

Ecological assessment of the Developmental Moreton Bay bêche-de-mer fishery

A report to the Australian Government Department of Environment and Heritage on the ecologically sustainable management of a highly selective dive fishery



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INTRODUCTION

In 1992, Australian Commonwealth, State, Territory and local governments committed to an ecologically sustainable development (ESD) approach to the use of natural resources (COAG 1992). Fisheries resources were (see Green et al. 1991) and still are (see Fletcher et al. 2003) considered to be one of many specific natural resource foci that fall squarely under the ESD umbrella.

To prompt continued progress towards ESD, the Commonwealth Government introduced the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) and the *Environment Protection and Biodiversity Conservation Amendment (Wildlife Protection Act) Act 2001*. Following these legislative changes, in order for harvested fish species to remain exempt from export controls fisheries management agencies must demonstrate (through ecological assessment submissions) that their fishery management regimes comply with the objectives of ecologically sustainable development. The Australian Government Department of the Environment and Heritage (DEH) is currently auditing the fishery management agency submissions (unless a state has in place alternative audit processes accredited by DEH). All submissions must be based on and satisfy DEH's 'Guidelines for the Ecologically Sustainable Management of Fisheries'. The Guidelines include a number of individual objectives broadly relating to impacts to target species; bycatch and byproduct species; endangered, threatened and protected (ETP) species; ecologically threatened communities; and the marine ecosystem generally (see: www.deh.gov.au/coasts/fisheries/assessment/guidelines.html).

This document represents the Queensland Government's ecological assessment submission to DEH for the Queensland Developmental Moreton Bay Bêche-de-mer Fishery. The Queensland Department of Primary Industries and Fisheries (DPI&F), has prepared this ecological assessment with the assistance of stakeholders in the fishery. Broadly, the document comprises two parts:

- Fishery Description - providing a detailed description of the fishery; and
- Ecological Assessment - detailing the assessment of the fishery against DEH's Guidelines.

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ACRONYMS

AFMA	Australian Fisheries Management Authority
CMR	CSIRO Division of Marine Research
DEH	Department of the Environment and Heritage
AIMS	Australian Institute of Marine Science
CFISH	Commercial Fisheries Information System
DPI&F	Queensland Department of Primary Industries and Fisheries
EPBC Act	Environment Protection and Biodiversity Conservation Act
ETP	Endangered, threatened, protected (species)
FRDC	Fisheries Research and Development Corporation
MSAC	Management and Scientific Advisory Committee
OCS	Offshore Constitutional Settlement
PZJA	Protected Zone Joint Authority
QBFP	Queensland Boating and Fisheries Patrol (part of DPI&F)
QFMA	Queensland Fisheries Management Authority (now part of DPI&F)
QPWS	Queensland Parks and Wildlife Service

1. DESCRIPTION OF THE FISHERY

MANAGEMENT AGENCIES

DPI&F is responsible for the day-to-day management of Queensland's fisheries resources. The *Fisheries Act 1994* is the legislative document guiding DPI&F operations, the overarching objectives of which are:

- “...to provide for the use, conservation and enhancement of the community's fisheries resources and fish habitats in a way that seeks to -
- a) apply and balance the principles of ecologically sustainable development; and
 - b) promote ecologically sustainable development.”

Under Offshore Constitutional Settlement (OCS) arrangements between the Commonwealth and Queensland governments, management of bêche-de-mer throughout most of the Australian Fishing Zone adjacent to the east coast of Queensland falls under Queensland law. The primary exception is the commercial harvest of bêche-de-mer in the Coral Sea, which is managed by the Australian Fisheries Management Authority (AFMA) under commonwealth legislation.

Bêche-de-mer are harvested under separate fishery management arrangements in several areas throughout Queensland waters, including Moreton Bay, Torres Strait and the Gulf of Carpentaria. The harvest of bêche-de-mer in Moreton Bay, which this report assesses, is managed by DPI&F as a developmental fishery using permits. Only one permit has been granted, to which strict conditions have been applied.

The *Marine Parks Act 1982* (Queensland) and *Marine Parks Regulations 1990* apply to Queensland Marine parks. Waters within Moreton Bay are included in the Moreton Bay Marine Park, which is administered by the Queensland Environmental Protection Agency in accordance with the provisions of the *Marine Parks (Moreton Bay) Zoning Plan 1997*.

The Torres Strait bêche-de-mer fishery operates within the jurisdiction of the Protected Zone Joint Authority (PZJA) for which management tasks (licensing and enforcement) are jointly carried out by DPI&F and AFMA. Prior to April 1st 1999, the Torres Strait fishery was managed under Queensland jurisdiction by the then Queensland Fisheries Management Authority (QFMA), now subsumed into DPI&F. Currently, the Torres Strait bêche-de-mer fishery is closed to fishing for *H. scabra* (sandfish), *H. whitmaei* (black teatfish) and *Actinopyga mauritiana* (surf redfish). Harvest of bêche-de-mer from waters of the Gulf of Carpentaria is also managed by DPI&F under developmental fishery permit conditions. No fishery is currently operating in the Gulf.

SPECIES INFORMATION

Sea cucumbers comprise the class Holothuroidea and are members of the phylum Echinodermata, along with starfish, brittle stars, sea urchins and feather stars. There are six orders within the class Holothuroidea. The order Aspidochirotida comprises two families, which are commercially exploited, the Holothuridae and Stichopodidae (Preston, 1993). Commercially important species are primarily used for bêche-de-mer production and are found to dominate in tropical waters, decreasing in species diversity in an easterly direction across the Pacific.

Bêche-de-mer fisheries of Queensland's east coast are based on a few deposit-feeding species belonging to four genera within two families: *Actinopyga* and *Holothuria* (Holothuridae), and *Stichopus* and *Thelenota* (Stichopodidae). The target species of the Moreton Bay bêche-de-mer developmental fishery are *Holothuria scabra* (sandfish) and *Stichopus horrens* (peanutfish). Although *Stichopus horrens* (peanutfish) is listed as a target species, it has not yet been harvested in the Moreton Bay bêche-de-mer developmental fishery because of difficulties in processing.

Sandfish (*H. scabra*) yield the second largest bêche-de-mer catch worldwide after the Japanese Sea Cucumber, *Stichopus japonicus*, and is an important fishery species in many countries of the Indo-west Pacific. Sandfish accounts for the majority of bêche-de-mer exports from India, Sri Lanka and Madagascar. It is also a commodity in Indonesia, the Philippines and some tropical Pacific Islands, particularly New Caledonia since 1983 (Conand 1989).

Sandfish is also an important commercial species across northern Australia, with significant fisheries occurring along the east coast of Queensland, in the Torres Straits, the Northern Territory and Western Australia. As mentioned earlier, the Torres Straits bêche-de-mer fishery is however currently closed to fishing for sandfish, black teatfish and surf redfish to allow stocks to recover.

Two separate subspecies of sandfish have recently been determined based on genetic studies: sandfish (*H. scabra*) and golden sandfish (*H. scabra* var. *versicolor*) (S. Uthicke, AIMS, pers.comm.). The two species were originally believed to be simply colour morphs of the same species. This new information adds to the already complex management needs for bêche-de-mer fisheries, particularly as the distributions of these subspecies remain poorly understood. More research is required to determine whether there are ecological differences between the two subspecies of sandfish and further strategies be developed to manage the fishery.

There is currently only a limited amount of information on specific life history parameters of the peanutfish (*S. horrens*), making the prediction of sustainable fishing levels difficult. However a high abundance of this species in Moreton Bay suggests it could support fishing effort. Experienced fishers explain that peanutfish is a much harder species to handle and process, as it requires specific processing within a short period of time. It is therefore considerably less sought after than other commercial species. At present, peanutfish are not collected in the MB BDM fishery, and no operations to do so are planned in the near future by the sole permit holder.

ECOLOGY AND BIOLOGY OF HOLOTHURIANS

The majority of holothurians are slow moving benthic animals and are usually found in close association with the substrate. Others live attached to marine plants and invertebrates, and a few are actually pelagic. They are important components of the reef and inshore ecosystem. Sandfish prefer habitats with a freshwater influence in muddy substrates, offshore from mangrove swamps, they are therefore usually absent from coral atolls and found abundantly in bays and inlets such as Moreton Bay, Hervey Bay and Tin Can Bay. Stocks in Hervey Bay and Tin Can Bay apparently remain depleted due to the combined impacts of overfishing and unusual flood events from the Mary River. A survey performed by CSIRO Division of Marine Research (CMR) on the distribution and abundance of *Holothuria scabra* (sandfish) found high densities in eastern Moreton Bay,

particularly adjacent to Moreton Island and North Stradbroke Island. *Stichopus horrens* (peanutfish) was also found to be in large abundance within the bay with a relatively narrow range centred around the Rous Channel. *H. scabra* was found to be generally more abundant in seagrass areas (though not exclusively) (Skewes *et al.*, 2002).

The average life span for bêche-de-mer is 5-10 years and most species reach reproductive maturity by 2 to 6 years. Many species are broadcast spawners and fertilisation takes place in the water column. Tropical species are not known to form aggregations during spawning times. Most bêche-de-mer species are dioecious (separate male and female), although some are hermaphrodites. They have planktonic larvae that, depending on the species, can spend 10 to 90 days in the plankton layer, and can be widely dispersed by water currents. Successful fertilization and therefore population maintenance for bêche-de-mer can be highly spawner density dependent.

In common with several other marine invertebrates, individuals of each holothurian species spawn simultaneously at specific times of the year, often at night and in synchrony with lunar or tidal conditions (Preston, 1993). Studies of the reproductive cycles of commercially important species reveal a seasonal variation in the spawning activity by holothurians. That is, some species become active in warmer months and others during cooler months. Published studies on *H. scabra* indicate a degree of variability in spawning period in different geographical locations. Studies in Moreton Bay suggest that the major spawning period occurs from October to December (Morgan, 2000 cited in Skewes *et al* 2003). The reproductive periodicity for *S. horrens* is unknown at this stage however is suggested to occur in warmer months. Subsequent to fertilisation, the eggs develop and after a free-swimming existence gradual metamorphosis forms a young sea cucumber, starting in the latter part of the planktonic stage. Eventually, the young sea cucumber settles to the sea floor and begins its development into an adult (Preston, 1993).

Growth rates for sandfish in Moreton Bay have not yet been established however estimates from Torres Strait indicate that the species reaches 125 mm total length (TL) after the first year and 200 mm TL after two years. It is probable that growth rates are slower in Moreton Bay than in Torres Strait, given the general relationship between growth and water temperature for most invertebrate species (Skewes *et al.* 2002).

The size at which holothurians first become sexually mature has also been investigated and varies considerably between species. For sandfish, the most relevant studies have found that maturity occurs at approximately 150 mm total length in Torres Strait (Skewes *et al.* 2003) and 160 mm in New Caledonia (Conand, 1989). At this length the individuals are estimated to be between 1 and 2 years old. Maturity has not been established for sandfish in Moreton Bay, however Skewes *et al.* (2002) suggest a breeding age of approximately 2 years. This is slightly older than estimates from the Torres Strait, again due to the colder mean water temperature experienced further south. The juvenile ecology and habitat preferences of sandfish are better known than other Queensland's harvested holothurians (Uthicke and Benzie 1998; Vaile 1989).

STOCKS AND AREAS OF FISHING

Bêche-de-mer fisheries in Australia are mainly limited to the tropical regions where species high in commercial value such as black teatfish (*H. nobilis*), white teatfish (*H. fuscogilva*) and sandfish (*H. scabra*) tend to be fished preferentially. Sandfish (*H. scabra*) in particular, is harvested across northern Australia, with significant fisheries occurring in Torres Strait,

Northern Territory and Western Australia. Bêche-de-mer fisheries occurring in coastal Queensland, Torres Strait and the Coral Sea are the only producers of the reef-based species in Australia. It is important to note that the Torres Straits bêche-de-mer fishery is currently closed to harvesting of sandfish. Northern Territory and Western Australian fisheries predominantly target sandfish. The temperate species harvested from Victoria (*Stichopus mollis*) have not been reported from Queensland waters.

Detailed scientific information on the distribution, stock structure and ecology of holothurian species harvested in Queensland waters is still very limited (Harriott 1984; Uthicke 1996; Uthicke et al. 1999; Uthicke and Benzie 2000; Breen 2001; Uthicke and Benzie 2001; Ponder et al. 2002; Benzie and Uthicke 2003). Gene flow analyses have identified that *H. scabra* populations along the north-east coast of Australia can be grouped into at least 3 genetically distinct stocks, suggesting the species has limited pre-recruitment dispersal. The three stocks include southern populations from the Hervey Bay region; a population from the central Queensland coast; and populations from Torres Strait (Uthicke and Benzie, 2001). No detailed genetic analyses have been conducted on Moreton Bay populations.

Prior to the permitting of the MB BDM fishery, CSIRO Division of Marine Research (CMR) was commissioned to undertake a survey of the potential bêche-de-mer habitats within Moreton Bay. The survey estimated the abundance of sandfish (*H. scabra*) in the area of the MB BDM fishery between 950-1000 tonnes total live weight, and the abundance of peanutfish (*S. horrens*) at approximately 1000 tonnes (Skewes *et al*, 2002).

