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**SHARK BAY 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 Shark Bay 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.

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 Shark Bay Prawn Managed Fishery (SBPMF), in accordance with the *SBPMF 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 SBPMF 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 *SBPMF 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 impacts on Shark Bay ecology from prawn fishing activity; and
- Develop measures to better utilize what would otherwise be discarded.

2.0 FISHERY DESCRIPTION

The SBPMF is located in Shark Bay, Western Australia (WA). The fishery is managed by the state of WA through the Department of Fisheries (the Department) and currently consists of 18 Licensed Fishing Boats, each using a four-net demersal otter trawl configuration referred to as a quad-rigged prawn trawl system. The fishery formally covers approximately 41 514 km², with a permitted trawl area within Inner Shark Bay of 6 063 km² (i.e. once permanent closures are accounted for). However, fishing generally only occurs in 40 – 50% of this permitted trawl area, which represents 14 – 18% of the Inner Shark Bay area (Figure 1).

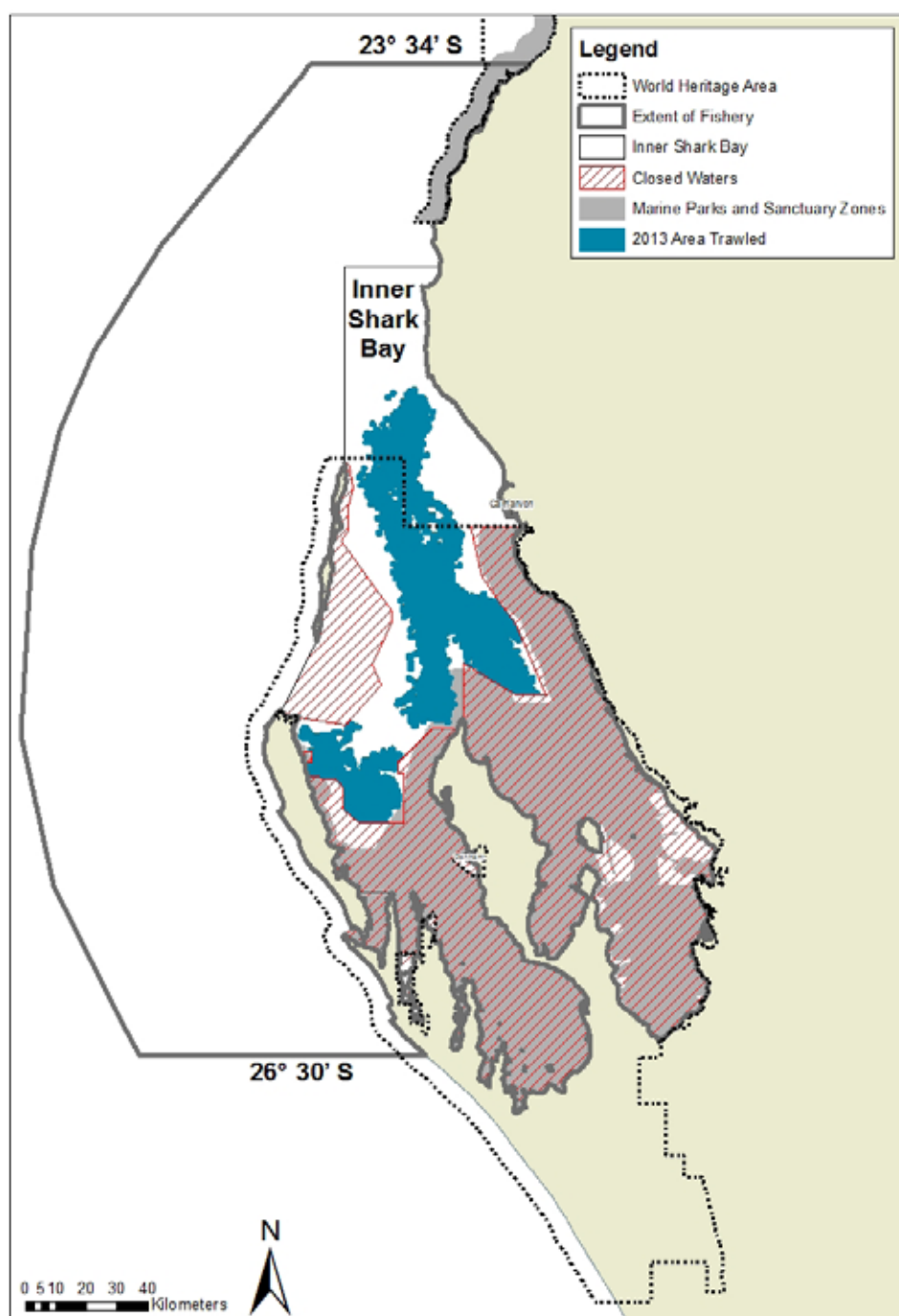


Figure 1. Full extent of the SBPMF, the Inner Shark Bay area where the fishery operates, areas permanently closed to trawling, and the actual area trawled in 2013. The boundaries of the Shark Bay World Heritage Area and Marine Parks and Sanctuary Zones are also shown.

The SBPMF is based on brown tiger and western king prawns (*Penaeus esculentus* and *P. latisulcatus*, respectively). These species are short-lived, fast-growing and have variable recruitment, which is primarily environmentally driven. The fishery also takes a variety of smaller prawn species, including endeavour (*Metapenaeus* spp.) and coral prawns (various species but primarily *Metapenaeopsis crassissima*), and retained non-target (byproduct) species, such as blue swimmer crabs (*Portunus armatus*), squid, cuttlefish (*Sepia* spp.), bugs (*Thenus* spp.), mixed finfish and octopus.

Few of the bycatch species are targeted by other sectors, with the exception of scallops (normally taken as part of Shark Bay Scallop Managed Fishery, which is currently closed) and some teleost species, such as pink snapper.

The SBPMF 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 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 *SBPMF Harvest Strategy 2014-2019*.

3.0 SUMMARY OF BYCATCH RESEARCH AND MITIGATION IN SHARK BAY

The Department, in association with the SBPMF 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 SBPMF interacts with a range of marine animals including numerous species of teleost fish and epibenthic invertebrates and ETP species (see below; Kangas & Thomson 2004; 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 levels for the SBPMF are variable, with a bycatch to target species catch ratio of 4 – 8:1 (prior to the introduction of BRDs). In comparison, the bycatch to catch ratio in the Northern Prawn Fishery (NPF) is 8 – 21:1 (Pender et al. 1992; Brewer et al. 1998). Bycatch in the SBPMF is dominated by mixed finfish and invertebrates (Kangas & Thomson 2004).

