FINAL APPLICATION TO AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENVIRONMENT AND HERITAGE ON THE BECHE-DE-MER FISHERY

Against the Guidelines for the Ecologically Sustainable Management of Fisheries

For Consideration Under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999*

AUGUST 2004

Department of Fisheries
Government of Western Australia

Fish for the future

DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA
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WA 6850

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1. INTRODUCTION TO THE APPLICATION

1.1 DESCRIPTION OF INFORMATION PROVIDED

This is an application to the Department of the Environment and Heritage (DEH) to assess the Beche-De-Mer Fishery (BDMF) against the *Australian Government Guidelines for the ecologically sustainable management of fisheries*. The submission of a successful application against these guidelines is now needed to meet the requirements under Part 13 and Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), to enable the sandfish (*Holothuria scabra*), white teat fish (*Holothuria whitmaei*), black teat fish (*Holothuria nobilis*), prickly red fish (*Thelenota annas),* deep water red fish *(Actinopyga echinites)* and lolly fish (*Holothuria atra)* to be listed on the section 303DB list of species exempt from export regulations (previously Schedule 4 of the *Wildlife Protection (Regulation of Exports and Imports) Act, 1982*) past December 2004.

The information provided in this application covers all the elements specified in the *Guidelines for the Ecologically Sustainable Management of Fisheries* (located on the DEH website www.deh.gov.au/coasts/fisheries/assessment/guidelines.html) along with other information (at a variety of levels of complexity) considered relevant to those who wish to gain an understanding of the management for this fishery. The application includes:

- Comprehensive background information on the history of the BDMF and a description of the management arrangements, which provides the context for assessing this application and the biology of the primary species caught (see Section 2 for details).
- A description of the National Ecologically Sustainable Development (ESD) Reporting Framework and methodology, which was used to generate the information that is presented in the application (see Section 3 for summary and www.fisheries-esd.com for full details).
- Specific supporting statements relevant to each of the criteria within the Australian Government Guidelines. These criteria include the "General Requirements", which cover many of the governance aspects related to the management of the BDMF, plus each of the objectives listed under "Principle 1" (target species issues) and "Principle 2" (broader ecosystem issues) of the Guidelines (see Section 4).
- Section 4 also has, where appropriate, specific links and references to the detailed ESD component reports contained in Section 5. Referral to this additional information is facilitated by the incorporation of appropriately placed hyperlinks (electronic version only).
- At the end of Section 4 there is an OVERVIEW TABLE that outlines for each issue, which Guidelines are relevant; if there is an operational objective, the availability of suitable data for the indicators, whether the current performance against the limit/measure chosen is acceptable, and a summary of what (if any) future actions are required.
- Section 5 includes a comprehensive account of the risk assessment outcomes and current performance of the fishery, presented in the National ESD Reporting

format, covering each of the environmental and governance issues relevant to this application for the fishery. These reports cover each of the issues in a comprehensive manner and include either; the explicit objectives, indicators, performance measures, current and future management responses and justification for each major component; or a full justification for why specific management of this issue within the BDMF is not required.

1.2 OVERVIEW OF APPLICATION

The main area of the BDMF extends north from Exmouth Gulf to the Northern Territory border with catches also taken from the Shark Bay area and the south coast of Western Australia (WA). There are six target species caught commercially in WA and they are sandfish, white teat fish *(Holothuria scabra)*, black teat fish *(Holothuria nobilis)*, prickly red fish *(Thelenota ananas)*, deep-water red fish *(Actinopyga echninitis)* and lolly fish *(Holothuria atra)*. The BDMF is an experimental fishery that began in 1995 harvesting 90 tonnes and expanded to 382 tonnes in 1997. The three-year average catch for the fishery is around 80 tonnes live weight. The management arrangements for this fishery has and will continue to be refined through time and are subject to regular reviews to achieve the overall aim of successful management.

- *Holothuria scabra* (sandfish) 16 cm
- *Holothuria whitmaei* (white teat fish) 32 cm
- *Holothuria nobilis* (black teat fish) 26 cm
- *Thelenota ananas* (prickly red fish) 30 cm
- *Actinopyga echninitis* (deep water red fish) 12 cm
- *Holothuria atra (lolly fish)* 15 cm

The *Fish Resources Management Act, 1994* (FRMA) provides the legislative framework to implement the management arrangements for this fishery. The FRMA, the regulations in the *Fish Resources Management Regulations, 1995* (FRMR) adheres to arrangements established under relevant Australian laws with reference to international agreements as documented in Section 5.4.2. The beche-de-mer endorsements expire on December 2007 and this date will coincide with a major review of the fishery 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 BDMF is an exploratory/developmental fishery managed through a Fishing Boat Licence (FBL) endorsement. The management of the fishery is a combination of input and output controls. These controls regulate the number of licensees, species collected, sizes harvested and the method used. These controls are used to maintain the beche-de-mer stocks within WA at adequate levels. Furthermore, the BDMF has minimal impacts on the wider ecosystem due the selective method of fishing used (i.e. “by hand” collection only).

Consequently, the management regime for the BDMF should meet the *Guidelines for the Ecologically Sustainable Management of Fisheries*. Detailed justification for this conclusion is documented within the remainder of this application.

2. BACKGROUND ON THE BDMF

2.1 DESCRIPTION OF THE FISHERY

The BDMF in WA is spread over an extremely large area with only six fishers having FBL endorsements to harvest beche-de-mer since 1995, and one exemption for Aboriginal fishing in Shark Bay. The main area of operation for the BDMF in WA extends north from Exmouth Gulf to Northern Territory, however minor catches are also taken south of Exmouth Gulf (Figure 1). Section 5 of this application provides details on the catch by statistical area.

Endorsement conditions on each of the FBLs prohibit the take of beche-de-mer from the areas listed below (see also Figure 1):

- within any marine park, aquatic reserve or sanctuary area,
- within an area between Cape Preston and Cape Lambert (excluding an area in the center of Nickol Bay);
- within a 5 nautical mile radius of Cape Keraudren;
- within any Western Australian waters surrounding the Rowley Shoals; and
- within any Western Australian waters surrounding the Abrolhos Islands.

Fishing Methods

The harvesting of beche-de-mer is only allowed by diving or direct collection by hand. Fishing takes place in shallow-water mangrove lagoons and estuaries during neap tides, as the strong current and poor visibility in the Pilbara and Kimberley regions resulting from extreme tidal ranges renders fishing impractical at other times of the month. Collection is limited to easily accessible, open water areas where there are fewer dangers for divers or waders from saltwater crocodiles. Currently, there is minimal information pertaining to the precise areas targeted by the fishers.

Wading is a minor fishing method employed for this fishery and occurs in shallow-water mangrove lagoons and estuaries. This method can be applied in areas of the Kimberley that are accessible and prone to extreme tidal movements. Wading usually occurs on soft sandy substrates with minimal impact on these habitats.

The method of fishing for beche-de-mer by vessels in this fishery is similar to that employed in the pearling wildstock fishery. The vessel is fitted with booms and a hookah system. Up to four divers are towed/drifted from the stern of the vessel during the neap tides. The divers collect the beche-de-mer as they drift over the bottom therefore there is minimal impact on the habitat as divers are highly selective in their fishing effort and no fishing gear/lines contact the seabed. Due to the remoteness of the fishing areas vessels stay out for 2 to 6 weeks at a time.

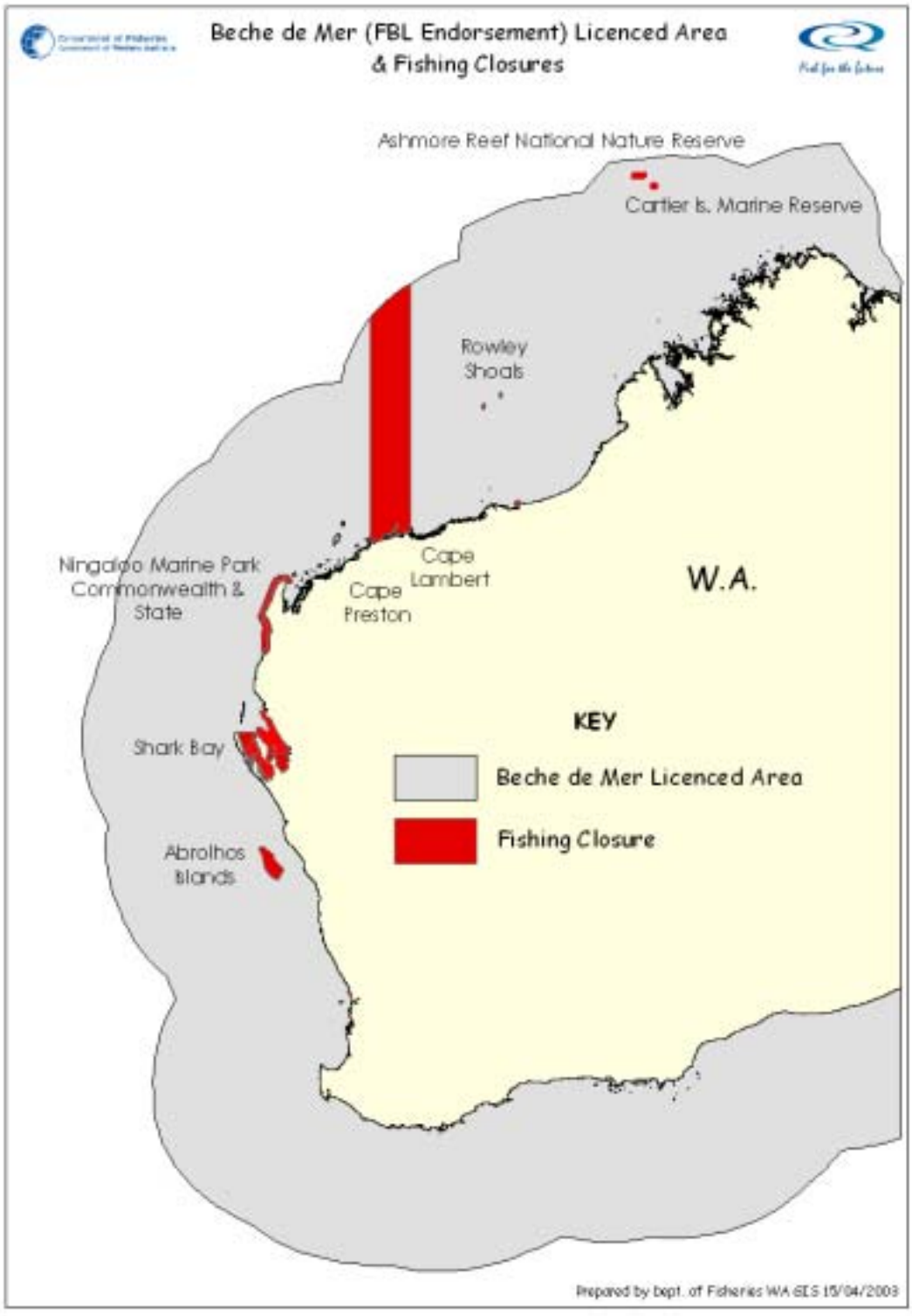


Figure 1 Licence area for the BDMF.

Management

The BDMF is managed by input and output controls, which include limited entry, maximum number of divers, species dependent, minimum legal size limits and gear restrictions. These management restrictions help to limit effort thereby sustaining the

species and maintaining the supporting environment. The current management strategies for this fishery are not expected to change prior to the major review of the fishery scheduled for late 2007.

The current management strategies for the fishery are as follows:

Limited Entry. Access to the fishery is limited to the six operators holding an FBL endorsement to take beche-de-mer. Beche-de-mer may only be harvested by hand or diving by licensed commercial fishers who currently hold a permit and who operate from a Licensed Fishing Boat, which is endorsed to take beche-de-mer. Aboriginal communities may be granted a non-transferable Exemption to fish. Currently, there is one aboriginal community with an Exemption to harvest beche-de-mer but they have not been actively collecting.

Gear Restrictions. The maximum number of divers (per endorsed Fishing Boat Licence) allowed to dive for beche-de-mer at any one time is 4. As stated above, beche-de-mer can only be harvested by diving or direct collection by hand. In 2001, a maximum number of crew (6) allowed on the vessel was introduced.

Species and Minimum Size Limits. There are six target species of beche-de-mer harvested in WA. At present the minimum lengths for these commercial beche-de-mer species are based on the NT's minimum sizes, which have been set based on size at sexual maturity. The species and minimum size limits are as follows:

- *Holothuria scabra* (sandfish) 16 cm
- *Holothuria whitmaei* (white teat fish) 32 cm
- *Holothuria nobilis* (black teat fish) 26 cm
- *Thelenota ananas* (prickly red fish) 30 cm
- *Actinopyga echninitis* (deep water red fish) 12 cm
- *Holothuria atra* (lolly fish) 15 cm

History

Since the rapid development of this fishery in the mid 1990's when catches and catch rates reflected the relatively lightly fished state of WA's populations of beche-de-mer, production from the BDMF has begun to stabilise at levels more closely reflecting the annual productivity that can be expected from known fishing grounds. While new fishing grounds may be identified in the future, current fluctuations in catch and effort mainly reflect changes in operators, operator skill and fishing practice. Despite the declines in catch and effort from within the fishery there is little danger of the fishery affecting the overall sustainability of the stock given the relatively limited area where fishing occurs compared to the wide distribution of these species both in WA and across this geographic region.

2.2 BIOLOGY OF BECHE-DE-MER SPECIES

Taxonomy

Beche-de-mer, also known as sea cucumbers or trepang, are in the Phylum Echinodermata, Class Holothuroidea. Holothurians are soft bodied, elongated animals that usually live with the ventral surface in contact with the benthic substrate or buried in the substrate. They share with other echinoderms (eg. sea stars, sea urchins) an internal water vascular system, which may form blind end sacs of tube feet projecting through the external body wall and a pentaradial body plan but have a secondarily imposed bilateral body symmetry. A ring of ten plates at the anterior end form a calcareous ring which support the pharynx, nerve endings and act as a point of insertion for the longitudinal muscle bands along the body.