The survey divided the fishery into three zones based on the proportional abundances observed at specific areas during the initial survey (Figure 1). Skewes *et al*, (2002) found that the proportional abundances of *H. scabra* observed in the Moreton, Amity and North Stradbroke zones (zones 1, 2, and 3) were found to be 45.6%, 29.1% and 25.3% respectively. For *S. Horrens* the proportional abundances were found to be 65.1%, 34.8% and 0.1% respectively. The survey results were used to help develop the initial zonal Total Allowable Catch (TAC) for each species. Greater information detailing the development of the total and zonal TACs for the MB BDM fishery is outlined later in this report under 'Management Arrangements for the fishery'.

LOCATION AND EXTENT OF THE FISHERY

The area of the MB BDM developmental fishery is shown in Figure 1. The commercial fishery is confined to a limited area in Moreton Bay between Moreton Island and North Stradbroke Island and is divided into three zones. Zonation helps reduce the probability of localised depletions of the target species, restricts the impacts of commercial fishing to certain locations (especially during spawning months) and avoids conflict with other fisheries. The zonal arrangements in place in the MB BDM also allow a large proportion of the stocks in Moreton Bay to be protected through 'no-take zones'. Skewes *et al.*'s (2002) initial surveys found harvestable quantities of bêche-de-mer both north of zone 1 and south of zone 3, however these areas are not included in the permitted MB BDM fishery area, to provide greater protection.

The collection of sandfish is permitted in all three zones however peanutfish may only be harvested from zone one. The exact coordinates for the three fishing zones are provided in Appendix 3.

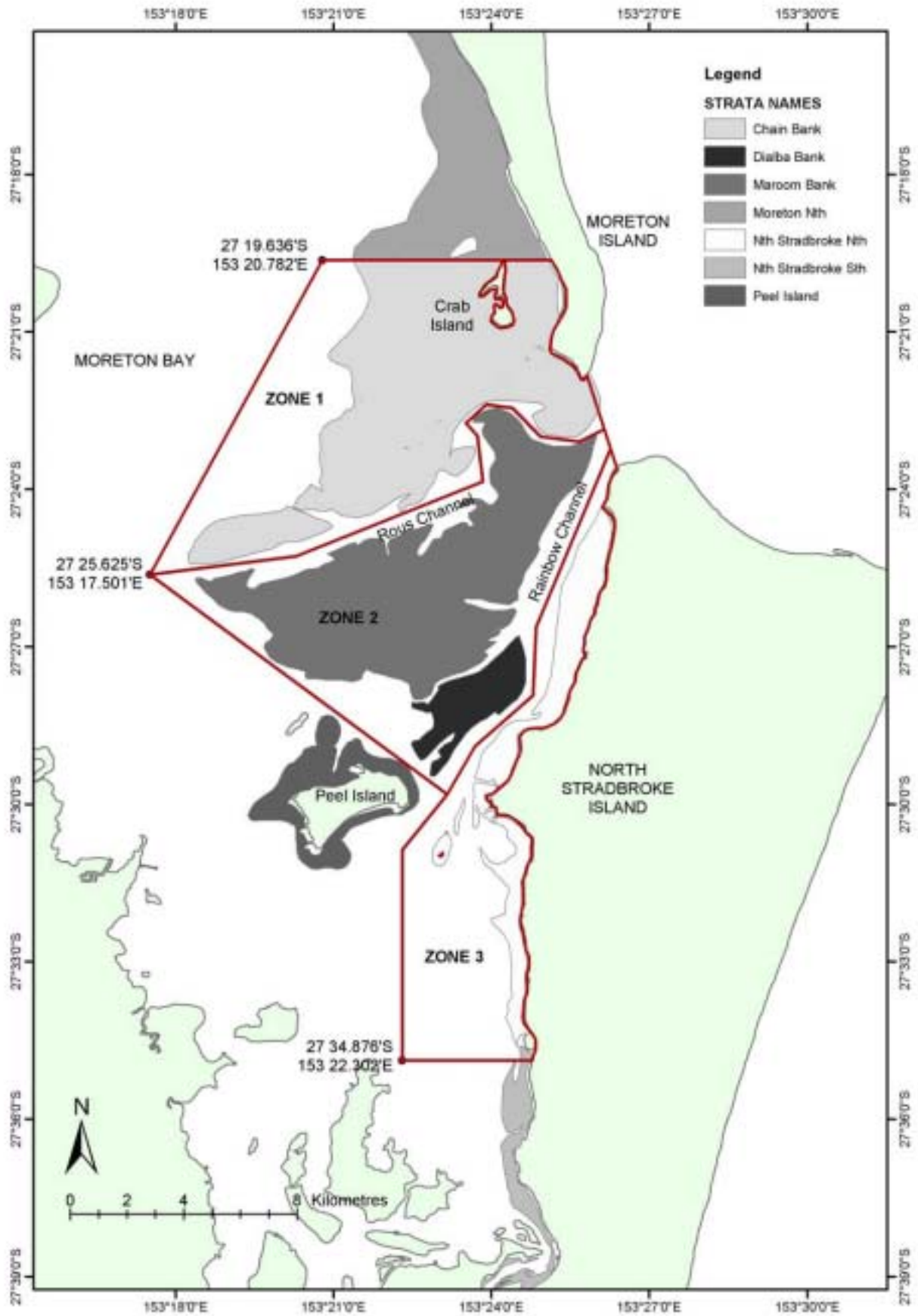


Figure 1. Map showing the area of Moreton Bay's Bêche-de-mer Developmental Fishery

FISHING METHODS AND APPARATUS

Commercial fishers

Harvesting of bêche-de-mer in Moreton Bay is by hand only without the aid of diving apparatus such as the use of hookah gear or scuba diving equipment. This method allows species to be identified and physically selected. Bêche-de-mer is collected in mesh bags that hold approximately the equivalent of a 25 kg bucket of gutted wet weight. The collected species are gutted and product is salted down.

A maximum of 2 boats, less than 7 metres in length are licensed to operate within the fishery. The boat restrictions limit the effort applied in the fishery, and limit the boating related impacts on marine habitats within the fishery area. A maximum of 6 people, 3 in each boat, acting under the directions of the holder are permitted to collect bêche-de-mer, with one person remaining in each boat and 4 to dive.

Recreational fishers

Recreational fishers are restricted to a bag limit of 5 bêche-de-mer, excluding black teat fish, from Queensland waters including Moreton Bay. Skewes *et al* (2002) noted that there have been reports of illegal take of sandfish in Moreton Bay however these remain unconfirmed. An established commercial fishery may help to reduce any illegal take in the permitted area, as an incentive would exist for stakeholders to protect the resource-base with QBFP officers informed of the fishery area and designated operators (Skewes *et al*, 2002).

Indigenous fishers

Quantifying the area and effort of indigenous fishing is difficult due to the lack of detailed information. The level of traditional fishing for bêche-de-mer in Moreton Bay is presently unknown however it is believed to be negligible. While there is no known indigenous traditional fishing for bêche-de-mer in Moreton Bay, it should be noted that an indigenous group, the Nunukul Nguhi Cultural Heritage Corporation, the sole permit holders in the developmental commercial fishery, employed an experienced bêche-de-mer fisher in the initial phase of the operation to teach the necessary harvesting and processing techniques.

Indeed Indigenous fishers taking bêche-de-mer for 'customary or traditional purposes' are permitted to legally fish in all Marine Park zones including Preservation Zones, thereby effectively having access to stocks throughout the entire east coast of Queensland.

HISTORY OF THE FISHERY

Moreton Bay bêche-de-mer fishery is a developmental fishery established in response to interests associated with a possible sustainable and commercially viable population of holothurians found within Moreton Bay. DPI&F together with the Queensland Parks and Wildlife Service (QPWS – a division of the Environmental Protection Agency), have issued one developmental fishing permit for the harvesting of bêche-de-mer in Moreton Bay. Fishing commenced during April 2003 and is permitted for a period of 3 years unless surrendered or revoked.

CURRENT FISHING EFFORT

The commercial fishing permit holder is required to maintain compulsory daily logbooks documenting catch and effort for each year. This information is required by DPI&F to help determine whether this new developmental fishery is ecologically sustainable, commercially viable and socially acceptable. Logbook data has been collected since the fishery commenced in April 2003.

Fishing occurs in three separate zones (see Figure 1), with annual catch and effort trends differing substantially in between zones and at different times of the year. Catch is measured in terms of "gutted wet weight" - the weight of the sea cucumber with its gut removed before it has undergone preliminary processing. Approximately 25 tonnes of sandfish was caught in 2003, the first fishing year, well below the total allowable catch (TAC) of 45 tonnes. Greater information on the catch and effort of the fishery are contained in criteria 1.1.4.

2. THE ENVIRONMENT LIKELY TO BE AFFECTED BY THE FISHERY

Harvesting in the fishery involves hand collection of bêche-de-mer specimens using free diving methods only (i.e. without the use of hookah apparatus or SCUBA). Hand collection is a totally selective method of fishing as only those individuals specifically chosen for harvesting are collected. As a result, this fishery produces no bycatch.

Hand collection using no equipment also limits the potential for impacts on any endangered, threatened or protected (ETP) species or on benthic marine fauna or flora. While the fishery does occur within the protected dugong and turtle habitats of the Moreton Bay Marine Park no interactions with these species have been reported or are considered likely. The only potential impacts are associated with small vessel operation generally such as boat strikes with ETP species or damage to seagrass beds or the sea floor due to anchoring.

The primary impact to the environment arising from this fishery is the removal of the target bêche-de-mer species from associated food webs. The scale of the impact has not been assessed however it is considered to be minimal given the size of the harvest (25 tonnes in 2003) and considering the food webs of the species which prey on bêche-de-mer. Fish species within the families Balistidae, Labridae, Lethrinidae and Nemipteridae have been identified as predators of bêche-de-mer (Dance et al. 2001). Species within those families that do prey on bêche-de-mer almost certainly do so as part of a 'generalist' predatory strategy – preying on a range of species of which bêche-de-mer is just one component (see Fishbase database: <http://www.fishbase.org/search.cfm>).

Broader ecosystem effects of the fishery are largely unknown. The limited available research suggests that holothurians play an important role in the natural nutrient recycling pathways of benthic environments. Research is currently being undertaken as part of a PhD project titled "Impacts of Removal – A Case Study on the Ecological Role of the commercially important sea cucumber *Holothuria scabra* in Moreton Bay" (S.M. Wolkenhauer, CMR, pers comm 2003). It is envisaged that the results of this research project will provide useful information on the biology and ecosystem functions of holothurians, as well as an increased understanding of the environmental impacts associated with the removal of holothurians from associated food webs. When results of this study become available, they will be considered by DPI&F to help guide any future management decisions.

As the fishery occurs within the Moreton Bay Marine Park, additional responsibilities are incumbent upon DPI&F to manage the area in accordance with the provisions of the *Marine Parks (Moreton Bay) Zoning Plan 1997*.

3. MANAGEMENT ARRANGEMENTS FOR THE FISHERY

BASIS FOR CURRENT MANAGEMENT ARRANGEMENTS

DPI&F has taken a very conservative approach to investigating the feasibility of a sustainable bêche-de-mer fishery in Moreton Bay. Measures to ensure this include:

- Limited entry (by the issue of a single permit only);
- Spatial management through specified fishing zones;
- Temporal management through seasonal closures;
- Output controls including minimum legal sizes (MLS) and TAC;
- Input controls including gear and methods able to be used.

In fisheries management generally, limited entry into the fishery restricts the number of fishers and vessels allowed to fish. The number of authorities or endorsements issued is set at a level that is calculated to be capable of imposing some predetermined level of fishing mortality, which is within the sustainable limits of the target population. Restricting the number of operational fishing units also minimises the environmental impacts associated with fishing, such as propeller damage and dugong and turtle interactions.

Fishing is restricted to a small area within Moreton Bay, divided into three fishing zones (see Figure 1). The area of the fishery was based on the results of the initial CMR survey. The survey focussed on eastern Moreton Bay from approximately half way up Moreton Island south to beyond Jumpinpin Passage and included shallow banks (less than 5 metres deep), which were divided into several strata for ease of identifying greatest abundance of *H. scabra* (Figure 1). The 3 zones were based on the distribution and abundance of *H. scabra* recorded at each site. The northern and southern extents of the MB BDM fishery area were set to protect approximately 40% of the surveyed population of *H. scabra* in specific “no-take zones”(Skewes *et al*, 2003).

A primary consideration in fisheries stock management is not to reduce the breeding stock by fishing to a level where recruitment to the fishery is affected considerably. This is particularly important for sandfish in Moreton Bay as the species has a locally recruiting population (Skewes *et al*, 2002). Minimum legal size (MLS) limits, the TAC and seasonal closures all contribute to sustainable catches. The MLS limits have been based on the principle of allowing 50% of individuals of the species to reach first sexual maturity and breed before being removed. Seasonal closures, from 1st October to 30th November inclusive each year, are designed to protect the breeding populations of *H. scabra* (sandfish) during spawning periods (Skewes *et al*, 2003).

CURRENT MANAGEMENT ARRANGEMENTS

Commercial fishers

As is the standard approach under DPI&F policy for developmental fisheries in Queensland, commercial harvesting of bêche-de-mer is controlled through permits, allowing maximum management flexibility to ensure the activity remains sustainable. Only one permit has been issued for a period of 3 years for the developmental bêche-de-mer fishery in Moreton Bay. Permit conditions can be seen in Appendix 2. The permit allows 2 boats, less than 7 metres in length, to perform, or assist in the performance, of the collection of bêche-de-mer. The boats carry the fishing symbols ‘NN-1’ and ‘NN-2’, which they must have on them at all times. Sandfish and peanutfish are the only permitted

species. Harvesting must be by hand collection without the use of any equipment, including hookah apparatus or SCUBA. A total of 6 people, 3 in each boat, are permitted to commercially harvest bêche-de-mer under the direction of the holder, with one person to remain in each boat and a maximum of 4 permitted to collect. Sandfish and peanutfish that are collected must be separated by species and kept in different containers while the fish are stored on board the boat.

