



**Australian Government**

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**Department of the Environment and Heritage**

Assessment of the  
**Queensland East Coast Trochus Fishery**

May 2005

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This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999*. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

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# Assessment of the ecological sustainability of management arrangements for the Queensland East Coast Trochus Fishery

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## EXECUTIVE SUMMARY

### Background

The Queensland Department of Primary Industries and Fisheries (DPI&F) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Ecological Assessment of Queensland's East Coast Trochus Fishery* (the submission) was received by the Department of Environment and Heritage (DEH) in July 2004. The submission was released for a thirty-day public comment period that expired on 10 September 2004. No public comments were received.

The submission reports on the Queensland East Coast Trochus Fishery (ECTF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission and associated documents.

**Table 1: Summary of the Queensland ECTF**

<b>Area</b>	Waters adjacent to the State of Queensland (Commonwealth and State waters). The majority of the east coast commercial trochus fishery operates in the tidal waters between Cape York and Gladstone, within the range of the Great Barrier Reef Marine Park (GBRMP).
<b>Fishery status</b>	The target species is considered underfished.
<b>Target Species</b>	Trochus shells ( <i>Trochus niloticus</i> ). Also known as topshells or topsnails.
<b>By-product Species</b>	No byproduct species permitted.
<b>Gear</b>	Harvesting is by hand held non-mechanical implements. Self Contained Underwater Breathing Apparatus (SCUBA) and hookah apparatus is permitted, however the majority of harvest occurs when free diving with a mask and snorkel in waters 2-10 metres deep or collection of trochus from reef tops at low tide.
<b>Season</b>	Primarily between August and February.
<b>Commercial harvest 2003/04</b>	133.5 tonnes.
<b>Value of commercial harvest</b>	Unknown.
<b>Commercial licences issued</b>	6 authority holders, with a maximum of 10 crew members collecting under each (4 authorities operating in 2003/04)
<b>Recreational harvest</b>	Take is limited by bag limits (50 trochus shells in possession) and minimum (8 cm) and maximum (12.5 cm) size limits. Recreational take is minimal.
<b>Management arrangements</b>	<p>Output controlled through:</p> <ul style="list-style-type: none"> <li>▪ Total Allowable Catch (TAC), currently set at 300 tonnes. Only 250 tonnes has been allocated for harvest (50 tonnes is currently unallocated).</li> <li>▪ Individual Transferable Quotas (ITQs)</li> <li>▪ Minimum (&gt;8 cm) and maximum (&lt;12.5 cm) size limits</li> </ul> <p>Input controlled through:</p> <ul style="list-style-type: none"> <li>▪ Limited entry (6 authority holders permitted to harvest 25 tonnes of trochus each)</li> <li>▪ Hand collection with the use of non mechanical</li> </ul>

	<p>equipment only</p> <ul style="list-style-type: none"> <li>▪ Limited number of crew authorised to dive for or gather trochus under an authority (10)</li> <li>▪ Closed areas within the GBRMP, including Marine National Park, Buffer, Scientific Research and Preservation Zones (not applicable to indigenous fishers collecting for traditional or customary purposes)</li> </ul>
<b>Export</b>	No current export
<b>Bycatch</b>	No bycatch due to the highly selective harvest method utilised in the fishery.
<b>Interaction with Threatened Species</b>	No interactions have been reported to date.

The area of the fishery includes waters adjacent to the east coast of the state of Queensland generally south of latitude 10°41' and east of longitude 142°31'49". The majority of the ECTF operates in the tidal waters between Cape York and Gladstone, within the range of the Great Barrier Reef (GBR). Mackay is the main port of the fishery.

The fishery targets trochus shells (*Trochus niloticus*). The fishery is a highly selective harvest fishery and does not take any byproduct or bycatch species.

Trochus are gastropods belonging to the family Trochidae. They inhabit intertidal and shallow subtidal areas of coral reefs, mainly in exposed aspects. Trochus have a conical shaped shell and can attain 16 cm in shell diameter (but are more commonly found between 8-12 cm). The trochus shell contains a layer of mother of pearl, which is used for the manufacture of jewellery, buttons, ornaments and cosmetics. Trochus meat is of secondary importance to the shell.

The average life span for trochus is 15-20 years, with most specimens reaching reproductive maturity by 2 years of age at a size of between 5-6.5 cm in diameter. Trochus are broadcast spawners and fertilisation takes place in the water column, often in synchrony with lunar cycles. In the central GBR region, spawning occurs throughout the year.