Distribution

The BDMF in WA is presently dominated by fishing for sandfish, *Holothuria scabra*. Sandfish, which are found in large numbers in habitats under terrigenous (land based) influence with densities often reaching several hundred per hectare. Sandfish are found throughout the Indo-Pacific at latitudes ranging from 30°N and 30°S, and are one of the few Holothurian species that prefers muddy sandy bottomed coastal areas to coral reef (Hamel *et al*., 2001). *Holothuria whitmaei*, white teatfish, inhabit clear water in coral reef areas around depths of 30 m and deeper.

Biology

Published studies on size at sexual maturity in *Holuthuria scabra* indicate considerable variability over their geographic range, from 14 cm in PNG (Lokani, 1995) to 23 cm in India (Basker and James, 1995). Some studies have also indicated there may be sexual differences, with females maturing at larger sizes than males. The most reliable and/or relevant studies are:

- New Caledonia (Conand, 1989). Size at maturity (TL50) 184 g (16 cm TL).
- Moreton Bay (Harriot 1980). Size at maturity, 16 cm TL.
- Torres Strait (CSIRO). Size at maturity (TL50), 15 cm TL.

On this basis, CSIRO researchers concluded that a minimum legal size of 18 cm (live length) should allow for individuals to spawn once before they enter the Torres Strait fishery (Skewes, unpublished data). Western Australia has adopted the Northern Territory size-limits (16 cm), however this will need to be reviewed when the major fishery review occurs in 2007.

Long and Skewes (1997) reported that 18cm *H. scabra* are approximately two years old, suggesting that this species has relatively fast growth. An overall review of the biology and exploitation of *Holothuria scabra* is provided by Hamel *et al*., (2001). Few data relevant to fisheries management (growth, size-at-maturity, mortality) is available for the other species of beche-de-mer. At about 60 cm prickly redfish attains the largest size, being the largest beche-de-mer species collected in this fishery (Kailola *et al.*, 1993).

2.4 MAJOR ENVIRONMENTS

2.4.1 PHYSICAL ENVIRONMENT

The main area of operation for the BDMF is similar to that of the Pearl Oyster Fishery, which extends over 3 bioregions of WA – the Gascoyne, Pilbara and Kimberley with a vast variation in the environmental conditions over this large area.

The Gascoyne Region is significant because it represents the transition zone from tropical and warm temperate areas. The climate in the region ranges from hot, arid conditions to warm semi-arid conditions. The annual average minimum and maximum temperatures for the region are approximately 17°C and 27°C respectively, with the coolest month being July. Rainfall averages 300 mm annually with peak falls occurring in both winter and summer because of the influence of tropical cyclones, the incursion of warm moist air from the Kimberley Region, and mid-latitude depressions. Tropical cyclones in the north around Exmouth Gulf with wind speeds in excess of 40-50 knots occur every three to five years, with less intensive systems occurring annually during January to March.

There are three ecologically sensitive habitats in the Pilbara and Kimberley regions: mangroves, seagrasses and coral reefs. Seagrasses are widely distributed along the Pilbara and Kimberley coasts and offshore islands. However, in contrast to the dense meadows formed in south-western Australia, most of the tropical species found along the north coast form only patchy associations in which the plants have 10% or less of the biomass of southern seagrass communities. The only exceptions are an extensive meadow of dense seagrass near Onslow and second, very large meadow in the area off Sunday Island, north of Cape Leveque (Walker and Prince, 1987; Walker *et al.*, 1996b).

Corals are diverse in both the Kimberley and Pilbara regions, and form extensive reefs in many areas. Coral reefs are well known to harbour a biologically diverse and ecologically productive community in areas where nutrient supplies are low. Some of the major coral reefs in the Pilbara are protected as marine parks, for example the Rowley Shoals Marine Park. While some species of corals can survive as small individual communities in turbid areas, the extensive coral reefs are in offshore waters where the water is clear. Studies undertaken by the WA Museum in conjunction with the University of Western Australia and the Museums and Art Galleries of the Northern Territory (Morgan, 1992; Walker *et al.*, 1996b; Walker, 1997) have documented the distributions of many species of marine plants and animals in the Kimberley region.

Sandfish are one of the few Holothurian species that prefers muddy sandy bottomed coastal areas to coral reef (Hamel *et al*., 2001). *Holothuria whitmaei*, white teatfish, inhabit clear water in coral reef areas around depths of 30 m and deeper'

2.4.2 ECONOMIC ENVIRONMENT

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. The price for

beche-de-mer fluctuates largely depending on the size and condition of the product with the market paying considerably higher prices for larger product that has been processed professionally. This factor in conjunction with the size limits imposed under the management regime ensures that there is little incentive for fishers to take undersized product.

2.4.3 SOCIAL ENVIRONMENT

There are six boats within the BDMF with a total of 6 crew members allowed on each boat. This equates to a total of 36 crew members on the boats. Additional individuals are employed for the processing of the product. These activities are mostly located in remote areas of the Kimberley and Pilbara regions.

3. METHODOLOGY

3.1 SCOPE

This application is based upon the ESD report for the BDMF. The ESD report was generated by assessing "**the contribution of the BDMF to ESD".** This assessment examined the benefits and the costs of the BDMF across the major components of ESD (see Table 1). In doing so, it will eventually provide a report on the performance of the fishery for each of the relevant ecological, economic, social and governance issues associated with this fishery. Given the timeframes involved, only the criteria required for the "Guidelines for the Ecologically Sustainable Management of Fisheries", which cover mainly the environmental elements of ESD (outlined below in Table 1) were generated for this application.

Table 1 Main National ESD Reporting Framework Components.
Nb: Only those ESD components in bold* are reported in this application.

National ESD Framework – ESD COMPONENTS
Contribution to Ecological Wellbeing
Retained Species*
Non-Retained Species*
General Ecosystem*
Contribution to Human Wellbeing
Indigenous Community Issues
Community Issues
National Social and economic Issues
Ability to Achieve
Governance*
Impact of the environment on the fishery

3.2 OVERVIEW

There were four steps involved in completing the ESD report for the BDMF. It was based upon using the National ESD Reporting Framework, which is outlined in detail in the WA ESD policy paper (Fletcher, 2002) and in the "*How to Guide*" (Fletcher *et al.*, 2002) located on the website (www.fisheries-esd.com):

1. The Departments research staff for the fishery determined the issues that needed to be addressed for the BDMF. This process was facilitated by adapting the set of "Generic ESD Component Trees" into a set of trees specific to the BDMF.
2. A risk assessment/prioritisation process was completed that objectively determined, which of these identified issues was of sufficient significance to warrant specific management actions and hence a report on performance. The justifications for assigning low priority or low risk were, however, also recorded.

3. An assessment of the performance for each of the issues of sufficient risk to require specific management actions was completed using a standard set of report headings where operational objectives, indicators and performance measures, management responses etc. were specified.
4. An overview assessment of the fishery was completed including an action plan for activities that will need to be undertaken to enable acceptable levels of performance to continue or, where necessary, improve the performance of the fishery.

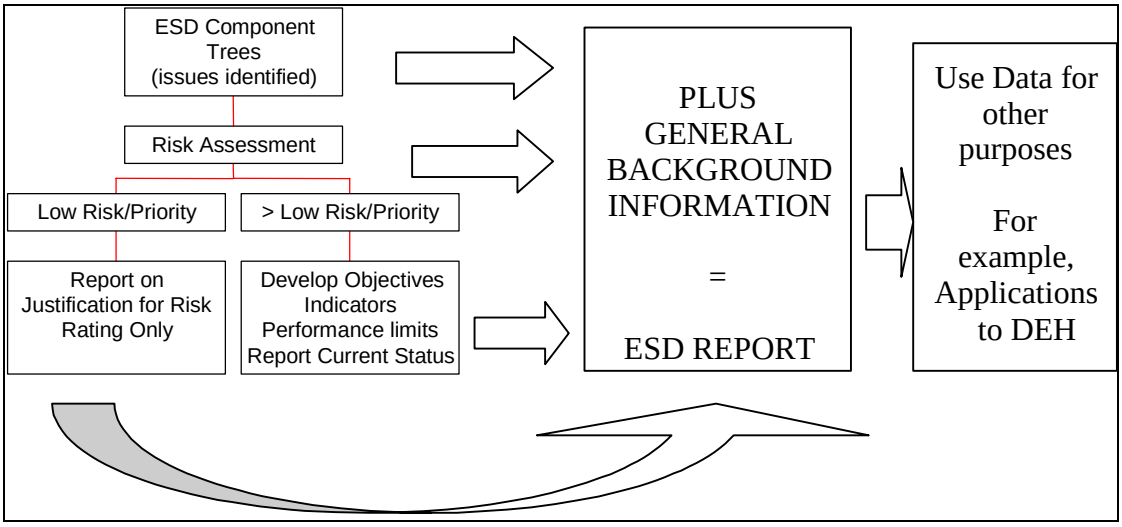


Figure 2 Summary of the ESD reporting framework processes.

3.3 ISSUE IDENTIFICATION (COMPONENT TREES)

The National ESD Reporting Framework has eight major components, which fall into three categories of the "contributions to ecological wellbeing", "contributions to human wellbeing" and the "ability to achieve the objectives" (Table 1). Each of the major components is broken down into more specific sub-components for which operational objectives can ultimately be developed.

To maximize the consistency of the approach amongst different fisheries, common issues within each of the components were identified by the then Standing Committee on Fisheries & Aquaculture (SCFA) and the ESD reference group within each of the major component areas and arranged into a series of "generic" component trees (See Fletcher (2002) and the www.fisheries-esd.com web site for a full description). These generic trees were used as the starting point for identifying the issues. These trees were subsequently adapted into trees specific to the BDMF by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (see Figure 3). The Department's research staff developed the trees for the BDMF in February 2003.

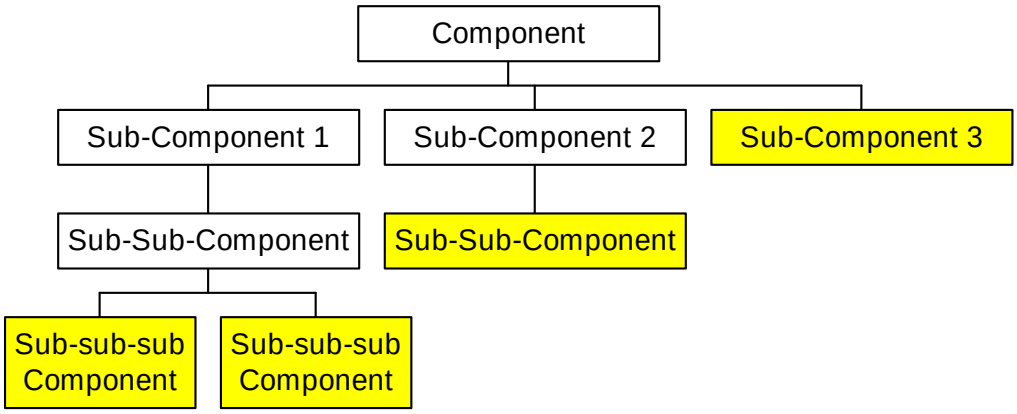


Figure 3 Example of a component tree structure.

3.4 RISK ASSESSMENT/PRIORITISATION PROCESS

After the components/issues were identified, a process to prioritise each of these needs was completed using a formal risk assessment process. The risk assessment framework that was applied at the internal workshop was consistent with the Australian Standard AS/NZS 4360:1999 Risk Management, concentrating on the risk assessment components. The general Risk Assessment process is well documented but in summary, it considers the range of potential consequences of an issue/activity and how likely those consequences are to occur. The combination of the level of consequence and the likelihood is used to produce an estimated level of risk associated with the particular hazardous event/issue in question.

An estimate of the consequence level for each issue was made by the researchers. This level was from 0-5, with 0 being negligible and 5 being catastrophic/irreversible (see Appendix 2 for details of consequence tables).

The level of consequence was determined at the appropriate scale for the issue. Thus for target species the consequence of the BDMF was based at the population not at the individual level. Obviously catching one fish is always catastrophic for the individual but not always for the population. Similarly, when assessing possible ecosystem impacts this was done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or individuals of non-target species.

The likelihood of a consequence occurring was assigned to one of six levels from remote to likely. In doing so, again it was considered the likelihood of the "hazardous" event (consequence) actually occurring based upon collective wisdom, which included an understanding of the scale of impact required.

From these two figures (consequence and likelihood), the overall risk value, which is the mathematical product of the consequence and likelihood levels (Risk = Consequence x Likelihood), was calculated. Finally, each issue was assigned a Risk Ranking within one of five categories: High, Moderate, Acceptable, Low and Negligible based on the risk value (see Table 2).

Table 2 Risk ranking definitions.

RISK	Rank	Likely Management Response	Reporting
Negligible	0	Nil	Short Justification Only
Low	1	None Specific	Full Justification needed
Moderate	2	Specific Management Needed	Full Performance Report
High	3	Possible increases to management activities needed	Full Performance Report
Extreme	4	Likely additional management activities needed	Full Performance Report

In general, only the issues of sufficient risk (Moderate, High & Extreme), - those that require specific management actions need to have a full performance reports completed. Nonetheless, the rationale for classifying issues as low risk or even negligible were also documented and formed part of the ESD report. This allows all stakeholders and interested parties to see why issues were accorded these ratings. This process is summarized in Figure 2 (above).

It is important to note that the Risk Assessment involves the completion of reports that contain the completed justifications for the scores generated. Thus, the scores determined within the meeting by themselves are insufficient.

3.5 COMPONENT REPORTS

Only the issues of sufficient risk or priority that require specific management actions have a full performance report completed (which form section 5 of this application). Nonetheless, the rationale for classifying issues as low risk/priority were also documented and forms part of the report so that stakeholders can see where all the identified issues have finished.

For each of the lowest level sub-components (assessed as being of sufficient risk/priority to address), a detailed assessment of performance is generated. The SCFA Working Group in conjunction with the ESD Reference Group agreed upon a set of 10 standard headings each of which need to be addressed (Table 3). Added to this list a further heading, "**Rationale for Inclusion**", has been added. This specific heading allows the issues raised within the risk assessment process to be explicitly recorded. A full description of each of these headings is located in the WA ESD policy (Fletcher, 2002), which is available on the WA Fisheries website.

Table 3 The National ESD reporting framework headings used in this report.

