



**Australian Government**

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**Department of the Environment and Heritage**

Assessment of the  
**Coral Sea Fishery**

**October 2004**

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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 10, 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  
Coral Sea Fishery**

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## EXECUTIVE SUMMARY

### Background

The Australian Fisheries Management Authority (AFMA) has submitted documents for assessment of the Coral Sea Fishery (CSF) under Parts 10, 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

On 12 November 2002, the Minister for the Environment and Heritage (the Minister) signed an Agreement with AFMA to initiate the strategic assessment of the fishery. Following public consultation, *Terms of Reference for the Environmental Assessment of the Coral Sea Fishery* were adopted. The draft document, "*Environmental Assessment Report – Coral Sea Fishery*" (the submission) was received by the Department of the Environment and Heritage (DEH) on 20 November 2002. The document was released for a thirty-day public comment period that expired on 25 March 2003. Four public comments were received. AFMA provided a response to the issues raised and amended the submission where necessary. A final submission for assessment was received on 5 August 2003. The *Coral Sea Fishery Statement of Management Arrangements 2004/05* (CSF SoMA) was submitted as an adjunct to the submission on 26 March 2004.

The submission reports on the CSF against the Terms of Reference, including the Australian Government's *Guidelines for the ecologically sustainable management of fisheries*. The DEH assessment considers the submission and associated documents, public comments and AFMA's response to the comments.

Summary information relating to the fishery is provided below. Table 1 provides an outline of the fishery sectors, including species harvested, permitted gear types and the number of permits issued. Table 2 provides an overall summary of the fishery, including fishery area, harvest levels, fishery status and the overall value of the fishery.

**Table 1: Summary of the Coral Sea Fishery by sector**

	Permits	Target species	Fishing method/gear
<b>Trawl</b>	2	tropical finfish and crustaceans	demersal otter trawl
<b>Line</b>	9	tropical snappers, emperors, coral trout and jobfish	demersal longlines, trotlines, droplines and handlines
<b>Trochus &amp; Rock Lobster</b>	3	<i>Trochus niloticus</i> and Tropical Spiny Rock Lobster ( <i>Panulirus ornatus</i> ).	hand collection with SCUBA
<b>Aquarium</b>	2	Classes <i>Chondrichthys</i> (cartilaginous fishes) and <i>Osteichthyes</i> (bony fishes)	SCUBA, scoop nets, seine nets, and handlines
<b>Sea Cucumber</b>	2	<ul style="list-style-type: none"> <li>▪ Amberfish (<i>Thelenota anax</i>)</li> <li>▪ Blackfish (probably <i>Actinopynga miliaris</i>)</li> <li>▪ Black teatfish (<i>Holothuria whitmaei</i>)</li> <li>▪ Greenfish (<i>Stichopus chloronotus</i>)</li> <li>▪ Lollyfish (<i>Holothuria atra</i>)</li> <li>▪ Prickly redfish (<i>Thelenota ananas</i>)</li> <li>▪ Sand fish (<i>Holothuria scabra</i>)</li> <li>▪ Surf redfish (<i>Actinopyga mauritiana</i>)</li> <li>▪ White teatfish (<i>Holothuria nobilis</i>);</li> </ul>	hand collection with SCUBA

SCUBA – Self Contained Underwater Breathing Apparatus

**Table 2. Summary of the Coral Sea Fishery – overall fishery statistics**

<b>Fishery Area</b>	Commonwealth waters in the Coral Sea between Cape York and Sandy Cape outside the Great Barrier Reef
<b>Fishery status</b>	All sectors except sea cucumber considered underdeveloped. Within the sea cucumber sector Black teatfish is assessed as overfished
<b>Commercial harvest 2002-03</b>	166.4 t
<b>Value of commercial harvest</b>	\$1.2 M in 2002-03
<b>Five year trend and average</b>	Increasing total catch from 40 t in 1998-99 (except the trochus and lobster hand collection sector - almost no effort over the history of the fishery)
<b>Bycatch</b>	None in the hand collection sectors. Trawl and line take some bycatch, such as shark, but this has yet to be quantified
<b>Interaction with Threatened Species</b>	None recorded although there is some potential for interaction

The CSF is approximately 250 000 square kilometres in area and is generally considered to be geographically isolated. The western boundary of the fishery forms a line, 10 to 100 nautical miles seaward of the Great Barrier Reef, while the Australian Fishing Zone forms the eastern boundary.

The 1995 Offshore Constitutional Settlement (OCS) agreement between the Queensland and Australian Governments gave AFMA jurisdiction over a number of species, methods and areas. AFMA consolidated a number of small-scale demersal line, trawl and hand collection fisheries that had existed prior to the agreement into the CSF. The CSF now comprises five sectors: line, trawl and three hand collection sectors (sea cucumber, trochus/lobster and aquarium), including an additional experimental demersal finfish trap trial. The five separate sectors of the CSF each target different species and species assemblages.

In the sea cucumber sector, two operators target a range of species using hand collection methods (SCUBA). Some species are preferentially fished in the Coral Sea, with Black (*Holothuria whitmaei*) and White (*H. nobilis*) teatfish being commercially prized.

Little is known about the biology and life history of the target stocks but information can be inferred from other Australian fisheries. Stutterd and Williams (2003) report a “boom and bust” cycle in almost all regional sea cucumber fisheries. Recent research into the Queensland holothurian fishery conducted within the Great Barrier Reef (Benzie and Uthicke, 2003) shows no signs of recovery from overfishing in the three years between surveys. The sedentary nature and the shallow habitat preference of this family render it particularly susceptible to overfishing.

