



Assessment of the
Western Australia Shark Bay Prawn Trawl Fishery

Environment Australia

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This document is an assessment carried out by Environment Australia of a commercial fishery against the Commonwealth's Guidelines for the Ecologically Sustainable Management of Fisheries. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the EPBC. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Commonwealth Government.

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**Assessment of the ecological sustainability of management arrangements for the
Western Australia Shark Bay Prawn Trawl Fishery**

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EXECUTIVE SUMMARY

Background

The Department of Fisheries Western Australia (DFWA) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Application to Environment Australia for the Shark Bay Prawn Fishery* (the submission) was received by Environment Australia (EA) in April 2002 after a period of discussion between DFWA and EA, during which preliminary drafts were refined. The submission was released for a thirty-day public comment period that expired on 31 May 2002. Five public comments were received and DFWA provided a response to the issues raised. No changes were made to the submission as a result of public comment.

The submission reports on the Western Australia (WA) Shark Bay Prawn (SBP) Fishery against the Commonwealth *Guidelines for the Ecologically Sustainable Management of Fisheries*. The EA assessment considers the submission and associated documents, public comments and WADF's response to the comments.

Summary of the Shark Bay Prawn Fishery

Area	Shark Bay in Western Australia
Fishery status	The two target species are fully fished
Target Species	Brown tiger prawns (<i>Penaeus esculentus</i>) Western king prawns (<i>Penaeus latisulcatus</i>)
Byproduct Species	Not limited. Predominantly endeavour and coral prawns. Other species retained include squid, cuttlefish, crabs, shark, mulloway and small numbers of other fish and shells.
Gear	Twin gear otter trawl. 10mm ground chain. Currently tow two 8 fathom nets however there is provision in the plan to use up to four 6 fathom nets or three 8 fathom nets.
Season	Closed November to March. The tiger prawn spawning area closure is triggered by the catch rate of tiger prawns.
Commercial harvest 2001	1860 tonnes of prawns
Value of commercial harvest 2001	\$27 million
Recreational harvest	No significant recreational take of target species
Commercial licences issued	27 boats licensed to operate in the fishery since 1990
Management arrangements	Input controlled through: limited entry, boat and gear restrictions, and spatial and temporal closures. No quota.
Export	Major markets for tiger prawns are Japan and Taiwan. Australia, Europe, United States of America and Taiwan are the major markets for western king prawns. Endeavour prawns are mainly sold in Australia and New Zealand.
Bycatch	Various
Interaction with Threatened Species	Seasnakes – occasionally caught and generally returned alive Syngnathids – approx 1 per night caught across entire fleet Turtles – very few reported captures, returned alive

The area of the fishery includes waters of and surrounding Shark Bay, located off the mid-west coast of WA. Part of the fishery area is in Commonwealth waters however the entire fishery is managed by WA under an Offshore Constitutional Settlement (OCS) between the Commonwealth Government and the Government of Western Australia. The Shark Bay region was declared a World Heritage Area in 1991 and this fishery operates within the declared area. Fishing for prawns in this area has occurred since 1962, well before the World Heritage declaration.

The fishery targets brown tiger prawns (*Penaeus esculentus*) and western king prawns (*Penaeus latisulcatus*). There is no limit to the quantity or species that may be taken as byproduct by the fishery. Species currently retained by the fishery as byproduct include coral and endeavour prawns, squid and cuttlefish, scallops, crabs, shark, mulloway and small fish and shells. Some finfish species are taken by line under a separate endorsement. The take of finfish from line and the take of scallops are assessed under the other relevant fishery submissions and therefore are not discussed significantly in this report.

The two target *Penaeus* species are widespread in Australia with western king prawns also spread throughout the western Indo-Pacific region. The brown tiger prawn is found in significant numbers along the northern coast of Australia from WA to southern Queensland. Western king prawns have been found from waters of South Australia around the coast to WA, Northern Territory, Queensland and as far south as northern New South Wales. Both of these species are harvested in several trawl fisheries throughout their distribution. The DFWA submission states that genetic differences have been identified between western king prawn populations and although no genetic differences were detected between brown tiger prawn populations, the majority of these operate as functionally independent stocks. Both of these species are relatively short-lived with individuals over two years only rarely caught by the current harvesting operations.

These prawn species are typically found in hard sand or sandy mud substrate in their adult phase. Prawn species are highly fecund and these two species release between 50, 000 and 700, 000 eggs per spawning. They are prey for a variety of species, especially during larval stages.

Approximately 1860 tonnes of prawns were harvested in the SBP fishery in 2001, at an estimated value of A\$27 million. The fishery began in 1962 and quickly expanded to a maximum take of 2370 tonnes of prawns in 1981. Catch declined severely in the 1980s and it is believed that the brown tiger prawn stock was recruitment overfished. Management measures since that time have brought the level of brown tiger prawns back to within ecologically viable stock levels. Prawns are snap-frozen at sea and sold into both domestic and export markets.

The fishery currently targets prawn species with twin otter trawl gear. There are restrictions on the size of the vessel, the length of the gear and the weight of the ground chain. Bycatch reduction devices (BRDs) including turtle exclusions devices (TEDs) are now compulsory in all nets.

Fishery management arrangements include spatial and temporal closures, based on real time monitoring of spawning stock. In addition to gear limitations, there is limited entry to this fishery and there have been 27 licences since 1990. The area of the fishery is permanently limited to less than 40% of Shark Bay waters.

As in any trawl fishery, bycatch to target ratios are high with a large variety of species caught. Some bycatch species in this fishery are currently listed protected species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Protected species interactions in this fishery include the direct capture of syngnathids (seahorses and pipefish), seasnakes and loggerhead and green turtles, and the provisioning and possible habituation of dolphins and seabirds. These interactions are assessed under Principle Two of this report.