1. Rationale for Inclusion
2. Operational Objective (+ justification)
3. Indicator
4. Performance Measure (+ justification)
5. Data Requirements
6. Data Availability
7. Evaluation
8. Robustness
9. Fisheries Management Response
-Current
-Future
-Actions if Performance limit is exceeded
10. Comments and Actions
11. External Drivers

The completion of these component reports was initiated after the development of the component trees in February 2003. Progress towards completing these reports was subsequently made by a variety of Departmental staff. The draft application was sent to DEH and stakeholders including industry members and industry groups for review. This final application was generated after the review process.

4. ASSESSMENT OF THE BDMF MANAGEMENT REGIME AGAINST THE GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

4.1 GENERAL REQUIREMENTS OF THE GUIDELINES

The management arrangements must be:

Documented, publicly available and transparent;

As per the FRMA (1994) "the Executive Director is to cause a copy of every order, regulation and management plan in force under this Act:

- To be kept at the head office of the Department; and
- To be available for inspection free of charge by members of the public at the office during normal office hours."

In addition to these legislative requirements, any discussion papers and proposals for modifications to these management arrangements are distributed widely to stakeholder groups automatically and other interested individuals by request in hard copy format. Where appropriate, they are also made available on the Departmental web site www.fish.wa.gov.au.

Finally, once completed, the full ESD Report on the BDMF will be made publicly available via publication and electronically from the Departmental website. This will provide increased transparency through explicitly stating objectives, indicators, performance measures, management arrangements for each issue and how the fishery is currently performing against these criteria.

There is also a proposal to formally publish the relevant objectives and performance measures for each fishery, including the BDMF, in a series of Ministerial Guidelines.

Developed through a consultative process providing opportunity to all interested and affected parties, including the general public;

S64 and S65 of the FRMA define the requirements for procedures that must be undertaken before determining or amending all management plans. Consultation with industry groups (eg WA Fishing Industry Council - WAFIC), other stakeholder groups (eg Recfishwest, Conservation Council of WA) and the general public will take place if this fishery progresses to a managed fishery status.

Ensure that a range of expertise and community interests are involved in individual fishery management committees and during the stock assessment process;

The groups that have been involved in the review of the information contained within this application include:

- Department of Fisheries, WA; and
- The industry.

The general consultation methods used for this fishery are summarised in the Governance Section 5.4.2.1. As previously mentioned, consultation with industry groups (eg WAFIC), other stakeholder groups (eg Recfishwest, Conservation Council of WA) and the general public will take place if this fishery progresses to a managed fishery status. This will be determined in conjunction with the major review of the fishery scheduled to take place in 2007.

Be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements is measured;

The ESD Component Reports (see Section 5) contains the objectives, indicators and performance measures for determining the effectiveness of the management for the BDMF[1]. Since this fishery is in an exploratory/developmental state, precise performance measures have not been developed. The status of the fishery is reviewed and assessed on an annual basis through the monthly returns received by the fishers, which include the catch, effort and catch rates for the fishery and annual report submitted to the Department from the fishers (see licence condition Section 5.4.1.2). Before the fishery progresses past a developmental stage, more precise performance measures will be developed. The status of this information is documented within each of the individual component reports within the ESD Reports in Section 5.

Be capable of controlling the level of harvest in the fishery using input and/or output controls;

The FRMA and the conditions placed on the BDMF FBL endorsements provide the legislative ability to control the level of harvest within this fishery. This is achieved through the use of input and output control measures including limiting entry, species dependent, legal minimum size and gear and restriction on number of divers.

Contain the means of enforcing critical aspects of the management arrangements;

The Department has limited compliance resources dedicated to the beche-de-mer fishery (in light of the competing requirements of other fisheries). However, the emphasis of the management framework on specific effort restrictions and licencing requirements (for authorised "collectors") allow a relatively small effort to ensure a high degree of compliance. These compliance measures are mostly checks of licences and catch. To date, there have not been any offences detected in this developmental fishery.

It is expected that the completion of a compliance risk assessment for the fishery will enable the Department to better direct resources to further increase the effectiveness of the limited compliance activities.

[1] These will also be formally published in a set of Ministerial Guidelines.

Provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria;

There is an annual review of the performance for the major aspects of the fishery through the completion of the annual reports required by DEH. In addition, the objectives for the fishery, including compliance matters are strategically assessed through the annual Northern Australian Fisheries Management Workshop, which includes States, Territory and Commonwealth fishery managers, research scientists and compliance officers.

The ESD Component Reports contain comprehensive performance evaluations of the fishery based upon the framework described in the Fisheries ESD policy (Fletcher, 2002). This includes the development of objectives, indicators and performance measures for this fishery and includes status reports for those components that are not subject to annual assessment. This full assessment, including an examination of the validity of the objectives and performance measures, is planned to be completed and reviewed externally every five years.

Be capable of 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;

Capabilities for the assessment, monitoring and avoidance, remedying or mitigating any adverse impacts on the wider marine ecosystem are documented in "General Environment" Section 5.3. Due to the low amounts harvested for the six targeted beche-de-mer species, the large area over which the fishery operates, and the limited number of "licensees" in the fishery no issues were identified as posing greater than a negligible risk. As a result, there is currently no need to implement specific monitoring for such impacts.

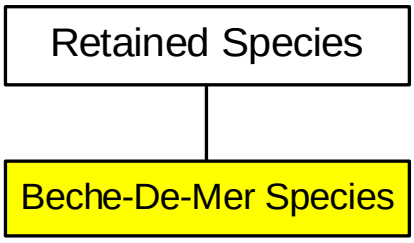
Require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy;

The management regime for BDMF complies with all the relevant threat abatement plans for species where there are significant interactions. Details are provided in the 'non-retained species' section of this application (Section 5.2.). There are no known non-retained species taken in this fishery.

4.2 PRINCIPLE 1 OF THE GUIDELINES

OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVELS OF TARGET SPECIES

A fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.



The component tree detailing the stocks of retained species relevant for this fishery is shown above. There are six main beche-de-mer species targeted by this fishery, sandfish (*Holothuria scabra)*, white teat fish (*Holothuria whitmaei)* black teat fish (*Holothuria nobilis)*, prickly red fish (*Thelenota ananas)*, deep-water red fish (*Actinopyga echninitis)* and lolly fish (*Holothuria atra)*. All of the beche-de-mer species caught by this fishery have been assessed together in the one report. This full report is located in Section 5.1. It was determined that the fishery was of **Moderate risk** to beche-de-mer stocks.

The BDMF is managed through a series of input controls including limited entry, legal minimum size limits for species of beche-de-mer targeted by fishers and gear restrictions.

Analysis of the current performance by the BDMF demonstrates that the beche-de-mer stocks are being maintained at ecologically viable stock levels. Thus, in summary:

- Legal minimum sizes are set for each species harvested within the fishery and are based on the Northern Territory minimum sizes which have been determined from size at onset of maturity.
- Catch, effort and catch rate data is collected and analysed for this fishery on an annual basis. These data show that the fishery is currently maintaining or increasing catch rates with a 3-year average catch of around 80 tonnes live weight[2]. There is no evidence that the fishery is depleted.
- There are no by-product or bycatch species taken by this fishery nor are any detrimental impacts on the habitat of beche-de-mer likely to occur (i.e. nothing else is "touched").

The BDMF is predominantly an exploratory/developing fishery and current performance measures are only of a preliminary form, with further development expected, leading up to the 2007 review. These current measures have been developed to ensure that any major changes in the pattern of fishing are noticed and

[2] Unless explicitly stated, all estimates of weight refer to live weight.

investigated. If triggered, given the developmental nature of the fishery, these may not necessarily indicate there are problems for the stocks (see Section 5.1.1.1).

Consequently, this fishery is meeting the requirements of Principle 1. The information relevant to this principle for these species is detailed below.

Information Requirements

1.1.1 There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.

This is predominantly an exploratory/developing fishery with only six operators allowed to harvest beche-de-mer in a fishery that has operated since 1995. As a result, information is collected through fishery dependent means.

Current fishery dependent data collection systems monitor the catch (not species specific), effort and catch rates for the fishery. Fishers within the BDMF provide monthly returns under the statutory catch and effort system (CAES). These returns contain information on catch (weight and spatial area - 60 x 60 nmile grids), days and hours fished by month and year, and number of crew on each vessel. Fishers also note the method and condition of catch (whole or "gilled and gutted"). Work is currently underway with industry to develop a more informative daily logbook for the fishery, which will provide species-specific and effort-specific data. A trial of the new logbook is scheduled to take place before the end of the 2004 season.

The specific data requirements needed to assess performance for each of the relevant objectives are detailed in the relevant sections of the ESD report, which is in Section 5.1. Retained Species. These requirements are summarised as follows:

Monitoring Program	Information Collected	Robustness
CAES returns	Provided on a monthly basis since 1995. Include the total catch for all beche-de-mer species combined, effort, catch rates, method and condition of catch.	Medium
Annual Internal Report to the Department	Summary of nature and success of the fishery.	Medium-High
Climatic data	Rainfall data; Wind data; and Swell Height conditions.	High

Assessments

1.1.2 There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and/or reproductive capacity. Review should ideally take place at regular intervals but at least every three years.

There are six target species for the Fishery. A review is conducted annually which assesses the effort, both in terms of the days fished and the diver effort, total catch and the catch rates. This assessment examines the current years results compared to the previous historical data from the fishery and a set of preliminary performance measures for the fishery.

A preliminary biomass dynamics model has been generated for this fishery that utilises the catch and catch rate data for the entire fishery. This analysis provides an estimate of the carrying capacity and the maximum sustainable yield (see 1.1.5 below).

As the fishery develops and matures more information will be collected (i.e. catch identified between the species, longer catch series etc) and this will lead to the ability for more characteristics of each species to be taken into account when setting the harvest limits.

A major review of the fishery is scheduled to take place at the end of 2007. Preliminary performance measures have, however, been developed to ensure that any major changes in the patterns of fishing are noticed and investigated. If they are triggered, given the developmental nature of the fishery, this may not necessarily indicate a problem with the stocks (refer to Section 5.1.1.1).

1.1.3 The distribution and spatial structure of the stock(s) has been established and factored into management responses.

While there is a good base of biological knowledge and the overall geographical distribution for beche-de-mer species (see section 2), very limited information is known regarding the distribution and abundance of the local fishery and stocks. Data is collected at a 60 x 60 nautical mile spatial resolution

1.1.4 There are reliable estimates of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stock. These estimates have been factored into stock assessments and target species catch levels.

Sector	Catch Data Collected	Frequency
Commercial	Catch and effort data	Monthly
Recreational	N/A	N/A
Indigenous	Catch and effort data	Monthly
Illegal	Estimated from compliance data.	Annually

The monitoring programs for the BDMF, outlined above, covers the catch by the commercial fishers and any illegal fishing activities, which are obtained on a monthly and yearly basis, respectively. There is no recreational take and only limited take of beche-de-mer species by the indigenous communities. Currently, there is one aboriginal community with an Exemption to harvest beche-de-mer but they have not been actively harvesting.

1.1.5 There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.

The Department of Fisheries is currently monitoring the status of the fishery through an analysis of the information provided within the CAES returns. These returns provide the Department with the catch, effort and catch rates for the fishery on a monthly basis. During the past three years, the fishery has maintained or increased the catch rates whilst collecting close to the 3 year average catch of around 80 tonnes live weight.

The parameter estimates for the exploited stock of beche-de-mer as calculated by the biomass dynamics model are:

r (intrinsic rate of increase) = 0.55
K (carrying capacity) = 1131
q (catchability) = 0.254

The estimated maximum sustainable yield from this fishery can be calculated by r*K/4. This generates a value of approximately 155t per year. Given that the MSY values calculated from a new fishery are often optimistic, it is appropriate that the current catches are in the vicinity of being 30-40% lower than this estimate, at approximately 80-100t per annum.

This fishery is still in an exploratory phase and catches may remain dynamic until seasonal rotational harvesting patterns have been established for all areas. As areas are explored and fished consistently the picture of the potential productivity of the stocks may develop through further analysis of the catch and effort data.

The analyses conducted indicate that the fishery at the current levels of effort and catch is sustainable.

Management Responses

1.1.6 There are reference points (target and/or limit), that trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.

The preliminary performance measures include an acceptable catch range of 50 – 150 tonnes, which covers the likely take by this fishery during the next few years noting the average annual catch for the last 3 years has been 80 tonnes. If the catch declined below 50t this would require investigation of the reasons for the decline. Similarly, if the catch exceeded 150t this would represent a major change in fishing patterns and require investigation.

The catch rate by the fishery should remain above 80 kg/crew-day fished. This level is below the previous 8 years data and, if such a result was recorded, could indicate that a significant decline in the relative abundance of beche-de-mer may have occurred (see Section 5.1.1.1 Figure 7).

These preliminary performance measures have been developed to ensure that any major change in the patterns of fishing are noticed and investigated. If they are triggered, given the developmental nature of the fishery, this may not necessarily indicate any problem with the stocks (see Section 5.1.1.1).

1.1.7 There are management strategies in place capable of controlling the level of take.

A full discussion of the main regulations and their justifications are located in Section 2.1. The following is a summary of the management arrangements for the fishery which has:

- Limited entry (6 operators plus one non-transferable permit);
- Species specific minimum size limits; and
- Gear and effort restrictions (max number of divers per boat is 4 and collection by hand only).

The current legal minimum size limits for the six target beche-de-mer species commercially harvested are as follows:

- *Holothuria scabra* (sandfish) 16 cm
- *Holothuria whitmaei* (white teat fish) 32 cm
- *Holothuria nobilis* (black teat fish) 26 cm
- *Thelenota ananas* (prickly red fish) 30 cm
- *Actinopyga echninitis* (deep water red fish) 12 cm
- *Holothuria atra* (lolly fish) 15 cm

1.1.8 Fishing is conducted in a manner that does not threaten stocks of by-product species.

There are no by-product species caught in this fishery.

1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The BDMF is currently managed through input and output controls including gear and effort restrictions, limited entry, species dependent and legal minimum sizes. The relatively limited area where fishing occurs compared to the wide distribution of these species both in WA and across this geographic region, combined with the small number of operators in this fishery make it highly likely that the objective of maintaining adequate stocks of these species will be met.

