Australian Government

Department of the Environment and Heritage

Assessment of the
Western Australian Beche-de-mer Fishery

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Disclaimer

This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Australian Government *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 *Environment Protection and Biodiversity Conservation Act 1999*. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

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Assessment of the ecological sustainability of management arrangements for the Western Australian Beche-de-mer 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 *Final Application to Australian Government Department of the Environment and Heritage on the Beche-de-mer Fishery* (the submission) was received by the Department of Environment and Heritage (DEH) in October 2004. The submission was released for a thirty-day public comment period that expired on 22 November 2004. Three public comments were received. DFWA provided a response to the issues raised and amended the submission where necessary. A final submission for assessment was received on 14 December 2004.

The submission reports on the Western Australian Beche-de-mer Fishery (BDMF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comments and DFWA response to the comments.

Table 1: Summary of the BDMF

Area	All waters adjacent to the State of Western Australia (WA). Harvest primarily occurs in waters north from Exmouth Gulf to the Northern Territory border including the Shark Bay area and the south coast of WA (Commonwealth and State waters).
Fishery status	The target species are considered underfished.
Target Species	Six species of beche-de-mer including: • *Holothuria scabra* (sandfish) • *Holothuria nobilis* (white teat fish) • *Holothuria whitmaei* (black teat fish) • *Thelenota ananas* (prickly red fish) • *Actinopyga echninitis* (deep water red fish) • *Holothuria atra* (lolly fish)
By-product Species	No byproduct species taken (limited to the 6 species of beche-de-mer listed above)
Gear	Hand collection by diving (with scuba or hookah gear) or wading in shallow waters.
Season	Year round during neap tides (strong currents and poor visibility resulting from extreme tidal ranges renders fishing impossible at other times of the month).
Commercial harvest 2002/03	Approximately 120 tonnes live weight (three year average – approximately 100 tonnes).
Value of commercial harvest 2001	Currently unknown.
Recreational harvest	No recreational take. No indigenous take.
Commercial endorsements issued	Limited to 6. One exemption to harvest beche-de-mer commercially has been granted to an indigenous community.
Management arrangements	Output controlled through species specific minimum size limits (MSL): • *Holothuria scabra* (sandfish): 16 cm

	• *Holothuria nobilis* (white teatfish): 32 cm • *Holothuria whitmaei* (black teatfish): 26 cm • *Thelenota ananas* (prickly redfish): 30 cm • *Actinopyga echninitis* (deep water redfish): 12 cm • *Holothuria atra* (lollyfish): 15 cm Input controlled through: • Limited entry (six endorsements and one exemption to take beche-de-mer) • Gear restrictions (harvest by hand only) • Limits on the number of divers operating under each endorsement (4 divers harvesting at any one time)
Export	Exported after processing to Asia.
Bycatch	Bycatch is limited to commensal organisms living on the beche-de-mer harvested.
Interaction with Threatened Species	No interactions have been reported to date.

The area of the fishery includes all waters adjacent to the state of WA, with harvest primarily occurring north from Exmouth Gulf to the Northern Territory border, with catches also taken from the Shark Bay area and the south 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 Australian Government and the Government of WA.

The fishery is limited to the take of 6 species of beche-de-mer (as outlined in Table 1). While all 6 species are permitted under endorsement and exemption conditions, the fishery primarily harvests sandfish. No byproduct is taken in the fishery.

Beche-de-mer are found predominantly in tropical waters and are harvested throughout Australia, with fisheries occurring along the east coast of Queensland, Moreton Bay Queensland, the Torres Strait, Coral Sea, Gulf of Carpentaria and the Northern Territory. Sandfish, black teatfish and surf redfish fisheries have been closed in the Torres Strait, and in some parts of Queensland, to allow these species to recover from overfishing.

The average life span for beche-de-mer is 5-10 years. The size at first sexual maturity varies between species. For sandfish, the most recent estimates have found that sexual maturity occurs at 150 mm in the Torres Strait (Skewes et al. 2003) and 160 mm in New Caledonia (Conand 1989). Age at first maturity has not been established for sandfish, however Long & Skewes (1997) suggest a breeding age of approximately 2 years. The prickly redfish attains the largest maximum size in the fishery at 60 cm.

Beche-de-mer are generally broadcast spawners and fertilisation takes place in the water column. Successful fertilisation and population maintenance can be highly dependent on spawner density (Stutterd & Williams 2003). Studies of the reproductive cycles of commercially important species reveal a seasonal variation in the spawning activity with some species becoming active in warmer months and others during cooler months (Preston 1997).

Beche-de-mer occur in a range of environments including muddy, sandy bottomed coastal areas (sandfish), shallow reef tops (black teat fish) and clear water in coral reef areas at depths of 30 m and deeper (white teat fish). The fishery occurs in three bioregions in WA including the Gascoyne, Pilbara and Kimberley.

Beche-de-mer is a highly valued marine product that is in large demand throughout Asia. The fishery supports a significant processing and export industry.