There is no significant take of prawns by the indigenous and recreational sectors, however some species caught as byproduct and/or bycatch in this fishery are targeted by these users and in other commercial fisheries

The fishery is managed under the *Shark Bay Prawn Managed Fishery Management Plan 1993*, which obtains its authority from the *WA Fish Resources Management Act 1994*. In addition, an Ecologically Sustainable Development (ESD) workshop was held to conduct a risk assessment of this fishery. The outcomes from this workshop are contained in an ESD report. Actions, performance measures and monitoring requirements contained in the ESD report have been considered during the EA assessment.

Overall assessment

The material submitted by DFWA indicates that the fishery operates in accordance with the Commonwealth *Guidelines for the ecologically sustainable management of fisheries*. EA concurs that the SBP Fishery is a well managed fishery that is unlikely to have an unacceptable or unsustainable impact on the environment in the short to mid term. Recommendations have been developed to ensure that the risk of impact is minimised in the longer term. Overall, the sophisticated management regime of real time monitoring, spatial and temporal closures based on spawning stock, data collection systems and defined acceptable ranges suggests that the fishery is being managed in an ecologically sustainable way.

In making this assessment, EA is satisfied that the information collection system, risk assessments, management arrangements and objectives are sufficient to ensure the fishery is conducted in a manner that does not lead to overfishing and that stocks are not currently overfished. Considering the research programs and management arrangements in place, EA is satisfied that fishing operations are managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. Management of this fishery has a history of reacting appropriately to threats to sustainability and EA is confident that DFWA will continue to provide this high quality management.

As the official fishery area encompasses Commonwealth as well as State waters, consideration under Part 13 of the EPBC Act is required regarding the impact of the fishery on listed threatened species, listed migratory species, cetaceans and listed marine species.

A number of protected species occur in the fishery area. EA is satisfied that the monitoring of interactions, assessment of the impacts, current management responses and triggers for future management are sufficient to ensure all persons engaged in fishing are required to take all reasonable steps to minimise impacts. EA considers that the fishery is unlikely to have an

unacceptable impact on protected species. EA recommends that this fishery be accredited under Part 13 of the EPBC Act.

The assessment concludes that the fishery is managed in an ecologically sustainable way. EA recommends that the export of species taken in the fishery should be exempt from the export permit requirements of Part 13A of the EPBC Act, with that exemption to be reviewed in five years.

To further strengthen the effectiveness of the management arrangements for the SBP Fishery, and to contain the environmental risks in the medium to long term, a series of recommendations have been developed. The implementation of these recommendations and other commitments made by DFWA in the submission will be monitored and reviewed as part of the next Commonwealth review of the fishery in five years time.

Recommendations

1. Opportunity should be provided to conservation, community, recreational fishing and world heritage area management interests to participate in the processes of the main advisory body to the WA Fisheries Minister for this fishery. DFWA should also ensure that any relevant indigenous interests are considered through appropriate consultative mechanisms.
2. The ESD report, including all performance measures, responses and information requirements, should be formally incorporated into the management regime and decision making process within one year, with a clear timeframe for implementation.
3. EA should be informed of any changes to the management plan or managerial commitments in the ESD report.
4. The ESD report should be amended to incorporate time frames for all management responses to breaches of performance measures.
5. Permitted byproduct should be limited to species currently harvested, with a robust system developed to add or remove species as appropriate. Suitable catch triggers should be developed to ensure any change in targeting behaviour can be detected and addressed as it occurs. Management responses should be clarified, with timeframes for implementation, to address such changes, so that the management arrangements are able to minimise threats to byproduct species.
6. DFWA should participate in any cross-jurisdictional activities regarding relevant target and byproduct species, including squid.
7. Ongoing monitoring should be implemented sufficient to identify long-term trends in bycatch between fished and unfished areas to ensure that information used in the risk assessment for the fishery remains based on accurate and current data.
8. The importance of specific areas and habitats to applicable bycatch species during all stages of their life cycle should be considered when applying the results of biodiversity research to management arrangements.

9. A mechanism should be developed to enable the amendment of management arrangements to respond to new information or future Government plans and policies.
10. All protected species interactions by commercial operations should be reported and coupled with an education program to ensure industry has the capacity to make accurate reports.

PART I - MANAGEMENT ARRANGEMENTS

The SBP Fishery is managed by the Department of Fisheries WA (DFWA). It is the largest prawn fishery in WA.

The management regime is described in the following documents, all of which are, or will be publicly available:

- The *Shark Bay Prawn Managed Fishery Management Plan 1993*
- Shark Bay Prawn Managed Fishery Licence
- The *Shark Bay Prawn Fishery ESD Report*
- The *WA Fisheries Resources Management Act 1994*
- The *WA Fisheries Resources Management Regulations 1995*
- Relevant Gazetted notices and licence conditions

There are a number of other documents, including research reports, scientific literature and discussion papers, which are integral to the management of the fishery.

Performance indicators, measures and actions to address issues when required are specified in the ESD report. An assessment of the effectiveness of these measures is included in Part Two of this report. They are the outcome of a stakeholder risk assessment workshop held for the fishery. This report has not yet been finalised and is not currently a formal component of the legislative arrangements for the fishery. Nevertheless, the submission indicates that these rules and requirements will be implemented in the fishery to ensure the fishery management regime remains strategic and capable of detecting and addressing unacceptable impacts of fishing activity. The ESD reports contains some triggers for action should performance measures not be met. However, no timeframes are included for the implementation of these actions.

The SBP Management Advisory Committee (the SBPMAC) consists of an independent chair, two Departmental representatives, commercial fishers and limited attendance from a community sector representative. It aims to provide information and advice to the Minister on matters related to the protection and management of the fishery. The ESD report, which will be reviewed every five years, was developed with participation from industry, government, recreational/regional groups, non-governmental environmental groups and invited specialists. DFWA have indicated in discussion that this workshop will be repeated at the five year review of the ESD report. A fishery management regime should be developed through a consultative process providing opportunity to all interested and affected parties. If the stakeholder workshop is not repeated at the five year review, then DFWA will need to ensure that this consultation will occur through other fora. This is also a requirement of the State fisheries legislation and EA is confident that DFWA will continue to ensure interested parties are consulted appropriately.