The tropical snappers and emperors (Lutjanids, Pristipomoides and Lethrinids), primarily targeted by the line sector, are demersal fish inhabiting tropical and subtropical waters. These families are highly fecund, with lutjanids estimated to live between 8-15 years depending on species and lethrinids estimated to live in the order of 15-25 years. The line sector also targets the lucrative coral cods (family Serranidae), stocks of which, while stable overall, have been subject to localised depletions in the Great Barrier Reef (Kailola et al, 1993). There is a paucity of information on the

status of the coral cod resource in the Coral Sea. There is little information on the status of the tropical snappers (lethrinids) in northern Australia.

The trawl sector, comprising two concession holders, targets a wide range of species including crustaceans, bony fish, sharks and rays. Anecdotal reporting by fishers indicates that bony fishes are the main target species with alfonsino being the focus of efforts. To date, no effort has been directed at crustacean fishing although industry has expressed interest in future crustacean fishing in the area of the fishery.

The aquarium sector targets a large number of ornamental reef fish species. The two concession holders collect a variety of species in both Queensland waters and the CSF. Some species harvested are endemic to the area but most have wide distributions throughout the western Pacific. There is limited information about species targeted as catch data are provided at genus or family level and there are no detailed effort data. The main groups harvested are damselfish (Pomacentridae), butterflyfish (Chaetodontidae), angelfish (Pomacanthidae), wrasse (Labridae), anemone fish (*Amphiprion* spp., *Premnas* spp.) and gobies (Gobidiidae).

Trochus and lobster are targeted in a hand-collection sector of the fishery by three concession holders. Trochus are distributed between Sri Lanka, the Ryukyu Islands, New Caledonia and northern Australia and the Wallis Islands. Trochus are estimated to live for 15-20 years and, due to the life history characteristics and accessibility for harvesting, are considered vulnerable to overfishing. In the early 20<sup>th</sup> century trochus were widely harvested for the shell but a decline in the value of this species has seen the trochus market collapse.

The tropical spiny rock lobster (*Panuluris ornatus*) is the primary species of lobster targeted in the trochus and rock lobster hand-collection sector although two other species occur in the Coral Sea (the painted rock lobster and the two-spined rock lobster). *P. ornatus* is widely distributed throughout the Indian and western Pacific oceans. In Australia they are distributed from North West Cape in Western Australia, throughout northern Australia to Sydney. Genetic studies have shown that the Torres Strait and east Queensland populations of *P. ornatus* are part of the same stock but there is little data on this species from the Coral Sea region. The Torres Strait Lobster Fishery, based on the same species, is considered overfished. There has been very little activity for either the rock lobster or the trochus in this sector in the last five years.

The level and quality of information relating to bycatch and protected species interactions varies between sectors. The hand collection sectors appear to be highly selective and bycatch and the opportunities for interaction with protected species are limited. Potential to take bycatch and protected species in both the trawl and line sectors exists, however, the low levels of catch and the small number of operators reduce this risk while observer coverage in the line, trawl and trap sectors provide some level of verification of logbook data, bycatch and discards. Bycatch and protected species interactions are discussed under Part II of this report.

The five sectors of the fishery harvest species that may be taken in other fishing operations in northern Australian waters. An assessment of the extent to which the CSF management regime takes into account harvest of shared stocks by other jurisdictions is presented in Part I of this report.

The CSF is a small fishery but one where the economic value of the catch has been rising steadily since 1989-90. Sea cucumber, alfonsino, and some species taken in the aquarium sector are the primary contributors to the overall value of the fishery. Export markets are developed for the sea cucumber sector and to some extent the aquarium sector. The other sectors export opportunistically. The fishery was valued at \$1.2 M in 2002-03.

AFMA describes the CSF as a developing fishery. Hence, emphasis in managing the CSF to date has been to increase the opportunity for development of the fishery, including encouraging effort through performance criteria to ensure that at least some fishing takes place on an annual basis to provide continuity in the collection of fishery dependent data. Current concession holders consider that there is a great deal to be learned about fish resources in the CSF and have expressed to AFMA the need to build in expansion capacity within the CSF management arrangements.

The CSF is managed under the CSF SoMA, which obtains its authority from the *Fisheries Management Act 1991* (FM Act). The fishery is managed through a mixture of input and output controls, depending on the sector. A summary of the various management measures is presented in Table 3. Transferable permits with legally binding conditions are issued annually under section 32 of the FM Act for each of the sectors.

A total of 11 concession holders operate 18 permits within the CSF. Entry to the fishery was closed to new operators in 1997 and remains closed under the CSF Statement of Management Arrangements. The breakdown of permits per sector and the main species targeted by each sector are described in Table 1 above.

### **Overall assessment**

The material submitted by AFMA indicates that the CSF generally operates in accordance with the Australian Government *Guidelines for the ecologically sustainable management of fisheries*.

The assessment found a significant difference in the extent of precautionary management and level of concern regarding target stocks between the sea cucumber sector and the other trawl, line, trochus and rock lobster, aquarium and trap (trial) sectors. DEH has serious concerns regarding the capability of existing management arrangements to detect, respond to or guard against overexploitation of vulnerable sea cucumber stocks. In contrast, the management arrangements for the remaining sectors, while not without some areas in need of improvement, are more precautionary and have no great sustainability concerns.

In addition, the Queensland and Commonwealth governments are currently discussing the possibility of re-negotiating the 1995 OCS agreement with respect to future management responsibility of the hand collection sectors, with the possibility that management of the sector will be turned over to Queensland in the near future. In view of the management and sustainability concerns and the possible OCS re-negotiation, DEH considers it appropriate to make separate export decisions for the sea cucumber and the remaining sectors.