Adult trochus are largely non-selective herbivores, grazing on a wide variety of algae and formanifera.

The ECTF is adjacent to the Australian Government managed Torres Strait Trochus Fishery. The genetic distribution for the species within and beyond the boundaries of the fishery are poorly known, however it is suggested that stocks along the east coast of Queensland may represent functional units of trochus due to the limited dispersal of trochus between the two fisheries.

Approximately 133.5 tonnes of trochus shells were harvested in the ECTF in 2003/04. The commercial value of harvest is currently unknown. The fishery officially began in 1912 when trial shipments were sent from Torres Strait reefs to Japan and Austria. By 1917 the annual catch was nearly 500 tonnes and trochus fishermen were harvesting along new grounds down the east coast of Queensland as far south as Mackay (Nash, 1989). A peak catch of 1380 tonnes was recorded in 1953. The introduction of plastics plummeted the industry into a depression in the mid 1950s. The industry recovered during the late 1970s due to an increase in demand for natural buttons. A further increase in demand for trochus shell occurred in the late 1980s and was accompanied by an increase in market price. Following extensive research and development commercial markets for trochus meat were established in 1992 and these continue to grow stronger every year (Brayshaw, 1998).

A TAC of 300 tonnes per financial year was set in the fishery in 1990, however only 250 tonnes has been allocated for harvesting. Licences for the remaining 50 tonnes were offered to two Torres

Strait Island collectors but have remained unallocated since 1992. DPI&F are looking to abolish the unallocated quota amount and to set the current TAC at 250 tonnes for the East Coast. In 1997 trochus authorities became transferable.

The fishery harvests trochus shell through the use of non-mechanical hand held implements. The use of scuba and hookah equipment is permitted, however the majority of harvest occurs with a snorkel and mask when free diving in waters 2-10 m deep or from the reef top in low tide.

Fishery management arrangements include a TAC with ITQs, minimum and maximum size limits, limitations on the number of harvesters under each permit and spatial closures. In addition to these arrangements, there is limited entry to the fishery. Currently there are 6 authority holders.

There is no bycatch in the fishery due to the highly selective harvest of the target species. Interactions with listed protected species under the EPBC Act are unlikely due to the selective harvest and small scale of the fishery. No interactions with protected species have been reported to date. The potential for interactions is assessed under Principle Two of this report.

Take of trochus by the indigenous and recreational sectors is not well documented. Recreational fishers are not permitted to use SCUBA or hookah apparatus for collection and are subject to a bag limit of 50 shells and minimum (8 cm) and maximum (12.5 cm) size limits. Indigenous fishers collecting trochus for subsistence purposes are exempt from all forms of Regulation and restrictions. The level of indigenous fishing effort is presently unknown, however no indigenous catch was reported during the National Recreational and Indigenous Fishing Survey in 2000-01 (Henry and Lyle, 2003).

The fishery is managed under the Queensland *Fisheries Act 1994* and in accordance with the Queensland *Fisheries Regulation 1995*. As the fishery primarily occurs inside the GBRMP, the fishery is also subject to the *Great Barrier Reef Marine Park Act 1975*, the Queensland *Marine Parks Act 1982* and *Marine Parks Regulation 1990*.

## **Overall assessment**

The material submitted by DPI&F indicates that the ECTF operates in accordance with the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. DEH considers that the ECTF is a well-managed fishery that is unlikely to have an unacceptable or unsustainable impact on the environment in the short to mid term. Recommendations have been developed to ensure that the risk of impact is minimised in the longer term. Overall, the precautionary management regime of limited take, limited entry, minimum and maximum size limits and zonal closures suggests that the fishery is being managed in an ecologically sustainable way.

In making its assessment, DEH considers that the management arrangements are sufficient to ensure the fishery is conducted in a manner that does not lead to over-fishing and that stocks are not currently overfished. Considering the management regime in place and the particularly selective and benign characteristic of the fishery operations, DEH considers that fishing operations are managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. DEH is confident that DPI&F will continue to provide this high quality management.