Beche-de-mer stocks are generally at risk from overexploitation due to their limited dispersal, patchy distribution, ease of collection, slow recovery from overfishing and the limited information on biological and spatial distribution available. There is a history of "boom-bust" cycles in international beche-de-mer fisheries, with a number of fisheries collapsing due to overfishing. The species therefore requires strict management controls to ensure the sustainability of harvests. Beche-de-mer is currently being considered for listing under the Convention on International Trade of Endangered Species (CITES) to afford the species further protection in trade.

Approximately 80 tonnes of beche-de-mer were harvested in the BDMF in 2002-03. The fishery began in 1995, harvesting 90 tonnes and rapidly developed to harvesting 382 tonnes in 1997. Catch in the fishery has since decreased to a more stable three-year average of 80 tonnes. The fishery is considered to be in an experimental phase and will undergo a major review in 2007 when the current beche-de-mer endorsements expire. The review is aimed at determining the appropriate level of allowable commercial exploitation in the future and any subsequent requirements for the implementation of a formal management plan and/or other management strategies.

The fishery harvests six species of beche-de-mer by hand harvest with the assistance of diving apparatus such as scuba or hookah or by wading in low tide periods. Fishery management arrangements include limited entry, species limit, minimum size limits and limits on the number of divers permitted to harvest under each endorsement. Currently 6 endorsements and one exemption are in operation. The exemption has been issued for harvest in the Shark Bay World Heritage Area. The Shark Bay exemption has not been fished, and expires in April 2005. DFWA has advised that given the lack of harvesting activity by the exemption holders, it would be questionable whether another similar exemption would be issued.

There are no bycatch species taken in the fishery (apart from minor amounts of commensal organisms living on or within the beche-de-mer) due to the highly selective nature of harvest. Listed species under the Australian Government EPBC Act that may be affected by this fishery, include turtles, syngnathids, seasnakes and cetaceans. Possible protected species interactions in the fishery include vessel interactions with turtles and cetaceans. There have been no interactions reported to date, and such interactions are considered unlikely given the low number and slow speed of the vessels through the fishing area. Possible interactions are assessed under Principle Two of this report.

There is no recorded take of beche-de-mer by the indigenous and recreational sectors.

The fishery is managed by endorsements issued under the WA *Fish Resources Management Regulations 1995* (FRMR), in force under the WA *Fish Resources Management Act 1994* (FRMA). An Ecologically Sustainable Development report (ESD report) has been prepared for the fishery and outlines objectives and indicators for determining the effectiveness of the management for the BDMF.

Overall assessment

The material submitted by DFWA demonstrates that the management arrangements for the BDMF meet most of the requirements of the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*.

While the fishery is relatively well managed, DEH has identified a number of risks that must be managed to ensure that their impacts are minimised:

- Absence of a robust stock assessment;
- Limited catch information, particularly species specific catch information;
- Potential for serial and localised depletion in the fishery;
- Limited information on critical elements of beche-de-mer biology and ecology; and
- Susceptibility of target species to overfishing.

Recommendations to address these issues have been developed to ensure that the risk of impact is minimised in the longer term. Through the implementation of the recommendations and the continuation of a responsible attitude to the management of the fishery, management arrangements are likely to be sufficiently precautionary and capable of controlling, monitoring and enforcing the level of take from the fishery while ensuring the stocks are fished sustainably.

The BDMF is in an experimental stage and has made some progress in developing sound management arrangements. The management regime aims to ensure that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. In the short term, the fishery is being managed in an ecologically sustainable manner and is working to address existing problems and minimise environmental risks.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements specified for the fishery, DEH considers that the fishery will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short term. DEH therefore recommends that the fishery be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be undertaken by DFWA to contain the environmental risks in the long term. DEH considers that the fishery, as managed in accordance with the management regime is not likely to cause serious or irreversible ecological damage over the period of the export decision. Specifically, the WTO declaration would allow the export of product from the fishery for a period of 3 years. The WTO declaration will require annual reporting on the progress of implementing the recommendations of this report and other managerial commitments. The implementation of the recommendations will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time. DEH welcomes the commitment to formally review the fishery in 2007.

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.

Protected species occurring in the fishery area include marine turtles, cetaceans, syngnathids and seasnakes. The fishery has no recorded interaction with these species groups. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the WA BDMF management regime be declared an accredited management plan under Sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEH considers that the fishery to which the regime relates does not, or is not likely to, adversely affect the survival in nature of listed threatened species or population of that species, or the conservation status of a listed migratory species, cetacean species or listed marine species or a population of any of those species. DEH also considers that the regime requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and the level of interaction under current fishing

operations is low. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the management regime, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

The assessment also considered the possible impacts on the World Heritage values of Shark Bay WA. One exemption has been given to an indigenous community to commercially harvest in the Shark Bay region. No other harvesters are permitted to harvest within the area. The community has not harvested any beche-de-mer, so there has been no impact on the World Heritage values of the Shark Bay area. On this basis DEH considers that an action taken by an individual fisher, acting in accordance with the management regime, would not be expected to have a significant impact on the World Heritage values of the Shark Bay World Heritage Area.