Although there is not a recent estimate of the volume of fish and invertebrates discarded by the SBPMF, 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 Shark Bay (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 SBPMF has the potential to interact with several groups of ETP species, including cetaceans, dugongs, marine turtles, sea snakes, listed elasmobranchs, 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.

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 SBPMF is to develop measures to mitigate known interactions regardless of their assessed level of risk. The key ETP species groups in Shark Bay are as follows:

Marine Mammals

The main mammal of potential concern in Shark Bay is the dugong. Due to the spatial and temporal closures in place the potential for capture of dugong in this fishery is largely diminished. These closed areas provide substantial areas of refuge, particularly over important habitats, such as seagrass.

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.

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 SBPMF 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 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).

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 SBPMF 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 SBPMF.

3.3.1 Fishing Effort

Fishing effort in the SBPMF has changed dramatically since the beginning of the fishery in 1962. From 1962 to the mid-1970s, the fishery expanded quickly from four vessels to a maximum of 35 boats in 1976 fishing with twin-net rigged trawl configuration. Effort has

declined significantly since that time. In 1990, a Voluntary Fishery Adjustment Scheme (VFAS) was introduced, reducing the number of licences and boats to 27, with this capacity maintained through to 2004. In 2005, boats started trialling quad gear (four nets), and the fleet reduced from 27 to 25 boats. By 2007, all boats were fitted with quad gear, and the total number of fishing boats was reduced to 18. The number of licences/boats was formalised at 18 through another VFAS in 2011.

Gear controls in place to control fishing effort include a maximum net headrope capacity, set in the SBPMF Management Plan at 790 metres (432 fathoms). The total headrope capacity was originally set at the level with 35 boats using twin-net trawl configuration, two 14.63 metre (8 fathoms) nets. However, in 2007 the entire fleet were fitted with quad net configuration. The Department imposed an 8% reduction of the net headrope to 724 metres (396 fathoms) to account for the increased efficiency of quad-net trawl configuration.