Output controls for the commercial fishery include TAC quotas for each species and MLS limits. The MLS for both sandfish and peanutfish is 17 cm. It is important to note that length measurement has proven difficult as bêche-de-mer take on a diversity of shapes upon capture. The standard practice for measuring length is to allow the specimen to relax on a flat surface, untouched for approximately 3-4 minutes following removal from the water (either upon capture or from the storage tank).

Individual TAC quotas apply to the two species in this fishery. The annual TAC for sandfish is set at 45 tonnes of gutted wet weight, consisting of 21 tonnes from Zone 1, 13 tonnes from Zone 2 and 11 tonnes from Zone 3. For peanutfish the annual TAC is set at 25 tonnes, which can only be collected from zone 1. If these zonal trigger limits are exceeded in any of the zones, the overall TAC must still not exceed the tonnages permitted for each species. Bêche-de-mer sold in Queensland by authority holders may only be sold to holders of a Buyer Licence (Class A).

The results from the distribution and abundance survey of *Holothuria scabra* (sandfish) in Moreton Bay (Skewes *et al* 2002) provided the foundations required to establish the current total and zonal TACs for the Moreton Bay bêche-de-mer developmental fishery. By calculating the Maximum Sustainable Yield (MSY) of the fishery, an estimate of the maximum biomass that can be removed sustainably from the fishery is estimated, such that fishing effort is in equilibrium with the products of recruitment and growth over mortality (the surplus yield) (Skewes *et al*, 2002).

With little data available to provide a stock-recruitment relationship of sandfish in Moreton Bay, Skewes *et al* (2002) calculated the MSY using the theoretical model $MSY = \frac{1}{2} MB_0$ (Gulland, 1983 cited in Skewes *et al*, 2002). M is natural mortality and B_0 is the virgin biomass. This model is based on the assumption that at least half the unfished breeding population (the virgin biomass) is needed to maximise surplus yield, and that any value below this leads to over exploitation (Gulland, 1983; Hilborn and Walters, 1992 cited in Skewes *et al*, 2002).

However, considering that in practice the proportion of the breeding population required to maintain recruitment levels may be larger than 50%, and that little information is known about the biology of holothurians, Skewes *et al* (2002) adopted a highly precautionary approach in recommending the initial TAC. First, based on the results of the survey the virgin biomass of sandfish was estimated at approximately 951 tonnes wet weight, with a 90% confidence interval of ± 414 tonnes. Skewes *et al*. (2002) used the lower estimate within the confidence interval, 537 tonnes wet weight, as a basis for the TAC calculation. Second, the original model used to estimate the sustainable yield ($MSY = 0.5 MB_0$) was replaced by the more conservative model of $MSY = 0.3 MB_0$. Incorporating these more precautionary refinements the conservative potential sustainable yield for the Moreton Bay study area was calculated as 161 tonnes wet weight. Taking into consideration suitable management strategies Skewes *et al* (2002) further ensured the sustainability of the sandfish population by recommending the initial TAC be set <100 tonnes wet weight, considerably lower than the 161 tonnes MSY estimate. Using a conversion factor of 0.7 to

convert wet weight to gutted wet weight, the recommend TAC was calculated at <70 tonnes gutted wet weight (see paragraph below on conversion factors).

A similar approach was adopted to calculate a sustainable TAC for peanutfish of up to 50 tonnes wet weight (35 tonnes gutted wet weight). With the abundance of peanutfish within Moreton Bay estimated at approximately 1000 tonnes Skewes et al. (2002, pp. 13) state that “the TAC appears to provide little risk of overexploitation”.

DPI&F has taken an even more conservative approach than that suggested by Skewes et al. (2002). The TAC for sandfish in Moreton Bay is set at 45 tonnes gutted wet weight, and for peanutfish is set at 25 tonnes gutted wet weight.

The re-survey of sandfish and peanutfish throughout Moreton Bay by CMR (Skewes et al, 2004), found that the conversion ratios used to convert live weight MSY estimates to gutted weight MSY estimates should actually have been closer to 0.5 rather than the 0.7 conversion factor used in the initial TAC discussions for the fishery (Skewes et al, 2004). Taking this factor into account, the initial conservative TAC recommendation as per the 2001 research report should be of the order of 50 tonnes gutted wet weight per year, still larger than the TAC allowed under the developmental permit (Skewes et al, 2004).

Based on the findings obtained from the initial survey conducted by Skewes et al (2002), Skewes et al (2003) recommended that the area be divided into 3 zones, which have individual TACs to mitigate localised depletions. The initial zonal TACs were based on the proportion of the total *H. scabra* population observed in each zone during the survey, with a small additional amount added to allow for some flexibility applied for fishing operations (Skewes et al, 2003).

Table 1. Sandfish estimated population size, and proportion of total population, for each zone (taken from the initial survey of Skewes et al. (2003))

Zone Name	Sandfish (n)	Proportion (% of Total)	Zone TAC (% of total TAC)
Moreton	997263	45.6	55
Amity	636831	29.1	35
Nth Stradbroke	552040	25.3	30
Zone Total	2186133	61.2	
Study area total	3569862		

Source: Skewes et al, (2003)

For *S. horrens*, it was recommended the entire TAC be caught in the Moreton zone, as this zone contained 65% of the surveyed populations and with the conservative total TAC for this species, it was believed that this would mitigate significant local depletion in the zone (Skewes et al, 2003).

A seasonal closure is enforced in the fishery between October 1st and November 30th (inclusive) each year. This is a precautionary measure designed to protect the breeding populations of *H. scabra* (sandfish) during spawning periods (Skewes et al, 2003). When the fishery is open, harvesting only occurs from one zone on any given day and no zone is fished for more than 6 consecutive weeks in a 12-week period.

Table 2. Peanutfish estimated population size, and proportion of total population, for each zone (taken from the initial survey of Skewes et al. (2003))

Zone Name	Peanutfish (n)	Proportion (% of total)	Zone TAC (% of total TAC)
Moreton	8654050	65.1	100
Amity	4619340	34.8	0
Nth Stradbroke	16274	0.1	0
Zone Total	13289664	94.2	
Study area total	14103889		

Source: Skewes et al, (2003)

Recreational fishers

Recreational fishers are restricted to a bag limit of 5 species of bêche-de-mer, excluding black teat fish, from Queensland waters including Moreton Bay.

Indigenous fishers

Fishing by indigenous people can be classified into three categories:

4# fishing for traditional or customary purposes;

4# commercial fishing; and

4# recreational fishing.

The taking of fish is an important part of indigenous peoples' tradition and custom. The *Fisheries Act 1994* recognises this. In particular, Section 14 of the Act provides that an Aboriginal may take, use or keep fisheries resources under Aboriginal tradition and that a Torres Strait Islander may do the same under Island custom.

Aboriginal or Torres Strait islanders collecting for 'traditional or customary purposes' are exempt from all forms of regulations and restrictions such as the use of apparatus, area closures, minimum and maximum size limits and bag limits.

PROPOSED MANAGEMENT ARRANGEMENTS

The fishery is regularly reviewed to ensure that it is operating within ecologically sustainable levels as is legislatively required under the *Fisheries Act 1994*. Management advice on general developmental fishery issues is provided to DPI&F through the management advisory committee for harvest fisheries known as HarvestMAC. DPI&F MAC process provides a consultative forum allowing all stakeholders to provide input into the management of particular fisheries. HarvestMAC representatives often include a DPI appointed chair, manager, researcher, compliance officer, commercial fishers, recreational fishers, seafood marketer, conservation member, indigenous representative and a GBRMPA representative.

A Management and Scientific Advisory Committee (MSAC) specific to the developmental bêche-de-mer fishery in Moreton Bay reviews all issues arising from or of relevance to the fishery, including any impacts to target, bycatch or ETP species, or to the broader marine environment generally DPI&F has also set up a Management and Scientific Advisory Committee (MSAC) specifically focussed on the developmental Moreton Bay bêche-de-mer fishery. The MSAC comprises a manager, researcher, compliance officer and

representatives from QPWS and the Nunukul Ngugi Cultural Heritage Corporation. All issues arising from or of relevance to the fishery, including any impacts to target, bycatch or protected species, or to the broader marine environment generally, are re discussed by the MSAC. The MSAC then advises DPI&F on any management actions required to ensure the fishery continues to operate within sustainable levels.

Fishery-dependent and –independent information is available to the MSAC to guide its reviews. This includes fishery-dependent information from the logbook program and the observer program; and fishery-independent data sourced from the annual scientific surveys of the stocks of bêche-de-mer and associated ecological values in Moreton Bay.

In the event the fishery progresses beyond the developmental phase a formal process will be undertaken to develop appropriate management arrangements. This process will include extensive public and stakeholder consultation.

RELATED LEGISLATION IMPACTING ON THE MORETON BAY BÊCHE-DE-MER FISHERY

The DPI&F ensures the appropriate management, use, development and protection of Queensland's fisheries resources through the preparation and implementation of regulations, management plans and declarations developed with regard to the principles of ecologically sustainable development (ESD).

Consistent with obligations under the principles of ESD, DPI&F has established a policy for consideration of applications for the development of new fisheries – “Policy Relating to the Establishment and Management of Exploratory and Developmental Fisheries”.

The DPI&F takes a cautious approach to all developmental fishing to ensure that it is conducted in accordance with the principles of ecologically sustainable development and with due regard to the impact of fishing on the marine environment. Following appropriate consultation with all interested parties including relevant Management Advisory Committees and other advisory groups, a developmental fishery may proceed. Prior to determining whether developmental fishing can proceed, all available information relating to the proposal is brought together. In undertaking this task, DPI&F prepared an information paper titled “Application for a developmental fishing permit to harvest bêche-de-mer in Moreton Bay” (2002). This was developed by DPI&F to provide information to those with an interest in the developmental fishery and to facilitate their involvement in the public consultation process.

A number of other Acts, both state and Commonwealth, also impact on the management of the developmental Moreton Bay bêche-de-mer fishery. As highlighted in the introduction, for any fisheries with an export component the federal *EPBC Act 1999* requires state fisheries management agencies to demonstrate (through ecological assessment submissions) that the fishery is managed in an ecologically sustainable way. As processed bêche-de-mer harvested in this fishery is exported, the requirements of the *EPBC Act 1999* apply to this fishery.

The Queensland *Marine Parks Act 1982* (and associated subordinate legislation) and the *Marine Parks (Moreton Bay) Zoning Plan 1997* also apply to this fishery, as the area of operation is within the boundaries of the Moreton Bay Marine Park. In order for the developmental fishery to initially proceed, the applicant was required to gain a permit approved by the Queensland Parks & Wildlife Service (QPWS), to commercially take bêche-de-mer within the Moreton Bay Marine Park. The DPI&F and QPWS jointly developed the permit conditions applying to the fishery.

4. ENVIRONMENTAL ASSESSMENT OF THE FISHERY

PRINCIPLE 1.

A FISHERY MUST BE CONDUCTED IN A MANNER THAT DOES NOT LEAD TO OVER-FISHING, OR FOR THOSE STOCKS THAT ARE OVER-FISHED, THE FISHERY MUST BE CONDUCTED SUCH THAT THERE IS A HIGH DEGREE OF PROBABILITY THAT STOCK(S) WILL RECOVER.

Objective 1. Fishery catch levels maintain ecologically viable stock levels within an acceptable level of probability

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.

Fishery information collection systems

The DPI&F has developed and maintains a range of data collection systems for providing up to date information on fish stocks, fish species taken and the level and distribution of fishing effort and fish catches. This information is used by managers to make decisions about maintaining sustainable harvests of principle species and ensuring provisions of the Queensland *Fisheries Act 1994* are met. It is also used by researchers in making scientific assessments about the status of these species and by analysts monitoring and interpreting spatial and temporal changes and trends in fishing activity and catch levels.

The only data collection system currently in use for the Moreton Bay bêche-de-mer developmental fishery is the daily *Commercial Fisheries Logbook Program (CFISH)*.

A comprehensive compulsory daily logbook program for Queensland's commercial fisheries was introduced in 1988. Logbooks were introduced primarily as a performance and compliance tool for the fishery. Logbook entries are recorded daily and reported monthly. Prior to this, catch and effort data from specific elements of the fishery were collected as part of short to medium term research projects. The Commercial Fisheries Information System (CFISH) database was established in 1988 to manage the large flow of data from fishers and provide access to fishery dependent data for fisheries research and management.

Fishery-dependent data

The main source of fishery dependent data within the developmental Moreton Bay bêche-de-mer fishery is from compulsory daily logbooks collected since 1 April 2003. This data is limited to only one species, *Holothuria scabra*, as the collection of *Stichopus horrens* has not commenced within the fishing area.

In addition, DPI&F has developed an observer program that operates within this developmental fishery to validate logbook records and provide additional information regarding the harvesting operations of the fishery.