The assessment finds that the fishery is managed in an ecologically sustainable way and its operation is consistent with the objects of Part 13A of the EPBC Act. DEH recommends that the export of species taken in the fishery should be exempt from the export requirements of Part 13A of

the EPBC Act, with that exemption to be reviewed in 5 years. DEH considers that the fishery, as managed in accordance with the management regime is not likely to cause serious or irreversible ecological damage over this period.

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

Protected species occurring in the fishery area include marine turtles, cetaceans, dugongs, seasnakes, syngnathids and seabirds. There have been no interactions reported to date. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the management regime for the Queensland ECTF be declared an accredited management plan under Sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEH considers that the fishery to which the regime relates does not, or is not likely to, adversely affect the survival in nature of listed threatened species or population of that species, or the conservation status of a listed migratory species, cetacean species or listed marine species or a population of any of those species. DEH also considers that the management regime requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and the level of interaction under current fishing operations is low. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the management regime, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

The assessment also considered the possible impacts on the World Heritage values of the GBRMP. DEH considers that the compliance with relevant GBRMP legislation, management arrangements and benign nature of the ECTF are sufficient to minimise any impacts on the GBRMP. On this basis DEH considers that an action taken by an individual fisher, acting in accordance with the ECTF management regime, would not be expected to have a significant impact on the World Heritage values of the GBRMP World Heritage Area.

To further strengthen the effectiveness of the management arrangements for the ECTF, and to contain the environmental risks in the medium to long term, DEH has developed a series of recommendations. The implementation of these and other commitments made by DPI&F in the submission will be monitored and reviewed as part of the next DEH review of the fishery in 5 years time.

## **Recommendations**

1. DPI&F to inform DEH of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on protected species or the ecosystem.
2. From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure (once developed).
3. DPI&F to develop and implement a robust system to validate commercial logbook reporting of catch and effort in the fishery within two years.
4. Within two years, DPI&F to investigate extinguishing the unallocated quota of 50 tonnes.

5. If the risk assessment to be conducted by DPI&F indicates that available stocks of trochus are at other than low risk of localised depletion, DPI&F to implement strategies to mitigate this risk in a timely manner.
6. Within two years, DPI&F to develop a process to improve estimates of recreational and Indigenous take and factor these into risk assessments, or any future stock assessments, and management controls.
7. DPI&F to develop fishery specific objectives linked to performance indicators and performance measures for the target species.

## PART I - MANAGEMENT ARRANGEMENTS

The Queensland ECTF is managed by DPI&F.

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

- the *Fisheries Act 1994*;
- the *Fisheries Regulation 1995*;
- the *Great Barrier Reef Marine Park Act 1975*;
- the *Queensland Marine Parks Act 1982*;
- the *Queensland Marine Park Regulation 1990*; and
- relevant Gazetted notices and permit conditions.

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

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

**Recommendation 1:** *DPI&F to inform DEH of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on protected species or the ecosystem.*

Management of the fishery incorporates a sound range of consultative mechanisms and a clear commitment to effective consultation with a variety of stakeholders. DEH considers the level of consultation to be adequate and is confident that the management agency will continue to ensure interested parties are consulted appropriately.

The management advisory committee for harvest fisheries (HarvestMAC) reviews all issues arising from or relevant to QLD harvest fisheries, including any impacts to target, bycatch, endangered, threatened or protected species or the broader marine environment generally. HarvestMAC advises DPI&F on any management actions required to ensure the ECTF continues to operate within ecologically sustainable levels, based on available fishery dependent and independent information.

HarvestMAC consists of a DPI&F appointed chair, DPI&F fishery manager, researcher, compliance officer, commercial fishers, recreational fishers, seafood marketer, Great Barrier Reef Marine Park Authority (GBRMPA) representative and a DEH observer. There are currently no indigenous or conservation representatives on the committee however there is a standing invitation from DPI&F for these groups to participate. DEH encourages DPI&F to continue to pursue membership from indigenous and conservation bodies.

The fishery is managed under permits in accordance with the *Queensland Fisheries Regulation 1995*, in force under the *Queensland Fisheries Act 1994*.

The fishery is also subject to a number of other Acts, both State and Commonwealth. The Australian Government *Great Barrier Reef Marine Park Act 1975* and associated Regulations

significantly impact on the fishery. Under the relevant zoning provisions, permits are required for collecting trochus in General Use and Habitat Protection Zones. The Regulations list protected species and define collectable species that can be taken. The recently revised zoning arrangements for the GBRMP protect approximately 15% more (in total area) fishable area from trochus harvesting.