There are a number of additional factors that make it highly likely that the stocks of these species will be maintained under this regime. These include:

- Isolation – vessel effort is severely restricted because the fishery operates in very isolated regions that are hard to get to;
- High tidal range (10-12 m)– this reduces the effective time available for fishing which can generally only occur during neap tides;
- The strong currents and high turbidity of water (which results in poor visibility) results in a low efficiency of capture;

- Dangerous animals (Crocodiles, sharks, jelly fish) controls effort in many regions because they are too dangerous to fish;
- Cyclones (restricts fishing to winter-spring); and
- Depth – dive safety profiles limit effort in deeper (> 20m) waters.

The interim performance measures also provide a level of surety that any major change in the operations of the fishery or changes to the status of the stocks should be recognised and assessed. If such a situation did occur, changes to the management arrangements could be implemented within a suitable timeframe.

OBJECTIVE 2. RECOVERY OF STOCKS

Where the fished stocks are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.

There are no stocks within the BDMF that are currently below defined reference points/limits.

4.3 PRINCIPLE 2 OF THE GUIDELINES

OBJECTIVE 1. BYCATCH

The fishery is conducted in a manner that does not threaten bycatch species.

There are currently no known bycatch species taken in this fishery.

Information Requirements

2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.

Not applicable.

Assessments

2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing.

No bycatch species are known to be taken in this fishery.

Management Responses

2.1.3 Measures are in place to avoid capture and mortality of bycatch species unless it is determined that the level of catch is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.

Not applicable.

2.1.4 An indicator group of bycatch species is monitored.

Not applicable.

2.1.5 There are decision rules that trigger additional management measures when there are significant perturbations in the indicator species numbers.

Not applicable.

2.1.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Given that there are no known interactions of the BDMF with non-retained species and the selective method of fishing used (diving or wading, collection by hand only) is likely to continue, the minimal level of interaction will also be maintained.

OBJECTIVE 2. PROTECTED, THREATENED AND ENDANGERED SPECIES

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

2.2.1 Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities.

There are no known interactions between the BDMF and any endangered, threatened, or protected species and threatened ecological communities. Due to the relatively selective method used in this fishery it is unlikely that the BDMF has interactions with endangered, threatened or protected species. Furthermore, there is minimal chance for interactions through boat strikes because the boats predominantly drift along when fishing. Therefore, they are moving at relatively slow speeds which allow for most of these species to be avoided and/or species to move away from the boats.

Assessments

2.2.2 There is an assessment of the impact of the fishery on endangered, threatened or protected species.

There are no endangered, threatened or protected species caught by this fishery.

2.2.3 There is an assessment of the impact of the fishery on threatened ecological communities.

There are no threatened ecological communities associated with the fishery.

Management Responses

2.2.4 There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.

There are no measures in place because to date there has been no reported captures or interactions between the fishery and any endangered, threatened and/or protected species.

2.2.5 There are measures in place to avoid impact on threatened ecological communities.

Not applicable.

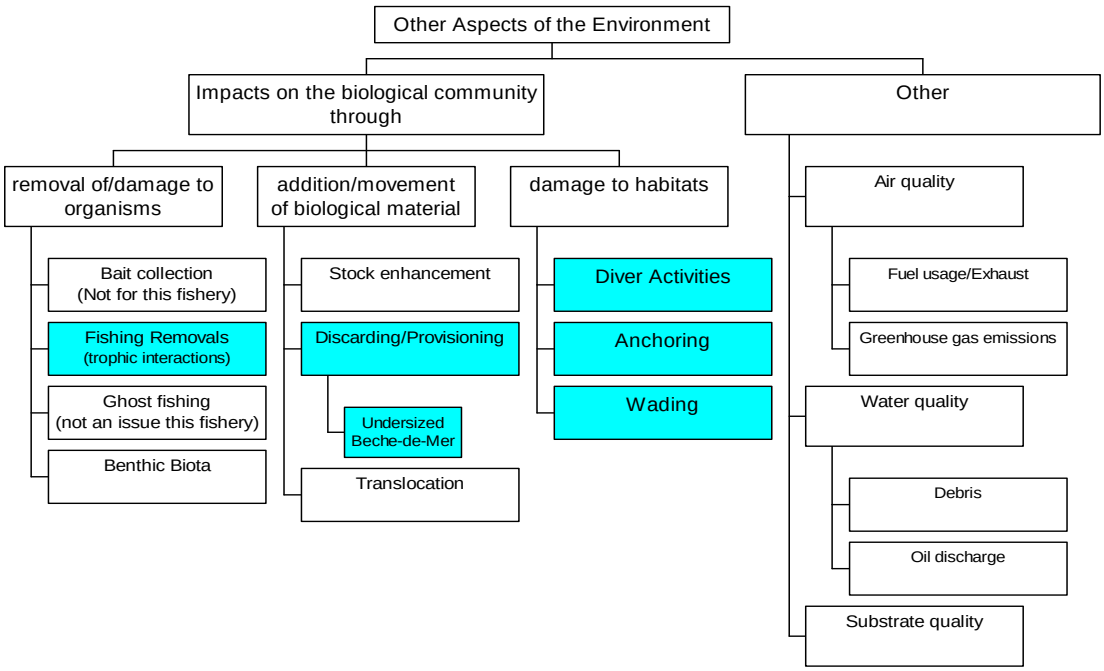
2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

There have been no reported interactions (including captures) of endangered, threatened and/or protected species with this fishery therefore it is unlikely that this fishery is having any unacceptable impacts on these species. Nonetheless, if they are

inappropriate and/or the level of interactions increases, appropriate alterations to practices will be taken.

OBJECTIVE 3. GENERAL ECOSYSTEM

The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.



The issues that relate to the broader ecosystem, which were identified for this fishery are shown above in the component tree. An internal risk assessment process subsequently assessed each of these issues with the information relating to each issue detailed in Section 5.3.

There were five issues identified, all of which were given a **Negligible risk** rating. Consequently, the fishery's current performance meets Objective 3.

Information Requirements

2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.

Appropriate levels of information (in relation to the scale of the fishery) have been obtained for most of the issues identified, which has allowed for a sensible assessment of the level of risk to be determined. This information includes data collected directly relating to the BDMF – in terms of catch and effort.

Given the nature of the BDMF (i.e. exploratory/developmental) and the small amount of catch and other direct impacts it has on the environment, a large amount of information is not needed to assess its level of impact on the broader ecosystem. As the fishery develops the Department of Fisheries will investigate the need for future research.

Assessments

2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.

A risk assessment was completed (see Section 5.3 for details) on each of the identified issues relevant to the BDMF (see component tree for issues). The identified issues that were assessed and a summary of the outcomes are located in Table 4- complete justification are located in the performance reports in Section 5.3.

Table 4 Summary of risk assessment outcomes for environmental issues related to the BDMF.

ISSUE	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Impact from removal of/damage to organisms:			**5.3.1**
Trophic Interactions	Negligible	This fishery harvests only a small amount (around 80 tonnes per annum) across six target species (primarily sandfish). The effect from this harvesting on the rest of the ecosystem, given that the catch is spread over a wide region, would be insignificant. In addition, predation on the beche-de-mer is relatively infrequent due to the toxins present in their body tissues. It is highly unlikely these animals are a major diet for higher order predators due to these toxins acting as an effective defence system.	5.3.1.1
Impact from addition/movement of biological material:			**5.3.2**
Discarding of undersized beche-de-mer	Negligible	Few undersized individuals are caught by this fishery. Fishing for beche-de-mer species is highly selective, undersize animals are not targeted and if inadvertently caught are returned directly to the fishing grounds after sorting/measuring on deck.	5.3.2.1
Damage to habitats:			**5.3.3**
Diver activities	Negligible	Divers collect beche-de-mer as they drift over the bottom, there is minimal impact on the habitat as divers are highly selective in their fishing effort and no fishing gear/lines contact the seabed.	5.3.3.1
Anchoring	Negligible	Vessels work during the day and anchor	5.3.3.2

		at night usually further inshore where they are protected from the open ocean which is subject to higher seas and wind. Most fishers are mindful of the habitat they choose to anchor over, so they avoid more diverse bottom habitat.	
Wading	Negligible	There are some areas, which fishers can access beche-de-mer by wading through the shallow water mangrove lagoons and estuaries. This is a minor component of the fishery. This method may be applied in areas of the Kimberley that are accessible and prone to extreme tidal movements. Wading usually occurs on soft sandy substrates with minimal impact on these habitats.	5.3.3.3

Thus, all of these issues were rated as **Negligible risk**.

Management Responses

2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1.

The most important management method required to ensure that there is minimal impact on the broader ecosystem include maintaining significant stock/biomass levels of beche-de-mer species. In most cases this serves to achieve both objectives of having a sustainable fishery and minimizing the potential for any negative trophic interactions. Other management measures such as limited entry, species dependent, minimum sizes and gear restrictions further minimise the potential for impacts.

2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is indicated by application of the precautionary approach.

None of the issues were of sufficient risk to require specific target levels as they are effectively covered by the other management arrangements and trigger points.

2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Given the risk assessment identified that under current management arrangements there have been minimal or negligible impacts from the BDMF on the broader ecosystem, it is highly likely that the fishery will continue to meet the objectives of having acceptable levels of impacts.

5. PERFORMANCE REPORTS

5.1 RETAINED SPECIES

COMPONENT TREE FOR RETAINED SPECIES OF THE BDMF

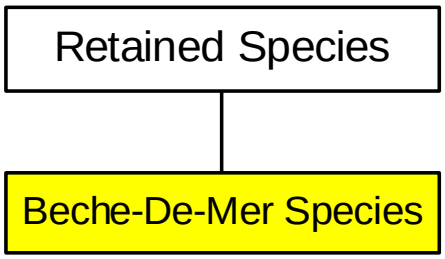


Figure 4 Component tree for retained species.
A Yellow box indicates that the issue was considered a high enough risk to warrant having a full report on performance.

5.1.1 PRIMARY SPECIES

5.1.1.1 BECHE-DE-MER SPECIES

Rationale for Inclusion:

Beche-de-mer (also known as sea cucumbers, and trepang) are soft bodied, elongated animals of the Phylum Echinodermata, Class Holothuroidea. They usually live with their ventral surface in contact with the benthic substrate or buried in the substrate. Of the thousands of species of Holothurians only a few species are commercially exploited (Conand and Bryne, 1993). There are six target species caught commercially in WA; they are sandfish (*Holothuria scabra*), white teat fish (*Holothuria fuscogilva*), black teat fish (*Holothuria nobilis*), prickly red fish (*Thelenota ananas*), deep-water red fish (*Actinopyga echninitis*) and lolly fish (*Holothuria atra*). The bulk of the commercial fishery in WA extends north from Exmouth Gulf to the Northern Territory border, however catches are also taken from the Shark Bay area and the south coast of WA.

ERA Risk Rating: Impacts on breeding stock (C3 L3 MODERATE)

Fishing takes place in shallow water mangrove lagoons and estuaries during neap tides, as the strong current and poor visibility resulting from extreme tidal ranges (10-12m) renders fishing impossible at other times of the month. The silty conditions under which these stocks are sought are thought to provide a useful level of protection for the species, as visibility underwater is generally very limited (<1m). Collection is limited to easily accessible, open water areas where there are fewer dangers for divers or waders from saltwater crocodiles. Despite the danger for fishers working in these environments there is very little development of fishing technology. Attempts at

employing cages (similar to those used by abalone divers) for protection against saltwater crocodiles have proved unsuccessful due to difficulty of use in shallow water areas and stirring up of the benthos which further decreases visibility. Due to these constraints divers and waders can only continue to harvest from a limited proportion of available habitats.

Operational Objective

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.

Justification:

The operational objective is in place to meet the environmental and commercial objective of sustaining beche-de-mer populations. As with any fishery species, it is important to minimise the risk of recruitment overfishing.

Indicators

Catch

The processed weight and/or live weight that is caught by the fishers. To standardise data for analysis a standard conversion ratio of 3 (Live wt = processed weight x 3) is used. However, experiments and anecdotal evidence suggest that the conversion factor varies from 2 to 5 dependent upon the time of fishing, method and length of processing time.

Since the CAES does not discriminate between species of beche-de-mer caught catch reports are not species specific.

Effort

Beche-de-mer fishers provide monthly returns under the statutory **CAES**. These returns contain data on **catch** (processed weight and/or live weight), **days** and **hours** fished by **month** and **year**, and number of **crew** on each vessel**.** Catch and effort are spatially allocated to 60 x 60 nautical mile statistical **blocks.** The Kimberley and Pilbara are the main sectors of the BDMF and are comprised of numerous 60 x 60 nm blocks (Figure 5). Fishers also note the **method** fished and **condition of catch** (whole or "gilled and gutted"). If gilled and gutted, a whole weight is calculated using a conversion factor of 3.

While the number of harvesters allowed to dive for beche-de-mer has only been 4, the variation in crew numbers has ranged from 2 to 8 (current FBL conditions restricted to 6 crew per vessel), and this is suspected to have an impact on catch rates. Assessments prior to 2002 did not standardise catch rates according to crew number. For 2002, effort was standardised by calculating number of crew days, as well as number of vessel days.

Crew days = vessel block days × number of crew.

Performance Measures

Catch

The preliminary acceptable catch range is 50 – 150 tonnes.

Justification:

This range covers the likely catch by the BDMF during the next few years. If the catch declined below 50 tonnes this would require investigation of the reasons for the decline. Similarly, if the catch exceeded 150 tonnes again this would represent a major change in fishing patterns and require some investigation.

Catch Rate

The preliminary limit point for this fishery is that the catch rate should remain above 80 kg/crew-day fished.

Justification:

This level is below the previous 8 years data and could, therefore, represent a significant decline in relative abundance of beche-de mer in the areas harvested.

Given that the BDMF is predominately still in an exploratory/developing phase it is not mature enough to have fully developed performance measures. These preliminary performance measures have been developed to ensure that any major change in the patterns of fishing are noticed and investigated. If they are triggered, given the developmental nature of the fishery, this may not necessarily indicate there is a problem with the stocks. Therefore, these preliminary measures may be subject to review over the next 2-3 years as more information comes from the fishery.

Data Requirements for Indicator

Data Required	Availability
Catch rate utilizing commercial catch and effort information provided through monthly returns by the fishers.	Yes; available on a monthly basis since 1995.
Method fished.	Yes; available on a monthly basis since 1995.

Evaluation

Summary

The data shows that the fishery has been through an initial expansion and contraction phase and is currently experiencing steady catches at a 3 year average catch of around 80 tonnes live weight, and a 3 yr average catch rate of 110 kg/crew day.