DEH considers that in the sea cucumber sector of the fishery there is a risk that stocks may be depleted and that the management regime is not yet capable of detecting or mitigating such an event. A number of factors contribute to this:

- Declining effort and catch over the last 5 years;
- Inadequate monitoring of catch and effort data;
- The absence of any assessment of the productivity of the sector; and
- Inadequate information on critical elements of holothurian biology.

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

two, adopted in the management of this sector, is critical. Should the number of operators be increased without additional management measures to relieve pressures caused by increased effort, a re-assessment of the fishery may be required.

Considerable progress has been made in formalising management arrangements for this sector. These arrangements move towards ensuring that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. On balance, the sea cucumber sector is being managed in an ecologically sustainable manner and is working to address existing problems and minimise environmental risks.

The operation of the sea cucumber sector is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements specified in the CSF SoMA and recommendations contained in this report, DEH considers that fishing in the sea cucumber sector of the Coral Sea Fishery, as managed in accordance with the CSF SoMA, will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short term. DEH therefore recommends that the sea cucumber sector of the Coral Sea fishery be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be undertaken by AFMA in order to contain the environmental risks in the long term. Specifically, the WTO declaration would allow the export of product from the sector for a period of 3 years. The WTO declaration will require annual reporting on the progress of implementing the recommendations of this report and other managerial commitments. The implementation of the recommendations will be monitored and reviewed as part of the next DEH review of the sector in 3 years time.

The management regime for the remaining trawl, line, trochus and rock lobster, aquarium and experimental trap sectors of the CSF, characterised by the limited number of operators, the limited entry nature of the fishery and its geographical isolation suggests that these sectors of the fishery are being managed in an ecologically sustainable way.

In making its assessment, DEH considers that the information collection systems and management arrangements are sufficient to ensure the operations in the remaining sectors of the fishery are conducted in a manner that does not lead to over-fishing and that stocks are not currently overfished. The management arrangements in place and the geographic isolation of the fishery as a whole, lead DEH to consider that fishing operations are being managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. AFMA has a history of reacting appropriately to threats to sustainability in these sectors and DEH believes that AFMA will continue to react appropriately.

The assessment finds that the operation of the trawl, line, trochus and rock lobster, aquarium and experimental trap sectors are consistent with the objects of Part 13A of the EPBC Act. DEH recommends that the export of species taken in these sectors of the fishery should be exempt from the export requirements of Part 13A of the EPBC Act, with that exemption to be reviewed in five years. DEH considers that these sectors of the CSF, as managed in accordance with the Statement of Management Arrangements, are not likely to cause serious or irreversible ecological damage over this period.

As the fishery area encompasses Commonwealth 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, sea snakes, cetaceans and seabirds. There are no recorded interactions with these species groups from any of the sectors of the CSF although some low level interaction is expected to occur. The actual and potential impact on Part 13 species under the management arrangements is considered low. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the CSF SoMA 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 Statement of Management Arrangements 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 Statement of Management Arrangements 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 Statement of Management Arrangements would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

Part 10 of the EPBC Act requires that Commonwealth managed fisheries undergo strategic assessment to determine whether actions taken in the fishery have a significant impact on the environment in Commonwealth Marine Areas. Under this Part, the Minister may accredit a management plan to exempt actions taken in accordance with the management plan from further impact assessment approval.

DEH considers, *inter alia*, that there has been adequate assessment of the impacts that actions approved in accordance with the CSF SoMA have, will have or are likely to have on the marine environment. DEH also considers that actions approved or taken in accordance with the Statement of Management Arrangements will not have unacceptable or unsustainable impacts on the marine environment in a Commonwealth area. DEH therefore recommends that, in accordance with Part 10, the CSF SoMA be accredited under section 33 of the EPBC Act for the matter of national environmental significance 'the marine environment'.

The assessment also considered the possible impacts on the world heritage values of the Great Barrier Reef, which is in close proximity to parts of the western boundary of the Coral Sea Fishery. 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. Persons who take actions that are a lawful continuation of a use of land, sea or seabed, which were 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 the current impact from fishing in the Coral Sea will not impact significantly on the listed values of the Great Barrier Reef. Any significant change to existing practices, which is likely to significantly impact on the World Heritage values of the Great Barrier Reef, may require approval by the Australian Government Minister for the Environment and Heritage.

On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the Coral Sea Fishery Statement of Management Arrangements, would not be expected to have a significant impact on a matter protected by the EPBC Act.

To further strengthen the effectiveness of the management arrangements for the trawl, line, trochus and rock lobster, aquarium and experimental trap sectors, to address concerns in the sea cucumber sector, and to contain the environmental risks in the medium to long term, DEH has developed a

series of recommendations. The implementation of Recommendations 1-5, 8, 9 and 10 and other commitments made by AFMA in the submission will be monitored and reviewed by DEH in five years time. Implementation of Recommendations 6 and 7, which are specific to the sea cucumber sector, and Recommendations 1, 2, 4, 5 and 8, as they relate to the sea cucumber sectors, will be monitored annually and reviewed by DEH in three years time.