Fishing effort is also restricted by the number of available fishing days during the year. The fishing season is generally open from March to November, with a maximum of 175 total available fishing days each year. Trawling is primarily undertaken at night, with restricted daylight trawl hours, as the target prawn species in Shark Bay are primarily nocturnal.

In 1987, voluntary closures of three days around the full moon were introduced (moon closures) as a part of the effort control and to reduce targeting of tiger prawns during periods of low king prawn catchability during this time. Moon closures generally occur for a minimum of seven days around the full moon each month.

The mean annual total effort between 1990 and 2004 by 27 twin-net configuration prawn boats was 44 864 hours. In 2013, the adjusted effort (due to the change to quad-gear) has reduced to 35 897 hours (twin-net equivalent). This adjusted effort is approximately 8 % higher than 2012 but well below the mean effort between 1990 and 2004.

3.3.2 Temporal and Spatial Closures

A system of spatial and temporal closures has been implemented in the SBPMF since the beginning of the fishery. In 1963, areas in the southern part of the Bay that were known to have a high abundance of small-size prawns were permanently closed to trawling activities. This permanent nursery area closure was extended in 1987. These closed areas are also used by turtles and dugongs as feeding grounds and also offer significant refuge to syngnathids and solenostomids.

A number of management areas have also been introduced throughout the history of the fishery (see *SBPMF Harvest Strategy 2014-2019*). These areas are opened or closed throughout the season depending on the results of fishery-independent recruitment and spawning surveys.

Apart from managing target species in the SBPMF, 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.

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, retained non-target (byproduct), bycatch, ETP species, habitats and the ecosystem, the Department has supported the development of the ERA processes for the SBPMF. This work has been undertaken to ensure the SBPMF 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 SBPMF 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).

Internal ERA workshops were undertaken in 2008 and 2010, in conjunction with industry and other stakeholders, as a number of key changes have occurred in the fishery since 2001. The aims of the workshops were to determine if the outcomes of the 2001 ERA were still relevant or required amendment and to identify any new risks. A summary of the 2010 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 SBPMF. The SBPMF 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.

Table 1. Summary of bycatch research undertaken in the SBPMF in recent years

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	1998 – 1999	
	2000	Broadhurst et al. 2002
	2000 – 2003	Kangas & Thomson 2004
Sampling of bycatch species composition	2000 – 2003	
Impact of prawn trawling on scallop populations	2007 – 2009	Kangas et al. 2012
Impact of trawling on faunal abundance and assemblages within Shark Bay	2002 – 2003	Kangas et al. 2007
		Kangas & Morrison 2013

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 SBPMF has been assessed for the purposes of the protected species provisions and wildlife trade provisions under the EPBC Act (Parts 13 & 13A) and has been found to meet the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* in 2003, 2007 and 2013¹. The management regime of the SBPMF has subsequently been accredited under Parts 13 and 13A of the EPBC Act, accompanied by an amendment to the LENS to allow export of product from the SBPMF until 31 January 2018.

Six 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 turtles and 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.

4.2 Marine Stewardship Council (MSC) Pre-assessment

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

- A lack of evidence that the prawn fishery is not detrimentally impacting the rebuilding strategies for blue swimmer crabs and saucer scallops in Shark Bay. The Shark Bay blue swimmer crab stock has shown moderate signs of recovery since the MSC pre-assessment. Stock assessments have informed the setting of a sustainable level of commercial catch and a portion has subsequently been allocated to SBPMF licence holders. However, the scallop stock remains at very low levels. While no scallop retention is currently (2014) permitted the management of this stock may need to include measures to limit incidental mortality. This will be informed by the outcomes of further research and ongoing monitoring. A scallop recovery plan is currently being developed.
- 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 (every 3 years) and a review of the Bycatch Action Plan Matrix (2010).
- Limited information on the impact of the fishery on sea snake populations in Shark Bay. 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.

5.0 BYCATCH ACTION PLAN 2014 - 2019

This SBPMF 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

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

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 bycatch species in Shark Bay and to improve species identification in the BMP; and
3. Better reporting of interactions with sea snakes, focussing on species identification and indication of condition status.

Four groups of ETP species interact with the SBPMF and of these two groups (marine turtles and large elasmobranchs) are already addressed through the use TEDs; however, mitigation measures for smaller ETP species, such as sea snakes, require further investigation.