The implementation of recommendations and other commitments made by DFWA in the submission will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time.

Recommendations

1. DFWA to advise DEH of any material change to the BDMF's legislated management arrangements that could affect the criteria on which EPBC decisions are based, within three months of that change being made.
2. DFWA to ensure, where appropriate, that any relevant indigenous and conservation groups interests in the fishery are considered through consultative mechanisms throughout the development of the fishery.
3. The ESD Report, including all performance measures, responses and information requirements to be incorporated into the management regime and decision making process.
4. DFWA to develop and implement a compliance risk assessment for the BDMF and implement a compliance strategy to address any identified risks.
5. DFWA in its Annual State of the Fisheries Report, to report in the performance of the fishery against performance measures that relate to the sustainability of the fishery.
6. Within 6 months DFWA to implement a revised logbook, inclusive of species specific data, to provide more reliable and comprehensive data for fishery management.
7. DFWA to cooperate with other jurisdictions in efforts to undertake research on key gaps in the understanding of beche-de-mer biology and ecology.
8. Within 2 years DFWA to implement data validation mechanisms to ensure that current information collected on the catch and effort patterns within the fishery is available to adequately inform management.
9. DFWA to obtain estimates of sustainable harvest levels for key target species in the fishery.
10. Within 18 months DFWA to review performance measures to take into account the best available information on sustainable harvest levels for the beche-de-mer fishery, implement species specific performance measures and revise the management response for the fishery to provide clear timeframes for the implementation of management action if a performance measure is exceeded.
11. DFWA to develop and implement within 18 months, measures to minimise localised depletion and serial depletion in the fishery.

12. Within 2 years DFWA to review the current size limits on all target species to ensure that they are set in a precautionary manner consistent with available research on the size at first maturity of beche-de-mer species.

13. DFWA to provide a mechanism which allows fishers to record interactions with protected/listed species. DFWA to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.

1. PART I - MANAGEMENT ARRANGEMENTS

The BDMF is managed by DFWA.

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

- The WA *Fish Resources Management Act 1994* (FRMA);
- The WA *Fish Resources Management Regulations 1995* (FRMR);
- The WA Ecologically Sustainable Development Report (ESD Report) on the BDMF;
- Relevant Gazetted notices and endorsement conditions.
- Reports provided to DEH in accordance with previous export approval conditions.

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

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the management arrangements and documents referred to above to DEH's assessment of the fishery, an amendment could change the outcomes of the assessment and decisions stemming from it. Export decisions relate to the arrangements in force at the time of the decision. In order to ensure that these decisions remain valid, DEH needs to be advised of any changes that are made to the management regime and make an assessment that the new arrangements are equivalent or better, in terms of ecological sustainability, than those in place at the time of the original decision.

Recommendation 1: *DFWA to advise DEH of any material change to the BDMF's legislated management plan and/or arrangements that could affect the criteria on which EPBC decisions are based, within three months of that change being made.*

Management of the fishery to date has included consultation between DFWA and industry. No management advisory or fishery management committee has been established. DFWA advises that consultation will occur with a range of industry and stakeholder groups if the fishery progresses to a managed fishery status in 2007 (in accordance with the requirements of s.64 and s.65 of the FRMA), however DEH considers that these groups, and indigenous groups, should be consulted on all issues relating to the management of the fishery.

Recommendation 2: *DFWA to ensure, where appropriate, that any relevant indigenous and conservation interests in the fishery are considered through consultative mechanisms throughout the development of the fishery.*

The fishery is managed as an experimental fishery under the FRMR and FRMA. An ESD report, on which the submission is largely based, is an integral part of the management regime. It examines benefits and costs associated with the fishery. It also identifies and assesses risks posed by the fishery to the target species and associated environmental components. When finalised the ESD Report will document the performance of the fishery and its management in terms of the ecological, economic, social and governance issues associated with the fishery. This report will be publicly available in document form and on the DFWA website. The management commitments specified in this report have been fundamental in DEH's assessment and consequent recommendations. The ESD report is not currently a formal component of the legislative arrangements for the fishery. Although DEH 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. DFWA has advised that it proposes to formally publish the

management objectives and performance measures for the fishery as part of a series of Ministerial guidelines, as an adjunct to the management plan that is currently being developed. The Ministerial Policy Guidelines will provide the policy framework for the management for each fishery. This document will reflect the management objectives, philosophy and guidance for decision making including the upcoming legislated management plan, the ESD report, and as relevant, reference to other documents.

Recommendation 3: *The ESD Report, including all performance measures, responses and information requirements to be incorporated into the management regime and decision making process.*

The ESD report will be reviewed externally every 5 years, including an examination of the validity of the objectives and performance measures.

Management of the fishery is based on a mixture of input and output controls. Such controls include:

- Limited entry to six endorsements and one exemption for an indigenous community;
- Harvesting limited to six species of beche-de-mer;
- Size limits for all six species harvested in the fishery (outlined in Table 1);
- Gear restrictions (hand collection only by diving, hookah or wading);
- Limit on the number of harvesters and crew permitted under each endorsement (4 divers per endorsement harvesting at any one time with 6 crew members);
- A number of small area closures.