## **Recommendations**

1. AFMA to inform DEH of any proposed amendment to the management regime for the Coral Sea Fishery to enable DEH to evaluate any impacts on the ecological sustainability of the fishery.
2. AFMA to monitor and enforce compliance with spatial and temporal management measures for vessels operating in the fishery, particularly those in the aquarium sector where there is no move on provision or Integrated Computer Vessel Monitoring System (ICVMS) requirement in place.
3. AFMA to ensure that catch information for the Aquarium sector of the fishery is collected on an ongoing basis to the lowest possible taxonomic level. Where possible, species level data is to be used to inform the ecological risk assessment of the CSF.
4. AFMA to continue to cooperate with the Queensland Department of Primary Industries and Fisheries to pursue complementary management and research of shared stocks for all target and by-product species.
5. AFMA to develop operational objectives and catch triggers for all target species in each of the CSF sectors by the end of 2006. Operational objectives and catch triggers for key by-product species or species groups to also be developed for the line, trawl and trap (trial) sectors by the end of 2006.
6. AFMA to implement management measures to avoid localized or serial depletion of vulnerable species of sea cucumber by the end of 2006.
7. Within 3 years, AFMA to develop an indicator of stock status for the sea cucumber sector and establish and implement an ongoing process to determine target species catch limits for the sea cucumber sector based on estimates of total stock size.
8. AFMA to immediately commence monitoring of all catches including target, by-product and bycatch species or species groups in the line, trawl and trap (trial) sectors. AFMA to consider any trends in this catch information as part of the ecological risk assessment process and develop management responses as appropriate.
9. AFMA to develop objectives that take explicit account of fishery impacts on bycatch species, protected species and the ecosystem for the line, trawl and trap (trial) sectors by the end of 2006. Objectives that take explicit account of fishery impacts on the ecosystem to also be developed for the trochus and lobster, aquarium and sea cucumber sectors of the CSF by the end of 2006.
10. Within two years of completion of the ERA, AFMA to identify and implement appropriate management strategies to address/mitigate impacts identified through the ecological risk assessment of the CSF.

## PART I - MANAGEMENT ARRANGEMENTS

The Australian Fisheries Management Authority (AFMA) manages the Coral Sea Fishery (CSF), which comprises five sectors (trochus and lobster, line, trawl, aquarium and sea cucumber) plus an experimental demersal finfish trap sector.

The CSF is managed in accordance with the *Coral Sea Fishery Statement of Management Arrangements 2004/05* (CSF SoMA), which outlines the management measures for all sectors of the fishery and provides a transparent means of communicating the management regime to all stakeholders.

The CSF management regime is also described in the *Fisheries Management Act 1991* (FM Act) and related regulations, and legally binding conditions placed on permits under s32(6)(a) and 32(7) of the FM Act. 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 CSF SoMA and other documents referred to above to DEH's assessment of the fishery, an amendment could change the outcomes of our 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:** *AFMA to inform DEH of any proposed amendment to the management regime for the Coral Sea Fishery to enable DEH to evaluate any impacts on the ecological sustainability of the fishery.*

In particular, DEH expects to be informed of any proposal to introduce demersal finfish traps to the fishery as a permanent permitted gear type, following the completion of the trial and to change responsibility for management of the sea cucumber sector through re-negotiation of the 1995 Offshore Constitutional Settlement (OCS) agreement, under which management of the resource in the Coral Sea is the responsibility of AFMA.

The CSF management regime was developed with the involvement of relevant stakeholders through the Coral Sea Fishery Stakeholder Group and through consultation with registered interested persons. AFMA has advised that due to the small number of concession holders the management of the CSF is informed by an annual Stakeholders Meeting, chaired by AFMA and held to provide input into management arrangements prior to the renewal of annual permits in June each year. Membership is open to any interested persons and representatives of a range of interested groups have attended or been invited to attend the annual meetings. DEH is confident that AFMA will continue to ensure interested parties are consulted appropriately.

The means by which the effectiveness of management arrangements can be measured are poorly defined. The objectives under which the CSF is managed are those generic objectives contained within the FM Act. Fishery specific objectives, performance indicators and performance measures that take account of impacts on target, by-product, bycatch, protected species and the ecosystem generally have not been developed. The CSF SoMA states that AFMA will give consideration to the development of a series of objectives, triggers and target or limit reference points for current target and by-product species. The need for fishery specific objectives for an ecosystem based

approach to management and an assessment of the adequacy of existing performance indicators and measures is included in Part II of this report.

The CSF SoMA provides for the periodic review of the performance of the fishery, including a full review of the fishery management arrangements within three years. The CSF SoMA commits AFMA to regularly review the performance of the fishery against agreed performance measures that relate to the sustainability of the fishery and to make the findings of such a review publicly available. While the annual CSF Stakeholder Meeting provides an opportunity to review the overall performance of the fishery, it is not clear if this review is intended to satisfy the commitment made in the CSF SoMA, and as stated above, performance measures across the fishery are yet to be developed. In addition, the Bureau of Resource Sciences reviews and publishes performance of the major aspects of Commonwealth fisheries, including the CSF, via the Fishery Status Reports.

Management of the CSF is based primarily on input controls, although the sea cucumber sector is output controlled. The fishery is a closed entry fishery with 18 entitlements spread among 11 concession holders. The management measures for each sector of the fishery are described in Table 4, Part II of this report and their adequacy assessed.

Compliance and enforcement tools utilised in the CSF vary between sectors and are outlined in Table 3 below. The AFMA submission contends that it is likely that operators feel an ownership of the management arrangements and are therefore more likely to comply with them due to their involvement in managerial decisions. DEH is generally satisfied that these compliance measures contain the means of enforcing critical aspects of the management arrangements.

**Table 3: Compliance tools used across the five Coral Sea Fishery Sectors.**

Compliance tool	Coral Sea Fishery Sector					
	Trawl	Line	Aquarium	Sea cucumber	Trochus & rock lobster	Finfish trap trial
ICVMS*	✓	✓	✗	✓	✓	✓
Random at-sea/port inspections <sup>+</sup>	✓	✓	✓	✓	✓	✓
Prior and post fishing reports	✗	✗	✗	✓	✗	✗
Catch disposal records	✓	✓	✗	✓	✗	✓
Observer coverage	✓	✓ <sup>#</sup>	✗	✗	✗	✓

\* Integrated Computerised Vessel Monitoring System

<sup>+</sup> Fisheries Officers enforce compliance with size limits, permitted species, move-on provisions, gear restrictions etc.