Logbook Data

The logsheet used for the Moreton Bay bêche-de-mer developmental fishery (Appendix 1) collects information per tender vessel on the collection method (i.e., snorkel, wading); effort - including hours of collection, number of collectors and average harvest depth, location; and catch - including the number of specimens and total wet gutted weight. This information is collected and entered into CFISH system, allowing for the analysis of catch and effort in the fishery to help evaluate the effectiveness of management arrangements.

Observer Program

The observer program developed by DPI&F for the Moreton Bay bêche-de-mer developmental fishery collects information on fishing operations and any environmental impacts associated with the fishery. This includes information on collection methods, processing techniques, commercial discards and any damage occurring to the broader marine environment due to fishing activity. The observer program also validates logbook records and assesses compliance with permit and legal size conditions as well as addressing any other issues that may arise due to the operations of the fishery.

Data Validation

An observer program has been developed and implemented during the operation of the developmental fishery. The program involves a fisheries observer attending selected fishing trips annually, monitoring the harvest operations.

The observer program has collected considerable 'in-field' fishery dependent data on all aspects of the fishery operations detailed above. This provides DPI&F with greater understanding of the operation of the fishery, therefore allowing more effective management. The observer program also provides an independent record of fishing, enabling DPI&F to assess the accuracy of the detailed fishery-dependent data collected in the CFISH logbook program. The annual reports from the observer program (for example, Sumpton and McLennan 2004) also identify options for improving the quality and reliability of the data collected. Observers accompanied fishers on 6 out of the 105 fishing trips in 2003 for the collection of bêche-de-mer within the developmental fishery area. This is calculated at 5.7% of observer coverage, which is considered to be appropriate given that there is only 1 permit issued for the fishery.

Fishery dependent data reliability

Fishery dependent data for the Moreton Bay bêche-de-mer developmental fishery are, for the most part, the best currently available sources of fishery statistics. Logbook information is inherently reliant on the goodwill and honesty of the operator. Commercial operators in the fishery, however, are committed to ensure compliance with fisheries regulations (e.g., providing logbook information). As highlighted above, an onboard observer program is also used in this fishery to validate logbook records and ensure commitment to fisheries regulations.

New data from logbook returns are scrutinised for discrepancies or fisheries regulation breaches. The DPI&F Logbook Section investigates any discrepancies in commercial catch information provided by fishers to ensure data reliability when data are received. Enforcement officers from the Queensland Boating and Fisheries Patrol assist the

verification process by follow-up investigating of abnormal catch and logbook entries when they undertake fishing vessel inspections during surveillance patrols.

Fishery-independent data

Initially, an independent survey was conducted by CSIRO Division of Marine Research (CMR) (Skewes *et al*, 2002), as consultants to the permit applicants, into the distribution and abundance of sandfish in Moreton Bay to indicate if the area could sustain a level of commercial harvesting within the context of protecting the long term viability of the bêche-de-mer stocks. This survey looked specifically at the population structure of holothurians, the distribution and abundance of holothurians within the study area and also gathered information on habitat. Based on the results of this survey, and consideration by DPI&F and Queensland Parks and Wildlife Service the fishery was opened in 2003 with precautionary management strategies in place.

As one of the fishing permit conditions the commercial operator is required to engage a scientific organization to conduct annual surveys of the stocks and ecological values associated with the fishery. These surveys are conducted by CMR after the seasonal closure of the fishery on the 1 October each year. This research provides data on bêche-de-mer distribution and abundance, population structure and environmental variables. A survey was conducted in January 2004, which indicated that only a small and insignificant reduction in the average abundance of sandfish was recorded after one year of fishing. These results are encouraging with respect to sustainability of the current level of catch.

Fishery independent data reliability

Fishery independent data has been collected by a scientific organisation and is considered to be reliable. The results of these studies have provided a useful baseline for development of the fishery and for assessing stock structure and monitoring abundance during the course of the fishery. Results of independent surveys are provided to DPI&F, Management and Scientific Advisory Committee (MSAC) and are used to guide management actions required to ensure the fishery continues to operate within sustainable levels.

Assessment

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 take place at regular intervals but at least every three years.

Bêche-de-mer stocks generally are at risk from overexploitation because of their limited dispersal, patchy distribution, ease of collection (ie the harvest method allows specimens to be identified and physically selected), the slow ability of some species to recover from overfishing and the current limited biological and spatial distribution information available for these species across northern Australia. DPI&F has therefore implemented conservative management arrangements with due regard to the precautionary principle. The DPI&F believes the management controls in place and proposed within the Moreton Bay bêche-de-mer developmental fishery demonstrate a conservative and sustainable management approach for the fishery. Work is progressing to fill knowledge gaps through the information sources outlined in Guideline 1.1.1, including annual scientific surveys, data collection and the observer program.

The annual surveys conducted by CMR produce estimates of sandfish and peanutfish abundance throughout the area of the Moreton Bay fishery, which are then compared to the pre-fishing abundance estimates derived from the original population survey (Skewes *et al*, 2004). Information is also collected on relative cover / abundance of gross environmental biophysical parameters and compared with historical data to estimate any changes. Individuals are also collected and measured to produce size frequency distributions for each species. This information is then used to recommend sustainable management strategies for the upcoming year and is forwarded to the appropriate management advisory committee.

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

Sandfish and peanutfish stock distribution across northern Australia are not yet well understood, although a study on gene flow in *Holothuria scabra* populations identified 3 genetically distinct stocks along the north-east coast of Australia. These included southern populations from the area around Hervey Bay, one population from the central coast and populations from Torres Strait (Uthicke and Benzie, 2001)

Assessment of the target species in Moreton Bay is undertaken using a range of techniques of varying degrees. The observer program, logbook data and annual scientific surveys, as outlined in Guideline 1.1.1, provide the status of the bêche-de-mer stocks within the Moreton Bay developmental fishery. This provides an estimate of the sustainable harvest and fishing levels that can be used by managers and industry as a benchmark against which to monitor catch and effort.

The initial scientific survey conducted in 2002 by CMR (Skewes *et al*, 2002), produced an overall estimate of the distribution and spatial structure of *H. scabra* in Moreton Bay. The survey found *H. scabra* throughout the study area, from Moreton Island to south of Jumpinpin Passage with the highest abundance found adjacent to Moreton Island and North Stradbroke Island. The northern-most strata of North Stradbroke Island, the Dialba and Warragamba Banks, also had a high abundance of the species (Skewes *et al*, 2002). *H. scabra* was generally more abundant in seagrass areas (though not exclusively) (Skewes *et al*, 2002). Skewes *et al* (2002), found *S. horrens* to be the most abundant species of holothurian found in the study area with a relatively narrow range centered around the Rous Channel. This information was used to determine a conservative TAC for both species through the process detailed previously under 'Current Management Arrangements'. The division of the area into 3 zones was also based on the distribution of *H. scabra* to avoid localised depletion of the species throughout the fishery area.

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.

The commercial fishing permit holder is required to maintain compulsory logbooks documenting catch and effort for each year. This information is required by DPI&F to help determine whether a potential new fishery is sustainable, commercially viable and socially acceptable. As fishing started during April 2003 logbook data is limited to 1 year at this stage.

Catch is measured in terms of “gutted wet weight” - the weight of the sea cucumber with its gut removed before it has undergone preliminary processing. To date, fishers have not harvested peanutfish meaning that all catch estimates presented below apply to sandfish. Approximately 25 tonnes of sandfish were caught in 2003, well below the total allowable catch (TAC) of 45 tonnes (Table 1).

Table 3. Catch and quota of Moreton Bay bêche-de-mer Developmental Fishery for 2003.

	Zone 1	Zone 2	Zone 3	Total
Catch (kg)	2693	13330	8721	24745
Quota (kg)	21000	13000	11000	45000
Difference (kg)	18307	-330	2279	20255

The fishery is divided into three separate fishing zones (see Figure 1), with annual catch and effort trends differing substantially between the fishing zones and at different times of the year (see Figures 2, 3 and 4). A considerable component of the catch and effort occurred in Zone 2 (Amity), with the catch exceeding the zonal total allowable catch (TAC) quota by a minor amount. However, the total catch for the area remained well within the total TAC. In exceeding the TAC for Zone 2, the commercial fishers were dealt with under the processes detailed in s.27 of the *Fisheries Regulations 1995* (Notice of filling of certain quotas), described under Guideline 1.1.7 of this assessment. The fishers were contacted and fishing in Zone 2 ceased. Considering the conservative TAC that has been determined for the area and the developmental fishery still being in its early stages, the zonal TACs have been developed with the intention of allowing some flexibility. As detailed above under ‘Current Management Arrangements’, the current TACs are set well below the recommended TACs obtained from the scientific surveys. Current total TAC for sandfish in the fishery is placed at 45 tonnes however the existing TAC quotas for each zone are being reviewed with the intention of providing some degree of flexibility between zones in reaching the overall TAC.

Catch and effort rates appear to be highest in April and May and within Zone 2. It is important to note that the fishing information presented below represents sandfish harvesting only as fishing for peanutfish has not yet commenced.

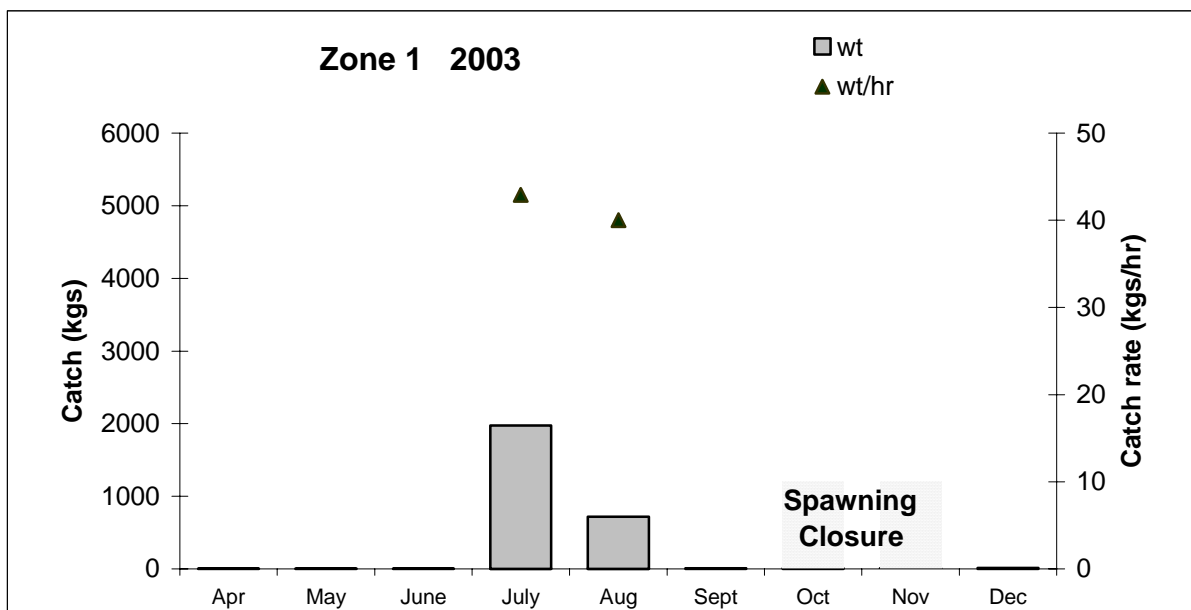


Figure 2. Monthly catch and effort for Zone 1 (Moreton) for 2003.

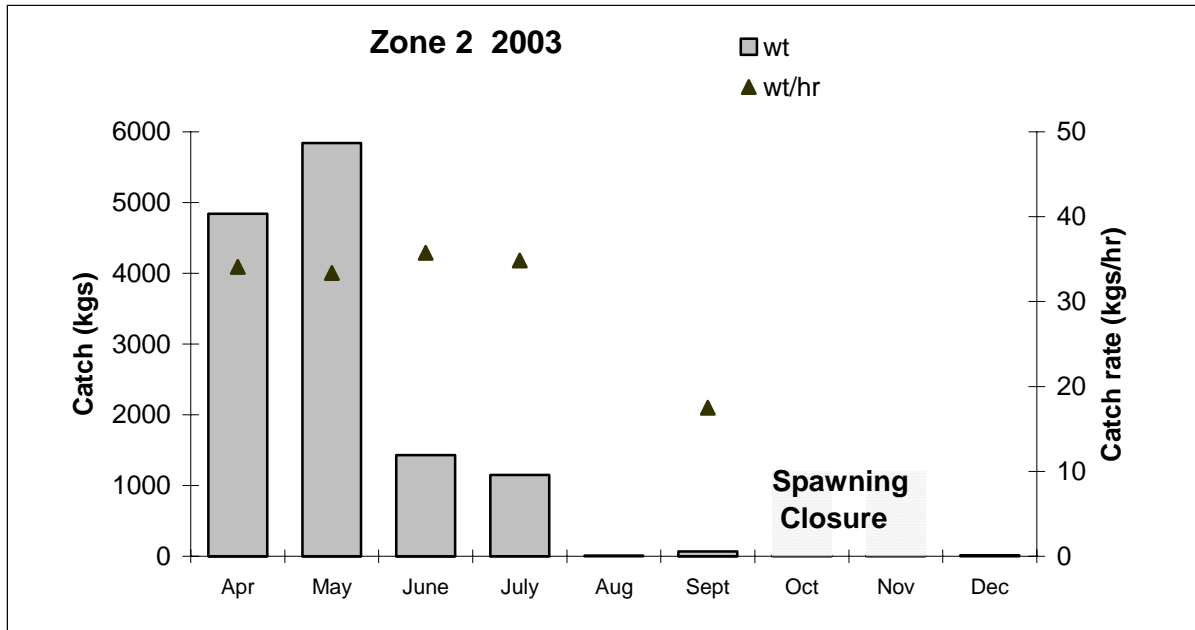


Figure 3. Monthly catch and effort for Zone 2 (Amity) for 2003.