Management of the fishery is based entirely on input controls. Such controls include:

- Limited entry with 27 licences;
- Gear and vessel restrictions;
- A seasonal closure for the whole fishery;
- Ban on day trawling in the majority of the fishery;
- Numerous permanent spatial closures; and
- A series of temporal spatial closures linked to spawning stocks and real-time monitoring;

Compliance and enforcement tools implemented in the fishery include a Vessel Monitoring System (VMS) and random at sea and port inspections. Given the level of enforcement, compliance in this fishery appears to be very high with only two infringements issued in 2001. Due to the small number of operators, their involvement in managerial decisions and efforts by DFWA staff to educate operators on their scientific process and basis for management decisions, it is likely that operators feel an ownership of the management arrangements and are therefore likely to comply with them. EA is satisfied that these compliance measures contain the means of enforcing critical aspects of the management arrangements.

Annual State of the Fisheries reports review the performance of the major aspects of the SBP fishery and are published following review by the WA Office of the Auditor General. In addition, the ESD report will be reviewed every five years. EA is satisfied that a five year review of the entire fishery is suitable while critical aspects are reviewed annually. The annual reviews include assessments of target and byproduct stocks. These are discussed more fully in Part Two of this report.

Fishery dependent and independent information relating to the target species is collected on a regular basis in the fishery. Fishery dependent data is obtained through compulsory monthly commercial logbooks, and a voluntary daily reporting system currently with 100% participation. This commercial data is validated against processor records and will soon be validated against VMS data. DFWA conducts annual independent surveys to identify levels of spawning stock in the fishery. In addition, an observer program has been active in this fishery since 1998. It is proposed to conduct observer surveys every five years. There are various projects currently approved or seeking funding which have application to the management of this fishery. These information collection systems are discussed under Part Two of this report.

An analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates is contained under Principle Two of this report.

EA is satisfied that the current management arrangements comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. However, there is no mechanism in the arrangements that requires compliance with any future plans or policies.

The SBP fishery has been operating within the area of the current Shark Bay World Heritage Area since 1962. Under the EPBC Act, a person may not take an action that has, will have or is likely to have a significant impact on the world heritage values of a declared World Heritage property. People that are taking actions that are a lawful continuation of a use of land, sea or seabed, that was occurring immediately before the commencement of the EPBC Act, may continue to take those actions. An enlargement, expansion or intensification of a use is not a continuation of a use. Shark Bay's listed World Heritage values are located primarily in areas that are protected from or unsuited to trawling. For this reason, and the outcomes of the assessment as listed throughout Part Two of this assessment report, EA is satisfied that fishing activities as currently practiced in this fishery are unlikely to have a significant impact on the world heritage values of Shark Bay in the next five years. Any significant change to existing practices, which is likely to significantly impact on Shark Bay's World Heritage

values, may require approval by the Commonwealth Minister for the Environment and Heritage.

As the fishery area contains Commonwealth waters, operators are required to comply with the International Convention on Marine Pollution (MARPOL). The submission is silent on how fishers and DFWA ensure that these requirements are adequately addressed however DFWA have specified that the WA Department of Transport does pre-season inspections of vessels to ensure they are seaworthy.

Conclusion

Management arrangements in the WA SBP fishery are reasonably precautionary. DFWA has demonstrated its commitment to the ecologically sustainable management of the fishery by conducting a stakeholder risk assessment workshop and developing the ESD report. It has a history of adapting management arrangements where required to address impacts of the fishery and EA is confident that using the ESD report as a guide they will continue to do so to reasonable levels of precaution in the next five years.

The SBPMAC is the body responsible for providing information and advice to the WA Minister for Fisheries on matters related to the protection and management of the fishery. This body currently consists of an independent chair, industry, DFWA officers and limited attendance by a community sector representative. EA considers that other interests and stakeholders should also participate in the processes of the main advisory committee for a fishery. This issue was also raised in public comment submissions. DFWA responded to these comments stating that one new trawl MAC to represent the Shark Bay Scallop, Shark Bay Prawn and Exmouth Gulf Prawn fisheries will be established and will include a member with community sector experience and a member with conservation sector expertise. No timeframe was provided for the establishment of a joint Trawl MAC.

EA considers that in addition to representation from the interest groups proposed, participation should also be sought from recreational fishers and world heritage area management. As this fishery occurs within a declared World Heritage Area, there is potential for conflict management decisions and conflict between agencies. This potential could be greatly minimised by involving a representative from the management of the World Heritage Area in the processes of the MAC to help provide advice to the group and to the WA Minister for Fisheries. EA therefore recommends that DFWA ensure that the processes of the main advisory body to the WA Fisheries Minister for this fishery include participation from conservation, community, recreational fishing and world heritage area management interests. DFWA should also ensure that any relevant indigenous interests are considered through appropriate consultative mechanisms.

Currently the ESD report is simply a guiding document that has no legislative basis. This document contains a number of detailed and explicit management triggers, decision rules and performance measures. It is the document that outlines the objectives, targets, monitoring requirements and responses of the fishery. The management commitments specified in this report have been fundamental in EA's assessment and consequent recommendations. Although EA is satisfied that this lack of a legislative base will not cause issues in the fishery in the short term, we recommend that the report be formally incorporated into the management regime and decision making process, within one year, with a clear timeframe for implementation.

EA considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the ESD report and Management Plan to EA's assessment of the fishery, an amendment to either could change the outcomes of our assessment. Therefore, EA recommends that DFWA inform EA of any changes to the management plan or managerial commitments in the ESD report.