A summary of the 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 Shark Bay marine communities potentially posed by the fishery are acceptable.

Monitoring of bycatch 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 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 SBPMF. 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 Shark Bay; 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 Shark Bay 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 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 encourage actions that result in an estimation of the population of sea snake species within Shark Bay in order to improve the risk assessment process and / or determine an estimate of the acceptable level of sea snake bycatch in the SBPMF.

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.

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.

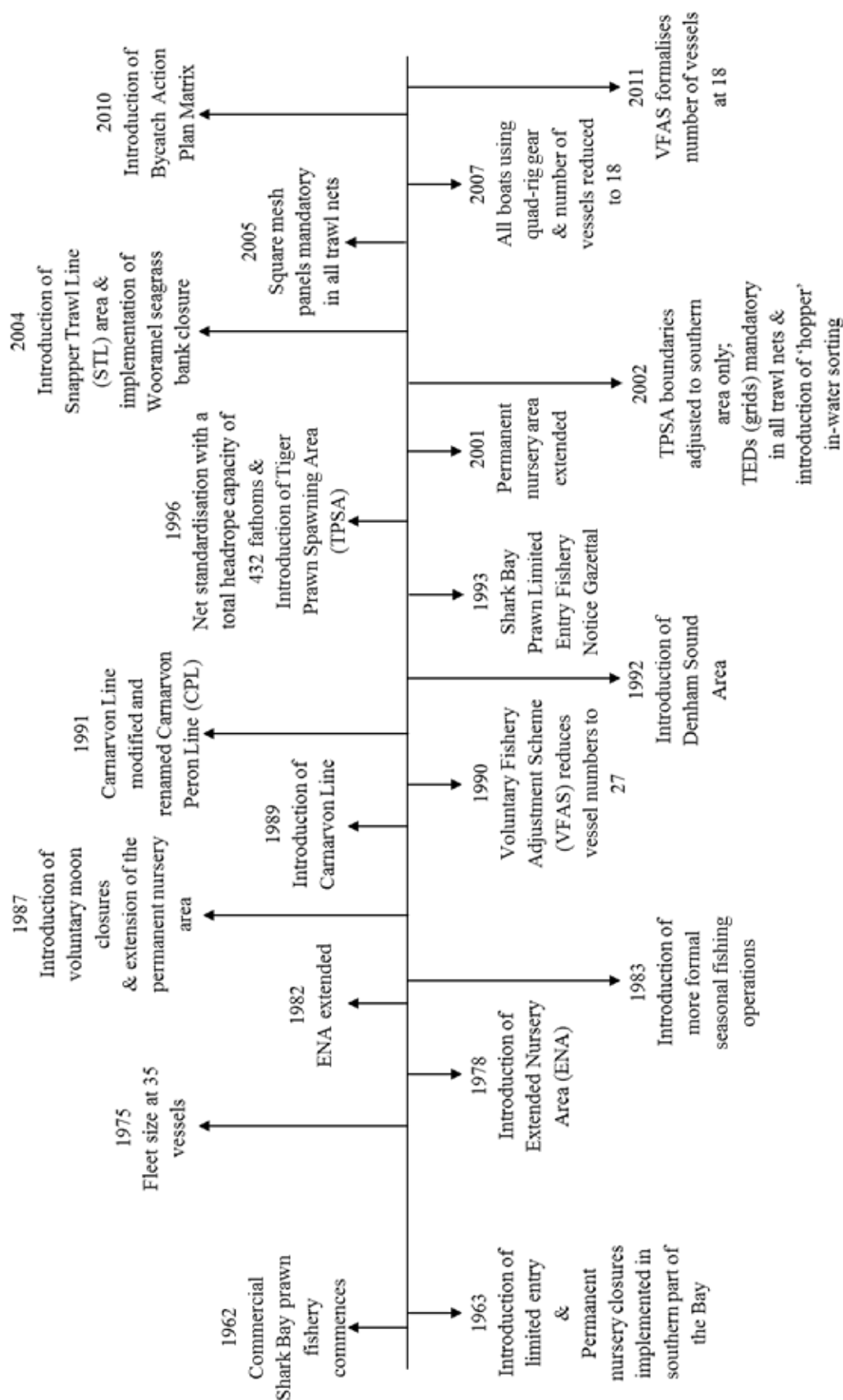
Table 2. Bycatch Action Plan for the Shark Bay Prawn Managed Fishery (2014 – 2019, specific timeframes to be determined with industry)