Effort

Fishing effort (mostly dive based) over the 9 years of the experimental beche-de-mer fishery has expanded from an initial level of effort of 183 vessel days (582 crew days) in 1995, to a peak of 550 vessel days (2565 crew days) in 1998 (Figure 5). This has subsequently declined to less than 150 vessel days in 2000 to 2002, which possibly indicates a stabilising of ongoing effort levels (Figure 5). The majority of fishing effort is divided between the Kimberley sector, and the Pilbara sector near Port Hedland (Figure 5).

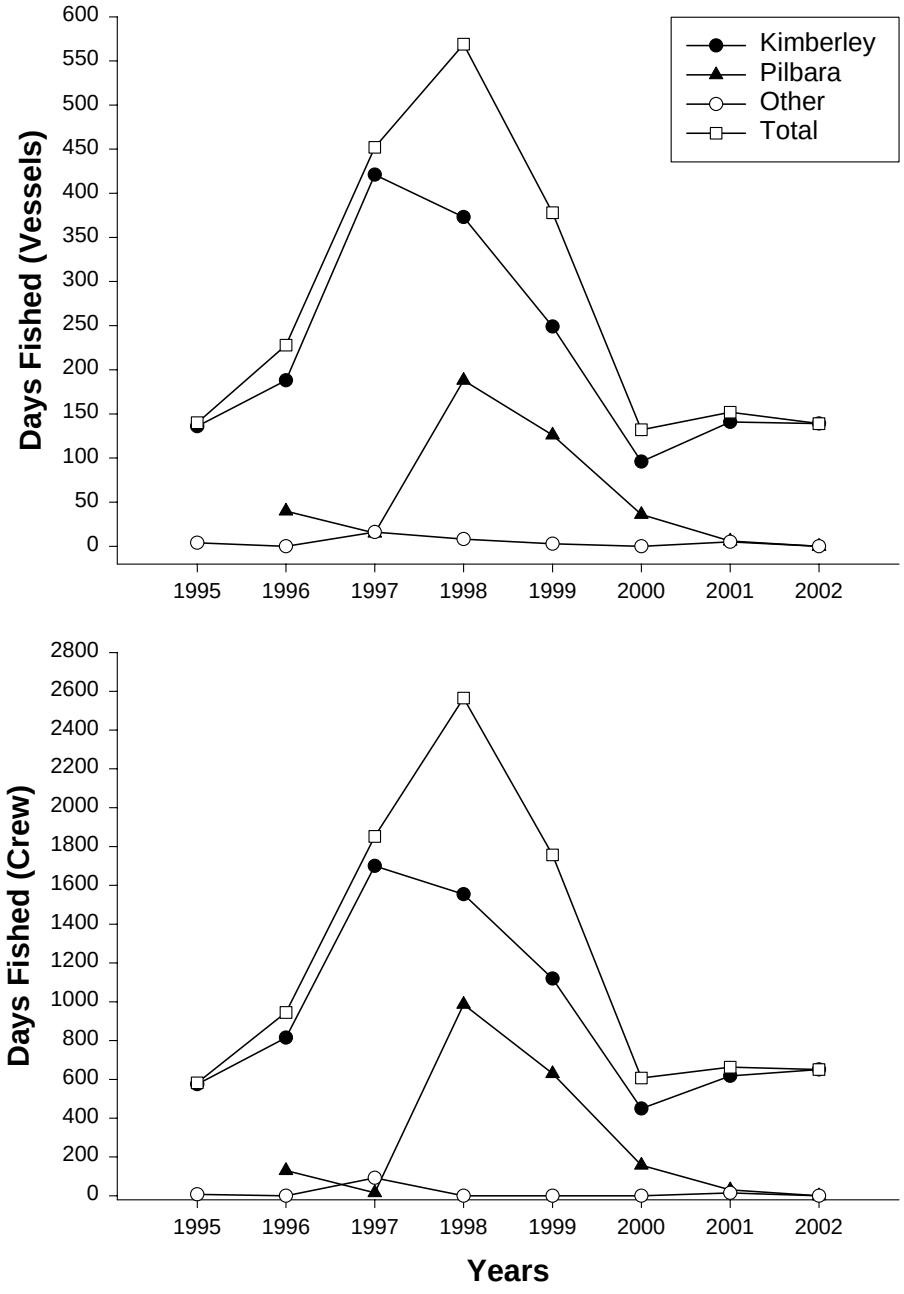


Figure 5 Fishing effort (days fished) across major fishing sectors of the Western Australian beche-de-mer fishery between 1995 and 2002

Catch

Catch (in tonnes) over the 9 years of the experimental beche-de-mer fishery expanded from 90 tonnes (live weight) in 1995 to a maximum of 382 tonnes in 1997, when effort was at it peak. The catch has, associated with the reduction in effort, declined to an average of 80 tonnes since 2002 (Figure 6).

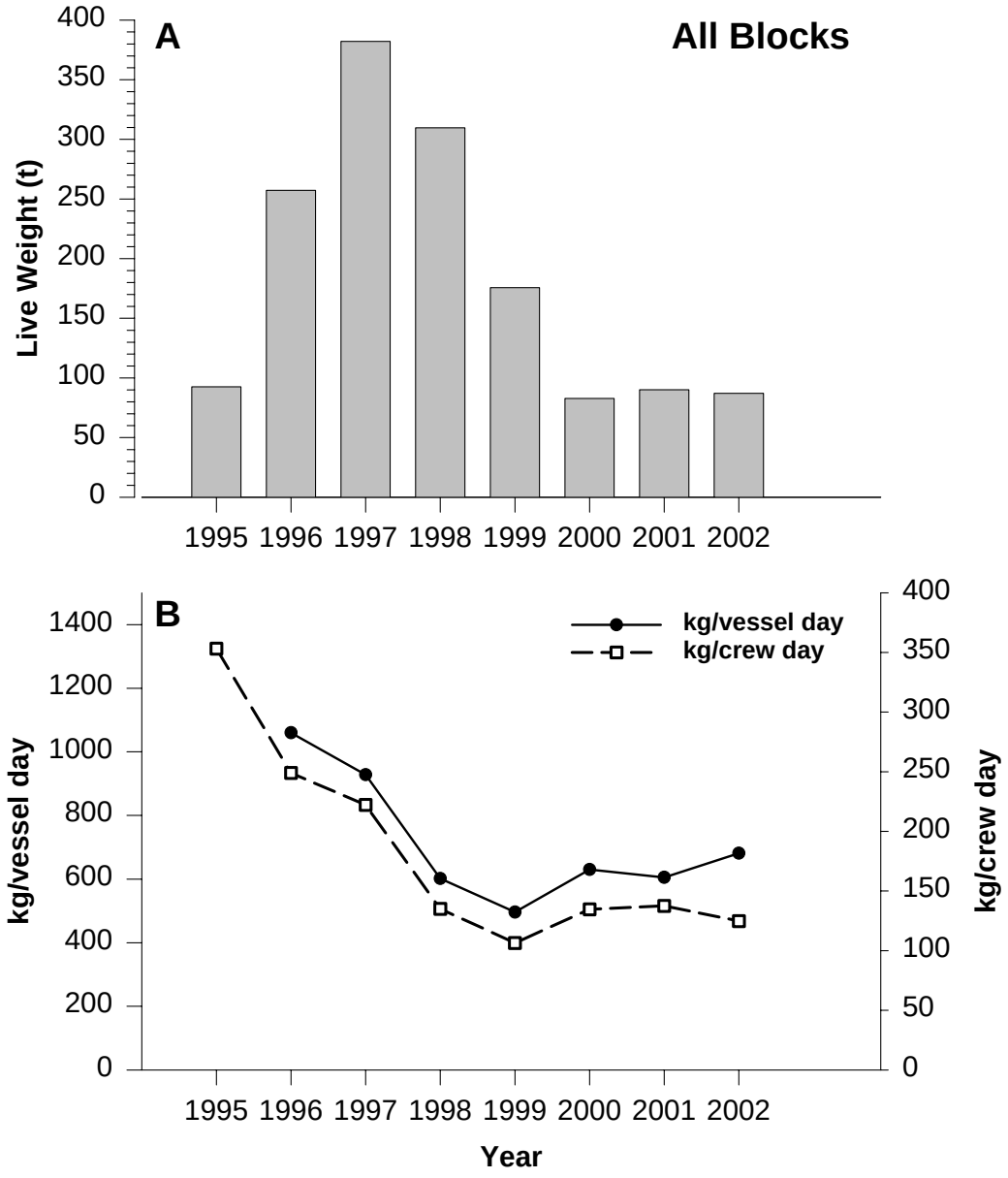


Figure 6. Production (tonnes/live weight – bars all fishing methods; A) and catch rate (kg/ vessel day; kg per crew day; B) from the Western Australian beche-de-mer fishery.

Catch Rates

The raw catch rates (kg/crew day) have declined from initial values of 360 kg per crew day in 1995 to 100 kg per crew day in 1999. They have subsequently stabilised at this level over the past (Figure 6). Catch rates in terms of kg/vessel day, and kg/crew day are showing similar patterns.

Biomass Dynamics Modelling

The catch and catch rate data for the entire Fishery have been assessed using Biomass Dynamics modelling techniques. This relates the catch taken by the fishery to changes in the catch rate to estimate the carrying capacity *K* and the intrinsic rate of increase *r* from which the sustainable catch can be calculated.

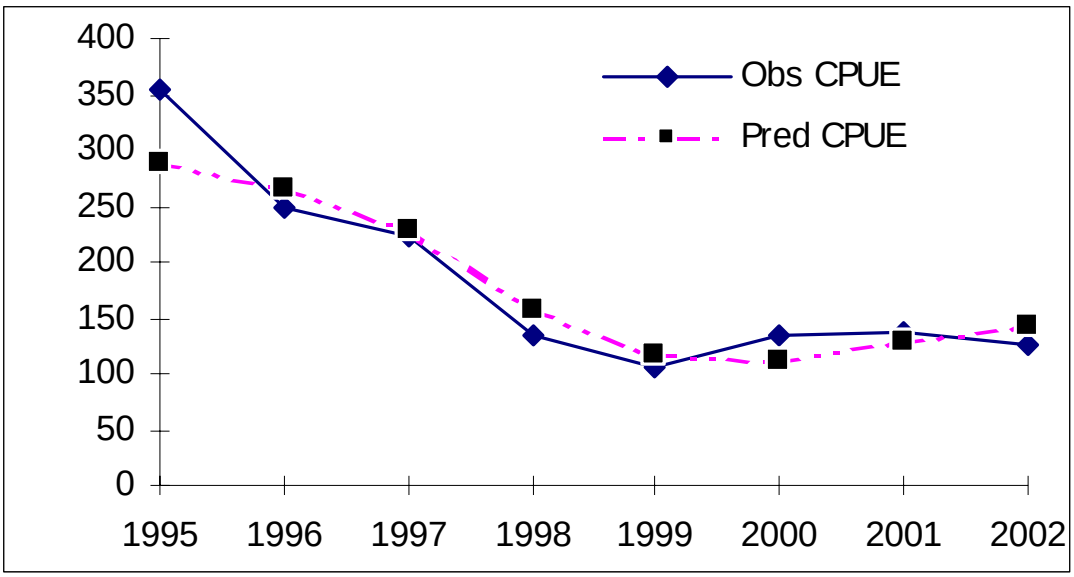


Figure 7. Relationship between actual catch rates and predicted catch rates using biomass dynamics modeling

r (intrinsic rate of increase) = 0.55
K (carrying capacity) = 1131
q (catchability) = 0.254

The estimated maximum sustainable yield from this fishery can be calculated by r*K/4. This generates a value of approximately 155t per year Given that the MSY calculated from a new fishery is often an optimistic value, it is appropriate that the current catches are in the vicinity of being 30-40% lower than this estimate, at approximately 80-100t per annum.

Blocks 1425 and 1426

The Kimberly sector is the mainstay of the fishery (Figure 5). Within this region, two statistical blocks (1425 and 1426) have produced 48% of the entire Western Australian catch since 1995.

In Block 1425, catches peaked in 1997 and 1998 at 140 and 75 tonnes respectively, however in all other years, between 20 and 40 tonnes were caught (Figure 8). Catch rates have oscillated with peaks in 1996 and 2001 (Figure 8).

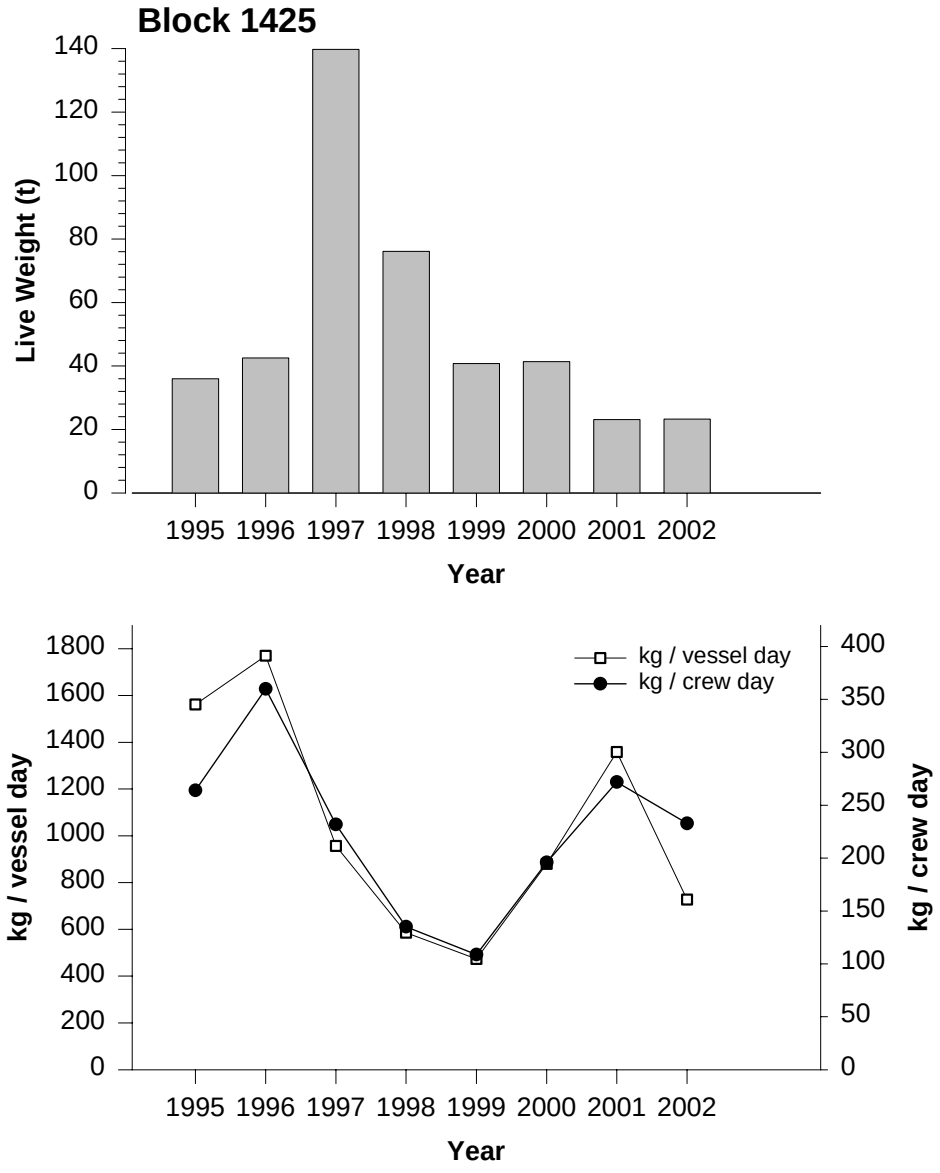


Figure 8. Production (tonnes - bars) and catch rate (kg per vessel day; kg per crew day;) from blocks 1425 in the WA BDMF. Block 1425 and 1426 have produced over 60% of the total catch of the fishery since 1995.