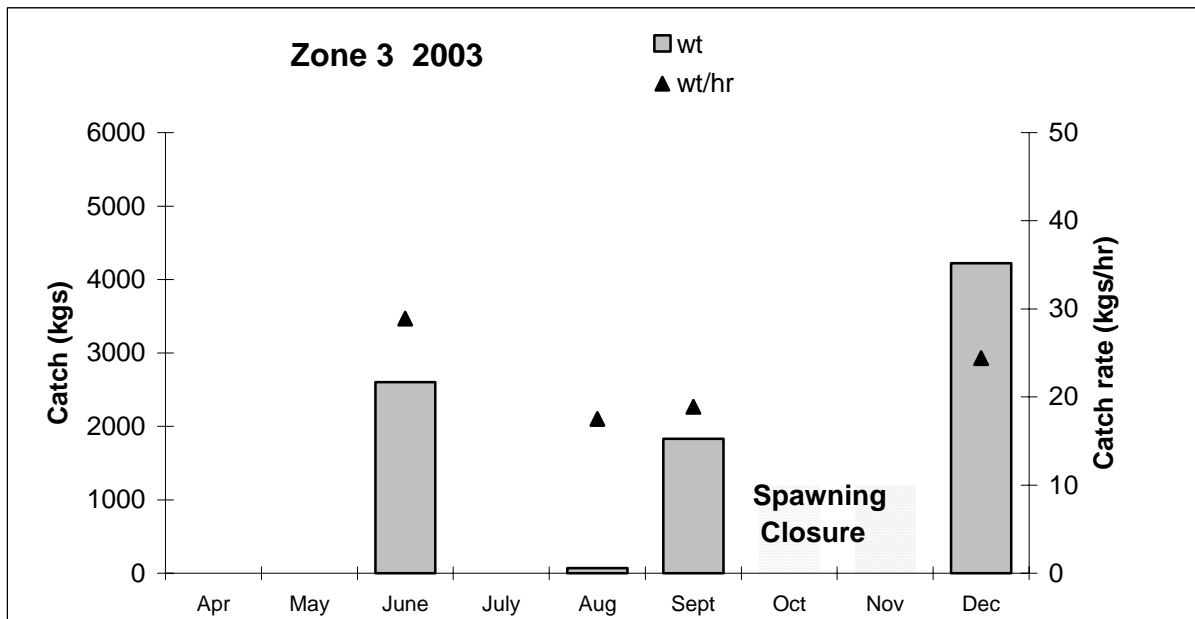


Figure 4. Monthly catch and effort for Zone 3 (North Stradbroke) for 2003.

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

Prior to the commencement of fishing in the developmental Moreton Bay beche-de-mer fishery, a survey of the distribution and abundance of sandfish was conducted. The survey, conducted by CMR, provided independent, empirically-based scientific advice upon which to base the TAC limit for the fishery.

Adopting a precautionary approach, by taking the lower confidence limit of the total biomass estimate (537 tonnes) and using a conservative surplus production model, the conservative potential sustainable yield of sandfish from Moreton Bay was estimated at 161 tonnes wet weight (Skewes *et al.* 2002). From this estimate, Skewes *et al.* (2002) recommended an initial TAC of <100 tonnes wet weight pending the results of future monitoring.

DPI&F and stakeholders in the fishery took a very precautionary approach to the developmental fishery, setting the initial sandfish TAC at 45 tonnes gutted wet weight, considerably lower than that recommended by the survey.

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 TAC limits for sandfish and peanutfish serve as proxy reference points for the fishery. As the TAC has been set lower than the estimated long term sustainable yield, there is a high confidence that the fishery will not progress beyond sustainable limits.

A maximum of 21 tonne from zone 1, 13 tonne from zone 2 and 11 tonne from zone 3 of sandfish and a total of 25 tonne of peanutfish from zone 1 are the permitted tonnages of gutted wet weight for each zone in any calendar year. These zonal trigger limits are currently being reviewed to allow for a degree of flexibility in respect to the relative split of the overall catch quota.

As outlined in the preceding criteria (1.1.5), the original survey of the distribution and abundance of sandfish in Moreton Bay (Skewes *et al.* 2002) estimated a conservative potential sustainable yield of 161 tonnes (wet weight). Highlighting that the estimate should be used conservatively and that post-fishing assessment and monitoring is required, Skewes *et al.* (2002) recommended that the TAC should initially be set at <100 tonnes (wet weight) which converted to 70 tonnes gutted wet weight (using the initial 0.7 conversion ratio). Following studies on conversion ratios for bêche-de-mer, Skewes *et al.* (2004) re-calculated the conservative TAC at 50 tonnes gutted wet weight. The 45 tonne (gutted wet weight) TAC that DPI&F has set is therefore conservative and promotes a high level of confidence that the fishery will not push the stocks beyond long-term sustainable limits, based on the best available scientific advice.

The annual survey of the fishery, required under the permit conditions, provides further assurance that the TAC is suitably conservative, and that the long-term viability of the stock is not being compromised. Peanutfish have not been harvested to date in the fishery therefore no specific survey is required at this point in time. However the distribution and abundance of this species was determined in Moreton Bay as additional information collected from the initial scientific survey conducted by CMR (Skewes *et al.* 2002). There is no current intention of harvesting peanutfish in Moreton Bay, as the processing techniques required for this species are difficult to undertake, with the species to be processed within a short period of time from collection.

Should the fishery progress beyond the developmental phase a formal process within the framework of the DPI&F developmental fishery policy will be undertaken to prescribe management arrangements, including extensive public and stakeholder consultation. The development of appropriate reference levels will be discussed as part of that process.

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

Management strategies are in place to restrict the level of take in the fishery. These consist of output and input controls.

Output controls

Total Annual Catch: A maximum of 45 tonnes gutted wet weight of sandfish and a maximum of 25 tonne gutted wet weight of peanutfish is the total allowable tonnages for each permitted species in any calendar year.

Zonal Trigger Limits: A maximum of 21 tonne from zone 1, 13 tonne from zone 2 and 11 tonne from zone 3 of sandfish and a total of 25 tonne of peanutfish from zone 1 are the permitted tonnages of gutted wet weight for each zone in any calendar year. These zonal trigger limits are currently being reviewed to allow for a degree of flexibility in respect to the overall catch quota.

It is standard DPI&F practice in all quota-managed fisheries that quota holders (the single permit holder in the case of this fishery) are sent a letter of notice when 25% and 10% of their quota is remaining. Actions to control the catch to within the TAC limit are enacted under s.27 of the *Fisheries Regulations 1995* (Notice of filling of certain quotas). The Regulations state:

- a) When the chief executive becomes aware that a quota (other than a daily or time quota) has been, or is likely to be, filled on or by a particular day, the chief executive must immediately notify a relevant authority holder, in writing, that the quota has been, or is likely to be, filled by a stated day.
- b) The authority holder must immediately tell persons acting under the authority that the quota has been, or is likely to be, filled on or by the stated day.
- c) A person given notice under subsection (1) or (2) must not take fish to which the notice relates after the day stated in the notice or, if the stated day has passed, the day after the notice is received.

Input controls

Size Limit: The minimum length for both sandfish and peanutfish is 17 cm which is determined by allowing the animal to relax on a flat surface, untouched for approximately 3-4 minutes after being removed from water.

Seasonal Closure: A seasonal closure is implemented in the commercial fishery between 1 October and 30 November (inclusive) each year, and aims to protect the breeding populations of *H. scabra* (sandfish) during spawning periods (Skewes *et al*, 2003).

Limited entry: Only one permit has been issued for the fishery. Harvesting only occurs from one zone on any given day and no zone is fished for more than 6 consecutive weeks in a 12-week period.

Vessel restrictions: A maximum of 2 boats, less than of 7 metres in length are licensed to operate within the fishery. These boat restrictions limit the impacts of fishing on marine habitats within the area.

Gear restrictions: Harvesting of bêche-de-mer is by hand collection only without the aid of diving apparatus such as hookah gear or scuba diving equipment. The restricted use of underwater breathing apparatus will effectively stop fishing for target species that occupy deep habitat.

Closed areas: Within Moreton Bay, all areas outside of the 3 designated fishing zones are closed to commercial harvesting of bêche-de-mer. The fishery is restricted to its northern and southern boundaries, from 27 deg 19.8' South (the northern extent of Crab Island) to 27 deg 34.8' deg (northern extent of Macleay Island) (Figure 1) to provide for substantial “no-take areas” in the northern and southern extents of Moreton Bay (Skewes *et al*, 2003). The 3 zones selected within the area of Moreton Bay for use in the developmental fishery allow at least 40% of sea cucumber stocks that were surveyed in 2001 (Skewes *et al*, 2002), to be protected in ‘no-take zones’. No-take zones are areas where collection is not permitted and allow for the protection of not only sea cucumber stocks but also biotypes.

Number of operators per vessel: A maximum of 6 people, 3 in each boat, acting under the directions of the holder are permitted to collect bêche-de-mer, with one person remaining in each boat and 4 to dive.

Compliance

QBFP officers from the Moreton Bay region comment that the MB BDM fishery has progressed without incident since it began operation. Two complaints have been received regarding breaches of permit conditions however following investigation both were found to be unsubstantiated. Operators have been inspected by QBFP officers on several occasions and no issues have arisen. Prior operational/collection advice is regularly received by QBFP. Overall the fishery appears to be low key and compliant (S. Dunn, QBFP, pers. comm., June 2004).

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

In practice, neither byproduct or bycatch are taken in the developmental Moreton Bay beche-de-mer fishery as all harvesting occurs by hand collection of selected specimens. As has been highlighted throughout, hand collection is a totally selective method of fishing as only those individuals specifically chosen for harvesting are collected.

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

The data collection, assessment processes and management responses - including the determination of sustainable quota levels - described in criteria 1.1.1 to 1.1.8 ensure a high probability that the target species of the fishery, *Holothuria scabra* (sandfish) and *Stichopus horrens* (peanutfish), will be managed within ecologically sustainable levels over the long-term. In particular, the TAC limits are very conservative, well below the estimated long term sustainable yield. This factor in itself promotes a high degree of confidence in the sustainability of the fishery.

DPI&F precautionary management of the fishery is also supported by a number of other management measures, including;

- the minimum legal size (MLS) limit set at a length greater than estimated size at first maturity (Skewes, 2003);
- the limited number of permitted vessels and participants;
- the requirement for an ongoing observer program; and,
- the requirement for an annual survey of impacts to the target species and the broader marine environment, to be conducted by an independent scientific organisation (CMR to date).

In addition to the conservative management arrangements listed above, the sole developmental permit for the fishery has been allocated for a limited period of three years and is set to expire April 1st 2006. While it is premature to predict the future of the fishery beyond this time, DPI&F will review all aspects of the operation of the fishery in allocating a new permit or progressing the fishery beyond the developmental phase.

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

Management responses

1.2.1 A precautionary recovery strategy is in place specifying management actions, or staged management responses, which are linked to reference points. The recovery strategy should apply until the stock recovers, and should aim for recovery within a specific time period appropriate to the biology of the stock.

and

1.2.2 If the stock is estimated as being at or below the biological and / or effort bottom line, management responses such as a zero targeted catch, temporary fishery closure or a 'whole of fishery' effort or quota reduction are implemented.

Neither of the two permitted species of the fishery, *H. scabra* (sandfish) and *S. horrens* (peanutfish) are considered to be at risk. Peanutfish are certainly not at risk due to the operation of the fishery as none have been harvested commercially to date.

Regarding sandfish, approximately 25 tonnes were harvested in 2003, well below the specified sandfish TAC of 45 tonnes. DPI&F set the TACs at very conservative levels in order to ensure that the fishery remains within ecologically sustainable limits. The original survey of sandfish distribution and abundance in Moreton Bay (Skewes *et al.* 2002), conducted by CMR, estimated a conservative potential sustainable yield of 161 tonnes wet weight annually. Based on this estimate, Skewes *et al.* (2002) recommended the initial TAC should be set at less than 100 tonnes, 70 tonnes gutted wet weight, pending further monitoring. Following studies on conversion ratios for bêche-de-mer Skewes *et al.* (2004), calculated a conservative TAC of 50 tonnes gutted wet weight. DPI&F TAC of 45 tonnes gutted wet weight is therefore very conservative.

As part of the fishing permit conditions, the permit holder is required to engage a scientific organisation to conduct an annual survey of the stocks of sea cucumber and associated ecological values in the area of the developmental fishery after the season closes on 1 October each year. The objectives of the survey are to assess the relative abundance of the fished stocks and to assess the sustainability of the current management arrangements. The 2004 survey, again conducted by CMR (Skewes *et al.*, 2004), indicated no significant change to either the average abundance of sandfish per site, or the size-frequency distribution of sandfish. The survey stated that “the small and insignificant reduction in the average abundance of sandfish recorded after a year of fishing is encouraging with respect to the sustainability of the current catch.” (Skewes *et al.*, 2004, pp. 3).

In the unlikely event that stocks are assessed as overfished or below an ecological reference point, the permit holder can be requested to ‘show cause’ why the permit should not be suspended or revoked otherwise emergency fishery declarations can be made under the powers contained in the *Fisheries Act 1994*.