The Queensland *Marine Parks Act 1982* and *Marine Parks Regulation 1990* apply to State Marine Parks with provisions complementary to the GBRMP Act. The Act and Regulation deal generally with marine parks while zoning plans determine which activities can occur in particular zones and which activities require permits.

An assessment of the effectiveness of the management measures for the fishery is included in Part II of this report.

Management of the fishery is based on a mixture of input and output controls including:

- a TAC (300 t) and ITQs;
- limited entry with 6 permits current;
- limited number of harvesters under each permit (currently 10 harvesters);
- gear restrictions (hand held non mechanical implements only, maximum of 4 tenders not greater than 7 m each);
- minimum (8 cm) and maximum (12.5 cm) size limits (for both commercial and recreational harvesters);
- bag limits (50 trochus shells in possession) for recreational fishers; and
- closed zones within the GBRMP.

Resources to undertake monitoring and enforcement for the fishery are limited due to the limited harvest and commercial value of the fishery. Compliance and enforcement tools utilised in this fishery are based on daily logbook records completed by the harvester and submitted to DPI&F every month. If a harvester fails to return the logbook data, DPI&F responds by sending a reminder letter in the first instance, sending a “show cause” letter one month later and finally suspending the harvester’s licence until the logbook data is provided. There have been no major compliance issues with the TAC or ITQs. Delayed logbook returns when no fishing is occurring were a concern in the past, however the issue has since been addressed and all fishers are currently compliant. The Queensland Boating and Fisheries Patrol (QBFP) undertakes compliance and enforcement activities for all Queensland fisheries resources, including the ECTF. No major compliance issues have been raised within the fishery. DEH considers that these compliance measures contain the means of enforcing critical aspects of the management arrangements for the fishery.

The fishery is regularly reviewed to ensure that it is operating within ecologically sustainable levels as is legislatively required under the Queensland *Fisheries Act 1994*. HarvestMAC provides advice on the management of Queensland harvest and developmental fisheries to DPI&F.

HarvestMAC meets twice a year to discuss recent developments in the fishery and data collected and to consider the adequacy of management arrangements. This review is rudimentary and is not strategically conducted against fishery specific management objectives and performance indicators, as these have not been developed (see Part II). Once these objectives and indicators have been developed, DEH encourages HarvestMAC to use these to strategically review the performance of the fishery.

Although an annual analysis of catch statistics is provided to DEH as a condition of previous export approvals, there is no publicly available annual review of the status of the fishery. DEH notes that

the confidentiality of information may limit the detail of public reporting but believes that some public statement about the performance of the fishery is needed on an annual basis.

***Recommendation 2:*** *From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure (once developed).*

Fishery dependent data relating to the target species are collected on a regular basis in the fishery. Limited fishery independent information is also collected. Discussion of the information collection system can be found in Part II of this report.

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

The ECTF is adjacent to the Torres Strait Trochus Fishery, which is managed by the Australian Fisheries Management Authority (AFMA). The genetic distribution of the species is poorly understood, however Larcombe (1993) suggested that stock distribution is dependent on the degree of larval connection between separate reef habitats of trochus as adults are not capable of moving between reefs to spawn (unless transplanted). It is therefore unlikely that Qld stocks are shared with Torres Strait.

DPI&F has committed to cross-jurisdictional cooperation through the Northern Australian Fisheries Management Forum and through the development of Memoranda of Understanding where necessary, if evidence emerges to suggest that stocks are shared.

DEH considers that the current management arrangements comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. DEH expects that DPI&F will also ensure compliance with any future plans or policies as they are developed.

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

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

The Queensland ECTF has been operating within the area of the current GBR World Heritage Area since 1927. Under the EPBC Act, a person may not take an action that has, will have or is likely to have a significant impact on the world heritage values of a declared World Heritage property. People that are taking actions that are a lawful continuation of a use of land, sea or seabed, that was occurring immediately before the commencement of the EPBC Act may continue to take those actions. An enlargement, expansion or intensification of a use is not a continuation of a use. DEH considers that harvesting activities as currently practiced in the fishery are unlikely to have a significant impact on the world heritage values of the GBR in the next 5 years due to the relatively

small scale and benign harvesting methods employed in the fishery (as discussed throughout Part II of this assessment report). Any significant change to existing practices, which is likely to significantly impact on the GBR World Heritage values, would require approval by the Australian Government Minister for the Environment and Heritage.