An assessment of the effectiveness of these measures is included in Part II of this report.

DFWA has limited compliance and enforcement resources dedicated to the BDMF. Compliance tools are based on licence and catch checks and no offences have been detected to date. Vessel Monitoring System (VMS) data will soon be available for all vessels in the fishery as fishers have recently agreed to fit VMS technology to all vessels. DEH commends this approach as one strategy to address compliance issues and validate effort data.

It is expected that, in the 2007 review of the fishery, the completion of a compliance risk assessment for the fishery will enable DFWA to better direct available resources to further increase the effectiveness of limited enforcement and compliance activities. DEH considers that this assessment should be conducted before the fishery review in 2007 to ensure that compliance measures utilised in the fishery are effective.

Recommendation 4: *The Department of Fisheries, Western Australia, to develop and implement a compliance risk assessment for the BDMF and implement a compliance strategy to address any identified risks.*

Annual reviews of the performance of the fishery have been provided to DEH in accordance with previous export declaration conditions imposed on the fishery. Additionally, the objectives and compliance matters for the fishery are strategically assessed through the annual Northern Australian Fisheries Management Workshop, which includes State, Territory and Commonwealth fishery managers, research scientists and compliance officers.

The performance of the fishery is reported annually within the State of the Fishery Report. The fishery does not currently report against a set of agreed objectives within the report, unlike other WA fisheries that operate under more formal arrangements. Currently the total catch for the fishery is reported within the report in an Appendix, which contains a table of catches from fishers'

statutory monthly returns. DFWA advises that if the fishery develops after 2007, the Department will progress towards individually reporting on the fishery in the State of the Fisheries document. DEH considers that the performance of the fishery should be reported on annually and, as is the case for all WA fisheries, made public in hard copy and on DFWA's website. Although the fishery is still considered to be in a developmental phase (despite being in operation for close to a decade), the performance of the fishery should be available for public scrutiny, particularly given the vulnerability of beche-de-mer stocks to overfishing and lack of information on species biology and ecology.

Recommendation 5*: Department of Fisheries, Western Australia, in its Annual State of the Fisheries Report, to report on the performance of the fishery against performance measures that relate to the sustainability of the fishery.*

The ESD Report, including objectives and indicators for the fishery, will be completed and externally reviewed every five years. The ESD Reports are discussed more fully in Part II of the report.

Fishery dependent data relating to the target species is collected on a regular basis in the fishery. No fishery independent information is collected. Discussion of the information collection system can be found in Part II 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.

Beche-de-mer is harvested under separate fishery management arrangements in the Northern Territory and Queensland including Moreton Bay, East Coast, Torres Strait, Coral Sea and the Gulf of Carpentaria. As beche-de-mer stocks are vulnerable to over-exploitation, management arrangements in place must take into account available research on the biology and ecology of the species. This is further discussed under Principle One of this report.

DEH considers 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. DEH expects that DFWA will also ensure compliance with any future plans or policies as they are developed.

No regional or international management regimes, to which Australia is a party, are of direct relevance to the fishery. The prime international regime affecting the fishery is the United Nations Convention on the Law of the Sea (UNCLOS). The management regime essentially complies with this. Other international regimes are applicable to fisheries management but do not explicitly involve this fishery, for example the 1992 Convention on Biological Diversity and in particular the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the Submission, the fishery's compliance with their requirements can be assessed by examination of Part II of this report. The application of the International Convention for the Prevention of Pollution from Ships (MARPOL) to vessels operating in the fishery is explicitly discussed under Principle 2, Objective 3.

Due to global concern about the status of beche-de-mer stocks, holothurians are being considered for listing on Appendix II of the Convention on the International Trade in Endangered Species (CITES). At the time of writing, potential listing of holothurians is still in the preliminary stages of

consideration. If they were listed on Appendix II, trade could still continue if the fishery met the CITES requirements under regulation of CITES permits. Assessment of the BDMF under the EPBC Act incorporates consideration of the CITES Appendix II requirements and therefore the implications of listing would be limited to a change in permitting for export and import product.

DEH considers it is incumbent on all authorities to develop a thorough understanding of the framework of national, regional and international agreements and their applicability to export-based fisheries for which they are responsible.

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, which was occurring immediately before the commencement of the EPBC Act, may continue those actions. An enlargement, expansion or intensification of a use is not a continuation of a use.

One exemption has been granted to an indigenous community to allow the commercial harvest of beche-de-mer from the Shark Bay World Heritage Area, however harvest has never occurred. The exemption expires in April 2005 and noting the lack of activity DFWA advises that the permit may not be reissued. Harvest of beche-de-mer under the 6 endorsements of the fishery is not permitted in the Shark Bay World Heritage Area. For this reason, and the outcomes of the assessment as listed throughout Part II of this assessment report, DEH considers 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 three 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 Australian Government Minister for the Environment and Heritage.

