery

RISK	RISK RATING – April 2002	RISK RATING – Nov 2008
<b>Primary Species</b>		
Tiger Prawns	Impact and breeding population <b>C3 L3 Moderate</b>	No change to risk rating
King Prawns	Impact and breeding population <b>C2 L5 LOW</b>	No change to risk rating
<b>By-product Species</b>		
Endeavour Prawns	Impact and breeding population <b>C2 L5 Low</b>	No change to risk rating
Banana Prawns	Impact and breeding population <b>C1 L5 Low</b>	No change to risk rating
Coral Prawns	Impact and breeding population <b>C1 L5 Low</b>	No change to risk rating
Blue Swimmer Crabs	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Squid & Cuttlefish	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Sharks	Impact and breeding population <b>C0 L5 Negligible</b>	Sharks are now Non-Retained Species
Bugs	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Finfish Species	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Other Species	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
<b>Non-Retained Species</b>		
Sharks	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Seasnakes	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating

Syngnathids	Impact and breeding population <b>C1 L2 Low</b>	No change to risk rating
Discarded Fish	Impact and breeding population <b>C1 L4 Low</b>	No change to risk rating
Invertebrates	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
<b>Interaction but no Capture</b>		
Migrating Humpback whales	Not Assessed	<b>Added C1 L4 Low</b>
Green Turtles	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Loggerhead Turtles	Impact and breeding population <b>C1 L4 Low</b>	No change to risk rating
Leatherback Turtles	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Flatback Turtles	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Hawksbill Turtles	Impact and breeding population <b>C0 L5 Negligible</b>	No change to risk rating
Dugongs & Cetaceans	Impact and breeding population <b>C1 L3 Low</b>	No change to risk rating
<b>Impacts from removal or damage to the env.</b>		
Removal of: - Prawns - Byproduct - Retained & Non-Retained	Impact on the environment <b>C1 L3 Low C0 L5 Negligible C2 L2 Low</b>	New combined risk rating of – <b>C2 L2 Low</b>
Impact to mud/sand habitat	Impact on habitat ecology and structure <b>C2 L2 Low</b>	No change to risk rating
Impact to coral/sponge habitat	Impact on habitat ecology and structure <b>C1 L5 Low/Negligible</b>	No change to risk rating
Impact to macro-algal and seagrass habitats	Impact on habitat ecology and structure <b>C0 L5 Negligible</b>	No change to risk rating
<b>Addition of materials to the environment</b>		
Discarding Fish	Impact on the environment <b>C2 L3 Low</b>	No change to risk rating
<b>General impacts on the environment</b>		
Creation of turbidity from trawling	Impact on the environment <b>C0 L5 Negligible</b>	No change to risk rating
Translocation	Impact on the environment <b>C0 L5 Negligible</b>	No change to risk rating

**APPENDIX 3: WA (INVERTEBRATE TRAWL) BYCATCH ACTION PLAN MATRIX (2010)**

Fishery	Exclusion grids	Fish Escape Panels	Reporting of ETP species	Use of Return Hoppers	Logbook reporting of bycatch and ETPs	Legislation allowed bycatch	Independent observer data collection and verification program	Seasonal and/or spatial closures	Industry education and promotion	Monitoring of new bycatch reduction strategies and technology	Return of bycatch ASAP to minimise mortality, injury or other adverse impacts	Limit total area trawled
Shark Bay Prawn Managed Fishery	Current status ✓	✓?	✓?	✓	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action ME	ME	IID; IR	NFA	IR	LEG	FI&O	ME	FISF	O	M	ME
Shark Bay Scallop Managed Fishery	Current status ✓	X	✓?	X	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action M	SMESH	IID; IR	NA	IR	LEG	FI&O	ME	FISF	O	M	ME
Exmouth Gulf Prawn Managed Fishery	Current status ✓	✓	✓?	✓	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action M	ME	IID; IR	X	IR	LEG	FI&O	ME	FISF	O	M	ME
Abrothos Islands Mid-West Trawl Managed Fishery	Current status ✓	X	✓?	X	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action M	SMESH	IID; IR	NA	IR	LEG	FI&O	ME	FISF	O	M	ME
Onslow Prawn Managed Fishery	Current status ✓	✓	✓?	X?	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action M	ME	IID; IR	R&I	IR	LEG	FI&O	ME	FISF	O	M	ME
Nickol Bay Prawn Managed Fishery	Current status ✓	✓	✓?	X?	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action M	ME	IID; IR	R&I	IR	LEG	FI&O	ME	FISF	O	M	ME
<b>KEY</b>												
✓	In place	IID	Improve species identification					FISF	Formalise, implement and secure funding			
?	Extent and Uniformity of use to be reviewed	IR	Improve completeness and accuracy of reporting	SMESH	Adopt square mesh panels							
X	Not yet in place	NFA	No further action required at this point	R&I	Review and Investigate							
M	Monitor on ongoing basis	FI&O	Formalise, implement and observe	NA	Not Applicable							
E	Experiment with variations and available options	O	Ongoing	LEG	Legislate							

Fishery	Exclusion grids	Fish Escape Panels	Reporting of ETP species	Use of Return Hoppers	Logbook reporting and monitoring of bycatch and ETPs	Legislation allowed bycatch	Independent observer data collection and verification program	Seasonal and/or spatial closures	Industry education and promotion	Monitoring of new bycatch reduction strategies and technology	Return of bycatch ASAP to minimise mortality, injury or other adverse impacts	Limit total area trawled
Broome Prawn Managed Fishery	Current status ✓	✓	✓?	X?	✓?	X	✓	✓	✓?	✓	✓	✓
Managed Fishery	Planned action M	ME	IID; IR	R&I	IR	LEG	FI&O	ME	FISF	O	M	ME
Kimberley Prawn Managed Fishery	Current status ✓	✓	✓?	X?	✓?	X	✓	✓	✓?	✓	✓	✓
Managed Fishery	Planned action M	ME	IID; IR	R&I	IR	LEG	FI&O	ME	FISF	O	M	ME
South West Trawl Fishery	Current status X	X	✓?	X?	✓?	X	✓	X	✓?	✓	✓	✓
Managed Fishery	Planned action NFA	R&I	IID; IR	R&I	IR	LEG	FI&O	R&I	FISF	O	M	ME
South Coast Trawl Managed Fishery	Current status X	X	✓?	X?	✓?	X	✓	X	✓?	✓	✓	✓
Managed Fishery	Planned action NFA	R&I	IID; IR	NA	IR	LEG	FI&O	R&I	FISF	O	M	ME
<b>KEY</b>												
✓	In place		IID	Improve species identification		FISF	Formalise, implement and secure funding					
?	Extent and Uniformity of use to be reviewed		IR	Improve completeness and accuracy of reporting	SMESH	Adopt square mesh panels						
X	Not yet in place		NFA	No further action required at this point	R&I	Review and Investigate						
M	Monitor on ongoing basis		FI&O	Formalise, implement and observe	NA	Not Applicable						
E	Experiment with variations and available options	O	Ongoing		LEG	Legislate						