In Block 1426, catches have varied between 20 and 80 tonnes since 1996 (Figure 9). Catch rates (raw and standardised) in this block peaked in 1996 and 1997, and with a further peak in 2001 at 60 t (Figure 9).

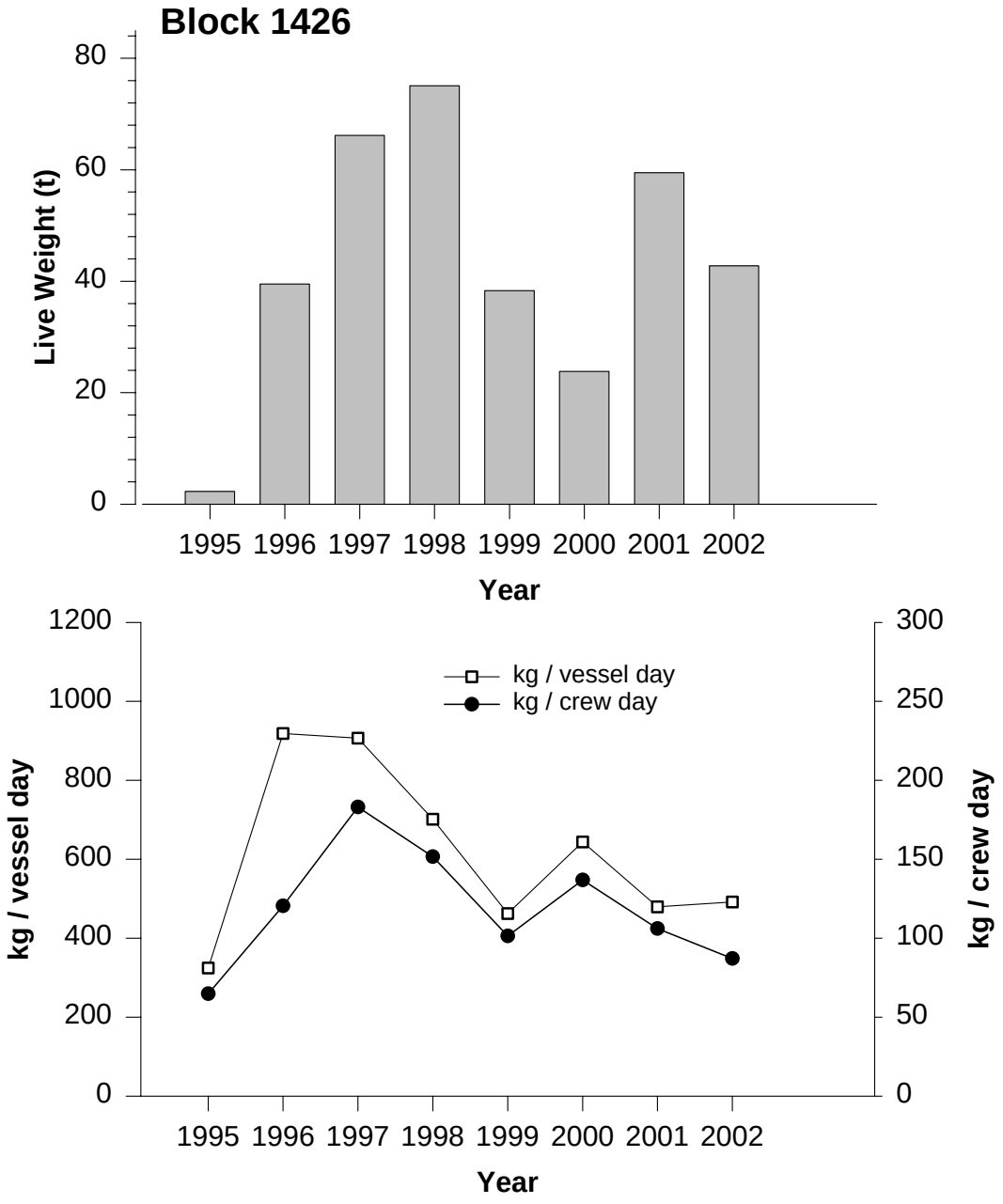


Figure 9. Production (tonnes - bars) and catch rate (kg per vessel day; kg per crew day;) from blocks 1426 in the Western Australian beche-de-mer fishery. Block 1425 and 1426 have produced almost 50% of the total catch of the fishery since 1995.

Overall Assessment (2002)

Catches and catch rates in the main two blocks have been relatively stable since 1999, after an initial increase in catch and effort followed by decreasing catch rates indicative of a developing fishery that is beginning exploitation on a previously unfished stock. The biomass dynamics modelling supports this assertion and suggests that the current catch of approximately 80 –100 t is sustainable being substantially lower than the calculated MSY.

In 2004, the fishery will be in its 10^{th} year of operation, and it is expected that a stabilisation of catch with catch rates should have occurred by this time. Thus, the review of the 2004 and 2005 data will focus on developing clearer target levels of catch and effort appropriate for monitoring the performance of this fishery.

Robustness
Medium - High

The indicators of beche-de-mer stock abundance are moderately robust as the data comes in on a monthly basis from each vessel, and can be standardised to some extent by crew numbers. However, data on species by species is lacking, and hence if species substitution occurs (e.g. if abundance of the principal species drops, and another species is targeted), the current catch and effort recording will not pick it up. Noting this, the Department of Fisheries (WA) is developing a daily catch and effort logbook in conjunction with industry that will gather accurate species-specific information. A trial of the new logbook is scheduled to take place before the end of the 2004 season.

The biomass dynamics modelling is of medium – high robustness given the close level of fit between the actual and predicted catch rates. It will be instructive to repeat this analysis after a few more years of data are collected.

Fisheries Management Response

Current: To ensure the maintenance of the breeding stock the following measures are employed:

- The fishery is managed through input controls (limited entry, maximum number of divers) and output controls (minimum legal size, species dependent); and
- The fishers provide monthly returns under the statutory CAES.

Future: The Department of Fisheries recognises the need to increase the robustness of the data used to monitor the status of stocks by obtaining better data on catch (e.g. isolating the catch by species) and effort (validating crew days; accounting for visibility and other conditions).

Biomass dynamics models at the level of each block may also be completed to provide finer resolution of the potential yield of this fishery

Actions if Performance Limit is Exceeded: The following approach would be used prior to the beginning of the next season if either of the performance limits was exceeded:

1. Find out why the acceptable catch range has not been met. Evaluate if there has been a 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 80kg/ 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.

Comments and Actions

Not applicable.

External Driver Check List (Constraints to Harvesting)

The following external drivers promote harvesting constraints by limiting effort and possibly affecting the catch rates of any one year:

- Isolation – vessel effort restricted because is an isolated fishery;
- High tidal range (10-12m) - can only fish neap tides;
- Strong currents and high turbidity of water - poor visibility;
- Dangerous animals (Crocodiles, sharks, jelly fish) control effort;
- Cyclones (restricts fishing to winter-spring); and
- Depth – dive safety profiles limit effort in deeper (20m+) waters.

5.2 NON-RETAINED SPECIES

There are no known non-retained species taken in this fishery.

5.3 GENERAL ENVIRONMENT

COMPONENT TREE FOR THE GENERAL ENVIRONMENT

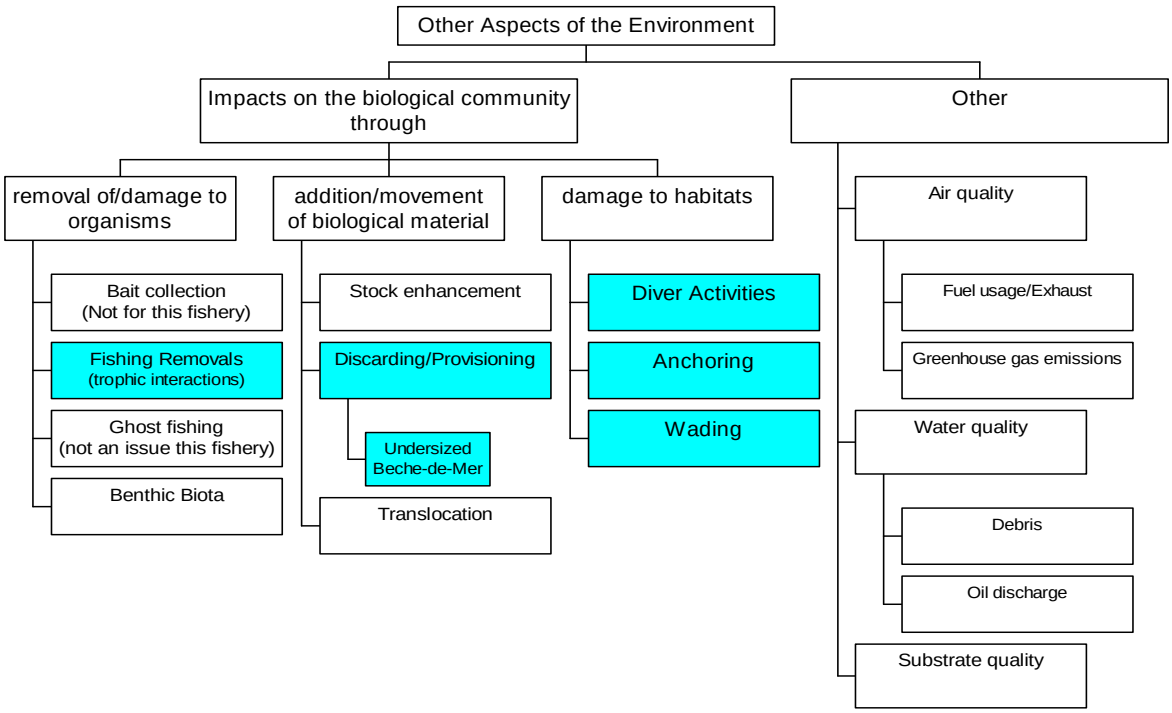


Figure 10 Component tree for the general environment.

5.3.1. IMPACT OF REMOVING OF/DAMAGE TO ORGANISMS

5.3.1.1 TROPHIC INTERACTIONS

Rationale for Inclusion:

ERA Risk Rating: Removal of beche-de-mer species on the ecosystem (C0 L3 NEGLIGIBLE)

As with all fisheries, the impacts of the removal of the target species on other elements of the ecosystem needs to be thoroughly examined. The presence of beche-de-mer in an ecosystem causes many variations to the composition of the benthic micro assemblages as well as the abiotic sediment structures. It has been suggested that bioturbation by Holothurians may inhibit larval settlement and development of suspension feeding and meiofauna populations (Massin, 1982), which may have implications for biodiversity. Energy flows within the sedimentary communities are altered as ammonium excretions from beche-de-mer favour some species of diatoms. Bioturbidation from beche-de-mer feeding causes an increase of oxygenation of the surface layers of sediment thus altering the associated sedimentary assemblages. Predation on beche-de-mer is relatively infrequent due to the toxins present in their body tissues. It is highly unlikely these animals are a major diet for higher order

predators due to these toxins acting as an effective defense system. Furthermore, the limited number of active operators coupled with the relatively small amounts harvested of the different species is unlikely to have any significant impact on the environment resulting in a **Negligible risk** rating.

5.3.2 ADDITION/MOVEMENT OF BIOLOGICAL MATERIAL

5.3.2.1 DISCARDING OF UNDERSIZED BECHE-DE-MER

Rationale for Inclusion:

ERA Risk Rating: Impact on environment from discards (C0 L1 NEGLIGIBLE)

Minimum size limits preclude the harvesting of undersize beche-de-mer, as they are hand picked. Fishing for beche-de-mer is highly selective, undersize animals are not targeted and if inadvertently caught are returned directly to the fishing grounds after sorting/measuring on deck.

5.3.3 DAMAGE TO HABITATS

5.3.3.1 DIVER ACTIVITIES

Rationale for Inclusion:

ERA Risk Rating: Impact on habitat from diver activities (C0 L2 NEGLIGIBLE)

Fishing for beche-de-mer is similar to fishing methods employed in the pearling wildstock fishery i.e. a vessel fitted with booms and hookah system. These vessels will tow/drift up to 4 divers from the stern of the vessel during the neap tides. Divers collect beche-de-mer as they drift over the bottom, there is minimal impact on the habitat as divers are highly selective in the fishing effort and all fishing gear/lines have no contact with the seabed.

5.3.3.2 ANCHORING

Rationale for Inclusion:

ERA Risk Rating: Impact on habitat from anchoring (C0 L1 NEGLIGIBLE)

Vessels work during the day and anchor at night usually further inshore where they are protected from the open ocean which is subject to higher seas and wind. Most fishers are mindful of the habitat they chose to anchor, so avoid more diverse bottom habitat unless they plan to wetfish recreationally for some time during the night.