PRINCIPLE 2

FISHING OPERATIONS SHOULD BE MANAGED TO MINIMISE THEIR IMPACT ON THE STRUCTURE, PRODUCTIVITY, FUNCTION AND BIOLOGICAL DIVERSITY OF THE ECOSYSTEM.

Objective 1. The fishery is conducted in a manner that does not threaten bycatch species.

Broadly defined, bycatch includes all non-retained catch – whether released alive or discarded (i.e. dead); and any individuals that are impacted by the fishing gear but are not landed (Alverson et al. 1994; Harris and Ward 1999). While bycatch obviously includes non-target species that are incidentally caught, target species that are caught and released are also considered to be bycatch.

Information requirements

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

Information on the bycatch of the MB BDM Fishery is recorded by DPI&F researchers as part of the observer program for the fishery, which is required under the permit conditions. In 2003, observers travelled to Stradbroke Island on observer duties on 10 occasions, accompanying fishers on 6 of these trips. With 105 days of fishing conducted across the three MB BDM fishing zones in 2003, observer coverage was approximately 5.7%. As only 1 permit is issued for the fishery this is considered an appropriate level of observer coverage.

The observers collect information on the target species (size, weight), bycatch, any environmental impacts arising from the fishery and fisher's compliance with permit conditions (MLS, logbook records), and provide anecdotal comments and insights into the practical operation of the fishery in the field. Observer reports are produced annually (e.g. Sumpton and McLennan 2004), and are provided to the fishery manager for distribution to MSAC members for comment and discussion.

Additionally, as mentioned earlier, the permit holders are required to engage a scientific organization to conduct an annual survey of the stocks of sea cucumber and associated ecological values in the area of the fishery. The objectives of the survey are to assess the relative abundance of the fished stocks and to assess the sustainability of the current management arrangements, including information regarding any bycatch impacts.

Assessments

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

In the developmental MB BDM fishery, hand collection is the only harvesting method permitted. Hand collection is a totally selective method of fishing as only those individuals specifically chosen for harvesting are collected. The 2003 Observer Report (Sumpton and McLennan 2004, pp. 4) supports this stating that '[t]here were no bycatch species noted due to the selective nature of the hand collection operation of the fishery'.

The 2003 Observer Report (Sumpton and McLennan 2004), and anecdotal information from fishers, supports the logical explanation for a hand collection fishery such as the MB BDM – bycatch is restricted to releasing undersize target species specimens. Undersize specimens are collected by fishers with Sumpton and McLennan (2004) outlining that on some occasions up to 20% of beche-de-mer were returned to the water because they were too small. Importantly however, the DPI&F observers have highlighted that with experience divers were noted to become more proficient at determining the marketable size of beche-de-mer and the practise of collecting and then returning undersized specimens at the boat decreased over time. The more experienced divers and crews collect very little undersize beche-de-mer.

At times divers were observed turning small beche-de-mer upside down on the sea bottom so that they would not be collected, however this was considered to be unlikely to effect their survival (Sumpton and McLennan 2004).

Sumpton and McLennan (2004) outline that the impacts to bêche-de-mer specimens that are released have not been quantified however they are expected to be very low given that undersize specimens are returned to the water relatively quickly and at the site of capture, and are kept in sea water prior to being released.

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.

2.1.4 An indicator group of bycatch species is monitored.

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

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

As outlined above, no incidental species have been observed caught in the MB BDM Fishery due to the totally selective hand collection harvest method. Undersize sandfish have been observed to be caught and released in the fishery however the impacts are considered to be very low. Accordingly, DPI&F believes that the management arrangements in place for this developmental phase of the fishery ensure that bycatch species are not threatened.

Although the fishery is still in an early stage, the 2004 survey of the Moreton Bay sandfish population (Skewes et. al, 2004) provides some preliminary verification that the limited catch and release of undersize sandfish has no adverse impacts on Moreton Bay bêche-de-mer. The survey found no significant change to either the average abundance of sandfish per site, or the size-frequency distribution of sandfish, since the original survey in 2002 (Skewes et al. 2002). Skewes et al. (2004, pp. 3) highlighted “the small and insignificant reduction in the average abundance of sandfish recorded after a year of fishing is encouraging with respect to the sustainability of the current catch.”

Given the extremely low bycatch risks in the MB BDM Fishery, the current management arrangements are considered sufficient to allow DPI&F to address any bycatch issues that should arise in a timely manner.

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

Information requirements

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

A number of sources provide information to DPI&F regarding any interactions with ETP species. The regular DPI&F observer trips view and record information on all aspects of the fishing operations including any interactions with ETP species and any impacts to the fishery habitat. An annual report is produced on the findings of the observer program (for example Sumpton and McLennan 2004), which is provided to the fishery manager for distribution to MSAC members. Any interactions highlighted in the report would be discussed at the MSAC meetings, who would then advise DPI&F of any management responses required.

Further information is provided by the fishers themselves. Fishers are members of the MSAC and are therefore able to provide 'in field' information on any interactions with ETP species.

Assessments and Management responses

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

No interactions with with ETP species have been reported in the MB BDM Fishery, either by DPI&F staff involved in the observer program or by the commercial fishers. This is to be expected given that:

- Hand collection is the only permitted method of harvesting, with no additional fishing gear allowed; and,
- All harvesting must be undertaken free-diving, without the use of hookah apparatus or SCUBA.

Highlighting the low impacts emanating from this fishery, a recent assessment by the Australian Marine Conservation Society (AMCS) rated hand collection dive fisheries such as the MB BDM Fishery as the equal most preferred fishery type. The assessment undertook a comparative analysis of the actual and potential environmental impacts arising from Australia's most widely used commercial fishing gears and methods. The potential impacts both to wildlife and on habitats were rated as low (www.amcs.org.au).

Potential impacts to ETP species from the MB BDM Fishery are assumed to be restricted to interactions with vessels. DPI&F acknowledges that the fishery operates in regions where marine turtles and dugongs are present, with some areas designated turtle protection zones. Interactions could occur during vessel transit through the fishery area however with only two vessels permitted to be used in the commercial fishery the potential risk is considered to be negligible.

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

There are no listed threatened ecological communities found within the the area of the MB BDM Fishery.

Seagrass beds do occur within the fishery area, providing vital nursery habitat and food for an extensive range of species, however, seagrass beds are not listed or considered to be threatened within Moreton Bay. In any case, most fishing occurs on sand banks rather than on seagrass beds and the fishery uses no equipment except the small dinghy from which fishing is conducted. Both these factors limit the potential for any impacts to seagrass beds.

The observer reports support this, stating that the fishery “has virtually no detrimental effect on the environment apart from minor impact caused to seagrass beds and the sea floor as a result of anchoring the small vessels from which divers operated. Divers were noted to cause minimal environmental disturbance, merely swimming close to the sea floor...” (Sumpton and McLennan 2004, pp. 4). If any impacts do arise they will be detected by the annual surveys required under the permit conditions, which survey the associated ecological values in the area of the developmental fishery.

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

Fishing in the MB BDM Fishery is restricted to free-diving hand collection; no additional fishing gear is permitted to be used, including hookah apparatus or SCUBA. This restriction on accessory fishing gear considerably limits the potential for any harmful interactions with ETP species.

With regard to interactions between MB BDM fishing vessels and ETP species, DPI&F has permitted only two vessels to operate in the fishery. Considering the scale of boating in Moreton Bay, the potential risk of interactions with two small vessels is considered to be negligible. In addition, measures such as reduced speed limits have been put in place in Moreton Bay to reduce the potential for interactions.

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

No ecological communities within the area of the fishery are listed as threatened. Accordingly, there is no need to implement any measures to reduce impacts.

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

As outlined above, no interactions with ETP species (harmful or otherwise) have been recorded in the MB BDM Fishery either by DPI&F observers or fishers. Management factors contributing to this include the low number of fishers (maximum of six in total) and boats (maximum of 2 in total) permitted to be used in the fishery, and the restriction of fishing to hand collection without the use of accessory gear.

As part of the permit conditions, the permit holder is required to cover the costs of an observer program to monitor the operation of the fishery 'in the field'. The DPI&F observer reports (e.g. Sumpton and McLennan 2004) have provided independent verification of fishers anecdotal comments that there are no interactions with ETP species. The observer reports are produced annually and are provided to the fishery manager to distribute to MSAC members. This process allows the members to provide comment on any issues and advise DPI&F of any management responses required.

DPI&F considers the current management arrangements are sufficiently precautionary to avoid mortality or injury of ETP species. As the fishery is developmental and operates under reviewable permit arrangements, there is considerable scope for DPI&F to address any issues that may arise with regard to interactions with ETP species.

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

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.

The primary source of information on any general ecosystem impacts from the MB BDM Fishery is the initial survey of the distribution and abundance of sandfish in Moreton Bay (Skewes et al. 2002) and the subsequent annual re-surveys of the fishery (e.g. Skewes 2004). Beyond the target stock, additional objectives of the annual surveys are to:

- # estimate relative cover/abundance of gross environmental biophysical parameters and compare with historical data to estimate any changes; and
- # recommend sustainable management strategies for the year 2004 and future research priorities.

The annual surveys are considered "essential for the sustainable fishing of holothurians in Moreton Bay,...[and] for mitigating ecological impacts that may be caused by the removal of this important animal group" (Skewes 2004, pp. 1).

Assessment

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.

1. Impacts on ecological communities

- # **Benthic communities**
- # **Ecologically related, associated or dependent species**
- # **Water column communities**

Benthic communities and Ecologically related, associated or dependent species

Similar to the majority of holothurians, sandfish are benthic organisms usually found in close association with the substrate. For this fishery, ecologically related, associated or dependent species will primarily be components of benthic communities and therefore these two sub-criteria are addressed jointly.

As has been mentioned previously, the MB BDM fishery operates on hand collection, meaning it is totally selective to the target beche-de-mer species and has no direct impact on related, associated or dependent benthic organisms. Accordingly, the primary potential impacts to the ecosystem appear to be indirect effects arising from the removal of the target bêche-de-mer species.

The scale of the impacts from the MB BDM fishery have not been assessed however a number of factors suggest that any impacts would be minimal. First, the commercial catch in 2003 was just 32 tonnes gutted wet weight, which is equivalent to approximately 60 tonnes live wet weight (based on the most recent conversion factors; Skewes 2004). Given that the sandfish population in the fishery area has been estimated at approximately 951 tonnes live wet weight (± 414 tonnes, 90% CI) the current catch is very low, less than 7% of the standing population (Skewes et al. 2002). The catch is well within the estimated annual sustainable yield and the TAC.

Fishing effort and catch is also distributed both spatially and temporally to minimise any impacts. Three separate fishing zones exist in the fishery, each with individual TAC limits that have been determined based on their proportional contribution to the population abundance. At a finer spatial scale, the fishery observers have explained that the fishers generally collect bêche-de-mer from a number of different sites each day, further ensuring that the impacts are not concentrated. Temporally, fishing is spread throughout the year with the exception of the spawning closure in October and November. The permit conditions for the fishery impose the additional restriction that each zone may not be fished more than six consecutive weeks in any twelve week period.

As mentioned above, there is limited quantitative data on the effects to benthic ecosystems from removing bêche-de-mer. However, research is currently being undertaken through a PhD project entitled "Impacts of Removal – A Case Study on the Ecological Role of the commercially important sea cucumber *Holothuria scabra* in Moreton Bay" (S.M. Wolkenhauer, CMR, pers comm 2003). It is envisaged that the research will provide essential information, specific to Moreton Bay, on the biology and ecosystem functions of holothurians, as well as increased understanding of the environmental impacts associated with the removal of holothurians from associated food webs.

Water column communities

As benthic grazers, sandfish have little involvement or impact upon water column communities, with the exception of spawning and larval contributions. As the TAC (45 tonnes) is well within the long-term sustainable yield estimated for Moreton Bay (Skewes et al. 2002; Skewes 2004), there is a minimal risk of impact to spawning capacity.

2. Impacts on food chains

Structure

Productivity/flows

Structure and Productivity/flows

Holothurians are important components of both reef and inshore ecosystems. They are slow moving benthic grazers usually found in association with seagrass, algae and corals. Bêche-de-mer are assumed to play a significant role in the recycling of the nutrients phosphorous and nitrogen, which is particularly important in maintaining the high

productivity on coral reefs (D'Elia & Wiebe (1990) cited in Uthicke 2001). It is generally thought that all sediment-feeders such as holothurians have this important ecological role. Studies on lollyfish and greenfish have shown they are an important component of a benthic recycling system on reefs (Uthicke 2001).

Beyond the impacts to ecologically related, associated or dependent benthic species, which have been discussed in the preceding section, the only further impacts are the food web interactions with water column species which prey on the target species. There is no direct information available to identify the key predators on sandfish in Moreton Bay. Dance et al. (2001) investigated the survival of sandfish in the Solomon Islands and identified species from the families Balistidae (triggerfishes), Labridae (wrasses), Lethrinidae (emperors) and Nemipteridae (threadfin breams) as the primary predators. Similarly, there is no evidence to assess the potential impacts to the key predators. However, species within the families identified as key predators in the Solomon Islands are generally acknowledged to follow 'generalist' predatory strategy – preying on a range of species of which bêche-de-mer is just one component (see Fishbase database: <http://www.fishbase.org/search.cfm>).