In addition, many of the triggers contained in the ESD report require specified actions to address a breach of a performance measure. No time-frames are included for the implementation of these actions. EA therefore recommends that these time frames be developed and incorporated into the ESD report in order to ensure prompt and efficient responses to arising issues.

The submission is silent on specific actions and requirements in the fishery related to the prevention of marine pollution from vessels. The ESD workshop concluded that air and water quality issues are of insignificant risk and do not require a managerial response or a justification within the report. Given the nature and scale of the fishery, and the thoroughness of the ESD workshop, EA is satisfied that management arrangements in the fishery ensure that MARPOL obligations are met in this fishery.

Recommendations

- Opportunity should be provided to conservation, community, recreational fishing and world heritage area management interests to participate in the processes of the main advisory body to the WA Fisheries Minister for this fishery. DFWA should also ensure that any relevant indigenous interests are considered through appropriate consultative mechanisms.
- The ESD report, including all performance measures, responses and information requirements, should be formally incorporated into the management regime and decision making process within one year, with a clear timeframe for implementation.
- EA should be informed of any changes to the management plan or managerial commitments in the ESD report.
- The ESD report should be amended to incorporate time frames for all management responses to breaches of performance measures.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

Principle 1: *‘A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover’*

Maintain ecologically viable stocks

Objective 1: *‘The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability’*

Information requirements

Fishery dependent data are obtained through compulsory monthly logbooks, which 100% of operators voluntarily complete on a daily basis. Commercial logbooks are validated against processor records and will soon be validated against VMS data. The logbooks contain information on daily and shot-by-shot target and byproduct catch, hours trawled and areas of operation.

Fishery independent surveys are conducted annually to measure the catch rates in different areas of Shark Bay and are used to determine the index of spawning stock abundance of tiger prawns and the recruitment index for king prawns. These surveys and resulting actions are outlined in the DFWA submission. The results of these surveys, once a relationship with old fishing records can be quantified, will be used instead of commercial data to determine the time of closure of components of the fishery. The submission is silent on when this standardisation will be available.

Further fishery independent research is conducted through current and new funding applications. An observer program and a biodiversity research project are discussed under Principle Two of this report.

EA is satisfied that this information system is reliable, appropriate to the scale of the fishery and is based on an appropriate mix of fishery independent and dependent research and monitoring.

Assessment

The submission states that the status of breeding stocks and the intra-annual variation for king and tiger prawns are assessed and evaluated every year, using a synthesis of the fishery dependent and independent information. These annual assessments are incorporated into the annual State of the Fisheries report which is published after review by the WA Office of the Auditor General. The relationship between spawning index and recruitment index is monitored carefully. Specified levels of target species in the fishery trigger temporal spatial closures.

This monitoring and assessment has been operational in the SBP fishery for several decades. Therefore a large data-set is available with which to detect trends in catch and effort and environmental influences. EA is satisfied that this allows DFWA to ensure assessments of the

dynamics and status of the fishery are robust and capable of identifying any reduction in biological diversity and reproductive capacity.

Because of the commercial value of the target species in several fisheries in Australia, the distribution and spatial structure of the stock are well understood. The submission cites Mulley and Latter (1981) as concluding that there is no genetic variation between the regions where large brown tiger prawn populations are found, but claims that they remain functionally independent stocks. The submission also cites Richardson (1982) as identifying genetic differences between western king prawn populations sampled from WA, the Gulf of Carpentaria and South Australia. Consequently management of the stock is based on information and indicators from the local area only. This management includes real-time monitoring and adaptive management.

There is no significant recreational or indigenous take of the target species. Fishers endorsed to fish only in the Shark Bay Scallop fishery are not permitted to retain prawns and use a much larger mesh size to minimise the incidental take of them. The compliance data, combined with the small number of operators and their involvement in managerial decisions, suggests that illegal activity in the fishery is very low. The nature of the fishery, including the investment into boat and fishing gear, makes it unlikely that an unauthorised operator would attempt to trawl illegally. Should it happen, it is likely that it would be detected and reported by DFWA or authorised operators. The implementation of a VMS is now an essential part of the compliance and enforcement strategy, and can be used to validate the assumed levels of compliance with spatial and seasonal management arrangements. Therefore EA considers that the data collection system ensures that reliable estimates of commercial removals are available.

Catch rates of tiger prawns are monitored carefully throughout the season and temporal spatial closures are triggered when catches in sections of the fishery decrease to certain rates. This system of opening and closing grounds throughout the season is outlined in the DFWA submission. The key tiger prawn spawning areas are closed when the catch rate decreases to 10 kg of tiger prawns per hour. This rate is based on spawning stock and recruitment relationships observed in the fishery in the past and also takes into account increases in effort due to technological advances. The submission is silent on the process for quantifying the technological effort creep. Independent surveys are being refined so that independent data can be used as the trigger in the future. EA considers the use of this constant escapement policy (ie managing fishing to ensure that stock levels will never go below a defined reference point) to be a highly reliable method of ensuring that fishing does not exceed the potential productivity of the stock.

The potential to overfish tiger prawns was clearly demonstrated in this fishery in the 1980s when, as discussed in Part One of this report, this species was severely depleted. Management arrangements since that time have enabled stocks to rebuild and the submission indicates that catches of tiger prawns are now well within an acceptable range that has been developed to detect long-term trends in catch. This range is 538-784t per season and a review will be triggered by a catch outside of this range. Such acceptable ranges have also been identified for the other three groups of prawns taken in this fishery. King, coral and endeavour prawn catches are also currently within their acceptable ranges of 1100-1600t, 80-280t and 1-30t respectively. An assessment of catch against these acceptable ranges will also help DFWA to detect any changes in targeting behaviour of the fishers.