Component	Fishery Objective	Current Information	Current Activities	Issue	Proposed Additional Activities
Bycatch	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) minimising mortality of bycatch that cannot be avoided	Bycatch data (species lists and level of bycatch) from BRD trials in 2000 – 2003	Continue to support industry to test the effectiveness of BRDs in reducing bycatch in the fishery	<p>1. Lack of evidence that prawn fishery is not detrimentally impacting rebuilding strategies for scallops & blue swimmer crabs</p> <p>2. 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>1. Investigate measures to reduce injury and incidental mortality of all bycatch species (including scallops) captured in the SBPMF</p> <p>2. (a/b) Develop and implement periodic (every 3 years) bycatch monitoring to report on overall bycatch quantity, composition of high-risk species</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) minimising 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"> Continue to measure the effectiveness of BRDs in reducing ETP interactions in the fishery Investigate measures to reduce injury and incidental mortality of ETP species captured in the fishery 	<p>Limited information on the impact of the fishery on sea snake populations in Shark Bay:</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:</p> <p>(a) species-level identification training for skippers / crew; and</p> <p>(b) independent monitoring to validate crew reporting (e.g. program using cameras or observers);</p> <p>(c) engage with external stakeholders (i.e. DPaW) to provide estimates of ETP species' population sizes within Shark Bay; and</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 Shark Bay from 2004	Fishery impacts monitored at component level (as part of harvest strategy)		Fishery-independent surveys (i.e. Departmental staff) to collect bycatch (non-retained) species composition data every three years.

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APPENDIX 1: KEY MANAGEMENT CHANGES IN THE SBPMF



APPENDIX 2: ECOLOGICAL RISK ASSESSMENT (INTERNAL REVIEW) OUTCOMES 2010

ECOLOGICAL RISK ASSESSMENT – INTERNAL WORKSHOP – 30 NOVEMBER 2010

Shark Bay Prawn Managed Fishery

Impact of the use of quad gear, unitization of head rope length, removal of the 375 boat unit rule and any fleet restructure – on target, byproduct, bycatch (including protected species) and the marine environment

Risk	ERA Risk Rating – Nov 2008	ERA Risk Rating – Nov 2010	Comments / Justification for change
Primary Species			
Tiger Prawns	Impact and breeding population C3 L5 High	No change to risk rating	Threshold levels to cease fishing have been increased
King Prawns	Impact and breeding population C2 L5 Moderate	No change to risk rating	No impact has been observed
By-product Species			
Coral Prawns	Impact and breeding population C2 L5 Moderate	No change to risk rating	Catch is mesh size dependent – change in gear will have no impact.
Endeavour Prawns	Impact and breeding population C1 L4 Low	No change to risk rating	Catch is mesh size dependent – change in gear will have no impact.
Squid & Cuttlefish	Impact and breeding population C0 L5 Negligible	No change to risk rating	Catch is mesh size dependent – change in gear will have no impact.
Blue Swimmer Crabs	Impact and breeding population C1 L5 Low	New risk rating of – C1 L4 Moderate	There has been increased targeting and retention of blue swimmer crabs.
Finfish Species	Impact and breeding population C0 L5 Negligible	No change to risk rating	Bycatch reduction devices have been improved and remain effective.
Other Species	Impact and breeding population C0 L5 Negligible	No change to risk rating	Bycatch reduction devices have been improved and remain effective.
Non-Retained Species			
Sharks	Impact and breeding population C0 L5 Negligible	No change to risk rating	Use of Grids avoid capture of most large sharks and rays
Seasnakes	Impact and breeding population C1 L2 Low	No change to risk rating	No change observed in numbers taken and all returned to the sea in good condition.
Syngnathids	Impact and breeding population C1 L2 Low	No change to risk rating	No change observed in numbers taken and all returned to the sea in good condition. Numbers insignificant.