<sup>#</sup> When auto longlining only

Given the remote location of the fishery, at-sea inspections of vessels are costly and the use of technologies such as Integrated Computerised Vessel Monitoring Systems (ICVMS) provides management with an additional valuable compliance and enforcement tool. ICVMS provides real time monitoring as well as a mechanism to ensure compliance with area closures, declaration of catches and validation of spatial effort in logbooks. DEH notes that all sectors, with the exception of the Aquarium sector are now required to use ICVMS, and that there is no apparent means of detecting non-compliance with spatial and temporal measures in this sector. At the May 2003 Stakeholder Meeting AFMA gave a commitment to examine the use of ICVMS in the Aquarium sector and DEH strongly encourages the introduction of this technology to the sector.

**Recommendation 2:** *AFMA to monitor and enforce compliance with spatial and temporal management measures for vessels operating in the fishery, particularly those in the aquarium sector where there is no move on provision or ICVMS requirement in place.*

Fishery dependent information relating to the target species is obtained through compulsory daily commercial logbooks for all sectors of the CSF. Some observer coverage is required of operations in the trawl and line sectors. Information collection systems, including the observer programs and bycatch information, are discussed in detail in Part II of this report.

Information and management regarding bycatch in the line and trawl sectors is limited, while bycatch is not a problem in the remaining sectors due to the selective nature of hand collection fishing methods. 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 CSF targets a range of species that are harvested in other northern Australian fisheries. Concerns about cross-jurisdictional management of the many species that are taken in jurisdictions abutting the CSF may not currently be a priority for this fishery but could become so in the future. This issue is discussed in greater detail under Part II of this report.

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

Australia is a party to a number of international regimes including the United Nations Convention on the Law of the Sea; the FAO Code of Conduct for Responsible Fishing; and the International Convention for the Prevention of Marine Pollution from Ships (MARPOL). 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 is discussed in Part II of this report. The application of MARPOL to vessels operating in the fishery is explicitly discussed under Principle 2, Objective 3.

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 World Heritage Convention is relevant to this assessment as the Great Barrier Reef Marine Park (GBRMP), a world heritage listed area, is in close proximity (10 nm – 100 nm) to the western boundary of the CSF. 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. This includes actions taking place in an area abutting a world heritage area. Thus actions taking place in the Coral Sea Fishery can potentially impact on the values of the GBRMP.

A person 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. The GBRMP's listed World Heritage values are protected under the *Great Barrier Reef Marine Park Act 1975* and the adequacy of the protection of these values will be considered during the assessment of

fisheries managed by AFMA. For so long as the current fisheries management regimes in operation within the GBRMP continue and OCS arrangements remain in place, DEH considers that fishing activities as currently practiced in this fishery are unlikely to have a significant impact on the world heritage values of the GBRMP in the short or medium term. Any significant change to existing practices in the GBRMP may require approval by the Minister for the Environment and Heritage.

## **Conclusion**

DEH considers that the CSF management regime is documented, publicly available, transparent, and is developed through a consultative process. The management arrangements are adaptable although improvements are required regarding objectives, performance indicators and performance measures 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**

The fishery comprises five sectors: the sea cucumber sector, demersal line, trawl, the aquarium collection sector and a sector focused on hand collection of trochus and lobster. In addition, a demersal finfish trap trial is underway in the fishery. The data collection systems in place in the CSF vary from sector to sector. Overall, data collection is exclusively fishery dependent.

An AFMA-wide data collection and monitoring strategy is currently being developed and its implementation will have implications for the CSF. The major elements of the strategy are data collection, assessment and monitoring for each sector of the CSF, with review every three years. The first review is proposed for 2005-06.

Performance criteria, in the form of number of days fished, are in place to ensure that enough data is collected across the fishery to enable stock assessments in the future. There is a minimum operational commitment of 20 days per vessel per year in place in the aquarium, line and trawl sectors and 5 days per vessel per year for the lobster/trochus sector.

In all sectors of the fishery the completion of logbooks is required. Catch disposal records for all sectors except the Aquarium sector must be reported to AFMA within a 24-hour period of landing product. Under the CSF SoMA, for each sector, permit holders must also provide a written report at the conclusion of a fishing trip, providing details about fishing activity. Details to be recorded include catch statistics, discarded catch composition, protected species interactions and details regarding lost gear. Operators in the sea cucumber sector are also required to comply with prior departure and landing reporting requirements, providing real time monitoring capabilities for the sector. DEH considers that the level of compliance with catch disposal and prior reporting requirements is adequate.

The demersal finfish trap trial also includes data collection requirements. Each permit holder must provide comprehensive data on the catch of target, by-product and bycatch species during the course of the trial. Permit holders are also required to provide 48 hours pre-departure notice before each fishing trip.

While the completion of logbooks is required in the aquarium sector, the required information is insufficient for monitoring the impacts on individual species. Pogonoski *et al* (2002) report that more than 100,000 specimens of fishes per year were collected for the aquarium trade in Queensland between 1988 and 1991 with higher levels of catch occurring in more recent years. They conclude that with no catch statistics being collected at the species level there is currently no way of knowing whether any species, including the rarest, are threatened by this industry. DEH is

aware that the Qld Aquarium Fish fishery is developing a method of collecting species level information. DEH is also aware that collectors generally make their sales at the species level and that these data could be made available. DEH believes that while species identification may hinder species level reporting, fishers should be required to record catches to the lowest possible taxonomic level. DEH suggests that in the first instance species level data, where possible, be gathered and fed into the Ecological Risk Assessment (ERA) for the CSF in order to identify those species that may be vulnerable to localised depletion.