Should an acceptable range be breached, DFWA will conduct an assessment to identify the cause of the abnormality. If this assessment concludes that the fishery is impacting unacceptably on that stock, the ESD report specifies several actions that must be taken to address the impact. As discussed under Part one of this report, there are no time frames specified in the ESD report in which the action must be implemented. EA recognises that DFWA has a history of implementing action in this fishery when required, however we recommend that time frames for actions be incorporated into the ESD report.

If the review concludes that the decline was not due to fishing activities, these actions will not be implemented. The standard management responses will still apply however, including the triggers for spatial closures and seasonal closure.

Management response

The current SBP fishery management regime aims to maintain ecologically viable stock levels through a range of input controls.

As mentioned above, acceptable ranges have been identified for the four types of prawns taken in the fishery and the ESD report specifies review and response requirements should these ranges be breached. Such responses could include further spatial and/or temporal closures.

In addition to these reference ranges, a closure of the whole fishery is triggered when real-time monitoring detects tiger prawn catch rates of less than 10 kg per hour. Tiger prawns are more climate dependent and less robust and therefore far more susceptible to overfishing than the other prawn species of this fishery. It justifies this assumption using information from the period in the 1980s when tiger prawns became overfished and severely depleted. Therefore, by implementing a reference point for tiger prawns, the other species will be protected at levels higher than their own biological bottom line. EA is confident that these reference points and consequent management actions are appropriate to ensure viable stock levels with acceptable levels of probability.

The SBP fishery is managed through a system of input controls designed to regulate the level of harvest from the fishery. These are:

- licences limited to 27;
- gear restrictions (twin otter gear with 8 fathoms headrope length, ground chain of 10 mm, use of BRDs);
- a fixed season for the entire fishery and seasonal closures of tiger prawn spawning areas triggered by tiger prawn catch;
- a ban on day trawling in the majority of the fishery;
- permanent spatial closures to protect prawn nursery and other delicate habitats; and
- temporal spatial closures triggered by tiger prawn catch.

As mentioned above, the tiger prawn catch rate that triggers the temporal spatial closures incorporates increases in fishing power due to technological advances over the last few decades. The submission is silent on the process for quantifying technological effort creep in this fishery. EA is satisfied that even if this process is inaccurate, the combination of the above input controls and application of acceptable ranges will ensure adequate protection of the target stocks.

The submission states that all operators in the fishery tow two 8 fathom nets in normal operations. However, the management plan allows for the use of four 6 fathom nets or three 8 fathom nets. The submission is silent on the process for allowing increases to the size of fishing gear. Due to the combination of input controls and triggers as discussed above, EA is confident that such potential increase in fishing power, should it ever occur, will be managed effectively, including the standardisation of catch triggers, to ensure it will not impact the fishery resources to unacceptable levels in the short to mid-term.

The ESD workshop assessed the risk to byproduct species and only coral and endeavour prawns rated as sufficient risk to require ongoing monitoring. Acceptable ranges have been identified for these species and catches are monitored through logbooks. Several of the byproduct species in this fishery, primarily scallops, tuna and snapper are target species in other fisheries which are currently, or will soon be, under assessment by EA. The harvest of these species in the SBP fishery will be incorporated in those assessments and the risk of the SBP fishery to these species rated as negligible. The management of these species is not discussed in this report. Other species currently taken as byproduct include:

- squid;
- cuttlefish;
- blue swimmer crabs;
- sharks;
- mullet; and
- very small numbers of other fish and shells.

Currently this fishery does not have a list of permitted byproduct. This means that any species may be retained as byproduct if the operators are able to find a market. Although DFWA has a demonstrated history of adaptive management and will review the risk assessment every five years, EA believes that unacceptable levels of damage could be caused during that period if markets were to shift. EA therefore recommends that permitted byproduct should be limited to species currently harvested, with a robust system developed to add or remove species as appropriate. Suitable catch triggers should be developed to ensure any change in targeting behaviour can be detected and addressed as it occurs. Management responses should be clarified, with timeframes for implementation, to address such changes, so that the management arrangements are able to minimise threats to byproduct species.

Ideally, management arrangements affecting a single stock should be under a single jurisdiction, or at least complementary across jurisdictions. EA is satisfied that the majority of species retained in this fishery are fundamentally independent within WA waters.

Concerns were raised in the Northern Fisheries Managers meeting in Darwin in September 2002 that increasing fishing pressure and opportunistic targeting of squid in fisheries around the coast could significantly affect the status of this shared stock. Squid are taken in low amounts in the SBP fishery at an average of 31 tonnes per year. However because of the potential for this take to increase and the cumulative impact of squid harvesting in the numerous fisheries along the coast, EA believes it would be beneficial, for both squid stocks and WA governance, for DFWA to be involved in cross-jurisdictional actions to address shared stock concerns. EA therefore recommends that DFWA commit to participate in any cross-jurisdictional activities regarding squid. This is a concern applicable to all target and byproduct species that may be affected by cross-jurisdictional issues.

Conclusion

EA is satisfied that the information collection system and stock management arrangements are generally sufficient to maintain ecologically viable stock levels within acceptable levels of probability. The regime is capable of controlling the level of take from the fishery. The combination of real time monitoring and a constant escapement policy for the species most vulnerable to overfishing provides high levels of confidence in DFWA's ability to manage the fishery sustainably.

The potential to threaten stocks of byproduct species should be resolved by limiting the species that can be taken. This will prevent changes in fishing practices due to operators targeting species currently not considered as target species when market shifts encourage them to do so. A robust system to manage the addition and removal of species from this permitted byproduct species list should also be developed and implemented to ensure that sustainable harvest of these species is still able to occur. As discussed above, this should be coupled with the implementation of suitable catch triggers, management responses and timeframes for required action.

Concerns regarding cross-jurisdictional management of squid species may not currently be a priority for this fishery. However, EA considers that as squid are taken in several fisheries managed by DFWA, it would be beneficial to governance and environmental concerns if DFWA were to be involved in any action to address these cross-jurisdictional concerns. The benefits of participating in such discussions and responses would also benefit all other target and byproduct species whose stock may be shared with other jurisdictions.