Conclusion

DEH considers that the BDMF management regime is documented, publicly available and transparent, however further consultation is needed to ensure that all relevant stakeholders are involved in the development of the fishery. This will be addressed through the implementation of Recommendation 1. The management arrangements are adaptable and underpinned by appropriate performance criteria by which the effectiveness of the management arrangements can be measured, enforced and reviewed.

The management arrangements are somewhat capable of controlling the harvest through a combination of input and output controls and DEH has made a number of recommendations (**Recommendations 10, 11 and 12**) to ensure that management arrangements are capable of controlling harvest at an ecologically sustainable level. Periodic review of the fishery is provided for and DEH has made a recommendation (**Recommendation 2**) to ensure that management addresses the enforcement of critical aspects of the management arrangements. The management regime adheres to arrangements established under Australian laws and international agreements.

DEH considers that there is scope to further refine the management arrangements and has provided a number of recommendations for improvements in the longer term.

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 daily logbooks. The logbooks are completed for each day that fishing takes place and are provided to DFWA on a monthly basis in accordance with the statutory catch and effort system (CAES). Logbooks are based on 60 x 60 nautical mile grids and contain information on catch (weight), days and hours fished by month and year and number of crew on each vessel. Fishers note the method and condition of catch (whole or "gilled and gutted"). Plans are in place for observers to participate in one or two cruises during 2005 to validate the data. An annual report is submitted from each operation summarising the nature and success of fishing operations over the previous 12 months.

To date harvesters have not been required to provide species-specific or effort-specific data. DEH is concerned at the lack of species-specific data, especially for species such as the black teat fish, which is particularly vulnerable to overfishing and has been overfished in other Australian fisheries. Species specific data is essential to ensure the sustainable management of each species harvested in the fishery, particularly given that each species of beche-de-mer can exhibit different biology and ecology in terms of habitat preference, reproduction and growth and will therefore need management measures developed on a species specific basis.

DFWA has noted that because of the lack of species-specific data, the occurrence of species substitution (eg if abundance of the principal species declines and another species is targeted as a replacement) will not be detected through the current catch and recording. Species substitution (or market shift) is a concerning trend in beche-de-mer fisheries generally, in that once higher value species have been fully exploited (or in some cases overfished), effort shifts to lower value species (Stutterd &Williams 2003). DFWA has worked with fishers to develop a more detailed logbook, which is currently being tested on two vessels. The logbooks will be trialled in all 6 vessels in 2005, with a view to formally implementing the logbooks in 2006. The new logbooks will also include recording of Global Positioning System (GPS) coordinates that will provide more detailed spatial information.

DEH considers that the revised logbooks, inclusive of species specific data, should be implemented as a priority in the fishery to ensure that adequate catch information for the fishery is available to management to ensure that the harvest of each target species is sustainable and that changes in catch per unit effort (CPUE) or changes in the composition of catch, is noted and responded to. DFWA should also ensure that harvesters are able to identify species to a reliable level.

Recommendation 6: *Within 6 months DFWA to implement a revised logbook, inclusive of species specific data, to provide more reliable and comprehensive data for fishery management.*

No fishery independent data is collected in the fishery.

Understanding of the basic biology and ecology of beche-de-mer is fundamental to the ecologically sustainable management of the WA BDMF. Significant knowledge gaps exist across all Australian beche-de-mer fisheries, which would benefit from a cooperative approach to research. Areas requiring attention include but are not limited to:

- Juvenile ecology and habitat preference;
- Reproduction (fecundity, reproductive strategy, required density for successful fertilisation);
- Recruitment patterns (source/sink populations or localised recruitment);
- Basic biology (size at first maturity, growth rates, maximum size and age);
- Species distribution; and
- Ecological role of beche-de-mer species.

Public comments also raised concerns about these knowledge gaps. Given the limited resources available for research in a number of beche-de-mer fisheries, DEH recommends that DFWA cooperate with other jurisdictions in efforts to undertake research on key gaps in the understanding of beche-de-mer biology and ecology.

Recommendation 7: *DFWA to cooperate with other jurisdictions in efforts to undertake research on key gaps in the understanding of beche-de-mer biology and ecology.*

DEH considers that the validation of data for the fishery is currently insufficient to provide an accurate estimate of fishing activity. As no fishery independent data is collected for the fishery, robust and reliable fishery dependent data is vital for the sustainable management of the fishery. DEH therefore recommends that DFWA implement data validation mechanisms, to ensure that current information provided by fishers on the catch and effort patterns within the fishery are robust. DFWA has recently reached an agreement with fishers to allow observers onboard fishing vessels twice a year to validate data. DEH commends this approach as a means of validating data.

Recommendation 8: *Within 2 years DFWA to implement data validation mechanisms to ensure that accurate and robust information is collected on the catch and effort patterns within the fishery to adequately inform management.*

No research has been conducted, or is proposed for the fishery. DEH is concerned at the lack of research in the fishery, particularly given the vulnerability of beche-de-mer stocks to overfishing and the current limited information on beche-de-mer biology and ecology. DEH understands that this is the case across a range of Australian beche-de-mer fisheries, and has made a recommendation (**Recommendation 6**) to improve understanding of beche-de-mer ecology and biology.