To date, no research has been conducted to quantify the impacts to either benthic or water column food webs associated with the removal of holothurians. However, it is envisaged that PhD research project mentioned previously will provide some preliminary information specific to sandfish in Moreton Bay.

3. Impacts on the physical environment

- ⌘ **Physical habitat**
- ⌘ **Water quality**

Physical habitat

While it is recognised that divers in hand collection fisheries are likely to have some contact with the benthos, the level of contact and impact is minimal. Beyond this, the only impact would be from the anchors used by the two small boats in the fishery. The level of impact arising from two small boats would be insignificant relative to the considerable boating that occurs throughout Moreton Bay as a result of commercial and recreational fishing, tourism and other shipping generally. Moreover, the damage caused by a range of naturally occurring phenomena such as extreme weather conditions would be considerably greater than any anchor impacts arising from the MB BDM Fishery.

Water quality

The only impact to water quality from the MB BDM Fishery would appear to be due to the processing of the catch. Processing initially involves removing the gut of the bêche-de-mer while on the fishing grounds and then salting and packing the product at the barge moored in the boat harbour.

As the divers collect and bring the product back on board the bêche-de-mer are placed into nally bins filled to a depth of 10cm with sea water. The deckhand immediately starts sorting and gutting the catch while further collection takes place. Any undersize specimens are returned to the water while legal specimens are gutted and placed in a collection bucket. The guts are discarded back into the water.

There are a number of factors to consider in assessing the impacts to water quality due to gut discarding. The boat is usually anchored in the deepest part of the area being fished so that any guts dumped are dispersed through the water column. In addition, the boats are quite mobile between different fishing sites and may fish 6 or 7 different locations in one fishing day. Gutting of the days catch will be distributed between these locations (M. McLennan, DPI&F observer, pers. comm., 2004) The highest daily catch recorded in the 2003 Observer Report was approximately 340kg (wet weight). If this catch was considered to be spread over 5 fishing sites, discards would be limited to gut taken from 70kg of bêche-de-mer (wet weight). This represents a very minimal quantity of discards.

The observers noted that “the permit holders were not observed discarding any other material into the environment” (Sumpton and McLennan 2004, pp. 4). There has been no investigation of the ultimate fate of the discarded material however it is assumed to be dispersed by water currents and consumed by detrital feeders.

With a maximum of 2 small boats and six people permitted in the MB BDM Fishery water quality is unlikely to be affected either by vessel pollution or discharges. Poorly maintained vessels and the leaking of mechanical fluids and fuels would impact water quality however no such problems have been noted by the observers. Given that the success of the fishing operations depends on the vessels reliability it is highly unlikely that the operators would allow the maintenance to lapse. The *Transport Operations (Marine Pollution) Act 1995* requires all vessels to be maintained and not discharge any materials into the water. The Department of Transport is responsible for checking vessel maintenance and safety through annual survey inspections. Vessels can be inspected both wharveside and at sea for their compliance and sea worthiness.

Food safety standards prohibit the use of additives to either process the fish or maintain live fish on board the boats.

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.

DPI&F has taken a very conservative approach to the development of this fishery, both with regards to the target species and the environment likely to be effected. There are a number of measures which reduce the broader ecological impacts of the fishery.

- # The total allowable catch for both target species is very conservative. While this is primarily to ensure that the commercial catch does not impact on the long-term stock sustainability for each species, it also has flow on benefits of reduced impacts to associated food web species.
- # Three separate fishing zones, each with individual TACs, aimed at spreading fishing effort to avoid the possibility of localised depletions and any associated ecological impacts.
- # The permit conditions require that each fishing zone is fished not more than six consecutive weeks in a twelve week period.
- # Hand collection, without the use of additional equipment, is the only harvesting method allowed. In addition, all harvesting must be conducted while free-diving without the use of hookah apparatus or SCUBA. These measures essentially rule out any impacts to bycatch or associated species, or to the benthic communities.
- # Only one permit has been allocated, with only two vessels permitted to operate in the fishery. Limiting the amount of effort to such small levels minimises the potential for ecological impacts to negligible levels.

The requirement for an annual survey of the target stocks and the general environment, to be conducted by an independent scientific organisation, ensures that any broader ecological impacts are detected at an early stage, allowing management to be changed in a timely manner.

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.

Given the lack of detailed information on any general ecosystem components, no reference points or decision rules have been identified for the MB BDM fishery at this stage. However, as mentioned above, the annual survey of the fishery assesses any general ecosystem impacts and reports these to the fishery manager and in turn the MSAC members. As a developmental fishery managed under permits any impacts are able to be addressed in a timely manner.

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

In summary, there are minimal impacts to the broader marine environment as a result of the operation of the MB BDM Fishery. The management measures in place are considered sufficient to ensure that impacts are managed within sustainable limits. In addition, as the fishery is developmental and operates under reviewable permit arrangements, there is considerable scope for DPI&F to address any broader marine impacts that may arise.

REFERENCES

- Alverson, D.L., Freeberg, M.H., Murawski, S.A. and Pope, J.G. 1994. A global assessment of fisheries bycatch and discards. *FAO Fisheries Technical Paper No. 339*. FAO: Rome, Italy.
- Benzie, J. A. H. and Uthicke, S. 2003. Stock size of bêche-de-mer, recruitment patterns and gene flow in black teatfish, and recovery of over-fished black teatfish stocks on the Great Barrier Reef. FRDC Project 97/344. Townsville. The Australian Institute of Marine Science. 86pp.
- Breen, S. B. 2001. Queensland East Coast Beche-de-Mer Fishery: Statement of Management Arrangements. Brisbane. Department of Primary Industries, Queensland. 21pp.
- Conand, C. 1989 The fishery resources of Pacific island countries. Part 2. Holothurians. *FAO Fisheries Technical Paper, 272-2*. FAO, Rome, pp108
- Dance, S. K. Lane, I. and Bell, J. D. 2001 Variation in short-term survival of cultured sandfish (Holothuria scabra) released in mangrove–seagrass and coral reef flat habitats in Solomon Islands. *Aquaculture, 220*: 495-505
- Fletcher, W.J., Chesson, J., Sainsbury, K.J., Hundlow, T., Fisher M., (2003) National ESD Reporting Framework for Australian Fisheries: The ESD Assessment Manual for Wild Capture Fisheries. FRDC Project 2002/086, Canberra, Australia.
- Green, R., Harris, S. and Throsby, C. D. 1991. Ecologically sustainable development working groups – Final Report. Fisheries Volume. Australian Government Publishing Service: Canberra.
- Harriott, V. J. 1984. Census techniques, distribution, abundance and processing of large sea cucumber species (Echinodermata: Holothuroidea) on the Great Barrier Reef. Report to the Great Barrier Reef Marine Park Authority. 39pp
- Harris, A. and Ward, P. 1999. Non-target species in Australia's Commonwealth fisheries: a critical review. Bureau of Rural Sciences: Canberra.
- Ponder, W., Hutchings, P. and Chapman, R. 2002. Overview Of The Conservation Of Australian Marine Invertebrates. A Report For Environment Australia. Sydney. Australian Museum. 588pp.
- Preston, G. L. 1993 Sea cucumber. In: *Nearshore Marine Resources of the South Pacific* (eds A. Wright and L. Hill). Forum Fisheries Agency, Honiara, Institute of Pacific Studies, Suva.
- Queensland Fisheries Service. 2002 Information Paper – Application for a Developmental Fishing Permit to Harvest Beche-de-mer, Moreton Bay. Department of Primary Industries, Queensland
- Uthicke, S. 1996. Bêche-de-Mer: A Literature Review on Holothurian Fishery and Ecology. Townsville. Australian Institute of Marine Science. 44pp

- Uthicke, S. and Benzie, J. A. H. 1998. Improving the conservation management of the commerciaalsea cucumber *Holothuria scabra* (sandfish). Final report produced for the Australian National Parks and Wildlife Service. Townsville. The Australian Institute of Marine Science. 20p.
- Uthicke, S., Benzie, J. A. H. and Ballment, E. 1999. Population genetics of the fissiparous holothurian *Stichopus chloronotus* (Aspidochirotida) on the Great Barrier Reef, Australia. *Coral Reefs* **18**: 123-132.
- Uthicke, S. and Benzie, J. 2000. Allozyme electrophoresis indicates high gene flow between populations of *Holothuria (Microthele) nobilis* (Holothuroidea: Aspidochirotida) on the Great Barrier Reef. *Marine Biology* **137**: 819-825.
- Uthicke, S. and Benzie, J. A. H. 2001. Restricted gene flow between *Holothuria scabra* (Echinodermata:Holothuroidea) populations along the north-east coast of Australia and the Solomon Islands. *Marine Ecology Progress Series* **216**: 109–117.
- Uthicke, S. 2001. Interactions between sediment-feeders and microalgae on coral reefs: grazing losses versus production enhancement. *Marine Ecology Progress Series* **210**: 125-138.
- Skewes, T.D., Dennis, D.M., Wassenberg, T., Austin, M., Moeseneder, C., Koutsoukos, A. (2002) Surveying the distribution and abundance of *Holothuria scabra* (sandfish) in Moreton Bay. CSIRO Division of Marine Research Final Report
- Skewes, *et al*, 2003 Developmental Sea Cucumber Fishery in Moreton Bay – Submission to the Management and Scientific Advisory Committee. CSIRO Division of Marine Research. February 2003.
- Skewes, *et al*, 2004 Research for the sustainable use of *Holothuria scabra* (sandfish) in Moreton Bay – Interim report on the 2004 relative abundance survey, March 2004. CSIRO Division of Marine Research.
- Sumpton, W. and McLennan, M. 2004 Moreton Bay Developmental Beche-de-mer Fishery – Observer Report 2004. Agency for Food and Fibre Sciences, Southern Fisheries Centre.
- Vaile, L. 1989. Trepang resource surveys - Melville Island, Gove Harbour, Croker Island. Darwin. Northern Territory Museum of Arts and Sciences. 112pp.

APPENDICES

DIRECTION TO KEEP AND GIVE LOGBOOK RETURNS

Background

Under Section 118 of the Fisheries Act 1994 (the Act) a person must, if required under a regulation or management plan –

- a) Keep the records, documents or other information about fisheries required by the Chief Executive in the way and form and as directed by the Chief Executive; and
- b) Give them to the Chief Executive as the Chief Executive requires.

Under Section 109 of the Fisheries Regulation 1995 (the Regulation) all holders of an authority to take fish for trade or commerce must keep and give statistical returns to the Chief Executive as required by the Chief Executive.

Delegation

I advise that I hold a delegation under Section 118 of the Act given to me by the Chief Executive.

Direction

I now direct all holders of a Queensland general fisheries permit for trade or commerce to immediately obtain a logbook specific to the fishing activities conducted under the relevant authority from the Department if not already held, and immediately commence to:

1. Use the logbook if you are in charge of the fishing operation, or make the logbook available to the fisher in charge of the fishing operation;
2. Keep the logbook (or ensure that the logbook is kept) in accordance with the instructions contained in the logbook and any written instructions the Chief Executive may, from time to time provide. The instructions in the logbook explain how to use the logbook and how to report the landing of product if required under the management arrangements relevant to that fishery; and
3. Give the completed logbook (or ensure that the completed logbook is given) to the Chief Executive in accordance with the instructions contained in the logbook. In particular this instruction requires that the completed logbook returns be forwarded to the Chief Executive within a specified time period after the fishing to which they relate has occurred.

Please note that under Section 118 of the Act, a person who fails to comply with an obligation to keep and give the logbook or other information about fisheries required by the Chief Executive is liable to prosecution for an offence against the Act (maximum penalty 500 penalty units).



P J Neville
Deputy Director-General / Delegate for the Chief Executive
Queensland Fisheries Service

DEVELOPMENTAL MORETON BAY BECHE - DE - MER FISHERY LOGBOOK

PART A - FISHING INFORMATION

General Information

This logbook does not need carbon paper. The cardboard insert must be placed under the PINK page when you are filling in the logsheet to prevent accidental marks on the next set of forms.

The logbook is in triplicate, where one comes to QFS, one Part B goes to the Buyer and the third remains in the book for your record.

The top WHITE form is the original, and the whole page must be completed and forwarded to QFS including the Part A and Part B sections of the log.

The second YELLOW form is for the purposes of sending the Part B Landing Docket to the Buyer with the beche-de-mer product.

The third PINK form is for your own records and remains in the book.

The WHITE logsheet must be forwarded to the QFS no later than seven days after completion of each fishing trip. A fishing trip is completed when product is landed in Port and sold.

Vessel name and symbol, permit holders name and number of the permit holder must appear on every logsheet. Also, the declaration at the bottom of the form must be signed at the end of the trip.

If no fishing has occurred for a week, then a nil return must be submitted no later than the Friday following the nil fishing week. The nil fishing information must be filled out in the "I" have not been collecting for the period... and a non-collection code entered. This page must be signed by the permit holder (whomever is in charge of fishing operations at the time).

Effort Information

The fishing zone must be entered for each day so that detailed location information can be collected on each species.

Effort information is required for each fishing day. The boat symbol used, the harvest method code (snorkel or wading) and the number of divers fishing must be entered each fishing day. It is important that the average individuals diver hours is entered also.