## **Conclusion**

DEH considers that the Queensland ECTF management regime is adequately documented, publicly available and transparent, and is developed through a consultative process. The management arrangements are adaptable and underpinned by appropriate monitoring by which the effectiveness of the management arrangements can be measured, enforced and reviewed.

The management arrangements are capable of controlling the harvest through a combination of input and output controls appropriate to the size of the fishery. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements.

The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements.

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

## **PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES**

### **Stock Status and Recovery**

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

### **Maintain ecologically viable stocks**

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

### **Information requirements**

Fishery dependent data is obtained through the daily Commercial Fisheries Logbook Program (CFISH). Logbook entries are recorded daily and reported monthly. As many of the fishers that operate in the ECTF also operate in the Queensland East Coast Beche-de-mer Fishery, a common logbook is used for both fisheries. The current version of the logbook was first issued in July 2000 and collects information on the harvest methods (ie hookah, SCUBA), total daily hours fished, harvest depth, number and weight of trochus catch, latitude, longitude, fishing grid, authority and crew numbers. This information is collected and entered into the CFISH system and utilised in the analysis of catch and effort data for the fishery to help evaluate the effectiveness of management arrangements. DPI&F report that data reliability for target species is adequate and that compliance and enforcement activities have the capacity to ensure the ongoing reliability of data in the fishery.

Fishery independent data collection is limited. Initial management of the fishery was based on information provided by Nash (1985) on the distribution and abundance of trochus. In 1991 DPI&F commissioned a stock assessment of the GBR to address concerns in relation to the setting and allocation of the quotas and size limits imposed in the fishery. The stock assessment was completed in 1993 and provided an estimate of the size of the trochus standing stock in the GBR, developed a model of trochus production and an estimate of the sustainable yield for the fishery. It also investigated basic biological characteristics including size distributions, size/fecundity relationships, growth rate and mortality of trochus (Larcombe, 1993). These scientific studies provided the foundation for current management arrangements. DPI&F currently does not intend to review the management arrangements for the fishery and no other research programs are proposed for the fishery.

Fishery dependent data for the fishery are currently the best source of fishery information, due to the limited and relatively dated fishery independent studies conducted. Logbook returns are scrutinised for discrepancies or fisheries regulation breaches. The DPI&F Logbook Section investigates any discrepancies in commercial catch information to ensure data reliability when data are received. As management of the fishery relies on accurate fishery dependent data there is a need for the data to be validated. DEH therefore recommends that DPI&F develop and implement a system to validate commercial logbook data.

**Recommendation 3:** *DPI&F to develop and implement a robust system to validate commercial logbook reporting of catch and effort in the fishery within two years.*

Overall, given the fishery dependent data gathered by DPI&F and the mechanisms for regularly reviewing the data requirements, DEH considers that there is a reliable fishery dependent information collection system in place appropriate to the scale of the fishery. Continuation of existing data collections, combined with some extension and refinement of such activities will be a significant improvement in providing confidence in the future management of the fishery.

## **Assessment**

Management of the fishery is based on studies conducted in 1985 and 1991 on the distribution and abundance of trochus (Nash, 1985 and Larcombe, 1993). No formal stock assessments have been conducted since this time. DPI&F has committed to undertake a risk assessment for the fishery within the next three years to assess any effects on the fishery due to the revised GBRMP zoning implemented on 1 July 2004. DEH commends DPI&F for this and suggests that DPI&F develop a timeline for the implementation of the risk assessment to ensure its timely implementation and completion.

Ryan (1999) reviewed the fishery for DPI&F, using the studies conducted for the fishery in 1985 and 1993 and logbook data collected for the fishery. His report included a review of the historical and current catch and effort data, an investigation of the impact of GBRMPA exclusion zones on the fishery and a review of the TAC. Recommendations suggested by Ryan include:

1. catch and effort records prior to the daily logbooks should be collected and entered on the computer database supported by the Queensland Fisheries Management Authority (now DPI&F);
2. the accuracy of recording and data entry of the daily catch and effort logbooks should be improved;
3. the total biomass of legal sized trochus should be estimated to allow changes from the original estimate;
4. annual monitoring of Catch Per Unit Effort (CPUE) should be maintained as a sustainability indicator for the ECTF;
5. annual monitoring of the relationship between catch weight and number of individual shells should be adopted as a sustainability indicator for the ECTF;
6. the TAC should be reduced according to a revised estimate of the total biomass of legal sized trochus;
7. the unallocated quota of 50 tonnes should be extinguished; and
8. management of the fishery should be reassessed if major changes occur in the fishery, including changes in the availability of trochus habitat (or fishable areas) through management regime changes.