DEH does not consider that the range of fishery dependent data collected is currently sufficient to ensure the sustainable management of the fishery. DEH considers that the extension of existing data collection, combined with the implementation of a research program will be important for the future management of the fishery.

Assessment

No formal stock assessment has been conducted for the fishery. DFWA has generated a preliminary biomass dynamics model to estimate the maximum sustainable yield (MSY) for the fishery utilising available catch and catch rate data from the fishery reports. The estimated MSY for the fishery is 155 t per year. In order to ensure a precautionary approach and to take into account possible overestimations in the calculation of MSY, DFWA has set the MSY at 80-100 t per year.

Apart from information collected through logbooks, little is known about the distribution and spatial structure of stocks. CPUE decreased markedly from 1997 to 1999 and has since remained at fairly stable levels. DEH is concerned at the decrease in CPUE, particularly given the vulnerability of beche-de-mer to overfishing and localised depletion and the lack of a robust stock assessment for the fishery. DEH therefore recommends that DFWA obtain estimates of sustainable harvest levels for all target species in the fishery.

Recommendation 9: *DFWA to obtain estimates of sustainable harvest levels for key target species in the fishery.*

DFWA states that biomass dynamic models may be completed at the level of each fishing block to provide finer resolution of the potential yield of the fishery in the 2007 review. DEH considers that this approach will provide a more accurate picture of stock status at each block level and will assist in the prevention of localised and serial depletion in the fishery. DEH therefore supports the completion of biomass dynamic models at the level of each fishing block.

The fishery is assessed against a set of preliminary performance measures annually (see Table 2). The review assesses the effort, both in terms of days fished and diver effort, total catch and catch rates, and compares current years results with previous historical data for the fishery.

Removals from the recreational and indigenous sectors are insignificant. The monitoring arrangements for the fishery covers the catch by the commercial fishers, but does not obtain information on illegal catch or recreational take. There have been no reports of illegal catch or recreational take. There is no take from other fisheries, such as trawl fisheries. DEH expects that DFWA will continue to periodically monitor harvest from the recreational and indigenous sectors.

Byproduct is not currently allowed to be taken in the fishery.

Management response

The WA BDMF management regime aims to maintain ecologically viable stock levels through a range of input and output controls. These measures are outlined in Table 1 and Part I of this report. In addition to these controls, a range of external drivers control harvest by limiting effort spatially and temporally. These drivers include:

- the isolation of fishing locations within the fishery (vessel effort is therefore restricted);
- high tidal ranges resulting in harvesting during neap tides only;
- poor visibility due to strong currents and high turbidity of water;
- dangerous animals including sharks, crocodiles;
- cyclones restricting harvesting largely to winter-spring; and
- depth (dive safety profiles limit effort in waters deeper than 20+ metres).

DEH considers that the combination of input and output controls as well as external drivers listed above should ensure adequate protection of the target stock in the short term, but is concerned at the limited management strategies in place to control the level of take to ensure the longer term sustainability of all species in the fishery. DEH is further concerned that the lack of knowledge on the general biology and ecology of the target species may have the potential to seriously undermine the effectiveness of DFWA management strategies. A number of recommendations have been made to address these concerns.

The ESD report prepared for the fishery includes an operational objective, performance measures and management responses, as outlined in Table 2. DFWA advises that the current performance measures are only of a preliminary form, with further development expected leading up to the 2007 review.

Table Two – Summary of Operational Objective, Performance Measures and Management Response for the WA BD.

Operational Objective	Performance Measures	Management Response
Target stock - To maintain sufficient spawning stock, at or above a level that minimises the risk of recruitment overfishing, to ensure recruitment at levels will replenish what is taken by fishing, predation and other environmental factors.	**Catch –** The preliminary acceptable catch range is 50-150 tonnes. **Catch rate –** The preliminary limit point for this fishery is that the catch rate should remain above 80 kg/crew-day fished. **MSY–** Estimated maximum sustainable yield is 80-100 t per annum.	The following approach would be used prior to the beginning of the next season if either of the performance measures are exceeded: 1. Find out why the acceptable catch range has not been met. Evaluate if there has been a significant shift in the targeting or market prices for the beche-de-mer to significantly alter effort/catch. If the lowered catch levels are due to effort reduction then no action to be taken. 2. If there were a drop in the catch rate below the limit of 80 kg/crew-day, an assessment of the fishery operations would be made to determine if this was a reflection of a decline in the relative abundance or due to changes in the way the fishery was operating. If it was caused by a drop in abundance, strategies available to offer further protection to the breeding stock if required include: • Possible reductions in the total effort expended in the fishery through a reduction in the length of the fishing season; • Possible area closures The precise actions taken would be determined in consultation with industry. The ability to implement these strategies is provided for within the FRMA.