Recommendations

- Permitted byproduct should be limited to species currently harvested, with a robust system developed to add or remove species as appropriate. Suitable catch triggers should be developed to ensure any change in targeting behaviour can be detected and addressed as it occurs. Management responses should be clarified, with timeframes for implementation, to address such changes, so that the management arrangements are able to minimise threats to byproduct species.
- DFWA should participate in any cross-jurisdictional activities regarding relevant target and byproduct species, including squid.

Promote recovery to ecologically viable stock levels

Objective 2: *'Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes'*

This objective is not applicable to the fishery at present. Trigger points and management responses are in place to ensure that the risk of overfishing any of the target and byproduct stocks remains negligible. Tiger prawns were severely depleted in this fishery during the 1980s and actions taken during the 1990s have promoted recovery to ecologically viable stock levels and have maintained them above the limit reference point since 1991.

Ecosystem impacts

Principle 2: *'Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem'*

Bycatch protection

Objective 1: *'The fishery is conducted in a manner that does not threaten bycatch species'*

Information requirements

DFWA implemented a research program in this fishery in 1998 to quantify the levels and composition of bycatch and to assess the impact of Bycatch Reduction Devices (BRDs) on the catch of target and bycatch species. This program included observer surveys. At this time BRDs were only compulsory in one of the two fishing nets of each commercial vessel. BRD grids have been compulsory in both fishing nets since 2002. The use of fish excluder devices has also been trialled during this program. DFWA proposes to implement an observer program in the fishery every five years to ensure information used for risk assessments remains valid. The submission is silent on the scale of this program however EA is satisfied that coverage sufficient to quantify the impact of BRDs on catch would have been sufficiently representative to determine the scale and range of species affected by the fishery.

The submission states that some bycatch species are reported in commercial logbooks. This is generally within the comments section however reporting is very limited and usually only refers to large individuals such as sharks.

DFWA is undertaking research to quantify the populations and distributions of all bycatch species within and outside the trawl area of Shark Bay. The research also seeks to identify the distribution of different environments in Shark Bay. This research will be conducted in the next five years.

DFWA indicated in discussions with EA that target species surveys often collect data on bycatch. This data is currently *ad hoc* and predominantly reports on the catch of large individuals such as sharks.

Assessment

The submission states that bycatch in this fishery is between 4 and 8 times the volume of target catch and approximately 70-80% of this bycatch is small species of fish. The survival rates of these species after interaction with trawl gear are largely unknown but believed to be very low.

The stakeholder ESD risk assessment workshop that was held for this fishery analysed the risk to bycatch species. This analysis concluded that the fishery was of negligible risk to invertebrates and of moderate risk to discarded fish species. All issues raised in the ESD report will be reassessed within five years.

DFWA consequently assessed the risk to individual discarded fish species of this fishery applying the criteria developed by Stobutzki et al (2000). Of the 21 most commonly caught species, two rated as highly susceptible to trawling. The submission states that these two species have high turnover rates and also occur in areas outside the trawled area and therefore current management practices are ensuring that the impacts to these species are minimised. EA is satisfied that the independent surveying of areas within and outside trawl areas will quantify whether these assumptions are valid.

Management response

A scallop fishery also operates in Shark Bay. All fishers with an authority to take prawns also have an authority to retain scallops however fishers that only have an authority to fish for scallops can not retain prawns. Hence, the cumulative impacts on the ecosystem of trawling operations by both fisheries have been assessed and discussed under the assessment of the Shark Bay Scallop Fishery. In summary EA is satisfied that the management arrangements of the two trawl fisheries will not threaten bycatch species in the next five years. Some new actions have been recommended to minimise this risk further.

DFWA recently released a draft Bycatch Action Plan for public comment. The plan incorporates and addresses in detail the issues raised in the ESD report. EA looks forward to viewing this document on finalisation.

Bycatch reduction devices (BRDs) are compulsory in all fishing nets. The effectiveness of these devices has been tested during observer surveys since 1998. These devices currently consist of a grid (often referred to as a Turtle Exclusion Device (TED)) with a maximum grid bar space of 200mm. They generally allow the escape of large individuals of species such as turtles, sharks, fish and rays. Additional information received from DFWA indicates that, due to the detached weed problem in Shark Bay, vessels are currently trailing flounder grids with a bottom grid gap of 300mm and other bar spaces of 200mm. Preliminary data from the observer program indicate that the devices have reduced the catch of some species by 50%, and that they exclude the catch of large specimens, such as turtles, in almost 100% of trawls. The requirement to use these devices is included as a condition of licence.

Fish excluder devices have also been trialled along with the BRD grids. These secondary devices will shortly be implemented in the fishery, at the conclusion of the trials. DFWA have indicated in additional information that they will be compulsory in one fishing net from 2003.

The survival of bycatch species that escape through BRDs is still largely uncertain in most, if not all, trawl fisheries in Australia. Reducing the catch landed on the vessel of some species by 50% does not necessarily equate to a 50% reduction in fishing mortality of that species. Current technology and competing priorities limit the extent to which researchers can assess these reductions in a single fishery. This is a significant issue in a number of fisheries in Australia and is a consideration that EA considers should be a priority for research in the future.

This fishery is a night-only fishery with a minor exception at the opening of the season. Banning daylight trawling can reduce the catch of many bycatch species, that are far less active at night, while maximising the yield of target species that are more active at night, such as tiger prawns. The fishery is also closed for several days during a full moon for the same reason.

Currently less than 40% of Shark Bay is available for trawling. The remaining 60% is closed permanently. The submission indicates that approximately 20% is extensively trawled for prawns. The capacity of the untrawled habitats to sustain stocks of bycatch species is uncertain. As a result DFWA is surveying the species within and outside the trawl grounds to determine the relative proportion of refuge areas for these bycatch species. This research should occur in the next five years.