DPI&F has implemented a number of changes to logbook reporting to facilitate the recommendations relating to improved catch and effort records, and is currently considering extinguishing the unallocated quota of 50 tonnes. DEH considers that the latent effort in the fishery should be extinguished as a priority (recommendation 7, above), particularly given the reduction of available fishing area in 1998 and again in 2004 from the RAP.

**Recommendation 4:** *Within 2 years, DPI&F to investigate extinguishing the unallocated quota of 50 tonnes.*

DEH understands that a number of recommendations made by Ryan (1999), including the revision of the current TAC, have not yet been fully implemented by DPI&F. If the recent zonal closures from the RAP have significantly impacted on the amount of stock available for harvest, stocks outside of the closed zones may be vulnerable to overfishing and localised depletion. DEH

considers that if the risk assessment indicates that the newly closed zones have significantly impacted on the amount of available trochus stock for harvest, DPI&F will implement strategies to mitigate the risk of localised depletion in a timely manner.

**Recommendation 5:** *If the risk assessment to be conducted by DPI&F indicates that available stocks of trochus are at other than low risk of localised depletion, DPI&F to implement strategies to mitigate this risk in a timely manner.*

Trochus are naturally distributed within the tropical and subtropical confines of the Indo-Pacific region between Sri Lanka, the Ryukyu Islands, New Caledonia and northern Australia. Since the 1920s they have been extensively translocated to areas including the Cook Islands and French Polynesia. Commercial fisheries for trochus in Australia are restricted to tropical regions including the waters of Queensland, Western Australia and the Torres Strait. In Queensland trochus are generally found on the reefs and cays of the GBR.

There is little information on the current distribution and stock structure of trochus in Queensland. A stock assessment was undertaken in 1991 (reviewed by Ryan 1999) and indicated a total legal sized standing stock of 1500 tonnes. This stock assessment was used to establish current management arrangements.

Potential removals from the trochus population include direct harvest by this fishery, and recreational and indigenous harvest. While the level of trochus harvest in the fishery is well recorded, little is known about the recreational and indigenous component of total harvest. Recreational fishers are limited to a bag limit of 50 shells per person, however there are no reporting requirements. Data on recreational and indigenous fishing generally is collected through the Queensland Recreational Fishing Survey and the National Recreational and Indigenous Fishing Survey (Henry and Lyle, 2003) however this data is limited and has not gathered data on trochus harvest to date. DEH considers that all aspects of the total harvest are required in order to form a more complete understanding of harvest patterns in the fishery and potential impacts on trochus stocks. DEH therefore recommends that DPI&F develop a process to improve estimates of recreational and Indigenous take and factor these into stock assessments and management controls to ensure overall catch levels are sustainable.

**Recommendation 6:** *Within two years, DPI&F to develop a process to improve estimates of recreational and Indigenous take and factor these into risk assessments, or any future stock assessments, and management controls.*

The trochus fishery is managed with a range of input and output controls including limited entry, TAC, closed zones and gear restrictions. No reference points have been established. DPI&F argues that while there are no reference points in place, the TAC has been set in a precautionary manner and there are no concerns about the sustainability of the fishery due to its small scale and limited harvest. Quotas are set yearly and can be amended if necessary. DEH considers that although the fishery is currently operating on a small scale, fishery specific objectives linked to performance indicators and measures should be established to ensure that any significant change in trochus harvest is detected and the fishery can continue to be sustainably managed.

**Recommendation 7:** *DPI&F to develop fishery specific objectives linked to performance indicators and performance measures for the target species.*

No byproduct is taken in the ECTF as all harvesting occurs by hand collection of specific specimens.

## **Conclusion**

DEH considers that the management regime in the ECTF is appropriately precautionary and provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH considers that the information collection system, stock assessment and management arrangements generally are sufficient to ensure that the fishery is conducted at catch levels that maintain ecologically viable stock levels with acceptable levels of probability.