LOGBOOK QUERIES
PHONE - 3227 6707

For example, on one day on vessel NN-1 4 collectors are snorkeling, and they each fish for 5 hours each using two boats, at an average depth of 4 metres and on the same day NN-2 has 2 collectors wading for 3 hours in 1 metre of water, then the following should be entered:

Effort				
Boat symbol	Harvest Method	Number collectors	Indiv collector hours	Average Harvest depth
NN-1	S	4	5	4
NN-2	W	2	3	1

The total collector hours for that day are calculated by multiplying the number of collectors by the indiv collector hours (i.e. 4 X 5 = 20 diver hours in total). Accurate effort information will assist in calculating some fishery sustainability measures such as CPUE (Catch Per Unit Effort).

Location Information

Please provide your daily catch for each zone. The harvest for beche-de-mer is to be recorded in number of pieces and wet gutted weight.

Daily catch for each boat (NN-1 and NN-2) must be recorded on a separate line on the logbook.

The quota totals table can be used as authority/permit holders own personal record.

The original logsheet must be submitted to QFS, while the carbon copy remains in the book for your information. A new page must be used each new trip.

PART B – LANDING DOCKET

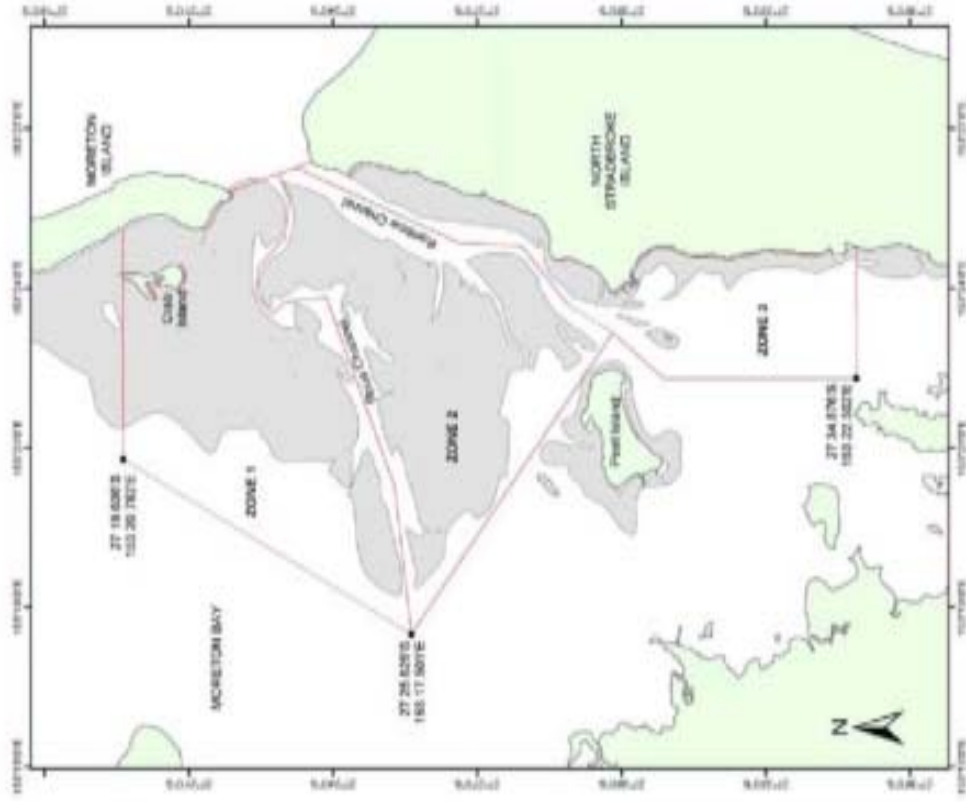
The Landing Docket is used to submit the actual weights of the product in the form as received by the buyer/processor. This docket travels with the product, and is filled out by the buyer/processor when weighing is completed. This information that provides the total weight harvested, and is used to calculate each individuals remaining quota.

The second **YELLOW** page Part B Landing Docket is forwarded to the Buyer with the product and is perforated for your use. The yellow Landing Docket is retained by the buyer/processor and must be attached to the Buyer Logbook return when they submit the Buyer return.

The weight and number of specimens must be entered under the correct product form for each species.

The docket serial number and the logbook number match, so the docket **must relate only to the product bought from the authority/permit holder that has been harvested on that page of the log**. If more than one page of the logbook has been used for the one fishing trip, then the docket on the second page of the logbook must be used.

ZONES



APPENDIX 2. PERMIT CONDITIONS APPLYING TO THE DEVELOPMENTAL MORETON BAY BÊCHE-DE-MER FISHERY

Permit Conditions –

Authorised Activities

1. The holder is authorised to conduct developmental fishing for the following species only:

- Sandfish (*Holothuria scabra*); and
- Peanutfish (*Stichopus horrens*) (the permitted species).

2. The holder is authorised to take, possess, process and sell the permitted species.

3. The holder is authorised to take sandfish only from the following waters within Moreton Bay:

- Moreton (Zone 1): 27 deg 19.8'S (northern extent of Crab Island) to Rous Channel (western boundary is a direct line between latitude 27 deg 19.63' south, longitude 153 deg 20.782' east and latitude 27 deg 25.62' south, longitude 153 deg 17.501' east); and

- Amity (Zone 2): Rous Channel to Rainbow Channel (western boundary is a direct line between latitude 27 deg 25.62' south, longitude 153 deg 17.501' east and latitude 27 deg 29.81' south, longitude 153 deg 23.157' east); and

- North Stradbroke (Zone 3): Area between Rainbow Channel and North Stradbroke Island to 27 deg 34.8' (northern extent of Macleay Island) (western boundary is a direct line between latitude 27 deg 29.81' south, longitude 153 deg 23.157' east and latitude 27 deg 30.859' south, longitude 153 deg 22.305' east and a direct line to latitude 27 deg 34.876' south, longitude 153 deg 22.302').
Excluding any waters within a licensed Aquaculture Oyster Area.

4. The holder is authorised to take peanutfish only from the following waters within Moreton Bay:

- Moreton (Zone 1): 27 deg 19.8'S (northern extent of Crab island) to Rous Channel (western boundary is a direct line between latitude 27 deg 19.63' south, longitude 153 deg 20.782' east and latitude 27 deg 25.62' south, longitude 153 deg 17.501' east).
Excluding any waters within a licensed Aquaculture Oyster Area.

Conditions

1. In accordance with section 66 of the Fisheries Act 1994, the General Fisheries Permit (GFP) is not transferable.
2. The holder is authorised to take the permitted species by hand only. In particular, the holder is not permitted to use hookah or scuba diving equipment.

3. The holder or a person authorised to act under the GFP, must use no more than 2 boats (less than 7m in length) at any time to perform, or assist in the performance of the authorised activities.
4. The holder may only take sandfish that are at least 17cm in length. This must be the length of the animal on its removal from the water on capture or from a storage tank on board the boats and laid on a flat surface. The animal must be left untouched on the flat surface for approximately 3 - 4 minutes once removed from the water before the measurement is taken.
5. The holder may only take peanutfish that are at least 17cm in length. This must be the length of the animal on its removal from the water on capture or from a storage tank on board the boats and laid on a flat surface. The animal must be left untouched on the flat surface for approximately 3 - 4 minutes once removed from the water before the measurement is taken. Notice must be given to the Queensland Boating and Fisheries Patrol when fishing for this species commences.
6. The holder must give to the Chief Executive the number of permitted species required by the Chief Executive for scientific or other purpose relevant to the management of the developmental fishery.
7. The holder must have given prior written notice to the Chief Executive of the place at first landing and initial processing of the permitted species. The notice must advise of the location and/or the street and postal address of the place. The holder is authorised to use a barge of the dimensions 8.5m by 2.44m as the place at first landing and initial processing (salting only) until 30 June 2003. The barge must be moored in the One Mile Gutter, just north of the Small Ships Club. The holder must have given prior written notice to the Chief Executive if the barge will be moored at another location.
8. The holder is prohibited from taking the permitted species between 1 October and 30 November (inclusive) each year.
9. No more than 3 persons acting under the direction of the holder may take permitted species under the GFP at any one time from the one boat. However one person must remain in each boat at all times, when the permitted species are being collected.
10. The holder is permitted to take up to a maximum of 45 tonnes gutted wet weight of sandfish (consisting of the breakdown in zones 1, 2 and 3) and a maximum of 25 tonne gutted wet weight of peanutfish (zone 1) in any calendar year. Should the zonal trigger limit be exceeded in any of the zones below, the overall Total Allowable Catch (TAC) must still not exceed the above tonnages for each permitted species.
"Gutted wet weight" means the weight of the sea cucumber with its gut removed before it has undergone preliminary processing. Also, the holder is permitted to take only the following zonal trigger limit from within each zone:
 - a) Zone 1: 21 tonne sandfish; 25 tonne peanutfish
 - b) Zone 2: 13 tonne sandfish;
 - c) Zone 3: 11 tonne sandfish;
11. The holder must ensure Sandfish and Peanutfish taken are separated by species and kept in different containers at all times the fish are possessed on board the boat.
12. The holder is authorised to take the permitted species from one zone only on any given day.

13. The holder must ensure that each zone is fished not more than 6 consecutive weeks in a 12 week period.

14. The holder must ensure that boats being used to perform the authorised activities are clearly identified with the mark "NN-1" and "NN-2" at all times the boats are in use, whether or not there are persons on board the boat.

The boats must have affixed to both sides of the hull the marks "NN-1" and "NN-2". The mark must be dark upon a light background or light on a dark background and be of at least the following dimensions:

Height (mm)	Width (mm)
200	20-25

15. The holder must keep a daily logbook in the form required by Chief Executive by written notice. The holder must make the logbook available for immediate inspection by an inspector at all times, in accordance with section 173 of the Fisheries Act 1994. The logbooks must be maintained and kept at the place described in condition 7 above.

The holder must submit the completed logbook sheets to the Chief Executive within 7 days after the end of each week to which the logbook relates.

Copies of the logbook sheets submitted to the Chief Executive will be forwarded onto the Environment Protection Agency (Queensland Parks and Wildlife Service) for their records.

16. If required by written notice by the Chief Executive, the holder must carry on board the boats a permitted person or persons nominated by the Chief Executive (the observer) to observe and report on the operations of the boats under this permit for such relevant purpose as the Chief Executive requires, including for scientific assessment or other purpose related to the management of the developmental fishery that the Chief Executive determines.

The holder must pay for all reasonable costs of the observer, including professional fees, accommodation and expenses where applicable.

The holder must cooperate with any reasonable request made by an authorised observer to enable the observer to adequately perform the observer's functions.

The holder must allow the observer to enter the facility at which processing occurs to observe and report on the operations of the facility under this permit for such purpose as the Chief Executive requires.

17. The holder must allow an inspector under the Fisheries Act 1994 to enter the facility described above in condition 7 at any time operations are occurring at that facility.

18. The holder must engage a scientific organisation to conduct an annual survey of the stocks of sea cucumber and associated ecological values in Moreton Bay in the area of this developmental fishery. The holder must obtain written approval from the Chief Executive on the scientific organisation engaged, methodology and survey aims and objectives before the survey is conducted.

The annual survey must be conducted between 1 October and 30 November each year. The Chief Executive must receive the results of the annual survey no later than 31 January each year.

19. The holder must advise the Queensland Boating and Fisheries Patrol Office at Pinkenba and the observer by telephone or

facsimile within a reasonable period prior to commencing authorised activities on a day and persons involved in the take of sea cucumber for that day. However, if the activities are to be done on a consecutive period of more than one day, the notice may be given once for the whole of the period, prior to the start of the period.

Queensland Boating and Fisheries Patrol Office at Pinkenba:

Agency for Food and Fibre Sciences - Deception Bay:

Nunukul Ngugi Cultural Heritage Corporation:

20. As required by section 88 of the Fisheries Act 1994, the holder or if the holder is not present and any other person authorised to act under the GFP is doing anything authorised by it, then the person in control of the boats (NN-1 and NN-2), must have a copy of the GFP (signed on the reverse side by the Chair of the Nunukul Ngugi Cultural Heritage Corporation) and map of zones, available for immediate inspection at all times.

21. The holder is responsible for the operation of all boats at a times that activities are carried out under this permit.

22. The holder may sell sea cucumber taken in accordance with this permit. However, sea cucumber sold in Queensland may only be sold to the holder of a Buyer Licence (Class A).

APPENDIX 3. COORDINATES OF THE DEVELOPMENTAL MORETON BAY BÊCHE-DE-MER FISHERY AREA.

Moreton (Zone 1): From Moreton Island 27 deg 19.8' south (northern extent of Crab Island) to Rous Channel (western boundary is a direct line between latitude 27 deg 18.636' south, longitude 153 deg 20.782' east), then following the Rous Channel back to the southern most point of Moreton Island, excluding any waters within a licensed Aquaculture Oyster Area; and

Amity (Zone 2); Rous Channel to Rainbow Channel (western boundary is a direct link between latitude 27 deg 25.62' south, longitude 153 deg 17.501' east and latitude 27 deg 29.81' south, longitude 153 deg 23.157' east), excluding any waters within a licensed Aquaculture Oyster Area.; and

North Stradbroke (Zone 3): Area between Rainbow Channel and North Stradbroke Island to 27 deg 34.8' (northern extent of Macleay Island) (western boundary is a direct line between latitude 27 deg 29.81' south, longitude 153 deg 23.157' east and latitude 27 deg 30.859' south, longitude 153 deg 22.305' east and a direct line to latitude 27 deg 34.876' south, longitude 153 deg 22.302' east), excluding any waters within a licensed Aquaculture Oyster Area.