5.3.3.3 WADERS

Rationale for Inclusion:

ERA Risk Rating: Impact on habitat from waders (C0 L1 NEGLIGIBLE)

There are some areas where fishers can access beche-de-mer by wading through the shallow water mangrove lagoons and estuaries. This is a minor fishing method employed and may be suitably applied in areas of the Kimberley region that are accessible and prone to extreme tidal movements. Wading usually occurs on soft sandy substrates with minimal impact on these habitats and in different areas than those accessed by boats.

5.4 GOVERNANCE

COMPONENT TREE FOR THE GOVERNANCE OF THE BDMF

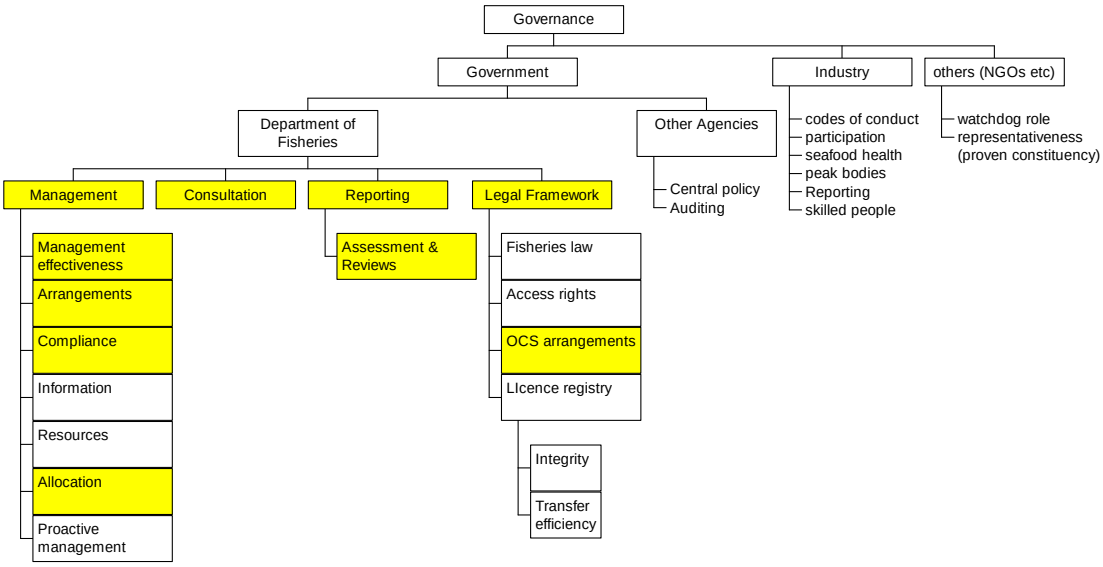


Figure 11 Component tree for governance.
NB- no generic components have been removed from the tree but only those boxes that are yellow will be reported in this application.

5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT

5.4.1.1 MANAGEMENT EFFECTIVENESS (OUTCOMES)

Rationale for Inclusion:

The effectiveness of management arrangements in the developmental BDMF is ultimately measured by assessing the outcomes of various strategies employed to manage this fishery.

The commercial exploitation of beche-de-mer in WA remains in a developmental/exploratory stage. The fishery's catch and effort has been controlled, since fishing began in 1995, via a number of methods (see below) including limiting the number of FBL "endorsed" to take beche-de-mer to six. This number of endorsements will remain until 2007 at which time a review of the BDMF will be conducted.

These beche-de-mer endorsements will expire on 31 December 2007. This date will coincide with a major review of the fishery. This review aims to determine the appropriate level of allowable commercial exploitation for the future and any

subsequent requirements for the implementation of a formal management plan and other management strategies.

Catch and effort are recorded on the standard CAES return forms (submitted monthly) and an annual report is submitted from each operation summarising the nature and success of fishing operations over the previous 12 months.

Given that beche-de-mer fishing in WA is relatively new and effort has been minimal, it is believed that beche-de-mer stocks are under-exploited at this time. The operational objectives with regard to management are largely directed towards capping effort, and ultimately determining an appropriate sustainable catch level for the fishery.

If the annual acceptable catch range of beche-de-mer is maintained, then the community's expectation is that variations in annual catch result only from annual changes in environmental conditions, or planned changes to the management of the level of commercial exploitation, and not from the depletion of the stock. Any large unexplained variation in catch is likely to be a reflection of a reduction in management effectiveness and therefore reduce the community's confidence in the management of the resource and raise concerns about the on-going sustainability of the fishery.

Operational Objective

To undertake an extensive review of the developmental/exploratory BDMF (after 31 December 2007) with a view to determining the appropriate allowable level of commercial exploitation in the future and subsequently to develop a comprehensive management plan that will enable the continuation of sustainable beche-de-mer harvesting.

During the developmental/exploratory phase, the commercial catch of the species of beche-de-mer taken in the fishery be maintained within a determined acceptable range on an annual basis.

Justification:

If effective management arrangements are operational in the fishery (including the restrictions on effective effort levels, compliance with the regulations are being maintained effectively, combined with our understanding of the size of the exploitable stock), then the actual total catch for the species of beche-de-mer caught should remain at or below a sustainable level. Any major variations in catch and catch rates would elicit the need to explain the cause of this deviation and potentially result in changes to management arrangements.

Indicator

That management arrangements exist to permit the take of a predicted, sustainable quantity of beche-de-mer whilst also being flexible enough to facilitate changes in effort (and therefore catch) if the predicted level of catch is not achieved.

Performance Measure

Subsequent the major review of the developmental/exploratory BDMF after 31 December 2007, future management arrangements will be investigated. Before the fishery progresses past a developmental stage, development of a comprehensive management plan that achieves the operational objective of maintaining catch levels within an acceptable range including performance measures will be developed.

Justification:

Given it is believed that the beche-de-mer resource is currently under-exploited, the current restrictions on allowable effort in the fishery should ensure that the risk of over-exploitation remains low until such time as a major review of the fishery is undertaken (post 31 December 2007) allowing a more structured approach towards future management arrangements to be developed.

Data Requirements for indicator

The following data are required for this indicator:

Data Requirement	Data Availability
Commercial catch and effort	Yes; obtained annually.
Historical catch levels	Yes; records available and accessible.
Level of fishing effort and fishing power	Yes; number of vessels, days fished, areas of operations and activity and fishing power comparisons readily available.
Environmental indicators	Yes; key environmental indicators readily available.

Evaluation

Summary: Despite the developmental nature of the BDMF, the available data shows that it has been through an initial expansion and contraction phase but now catch rates are being maintained or increased.

Robustness
Medium / High

The data required for the indicators in most cases are readily available. However, the developmental nature of the fishery requires that any significant variations in catch and catch rate be thoroughly investigated to ensure that the "interim" measures continue to be relevant.

5.4.1.2 MANAGEMENT ARRANGEMENTS

Rationale for Inclusion:

In WA, a number of instruments are used to articulate the management arrangements for fisheries. The FRMA has elements that affect all fisheries. The FRMA provides

for the creation of Management Plans, Orders, Regulations, Ministerial Policy Guidelines and Policy Statements.

The FRMA sets out the objects for the sustainable management of fish resources in WA, and provides the framework for developing and implementing management plans for each of the State's fisheries.

Table 5 Objects of the FRMA.

Objects

The objects of this Act are to conserve, develop and share the fish resources of the State for the benefit of present and future generations.
In particular, this Act has the following objects-

- to conserve fish and protect their environment;
- to ensure that the exploitation of fish resources is carried out in a sustainable manner;
- to enable the management of fishing, aquaculture and associated industries and aquatic eco-tourism;
- to foster the development of commercial fishing and recreational fishing and aquaculture;
- to achieve the optimum economic, social and other benefits from the use of fish resources;
- to enable the allocation of fish resources between users of those resources;
- to provide for the control of foreign interests in fishing, aquaculture and associated industries;
- to enable the management of fish habitat protection areas and the Abrolhos Islands reserve.

As is common practice in fisheries of a developmental/exploratory nature, management arrangements for the commercial take of beche-de-mer in WA are currently provided for by specific conditions placed on the FBL of "authorised" commercial beche-de-mer fishers. Section 69 of the FRMA establishes the authority of the Executive Director of the Department of Fisheries (ED) to impose conditions on "an authorisation" (in this case a FBL endorsement permitting the take of beche-de-mer).

The following "FBL condition" is imposed on all six of the FBLs currently endorsed to take beche-de-mer:

FBL condition No. 50

1. The boat described herein is authorised to be used for the purpose of taking beche-de-mer, of the Phylum Echinodermata, Class Holothuroidea on the conditions set out below.

2. Up to two licensed dinghies endorsed for the take of beche-de-mer may be used in conjunction with beche-de-mer fishing activities of the main fishing vessel.

3. Beche-de-mer may only be taken by diving or direct collection by hand.

4. No more than six crew members are permitted to operate from the vessel during beche-de-mer collection.

5. No more than four of the six crew are permitted to dive for beche-de-mer at any one time.

6. The beche-de-mer must not be collected from:

    - within any marine park, aquatic reserve or sanctuary area including the proposed Dampier Archipelago Marine Conservation Reserve;
    - within a 5 nautical mile radius of Cape Keraudren;
    - within any Western Australian waters surrounding the Rowley Shoals; and
    - within any Western Australian waters surrounding the Abrolhos Islands.

7. Only beche-de-mer greater than the minimum lengths specified below may be taken.

Species	Common Name	Length (cm)
Holothuria scabra	Sandfish	16
Holothuria whitmaei	White teat fish	32
Holothuria nobilis	Black teat fish	26
Thelenota ananas	Prickly red fish	30
Actinopyga echninitis	Deep water red fish	12
Holothuria atra	Lolly fish	15

8. In addition to the provision of statutory catch and effort returns in accordance with Regulation 64 of the FRMR, a report outlining and summarising the nature and success of the beche-de-mer fishing operation must be submitted by the 30 November, each year this condition is valid, to the Commercial Fisheries Program of the Department of Fisheries.

9. A holder of a Commercial Fishing Licence (CFL) operating from the Licensed Fishing Boat named on this licence is to be taken to hold a CFL that specifies that the holder of this licence may fish for beche-de-mer by way of diving gear.

10. This 'condition of licence' expires on 31 December 2007.

Operational Objective

In consultation with the industry members and other stakeholders, the Department periodically reviews the legislation (FRMA, Management Plans, Orders and Regulations), to ensure the management framework remains relevant and aligned with the management objectives.

Justification:

Management arrangements ultimately constrain exploitation of a natural resource where the potential to harvest the resource could exceed the ability of the resource to replenish itself. The development of rules can restrict the potential to harvest (effort) to an appropriate level, and management arrangements can define processes within which access to the resource can be allocated to competing user groups (including natural ecosystems).

Indicator

The extent to which the FRMA, FRMR, and other management arrangements allow for the timely setting of appropriate effort levels and resource allocation in the fishery.

Performance Measure

This should be 100%.

Evaluation

Notwithstanding the belief that the BDMF is currently under-exploited, no formal evaluation of the management arrangements of the developmental BDMF has been undertaken. Indeed, such a formal evaluation will probably not take place until after the fishery progresses towards a more structured management approach (i.e., post 31 December 2007). However, annual assessment of the catches in the BDMF suggest that management arrangements for the fishery are adequate in that little potential exists for fishermen to activate inappropriately high levels of effort that could place the target resource at risk.

Robustness
High

The management plans; licence conditions and related legislation have provided a diverse but reasonably complete set of fisheries management legislation. The fact that the management arrangements are contained within legislation provides a high degree of stability with respect to how the fisheries are managed. The process for achieving management framework changes is well understood by the majority of stakeholders and the system is flexible enough for the management process to respond to change in stimuli.

Fisheries Management Response

The Department has successfully administered the management framework and related legislation to achieve and pursue the stated objectives for the developmental BDMF. Until the major review of the fishery takes place (after 31 December 2007) changes to the management framework may occasionally occur in order to address key concerns or issues.

External Driver Check List

Potential resistance of fishers to support Department initiated management arrangements.
Potential reluctance of Minister to exercise power.

5.4.1.3 COMPLIANCE

Rationale for Inclusion:

Effective compliance is vital to achieve the management objectives of any fishery. This involves a mix of sea and land patrols. The ability to conduct at sea compliance patrols on the Kimberley coast is limited because of patrol boat size and availability. In addition, a number of the vessels currently operating in the fishery are based out of Darwin, highlighting the need for the cross-border cooperation on compliance issues.

Operational Objective

To have sufficiently high levels of compliance within the management framework to lend credibility to recorded catch and effort data.

Justification:

The activities of the participants in the fishery need to be sufficiently consistent with the management framework and legislation in order to make it likely that the expected outcomes and objectives of the fishery will be achieved.

Indicators

The levels of compliance with the legislation and compliance with conditions of licence.

Degree of understanding and acceptance of rules governing the operation of the BDMF by licensed operators and the broader community.

Performance Measure

The performance of the compliance program for the fishery will be a measure of the proportion of offences to the number of inspections.

Data Collection Requirements and Processes

Random inspections of vessels at sea and port.
Ongoing collection of data on illegal activities.
Comparative data on the relative effectiveness of certain compliance techniques.

Evaluation

The Department has limited compliance resources dedicated to the BDMF (in light of the competing requirements of other fisheries). However, the emphasis of the management framework on specific effort restrictions and licencing requirements (for authorised "collectors") allow a relatively small compliance effort to ensure a high degree of compliance.

Since the fishery's inception in 1995 there have been numerous 'opportunistic' compliance checks (i.e., encounters with beche-de-mer fishing operations by compliance staff in the area chiefly for reasons to do with other fisheries, particularly pearling) on boats operating in the fishery. Indeed, the significant pearling compliance activities in the Kimberley region result in relatively frequent interaction with the beche-de-mer "fleet". To date, there have not been any offences by licensed operators detected in this developmental fishery.

Were the fishery to become established under a more formal management regime (post 2007) the Department would evaluate and possibly look towards the implementation of a Vessel Monitoring System in the fishery.

Robustness
Medium

The difficulties in identifying illegal activity will remain particularly in light of the continued use of Darwin as a "home" port for many of the vessels operating in the fishery.