(modified from the WA submission *"Final Application to Australian Government Department of the Environment and Heritage on the Beche-de-mer Fishery August 2004"*).

DEH is concerned that while the biomass dynamic model estimated a MSY of 80-100 t per annum for the fishery, the preliminary acceptable catch range for the fishery is between 50-150 t. DEH considers that the acceptable catch range for any fishery should reflect any available information and be set within the parameters of an estimated MSY. DEH considers that the performance measures outlined for the fishery are not species specific and therefore do not take into account different species vulnerability to overfishing. DEH understands that this is because logbook reports

are not species specific but considers that the performance measures should be reviewed to consider the range of species harvested in the fishery. DEH is also concerned that the management response is not inclusive of timeframes for action and does not state the action to be taken if a performance measure is exceeded. DEH therefore recommends that the performance measures and management response should be reviewed and amended to be species specific, to take into account the best available information on sustainable harvest levels for the fishery and provide clear timeframes for the implementation of management action if a performance measure is exceeded.

Recommendation 10: *Within 18 months DFWA to review performance measures to take into account the best available information on sustainable harvest levels for the beche-de-mer fishery, implement species specific performance measures and revise the management response for the fishery to provide clear timeframes for the implementation of management action if a performance measure is exceeded.*

Localised and serial depletion is a potential concern in all beche-de-mer fisheries. Beche-de-mer are broadcast spawners and if spawning stocks are reducing below a critical level then successful recruitment may not occur due to the greater distance between males and females (Stutterd and Williams 2003). DEH considers that the risk of localised depletion of the target stock and its impact on the wider ecosystem have not been adequately addressed in management arrangements. Similarly the risk of serial depletion of the target stocks has not been addressed in management arrangements. DEH therefore recommends that DFWA develop and implement measures to minimise the risk of localised and serial depletion. Management measures could include zoning (on a smaller scale than currently in place) and/or seasonal closures during identified spawning periods.

Recommendation 11: *DFWA to develop and implement within 18 months, measures to minimise localised depletion and serial depletion in the fishery.*

Size limits have been specified for the target species (as outlined in Table One). DFWA states that these size limits are based on those established in the NT Trepang (beche-de-mer) Fishery. The size limits specified for the NT Trepang Fishery vary significantly from limits imposed in QLD beche-de-mer fisheries and are set at levels below or extremely close to the estimated size at sexual maturity as outlined in Table 3.

Table 3 – Comparison of size at first maturity and size limits between States for various beche-de-mer species.

Species	Estimated size at first maturity (cm)	WA/NT MLS Limits (cm)	Qld MLS Limits (cm)
Holothuria scabra (sandfish)	15	16	20
Holothuria nobilis (white teat fish)	32	32	40
Holothuria whitmaei (black teat fish)	26	26	30
Thelenota ananas (prickly red fish)	34.5	30	50
Actinopyga echninitis (deep water red fish)	12	12	20
Holothuria atra (lolly fish)	12	15	20

DEH considers that size limits currently set for the fishery do not adequately take into account available evidence on size at first maturity and therefore do not achieve the management objective

of protecting a proportion of the spawning stock. This is further supported by a 2003 study, which indicated that the WA BDMF size limits were set at the size at first maturity for most species and could therefore increase this limit by 20% to ensure that size limits are set in a precautionary manner (Stutterd & Williams 2003). DFWA states that the size limits will need to be reviewed when the major review of the fishery occurs in 2007, however DEH considers that size limits should be reviewed prior to this review to ensure that they are set in a precautionary manner consistent with current research on the size at first maturity of beche-de-mer species.

Recommendation 12: *Within 2 years DFWA to review the current size limits on all target species to ensure that they are set in a precautionary manner consistent with available research on the size at first maturity of beche-de-mer species.*

There is no byproduct taken in the fishery.

Conclusion
DEH considers that the management regime in the WA BDMF provides for the fishery to be conducted in a manner that does not lead to overfishing in the short-term but is concerned that the information collection system and management arrangements require further refinement to ensure the sustainable management of individual species and local areas in the long term.

DEH considers that there is scope to further refine some of the existing information collection, assessment and management responses and has provided a number of recommendations for improvements in the longer term.

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. Performance measures and management responses are in place to avoid the risk of overfishing the beche-de-mer stocks of WA. DEH has concerns in relation to the performance measures and management response timeframes to ensure that management arrangements are capable of detecting and remedying any significant decline in stock abundance, and has made recommendations to address this issue (see **Recommendations 6 & 7**).

Conclusion

DEH considers that the WA beche-de-mer stock is not currently below a defined reference point but is concerned that management arrangements are currently not sufficient to detect declines in stock abundance. DEH considers that the implementation of Recommendations made in Part I of the report will be essential to ensure the ecologically sustainable management of the fishery in the long term.

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

Due to the highly selective nature of harvesting in the fishery (hand collection of live specimens) bycatch is limited to commensal organisms such as pearl fish living on or within the beche-de-mer. Compulsory logbook data have not reported any take of non-target species. The implementation of a more detailed logbook system should provide further information on target stock and confirm the extent of any bycatch implications for the fishery.