A performance measure of the ESD report is that bycatch species are found in relatively significant numbers outside the trawled areas. Should the research survey discussed above indicate that this measure is not met, strategies such as expanding area closures or further modifications to trawl gear will be implemented. There are no time frames specified for the implementation of these responses. The number of individuals outside trawled areas may be a suitable trigger for some species, however this trigger should also consider the importance of different habitats for particular stages in the life cycle of some species.

Conclusion

EA is satisfied that reliable bycatch information is currently collected for the fishery however this system could be improved to ensure that significant impacts on bycatch species can be detected. The annual independent surveys on target species may provide an opportunity to monitor bycatch at regular intervals, noting that they may not be completely representative of commercial operations (especially considering the timing of the surveys). EA therefore recommends that DFWA implements ongoing monitoring sufficient to identify long-term trends in bycatch between fished and unfished areas to ensure that information used in the risk assessment for the fishery remains based on accurate and current data.

EA is satisfied that the risks of the impacts of the fishery on bycatch species has been assessed. Measures are in place to avoid capture and mortality of bycatch species. The major areas of concern will be addressed in the short-term by increased independent research. EA recommends that when DFWA applies the results of this research to management arrangements, they also consider the importance of specific areas and habitats to applicable bycatch species during all stages of their life cycle.

The inclusion of timetables in the ESD report to implement management responses to performance measure breaches would increase confidence that overall the fishery is conducted in a manner that does not threaten bycatch species. This is a generic concern that EA has with all management responses in the ESD report and has been addressed as a recommendation earlier in this report.

Recommendations

- Ongoing monitoring should be implemented sufficient to identify long-term trends in bycatch between fished and unfished areas to ensure that information used in the risk assessment for the fishery remains based on accurate and current data.
- The importance of specific areas and habitats to applicable bycatch species during all stages of their life cycle should be considered when applying the results of biodiversity research to management arrangements.

Protected species and threatened ecological community protection

Objective 2: *'The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities'*

Information requirements

Data on protected species interactions have been collected through the observer surveys operating in the fishery since 1998. Previously the only data collected on these species was by

the WA Department of Conservation and Land Management and the submission indicates that this information was sparse.

The submission advises that there is provision in the comments section of the commercial logbooks for recording interactions with cetaceans, dugongs, turtles, syngnathids and seasnakes. Currently this commercial reporting is not compulsory within WA waters. Although the submission states that currently there is only limited fishing in Commonwealth waters, commercial reporting of interaction within those waters is a compulsory requirement of Part 13 of the EPBC Act.

Fishery dependent data in this fishery is relatively robust. EA recommends that reporting of protected species interactions from commercial operations should occur. This data may be validated against observer records to ensure that accurate information is used when monitoring levels of interaction and assessing the impact of the fishery on those species.

One of the biggest barriers to successful commercial reporting of protected species interactions is the capacity of the fishers to identify the species involved. In addition, many operators may not be aware of the importance of reporting for the species involved. Both of these barriers can be reduced through education programs and opportunistic advice from observers and researchers as appropriate.

Assessment

The risks of the fishery to protected species were assessed during the ESD workshop and have been discussed in the ESD report. This analysis concluded that there was a negligible risk to green turtles and a low risk to loggerhead turtles, seasnakes, syngnathids, cetaceans and dugongs. The impact to the environment of provisioning through discards was rated as moderate with the submission listing several species that could be affected by this provisioning, including seabirds and dolphins. The risk assessment will be reviewed within five years.

An annual assessment of loggerhead turtle catches by DFWA is used to measure the performance of this fishery. The submission does not indicate that similar assessments are conducted for any other protected species.

Management response

The submission advises that during observer surveys since 1998, no turtles were caught in any of the nets that had BRDs fitted. The use of these BRDs is also believed to reduce discarded fish and therefore the provisioning of dolphins, sharks and seabirds. These devices are required through a condition of licence and have been discussed further in Objective One of Principle Two. The grids used to minimise turtle catch in this fishery currently consist of bars with spacing of 200 mm. This is somewhat inconsistent with similar devices used in other trawl fisheries in Australia. As a result EA supports rigorous testing and ongoing trials and research to improve the effectiveness of such devices to ensure they are appropriate to meet the objective.

40% of Shark Bay is currently available for trawling. DFWA believe that this, combined with the use of BRDs, allows sufficient refuge areas for protected species that are at risk from the fishery. As mentioned under Principle Two, Objective One, DFWA intends to conduct research surveys to identify the composition and distribution of species within and outside

trawled grounds. This survey will assist in identifying whether the current management responses addressing protected species are sufficient and appropriate.

Current management arrangements are consistent with all threat abatement plans, national plans of action and recovery plans. However, there is no provision in the management plan or the ESD report that requires an amendment to management practices to comply with any future plans of these types. Although DFWA has demonstrated in the past their capacity and willingness to amend arrangements when required, EA recommends that this commitment be formalised in the ESD report or management plan.

Conclusion

The risks to protected species have been identified and assessed and are monitored through a fishery independent system and voluntarily through commercial logbooks. The EPBC Act requires that all protected species interactions in Commonwealth waters be reported to EA. In addition, EA believes that monitoring and managing the impact of fishing on protected species is made more reliable when all interactions of the fishery are required to be reported to the relevant State Department. EA therefore recommends that all protected species interactions from commercial operations should be reported and coupled with an education program to ensure industry have the capacity to make accurate reports.

There are no declared threatened ecological communities in the SBP fishery area and therefore these provisions in the Guidelines are not applicable.

EA is satisfied that the fishery is generally conducted in a manner that aims to minimise and avoid death or injuries to protected species. This system could be strengthened to minimise the risk of unacceptable impact even further through the implementation of the following recommendations.