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

### **Promote recovery to ecologically viable stock levels**

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

This objective is not applicable to the fishery at present. Management actions are in place to avoid the risk of overfishing the trochus stock.

## **Conclusion**

DEH considers that, while no defined reference points have been set for the fishery, the Queensland trochus stock is not in danger of falling below an acceptable level. DEH considers that if that occurs in the future, DPI&F would manage the fishery to promote recovery to ecologically viable stock levels within nominated timeframes.

## **Ecosystem impacts**

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

### **Bycatch protection**

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

## **Information requirements and Assessment**

The ECTF is a highly selective single species hand collection fishery, and there is no recorded bycatch taken by commercial operators. No risk assessment has therefore been carried out.

## **Management response**

There is no bycatch taken in the ECTF. Therefore, there are no management strategies in place specifically to avoid the take of bycatch, however gear restrictions in place for the fishery should ensure that no bycatch is taken in the ECTF.

## **Conclusion**

DEH considers that there is a very high likelihood the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change DEH expects that DPI&F would undertake appropriate actions to ensure that bycatch species are not threatened by this fishery.

## **Protected species and threatened ecological community protection**

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

## **Information requirements**

Trochus fishers are not currently required to report interactions with endangered, threatened or protected species because of the small scale, highly selective and relatively benign nature of the fishery on non-target species.

## **Assessment**

The most likely negative interactions with protected species are likely to occur during vessel transit through the fishery area. Marine turtles and dugongs occur in the area of the fishery and may adversely interact with vessels.

No interactions with endangered, threatened or protected species have been reported to date. There are no listed threatened ecological communities in the fishery area.

## **Management response**

Although interactions with endangered, threatened or protected species are unlikely to occur in the fishery, DPI&F is considering the implementation of the Species of Conservation Interest (SOCI) logbooks already used in other fisheries for recording interactions with these species. DEH considers that while interactions with endangered, threatened or protected species in the fishery are unlikely, the SOCI logbooks should be implemented to ensure that any interactions with endangered, threatened and protected species, particularly in the GBRMP World Heritage Area, are reported and responded to.

## **Conclusion**

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

## Minimising ecological impacts of fishing operations

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

### **Information requirements**

Little information on the impact of the fishery on the ecosystem has been collected.

DEH notes the lack of information collection and research covering the fisheries impact on the ecosystem and environment generally. DEH understands that this lack of information is the case across a range of Australian and international fisheries and until appropriate research techniques and programs are developed and implemented this will continue to be the case. DEH strongly supports research in this area and encourages DPI&F to incorporate an assessment of the fishery's impact on the ecosystem into the risk assessment, which is to be completed for the fishery by 2008.

### **Assessment**

No risk assessment addressing the impact of the removal of trochus on the wider ecosystem has been conducted.

The scale of the impact of the fishery on the ecosystem has not been assessed, however is likely to be minimal due to the limited number of operators in the fishery, the benign method of harvest, the low catch levels and the highly selective nature of harvest. The fishery does not appear to have any significant impact on benthic, associated or dependent species and is not likely to have a major impact on associated foodwebs within the ecosystem, as all identified predators of trochus, including turtles, fish, crabs, octopus and carnivorous gastropods, are not known to feed exclusively on trochus.

### **Management response**

No specific management measures are in place to minimise the risk of significant impact of fishing on ecosystems and their components. DEH considers that this is appropriate given that the fishery is unlikely to have a significant impact on the ecosystem. The implementation of **Recommendation 5** will provide further protection for reef areas on a local scale by dealing with any potential effects of localised depletion on the wider ecosystem.

### **Conclusion**

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

## REFERENCES

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## LIST OF ACRONYMS

AFMA	Australian Fisheries Management Authority
CFISH	Commercial Fisheries Logbook Program
CPUE	Catch per Unit Effort
DEH	Australian Government Department of the Environment and Heritage
DPI&F	Queensland Department of Primary Industries and Fisheries
ECTF	East Coast Trochus Fishery
EPBC Act	The Australian Government <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
HarvestMAC	Queensland Harvest Management Advisory Committee
ITQs	Individual Transferable Quotas
QBFP	Queensland Boating and Fisheries Patrol
SCUBA	Self Contained Underwater Breathing Apparatus
SOCI	Species of Conservation Interest
TAC	Total Allowable Catch
UNCLOS	United Nations Convention of the Laws of the Sea