The two permit holders in the Aquarium sector are both licensed to operate in the Queensland Aquarium Fishery and, to reduce administration, the Aquarium sector operators are required to fill out a Queensland Department of Primary Industries and Fisheries (DPI&F) Logbook. The relevant data is sent to AFMA at the conclusion of each individual fishing trip. The aquarium sector is not subject to the catch disposal record requirement but in discussions held in July 2003 with operators in this sector, the utilisation of prior and post reporting was proposed as a cost effective option. DEH encourages AFMA to pursue such a reporting system for this sector.

DPI&F's Harvest Management Advisory Committee (MAC), which provides advice to the DPI&F on, among other things, management arrangements in the Queensland Aquarium Fishery, has established a working group to examine and revise data collection in the Queensland Aquarium Fishery. As AFMA currently use DPI&F logbook data to monitor the state of the CFS Aquarium sector, DEH urges AFMA to engage in the Harvest MAC data collection revision process.

**Recommendation 3:** *AFMA to ensure that catch information for the Aquarium sector of the fishery is collected on an ongoing basis to the lowest possible taxonomic level. Where possible, species level data is to be used to inform the ecological risk assessment of the CSF.*

Observer coverage is required in the trawl, line and demersal trap trial sectors of the fishery. For auto-longlining operations in the line sector a detailed fishing plan must be submitted and catch and reporting requirements are imposed on the operator. Observers must be carried on 25% (or 33% depending on gear type) of auto-longline trips in accordance with the Seabird Threat Abatement Plan. In addition, one in four trips while finfish trawling in the trawl sector and while engaged in the finfish trap trial required observer coverage so that a minimum of 25% of activity is independently observed. DEH commends AFMA for adopting this approach in these sectors and expects that valuable data on not only target species but also on by-product and bycatch species, will be collected for use in future management of the sectors.

With the exception of occasional research programs, fishery independent data are not collected in the CSF. The limited number of operators and geographical isolation of the fishery makes fishery independent collection costly. AFMA has sought to overcome this lack of independent data through a sound fishery dependent data collection system. However, as the fishery develops, fishery independent data may become increasingly necessary. The Data Collection and Monitoring Strategy for the CSF proposes a review of data collection, assessment and monitoring in 2005-06. DEH supports this review and encourages AFMA to evaluate the need for fishery independent data, particularly in the sea cucumber sector.

DEH concurs with AFMA's view that the commercial logbook data from most sectors of the CSF are reliable. In the sea cucumber sector, the Commonwealth Scientific and Industrial Research Organization (CSIRO) report (Hunter *et al*, 2002) recommends several modifications to the logbook design to increase the usefulness of the logbook data for stock assessment purposes. These include separating hookah and free-diving catch methodology and recording the catch-hours fished, number of fishers and method used for each dinghy per fishing session. The CSIRO also suggests that a logbook entry that allows fishers to record what sea cucumber species they were targeting would be

useful. DEH supports the CSIRO conclusions and strongly encourages the adoption of these recommendations by AFMA.

With the exception of the Aquarium sector, DEH considers the existing catch and effort reporting systems adequate and reliable. Data validation through catch disposal records, prior departure and landing reporting in some sectors, the carriage of observers in the trawl, line and trap sectors and the use of ICVMS in most sectors, provides confidence that the data collection systems provide reliable information to inform management. Monitoring of information collected in the fishery is vital for detecting changes in the fishery, particularly in relation to the target and by-product species. The submission is not clear on how information collected across all sectors of the fishery is routinely monitored. AFMA has however advised that since July 2004, additional funding for staff time for the CSF has been provided to monitor information collected across the fishery. DEH considers that structured regular monitoring of fishery data is required and that trends in information should be specifically examined during the ERA process (see **Recommendation 8**). **Recommendations 2 and 3** should further strengthen monitoring and validation capabilities, particularly in relation to the aquarium and sea cucumber sectors.

### Assessment

The sea cucumber sector has been the subject of a basic stock status review (Hunter, *et al* 2002). DEH has concerns regarding the stock assessment procedure currently in place for the sea cucumber sector. While some species harvested may be considered underfished, there are concerns about the status of a number of the high value species. A discussion of this sector, including an analysis of the stock assessment process and management arrangements, occurs under Principle 1, Objective 2.

Assessments of stock status and potential productivity of fished stocks have not been conducted for the remaining sectors of the CSF. Stock assessments are not conducted due to the low level of fishing effort within the CSF and the minimal data on which to conduct such an assessment. The submission states that steps are being taken to conduct assessments of the dynamics and status of the fishery 'at a level consistent with the available data' and that an ERA for the CSF is scheduled and is expected to be completed in May 2006. Furthermore, AFMA expects that the Data Collection and Monitoring Strategy and review of logbook data will lead to a better understanding of what species are taken and in what quantity. DEH also considers that the ERA will provide a basis for targeting assessment needs and defining appropriate management responses.

DEH emphasises the need for AFMA to develop a basic understanding of the productivity of the CSF. DEH suggests that an annual assessment, in the form of a review, of the removal of commercially targeted stock, for all sectors of the CSF, is a minimum requirement to enable AFMA managers to maintain productivity of the fished stocks.

As AFMA moves towards the basic assessment of stock status, distribution and dynamics referred to in its submission, it will be essential to take into account the considerable overlap in target species managed by other jurisdictions. The distribution and spatial structure of stocks harvested by all sectors is poorly understood and is not factored into management.

A large number of species harvested in the CSF are also taken in adjacent or other regional fisheries, primarily managed by DPI&F. The CSF abuts the Qld East Coast Trawl Fishery, Coral Reef Finfish Fishery, Rocky Reef Finfish Fishery, East Coast Sea Cucumber Fishery, Aquarium Fish Fishery, East Coast Tropical Rock Lobster Fishery and the East Coast Trochus Fishery. It also abuts the Torres Strait.