Assessment

Bycatch species (apart from commensal organisms) are not taken in the fishery. As a result no risk assessment has been conducted.

Management response

No bycatch species are taken in this fishery, other than commensal organisms. Accordingly no management measures are imposed in the fishery. DEH considers that possible impacts to bycatch species have been minimised.

Conclusion

DEH considers that there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that DFWA would undertake appropriate actions to ensure that the fishery does not threaten bycatch species.

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

Protected species occurring in the area include cetaceans, syngnathids, sea snakes and marine turtles. There have been no interactions reported to date, however fishers are not required to report interactions under endorsement conditions.

Assessment

Given the low impact and benign fishing method used in the fishery, the most likely negative impact on protected species would be boat strikes, however, boat strikes are unlikely due to the limited endorsements in the fishery and the fact that the majority of boats used in the fishery are "drifting" following the harvesters at very low speeds.

Management response

No measures to manage the impact of the fishery on protected species and ecological communities have been developed due to the highly selective and benign fishing method employed in the fishery.

Whilst DEH agrees that interactions with endangered, threatened or protected species are unlikely, DEH considers that a mechanism should be developed to allow for the reporting of interactions with endangered, threatened or protected species in the fishery, particularly as the fishery operates in Commonwealth waters and within the Shark Bay World Heritage area.

Recommendation 13: *Department of Fisheries Western Australia to provide a mechanism which allows fishers to record interactions with protected/listed species. DFWA to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.*

Conclusion

DEH notes that there have been no reported interactions with protected species in this fishery and considers that 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. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that appropriate actions will be undertaken to ensure the fishery avoids mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

A recommendation has been developed to ensure that the risk of unacceptable impact on protected species can be detected and minimised in the longer term.

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

Research regarding ecosystem impacts is not available for the fishery due to its relatively small size and limited number of participants. Impacts are believed to be minimal due to the relatively benign method of fishing and the range of external drivers (outlined in Part II, Objective 1) that prevent harvest in certain locations of the fishery area.

Assessment

The potential of the WA BDMF to impact unacceptably and unsustainably on the environment generally is considered to be low, due to the highly selective nature of harvest in the fishery. As a consequence, DFWA has not conducted a risk assessment of these issues in the fishery.
The impact of vessel discharge on the ecosystem is considered to be low. All vessel survey, manning, safety and operational requirements in WA are managed under legislation administered by the Department for Planning and Infrastructure. There have been no issues with vessel discharge from the fishery to date.

Fishing gear is not regarded as posing a significant risk to the physical environment in the fishery as harvesters are limited to hand collection only, with the assistance of scuba or hookah breathing apparatus. During collection, divers operate from live boats, which are not anchored but move with the diver, therefore minimising impacts of anchoring on the sediment.

The impact of removing beche-de-mer from the ecosystem is not well understood, however it is generally believed that the species play an important role in water quality, benthic communities and structure and productivity flows of the ecosystem. Experimental studies indicate that heavy overfishing can lead to general environmental degradation, including the decrease in occurrence of seagrass beds which provide important habitat for many marine species (Stutterd & Williams 2003). The effects of overfishing are further compounded by the susceptibility of beche-de-mer to localised depletion.

Management response

No management measures are in place to specifically minimise the effects of harvesting beche-de-mer on the wider ecosystem. Management measures to protect the target species, including limited

entry, minimum sizes and gear restrictions, may provide some mitigation for the ecosystem effects of harvesting beche-de-mer.

DEH considers that the risk of localised depletion of beche-de-mer and subsequent impacts on the ecosystem have not been adequately addressed in management arrangements. DEH has made a recommendation (**Recommendation 11**) to address the issue of localised depletion and serial depletion, which should also address potential ecosystem impacts and to ensure that the impact of removal of the species on the ecosystem is minimised.

Conclusion

DEH considers that the fishery is conducted in a sufficiently precautionary manner that minimises the impact of fishing operations on the ecosystem generally. Recommendations have been developed to ensure that the risk of significant impact by the fishery on the marine environment generally is minimised in the longer term.

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LIST OF ACRONYMS

BDMF – Beche-de-mer Fishery
CAES – Catch and Effort System
CITES – The Convention on International Trade of Endangered Species
CPUE – Catch per Unit Effort
DEH – The Department of the Environment and Heritage
DFWA – The Department of Fisheries Western Australia
EPBC Act – The Environment Protection and Biodiversity Conservation Act 1999
ESD Report – Ecologically Sustainable Development Report
FRMA – Western Australian Fisheries Resources Management Act 1994
FRMR – Western Australian Fisheries Resources Management Regulations 1995
GPS – Global Positioning System
MARPOL - International Convention for the Prevention of Pollution from Ships
MSL – Minimum Size Limits
MSY – Maximum Sustainable Yield
OCS – Offshore Constitutional Settlement
UNCLOS - United Nations Convention on the Law of the Sea
VMS – Vessel Monitoring System
WA – Western Australia
WTO – Wildlife Trade Operation