Risk	ERA Risk Rating – Nov 2008	ERA Risk Rating – Nov 2010	Comments / Justification for change
Discarded Fish (Page 84-87)	Impact and breeding population C2 L3 Moderate	No change to risk rating	No change observed in numbers taken and all returned to the sea in good condition
Invertebrates (Page 87-88)	Impact and breeding population C0 L5 Negligible	No change to risk rating	No change observed in numbers taken and all returned to the sea in good condition.
Interaction but no Capture			
Green Turtles (Page 88-89)	Impact and breeding population C0 L5 Negligible	No change to risk rating	Grids are effective in allowing escape.
Loggerhead Turtles (Page 89-90)	Impact and breeding population C1 L4 Low	No change to risk rating	Grids are effective in allowing escape
Dugongs and Cetaceans (Page 90-91)	Impact and breeding population C1 L3 Low	No change to risk rating	Grids are effective in allowing escape
Impacts from Removal or Damage to the Environment			
Taking of Prawns & Byproduct species (Page 91-93)	Impact and trophic structure C2 L2 Low	No change to risk rating	Spatial and time closures limit impacts
Impact on habitat ecology and structure (Page 93-96)	Impact on habitat ecology and structure C2 L5 Moderate	No change to risk rating	Spatial and time closures limit impacts. No sensitive or new areas are trawled
Impact to coral/sponge habitat (Page 96 – 100)	Impact on habitat ecology and structure C1 L6 Moderate	No change to risk rating	Spatial and time closures limit impacts. No sensitive or new areas are trawled
Impact to seagrass habitat (Page 100 - 101)	Impact on habitat ecology and structure C0 L5 Negligible		Spatial and time closures limit impacts. No sensitive or new areas are trawled

Addition to Materials to the Environment			
Discarding Fish (Page 102-106)	Impact to environment C2 L3 Moderate	No change to risk rating	No change in numbers discarded
General Impacts on the Environment			
Creation of Turbidity from Trawling (Page 106)	Impact on habitat ecology and structure C0 L5 Negligible	No change to risk rating	Spatial and time closures limit impacts. No sensitive or new areas are trawled
Translocation (Page 107)	Impact on habitat ecology and structure C0 L5 Negligible	No change to risk rating	Spatial and time closures limit impacts. No sensitive or new areas are trawled
Rubbish Disposal	Impact to environment L6C1	New risk identified as result of new shire waste management rules – some risk of landed rubbish being blown into ocean.	DoF is engaging industry to ensure risk is addressed.

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 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
Shark Bay Prawn Managed Fishery	Current status	✓	✓?	✓	✓?	✓	✓	✓	✓?	✓	✓	✓
	Planned action	ME	IID; IR	NFA	IR	LEG	FI&O	ME	FISF	O	M	ME
Shark Bay Scallop Managed Fishery	Current status	✓	✓?	X	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action	M	IID; IR	NA	IR	LEG	FI&O	ME	FISF	O	M	ME
Exmouth Gulf Prawn Managed Fishery	Current status	✓	✓?	✓	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action	M	IID; IR	X	IR	LEG	FI&O	ME	FISF	O	M	ME
Abrolhos Islands Mid-West Trawl Managed Fishery	Current status	✓	✓?	X	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action	M	IID; IR	NA	IR	LEG	FI&O	ME	FISF	O	M	ME
Onslow Prawn Managed Fishery	Current status	✓	✓?	X?	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action	M	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	IID; IR	R&I	IR	LEG	FI&O	ME	FISF	O	M	ME
Broome Prawn Managed Fishery	Current status	✓	✓?	X?	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action	M	IID; IR	R&I	IR	LEG	FI&O	ME	FISF	O	M	ME
Kimberley Prawn Managed Fishery	Current status	✓	✓?	X?	✓?	X	✓	✓	✓?	✓	✓	✓
	Planned action	M	IID; IR	R&I	IR	LEG	FI&O	ME	FISF	O	M	ME
South West Trawl Fishery	Current status	X	✓?	X?	✓?	X	✓	X	✓?	✓	✓	✓
	Planned action	NFA	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	✓?	✓	✓	✓
	Planned action	NFA	IID; IR	NA	IR	LEG	FI&O	R&I	FISF	O	M	ME

KEY		
✓	In place	FI&O
?	Extent and Uniformity of use to be reviewed	O
X	Not yet in place	FISF
M	Monitor on ongoing basis	SMESH
E	Experiment with variations and available options	R&I
IID	Improve species identification	NA
IR	Improve completeness and accuracy of reporting	LEG
NFA	No further action required at this point	Formalise, implement and observe
		Ongoing
		Formalise, implement and secure funding
		Adopt square mesh panels
		Review and Investigate
		Not Applicable
		Legislate