Concerns regarding cross-jurisdictional management of the many species that are taken in jurisdictions abutting the CSF may not currently be a priority for this fishery but could become so in the future, especially with fishery adjustments proposed or underway in adjacent jurisdictions. AFMA needs to engage with DPI&F in pursuit of complementary management and research of shared stocks. Data from these jurisdictions should also be incorporated into the ERA. As the CSF develops, it will become increasingly important to ensure that estimates of all removals from the various fished stocks are factored into stock assessments. DEH strongly encourages AFMA to share information with other jurisdictions, including with respect to recreational take of species from the Coral Sea by the Queensland recreational charter boat sector.

**Recommendation 4:** *AFMA to continue to cooperate with the Queensland Department of Primary Industries and Fisheries to pursue complementary management and research of shared stocks for all target and by-product species.*

### **Management response**

The CSF management regime aims to maintain ecologically viable stock levels through a mixture of input and output controls. Table 4 below summarises the management controls in place for each sector.

As noted earlier, a trial of demersal finfish traps in the CSF is underway. In a responsible and commendable approach by industry and AFMA, strict management measures, with the flexibility to tighten restrictions if needed, have been established for the two year trial. The use of fish traps is restricted to the line, trawl and aquarium permit holders. Included in the management controls is the requirement for 25 % observer coverage of all trap lifts by each permit holder, compulsory use of ICVMS, the use of sacrificial anodes on all traps to avoid ghost fishing by lost traps, data collection requirements for target, by-product and bycatch species throughout the trial, and prior departure reporting requirements. At the conclusion of the trial (30 June 2006) AFMA, in consultation with industry, has committed to review the trial and determine if demersal finfish traps should be discontinued, continued on a further two year trial basis or continued as an ongoing fishing method. DEH welcomes the structured approach to the trial and looks forward to following its progress. DEH notes however, that should trapping be introduced as a permanent fishing method in the CSF, the requirement under **Recommendation 1** would apply and it is likely that further assessment of the fishery would be required.

As with the 'Assessment' section earlier in this report, an assessment of the sea cucumber sectors is contained under Principle 1, Objective 2. For all remaining sectors, the management regime provides an adequate means for ensuring that the harvest of target species is controlled. The limited number of operators across all sectors, and the highly selective fishing methods associated with the aquarium and trochus and rock lobster sectors, provides added security for fished stocks and the management measures appear appropriate for the ongoing management of these sectors.

**Table 4: Management arrangements for the Coral Sea Fishery.**

Sector	Management measure
All sectors	<ul style="list-style-type: none"> <li>▪ Limited entry – 18 entitlements across 5 sectors</li> <li>▪ Prohibited take or possession of billfish (families <i>Istiophoridae</i> and <i>Ziphiidae</i>) and tuna or tuna like species (genera <i>Scomberomorus</i>, <i>Scomber</i>, <i>Acanthocybium</i>, <i>Grammatorcynus</i> and <i>Rastrelliger</i> (mackerels))</li> </ul>
Trawl	<ul style="list-style-type: none"> <li>▪ Limited to 2 permits</li> <li>▪ Restricted gear (otter trawl only, minimum 38 mm mesh)</li> <li>▪ ICVMS</li> <li>▪ Observer coverage (minimum 25 % of all trawls)</li> <li>▪ Prohibited possession of shark fins not attached to shark carcass</li> <li>▪ Prohibited possession of shark liver without associated shark carcass</li> <li>▪ Compulsory use of turtle excluder devices (TEDs) when crustacean trawling</li> </ul>
Beche-de-Mer	<ul style="list-style-type: none"> <li>▪ Limited to 2 permits</li> <li>▪ Only sea cucumber species permitted to be taken</li> <li>▪ Catch limits for individual species per permit (2 t WTF, 500 kg BTF, 10 t PRF, 5 t SF, SRF and 75 t in total all species)</li> <li>▪ Hand collection only</li> <li>▪ ICVMS</li> <li>▪ Limited number of operators (7) and tender boats (2) per permit</li> <li>▪ Move-on provision (5 t taken per permit in one location = vessel must move 15 nm)</li> </ul>
Lobster & Trochus	<ul style="list-style-type: none"> <li>▪ Limited to 3 permits</li> <li>▪ Only trochus and rock lobster species permitted to be taken</li> <li>▪ Hand collection only</li> <li>▪ ICVMS</li> <li>▪ Limited number of operators (7) and tender boats (2) per permit</li> <li>▪ Size limits (lobster = 25 mm tail length; trochus = 80 mm - 125 mm)</li> <li>▪ Move-on provision (3 t lobster or 5 t trochus taken per permit in one location = vessel must move 15 nm)</li> </ul>
Line	<ul style="list-style-type: none"> <li>▪ Limited to 9 permits</li> <li>▪ ICVMS</li> <li>▪ Permitted gear = dropline, demersal longline, trotline, set line or handline</li> <li>▪ Auto-longlining permitted if conditions relating to the following are met: using an approved system; tori line installed according to regulations, offal discharge regulations, seabird interaction reporting requirements; sets deeper than 200 m; and using less than 15 000 hooks.</li> <li>▪ Observer coverage (minimum 25 % of all shots when auto-longlining)</li> <li>▪ Prohibited possession of shark fins not attached to shark carcass</li> <li>▪ Prohibited possession of shark liver without associated shark carcass</li> </ul>
Aquarium	<ul style="list-style-type: none"> <li>▪ Limited to 2 permits</li> <li>▪ Only Class Chondrichthys and Osteichthyes species permitted to be taken</li> <li>▪ Permitted gear = barbless hook, line, scoop net, seine net, cast net (restrictions apply if using SCUBA)</li> <li>▪ Limited number of operators (7) and tender boats (2) per permit</li> </ul>

\* WTF = White teatfish; BTF = Black teatfish; PRF = Prickly redfish; SF = Sand fish; SRF = surf redfish

The CSF SoMA provides a clear description of the management arrangements for each sector, however, there is a lack of specific management objectives, performance indicators and performance measures to guide future management and evaluate the performance of the fishery.