Fisheries Management Response

Despite the relatively low levels of compliance work being done in the BDMF, the Regional Services division of the Department continues to gather intelligence on suspected breaches within this fishery. The Department will continue to provide high standard compliance services within budgetary and resource constraints.

Comments and Actions

The Department will continue to provide high standard compliance service, within budgetary and resourcing constraints, to the BDMF. It is expected that in due course the completion of a compliance risk assessment for the fishery will enable the Department to better direct resources to further increase the effectiveness of the limited compliance activities.

External Driver Check List

Some overseas/Eastern States beche-de-mer fisheries are over-exploited and have consequently experienced increasing restrictions on take. This, in conjunction with continued market development strategies employed by companies involved in the trade of beche-de-mer may increase demand for WA beche-de-mer and provide a greater incentive for non-compliance.

5.4.1.4 ALLOCATION AMONG USERS

Rationale for Inclusion:

Within the broad context of ESD, the issue of how fish resources can best be shared between competing users requires consideration. In WA, the Integrated Fisheries Management Review Committee (IFMRC) was established to develop a strategy to integrate the management and sustainable use of fish resources. The report produced by the IFMRC in November 2002 proposes an alternative management framework and a set of guiding principles for allocating fish stocks to ensure optimal benefits are realised for the WA community.

Notwithstanding recognition that beche-de-mer are essentially not targeted by recreational fishers in WA or other commercial fisheries and that the scope for indigenous take is limited, the Department of Fisheries recognises that the integrated fisheries management approach applies to the BDMF.

Operational Objective

To ensure that adequate management practices are in place to allow for the inclusive management of a variety, even if of limited influence, of stakeholders in the fishery.

To ensure that allocation decisions aim to maximize the overall benefit to the Western Australian community from the use of fish stocks and take account of the economic, social, cultural and environmental factors.

Indicator

The level of resource sharing conflict between users and the level of participation of interested groups in any focused resource sharing process.

The level of participation of interested groups / parties in any focused resource sharing process.

The willingness of the various interest groups to participate in the resource sharing process and include other user-groups.

Robustness
High

Presently there is no significant take by either the recreational or indigenous sector. It is considered unlikely that the recreational take of beche-de-mer will ever be significant and the indigenous take is likely to remain limited.

It should however be noted that a significant increase of indigenous take would prompt a reassessment of current management arrangements for all sectors.

External Driver Checklist

Resource sharing issues being raised with the Minister independently of the IFMRC recommended process.

5.4.2 DEPARTMENT OF FISHERIES - CONSULTATION

5.4.2.1 CONSULTATION (INCLUDING COMMUNICATION)

Rationale for Inclusion:

The FRMA has certain requirements with regard to consultation that must be undertaken in the course of managing fisheries. The management of the BDMF is based around a robust consultation and communication process.

Although the BDMF does not currently fall under a management plan, it is likely that if the major review (scheduled to take place after 31 December 2007) were to result in significant commercial access being granted then a management plan would likely be developed.

There are sections in the FRMA that relate to the consultation process in the development of management plans (Section 64) and to the amendment of a management plan (Section 65).

Section 64 of the FRMA states:

"*Before determining a management plan for a managed fishery under section 54(1) the Minister must –*

(a) consult with -

(i) any advisory committee established in respect of the fishery; and

(ii) such other advisory committees or persons, if any, as the Minister thinks appropriate; and

(b) consider any representations made under subsection (3).

Section 65 of the FRMA states:

(1) A management plan must specify an advisory committee or advisory committees or a person or persons who are to be consulted before the plan is amended or revoked.

(2) Before amending or revoking a management plan the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan.

(3) Despite subsection (2), the Minister may amend a management plan without consulting in accordance with that subsection if, in the Ministers opinion, the amendment is –

(a) required urgently; or

(b) of a minor nature

(4) If –

(a) the Minister amends a management plan; and

(b) the amendment is made without consultation because it is, in the Minister's opinion , required urgently,

the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan as soon as practicable after the plan has been amended.

If the BDMF were to move towards the implementation of a management plan then the Department would facilitate a forum of discussion in which the interests of the various stakeholders in this resource would be formally determined and considered in the development of any subsequent management framework.

Operational Objective

To administer a consultation process that is in accordance with the requirements of the FRMA and allows for the best possible advice from all relevant stakeholders to be provided to the decision maker (Minister/ED) in a timely manner.

Indicators

The Minister (or the Department on his behalf) conforms to the consultation requirements of the FRMA and the management plan.

The level to which licensees and other stakeholders consider that they are adequately and appropriately consulted.

Performance Measures

Proper consultation procedures have been followed in the development of the management plan, if developed.
Industry meetings held annually.

Data Requirements

The views of industry are collected from stakeholders at each annual meeting.

When an amendment is proposed, the formal consultation procedures are documented.

Evaluation

Even though this is a developmental fishery there has been considerable consultation undertaken. Consultation on management of the BDMF is conducted in an open, accountable and inclusive environment where all sectors of the industry and the Department's managers and researchers collectively identify and discuss appropriate courses of action.

Decision makers are provided with advice based on this consultation and reasons are provided for decisions that vary from consultation-based advice.

Were the fishery to continue under a more formal management framework (post 2007) the Department would embark on an expanded consultation effort to encompass the views of the broader stakeholder group including the community of WA as is currently done with other managed fisheries in WA.

Robustness
High

Consultation on the management of the BDMF will continue to be conducted in an open, accountable and inclusive environment where all sectors of the industry and the Department's managers and researchers collectively identify and discuss appropriate courses of action.

Comments and Actions

The Department will continue to provide a commercial fisheries management officer who coordinates and further develops the consultation process for the BDMF.

External Driver Check List

Despite the aforementioned consultation processes that are in place, disaffected parties may still seek to use political avenues to further their cause.

5.4.3 DEPARTMENT OF FISHERIES - REPORTING

5.4.3.1 ASSESSMENT AND REVIEWS

Rationale for Inclusion:

It is important that the outcomes of the fisheries management processes administered by the Department for the BDMF are available for review by external parties. It is also important that the community is sufficiently informed on the status of the fisheries, given that industry is utilising a community resource.

The reports that are currently developed and publicly available include: an Annual "State of the Fisheries" Report, an Annual report to the Auditor, the ESD report, and this application to DEH. There is also a longer-term plan to have the entire system of management audited by the WA Environmental Protection Agency (EPA).

Operational Objective

To continue to report annually to the Parliament and community on the status of all fisheries including the BDMF and to prepare a framework for reporting on ESD for all Western Australian fisheries.

Indicators

The extent to which external bodies with knowledge on the management of fisheries resources have access to relevant material and the level of acceptance within the community.

Performance Measure

General acceptance of the management system by the community.

Data Requirements

The majority of data required to generate reports are already collected in the course of pursuing resource management objectives. The Department conducts an annual survey of the community with respect to the community's opinion on the status of the State's fisheries and attitudes to the performance of the Department.

Evaluation

The Department has implemented more than one process to report on the performance of this fishery and in doing so has acted to ensure that the community has access to this information.

The Department has been the recipient of a number of awards for excellence including for its standard of reporting - Premiers Awards in 1998, 1999 for Public Service excellence, Category Awards in Annual Reporting in 1998, 1999, 2000; Lonnie Awards in 2000, 2001.

Current Reporting Arrangements for this fishery include:

State of Fisheries

There is annual reporting on the performance of the fishery within the "State Of The Fishery Report". However, in contrast to most commercial fisheries in WA, that operate under a more formal management framework, the developmental BDMF does not currently report against a set of agreed objectives in the "State of the Fishery" Report. Currently, the total catch for the fishery is reported on within the report in an Appendix which contains a table of catches from fishers statutory monthly returns. If

the BDMF is perpetuated post 2007 the Department will progress towards individually reporting on this fishery in the State of the Fisheries document. The document is available in hard copy format but is also available from the Department's web site in PDF format.

Annual Report

A summary of this report is presented within the Department's Annual Report and is used in some of the Performance Indicators that are reviewed annually by the Office of the Auditor General (OAG). Exemptions for Aboriginal fishing are also reported in the Annual Report.

In addition, an annual report is developed and submitted to DEH on the BDMF as a requirement under it's current declaration.

ESD

Once this application is completed it will become published in the ESD report series and be available from the web site.

Robustness
High

Fisheries Management Response

Current: For many years the Department has produced substantial and high quality documents that report on the operation of the Department and the status of its fisheries – these reports are the Annual Report and the State of the Fisheries.

Future: The Department is working with the EPA to prepare a framework for reporting on ESD for all Western Australian fisheries. It is proposed that this framework will be linked to a regular audit cycle involving the EPA and periodic reporting to the OAG. The Department is working to combine the processes for reporting to the States and the Australian Government and believes that this can best be achieved by using a Bilateral Agreement with DEH under the EPBC Act.

Comments and Actions

The assessment and review processes already established together with proposed external review processes should ensure that there would be many opportunities for the appropriateness of the management regime and the results it produces to be reviewed.

External Driver Check List

The assessments provided by independent review bodies and the community.

5.4.4 DEPARTMENT OF FISHERIES– LEGAL ARRANGEMENTS

5.4.4.1 OCS ARRANGEMENTS

Rationale for Inclusion:

The Offshore Constitutional Settlement (OCS) arrangements between Western Australia and the Commonwealth Government of 1988 established that it is the sole responsibility of the State of Western Australia to manage the BDMF. The OCS *"was developed to simplify legal arrangement for the management of fisheries operating in both State and Commonwealth waters". (Anon., 1988).*

This OCS agreement, jointly signed by Ministers Kerin, for the Commonwealth Government, and Grill for WA, prescribes that all aquatic invertebrate fishing in WA (including beche-de-mer) out to the limit of the AFZ is under the jurisdiction of WA. This simplified the management of the fishery from the previous system where jurisdiction was split between WA within 3 nm of the coast and the Commonwealth, outside of this area.

These arrangements were developed under State Law using Part 3 of the FRMA relating to the Commonwealth State management of fisheries and Commonwealth law at the time; Section 12H of the *Fisheries Act 1952* (now revoked). The *Fisheries Management Act 1991* replaced the *Fisheries Act 1952* and the new Act has powers to make OSC agreement under Division 3, Section 71 of the Act.

Operational Objective

To uphold the existing jurisdictional arrangements for the management of this fishery.

Indicators

Approaches from the Commonwealth Government to alter the existing OCS in bech-de-mer.

Performance Measure

Maintenance of the existing responsibility of the State for the management of the fishery.

Data Requirements

None specific.

Evaluation

The current jurisdictional arrangements are appropriate given the distribution of beche-de-mer and the good track record that exists under these arrangements for the management of these fisheries.

Robustness
Very high

Fisheries Management Response

The Department has successfully managed the BDMF to date and sees no reason to alter the jurisdictional arrangements that currently exist as they relate to beche-de-mer.

Comments and Actions

No action required.

External Driver Check List

Pressure to change any of the OCS arrangements.

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APPENDIX 1 ACRONYMS

BDMF	Beche-de-mer Fishery
CAES	Catch and Effort System
CFL	Commercial Fishing Licence
DEH	Australian Government Department of the Environment and Heritage
ED	Executive Director of the Department of Fisheries
EPA	Western Australian Department of Environment Protection
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
ESD	Ecologically Sustainable Development
FBL	Fishing Boat Licence
FRDC	Fisheries Research and Development Corporation
FRMA	*Fish Resources Management Act 1994*
FRMR	*Fish Resources Management Regulations 1995*
IFMRC	Integrated Fisheries Management Review Committee
MSY	Maximum Sustainable Yield
OAG	Office of Auditor General
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council

APPENDIX 2 DETAILS OF A CONSEQUENCE TABLE

Level	Ecological
Negligible	General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability **Target Stock/Non-retained:** undetectable for this population **Byproduct/Other Non-retained:** Area where fishing occurs is negligible compared to where the relevant stock of these species reside (< 1%) **Protected Species:** Relatively few are impacted. **Ecosystem:** Interactions may be occurring but it is unlikely that there would be any change outside of natural variation **Habitat:** Affecting < 1% of area of **original** habitat area *No Recovery Time Needed*
Minor	**Target/Non-retained:** Possibly detectable but little impact on population size but none on their dynamics. **By-product/Other Non-retained**: Take in this fishery is small (< 10% of total) compared to total take by all fisheries and these species are covered explicitly elsewhere. Take and area of capture by this fishery is small compared to known area of distribution (< 20%). **Protected Species:** Some are impacted but there is no impact on stock. • Ecosystem: **Captured species do not play a keystone role – only minor changes in relative abundance of other constituents.** **Habitat**: Possibly localised affects < 5% of total habitat area *Rapid recovery would occur if stopped - measured in days to months.*
Moderate	**Target/Non-retained**: Full exploitation rate where long term recruitment/dynamics not adversely impacted **By-product:** Relative area of, or susceptibility to capture is suspected to be less than 50% and species do not have vulnerable life history traits **Protected Species:** Levels of impact are at the maximum acceptable level • Ecosystem: **measurable changes to the ecosystem components without there being a major change in function. (no loss of components)** **Habitat:** 5-30 % of habitat area is affected. :or, if occurring over wider area, level of impact to habitat not major *Recovery probably measured in months – years if activity stopped*
Severe	**Target/Non Retained**: Affecting recruitment levels of stocks/ or their capacity to increase • By-product/Other Non-retained**: No information is available on the relative area or susceptibility to capture or on the vulnerability of life history traits of this type of species. Relative levels of capture/susceptibility greater than 50% and species should be examined explicitly.** • Protected Species: **Same as target species** **Ecosystem**: Ecosystem function altered measurably and some function or components are missing/declining/increasing outside of historical range &/or allowed/facilitated new species to appear. **Habitat:** 30- 60 % of habitat is affected/removed. *Recovery measured in years if stopped*

Major	**Target/Non retained:** Likely to cause local extinctions **By-product/Other Non-retained:** N/A **Protected Species:** same as target species **Ecosystem:** A major change to ecosystem structure and function (different dynamics now occur with different species/groups now the major targets of capture) **Habitat:** 60 - 90% affected *Recovery period measured in years to decades if stopped.*
Catastrophic	**Target/Non-retained:** Local extinctions are imminent/immediate **By-product/Other Non-retained:** N/A **Protected Species:** Same as target **Ecosystem:** Total collapse of ecosystem processes. **Habitat:** > 90% affected in a major way/removed *Long-term recovery period will be greater than decades or never, even if stopped*