Recommendation

- A mechanism should be developed to enable the amendment of management arrangements to respond to new information or future Government plans and policies.
- All protected species interactions by commercial operations should be reported and coupled with an education program to ensure industry has the capacity to make accurate reports.

Minimising ecological impacts of fishing operations

Objective 3: *'The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally'*

Information requirements

A range of data has been collected in Shark Bay during the 40 year history of the fishery. These data include catch and effort, environmental flows, climatic variations and sediment and habitat classifications. These will continue to be monitored and considered in assessments related to the fishery where appropriate.

The proposed research program as described under Principle Two, Objective One will provide additional information on habitat and species distribution in and around Shark Bay. This research will be implemented in the next five years.

Assessment

The ESD workshop analysed the risks to general ecosystem components. This assessment will be reviewed every five years. The assessment identified negligible risk to seagrass beds, negligible impacts of translocation and negligible impacts of turbidity caused by operation of the fishery. A low risk was identified for the impacts of taking target and byproduct species on the ecosystem and trophic relationships. These risks will be reassessed during the review in five years, however current management practices ensure they are adequately addressed.

The impact of the fishery on sand/shell habitats, coral/sponge habitats and provisioning through the discarding of bycatch were all rated as a moderate risk for the fishery. Specific management responses and data collection requirements have been developed and specified in the ESD report to address these risks. The management response and performance measures are discussed below.

Concerns were raised during the public comment period that the information used to assess these risks at the workshop was sparse and largely uncertain and that therefore the conclusions were inaccurate. The DFWA response outlined the precaution that was used when utilising the available data. EA concurs with DFWA that in cases where it is impossible to obtain comprehensive information on which to base a decision, that a risk assessment implemented in a precautionary way can provide a suitable decision making system and guide. EA has made several recommendations in this report aiming to improve the information system used when conducting risk assessments.

Management response

40% of Shark Bay is currently available for trawling by the SBP fishery and the remaining 60% is closed permanently. Of the entire fishery area, only 50% is extensively trawled, equating to 20% of the total area of Shark Bay. Research is currently underway to identify the habitat and species diversity inside and outside the trawl areas. This research will provide DFWA with an indication of whether or not they are protecting sufficient representative habitat.

Research to identify seagrass beds and other areas of delicate habitat has been conducted in Shark Bay through several research programs in the past. Habitats that have been identified have been closed to trawling permanently.

The ESD report contains a performance measure that no more than 40% of the sand/shell habitat of Shark Bay will be available for trawling. DFWA believe that currently 25% of this habitat type is available for trawling and therefore current management responses are appropriate.

The performance measure for coral/sponge habitats is that no more than 20% of that habitat type be contained within the legally trawlable area. If future surveys identify that this measure is being breached, the ESD report states that the trawl fishery boundaries may be revised to ensure the management arrangements meet the performance measure. Concerns were raised during the public comment period that 80% of the coral/sponge habitat closed to trawling may not be sufficient to ensure the protection of all of the sessile and long-lived species found in

Shark Bay. EA concurs with DFWA that protecting 80% of this habitat type from trawling entirely, if that 80% is representative, will allow sufficient refuge for long lived and sessile species in the short to mid-term, especially considering the long history of trawling on the remaining 20%. The survey program to quantify the populations and distributions of habitats and bycatch species will identify if further action is required in the mid to long-term.

The lack of a time frame to implement action when the performance measure is exceeded is of concern. This is part of a larger issue with the ESD report as discussed under Part One of this report.

As discussed previously in this report, the use of BRDs and restrictions on fishing gear aim to reduce the impact of fishing operations on the benthic environment and on the ecosystem generally. Using a ground chain of no larger than 10 mm helps to minimise these impacts.

As the risk to the environment from marine and air pollution from fishing operations was considered negligible, the submission is silent on current monitoring, assessment and management arrangements of such impacts. EA is satisfied that the risk assessment workshop was robust enough to ensure short to mid-term risks were identified and addressed. We are confident the DFWA will continue to consider such impacts in their management of the fishery and its impacts.

Conclusion

The environment of Shark Bay, marine and terrestrial, was recognised as outstanding and consequently declared a World Heritage Area in 1991. Shark Bay's listed World Heritage values are located primarily in areas that are protected from or unsuited to trawling. EA is satisfied that fishing activities as currently practiced in this fishery are unlikely to have a significant impact on the world heritage values of Shark Bay in the next five years. Any significant change to existing practices, which is likely to significantly impact on Shark Bay's World Heritage values, may require approval by the Commonwealth Minister for the Environment and Heritage.

As in any trawl fishery, the potential to impact unacceptably and unsustainably on the environment generally is quite high. DFWA has conducted a risk assessment of these issues in this fishery and has implemented actions to address areas of significant concern.

EA is therefore satisfied that the fishery is conducted in a manner that minimises the impact of fishing on the ecosystem generally to the greatest extent practicable in the short to mid-term. EA is satisfied that actions are in place to ensure that mid to long-term risks will be identified in the next five years and all significant issues will be addressed at the next review of the ESD report.

Further actions to strengthen current management of this fishery have been recommended previously in this report. EA is confident that these new actions will contribute to ensuring this objective is met.

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LIST OF ACRONYMS

BRD	Bycatch Reduction Device
DFWA	Department of Fisheries, Western Australia
EA	Environment Australia
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESD	Ecologically Sustainable Development
FRDC	Fisheries Research and Development Corporation
MAC	Management Advisory Committee
MARPOL	International Convention on Marine Pollution
OCS	Offshore Constitutional Settlement
SBP	Shark Bay Prawn (fishery)
SBPMAC	Shark Bay Prawn Management Advisory Committee
TED	Turtle Exclusion Device
UNCLOS	United Nations Convention on the Law of the Sea
VMS	Vessel Monitoring System
WA	Western Australia
WADF	Western Australian Department of Fisheries