Furthermore, no specific biological reference points have been developed for the CSF that would trigger management actions. The Aquarium sector and the hand collection sectors have upper level effort limits (days fished) that would trigger a stock assessment within a 12 month period were they reached but these reference points have no biological basis to them. The line sector remains without any form of effort or catch cap, management trigger or limit or target reference point.

DEH notes AFMA's commitment to consider the development of a series of objectives, triggers, target or limit reference points for current target and by-product species, by-catch and ecosystem level impacts as part of the annual stakeholder meeting and review process.

DEH considers that the development of fishery specific objectives for all target species and key by-product species to be a pressing need for the fishery. In addition, catch triggers are needed to ensure that appropriate management responses are developed if a change in status of species or species groups is identified and to provide added management confidence.

The following recommendation should ensure that there is an identifiable point at which management intervention can occur within the fishery should certain situations (for example escalation in effort, change in methodology) arise.

**Recommendation 5:** *AFMA to develop operational objectives and catch triggers for all target species in each of the CSF sectors by the end of 2006. Operational objectives and catch triggers for key by-product species or species groups to also be developed for the line, trawl and trap (trial) sectors by the end of 2006.*

Due to the selective nature of the hand collection sectors, there is no by-product taken in these sectors. Given the developmental nature of this fishery, in particular the trawl, line and experimental trap sectors, clear differentiation between target and by-product species has not occurred in these sectors. While these sectors may not be in a position to define by-product species, it is important to develop an understanding of the most commonly caught species in order to prioritise stock assessments. DEH considers that the ERA process, combined with increasing and improving data sets, will help identify by-product and target species in the coming years.

**Recommendation 8** should also ensure that routine monitoring of by-product in these sectors is undertaken and that by-product information is considered in the ERA process.

## **Conclusion**

DEH considers that the management regime in the CSF is appropriately precautionary. The management arrangements for the line, trawl, trap (trial), lobster and trochus and aquarium sectors provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH also considers that the information collection system and 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. Specific conclusions regarding the management of the sea cucumber sector are expressed under Principle 1, Objective 2 of this report.

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”

Several species of holothurian are fished preferentially in the CSF. AFMA has identified five species it considers are ‘high value’. The Black teatfish, (*Holothuria whitmaei*) is of most concern, as it is large and visible and is the subject of high demand in Asian markets.

While the sea cucumber species harvested in the CSF may not be ‘below a defined reference point’, this is more likely due to a lack of clear reference points, rather than a true indicator of stock status, particularly for some species.

The AFMA submission recognises the immediate concerns that the CSF fishery managers have for the Black teatfish and the CSF sea cucumber sector generally. Catch per unit effort (CPUE) data for the Black teatfish had declined markedly over the period 2000-2001. AFMA reduced the total allowable catch as a result of the Hunter *et al* (2002) report for both the Black and White teatfish in the CSF but failed to close the fishery for Black teatfish as recommended by Hunter *et al* (2002). Three other species were made subject to individual catch quotas to avoid serial depletion (see Table 4 for individual catch limits).

Unlike the other sectors of the CSF, the sea cucumber sector has been subject to a stock status review process undertaken by the CSIRO (Hunter *et al*, 2002). The data supporting this assessment were gathered from fishery dependent (logbook) sources. Evidence for overfishing can be found in the trend to continually fish for less valuable species, once higher value species have been fished out (serial depletion). The Hunter *et al* (2002) analysis of AFMA sea cucumber sector logbook data reported evidence of serial depletion and recommended a downward revision of catch limits for a number of holothurian species and a zero take on the Black teatfish.

Some major research has been conducted on sea cucumber species and fisheries at the regional, national and international scales. Stutterd and Williams (2003) summarise the history of fishing for this species worldwide and conclude (p42) that in almost all countries where Sea cucumber has been harvested there has been overfishing of stocks. They report that the developmental phase of Sea cucumber fisheries is often short (in one example they cite a period of one year between development and overexploitation). They also report that once the density of a population falls below a critical level it can take many years to see any recovery in the population, even after fishery closures are put in place (*ibid* p42). Benzie and Uthicke (2003) note the boom and bust cycle of most holothurian fisheries and have reflected that recent drastic declines in world wide catches and shifts towards less valuable species indicate that the ‘current global boom period has reached its end’ (*ibid* p65).

Benzie and Uthicke’s (2003) work on the Great Barrier Reef (GBR) led them to conclude that low and/or sporadic recruitment may be a feature of Sea cucumber populations generally and explain in part why these species are vulnerable to overfishing. Their work also found that the likely age of averaged sized Black teatfish was in the order of 10 years or more. This finding implies longer times to first reproduction and therefore slower recovery of populations that have been overfished. Their data show that a take of around 5% of the standing stock was more than the GBR population could sustain. Reefs that have been recently fished have a density of approximately 5 individuals ha<sup>-1</sup> which, report Benzie and Uthicke (2003), corresponds to a catch rate of 2-3 animals per hour by a snorkeler. Fishing methods utilised in the CSF, including the use of hookah are far more efficient than snorkelling and may result in localised depletions.

Benzie and Uthicke (2003) state that sea cucumber are broadcast spawners with external fertilisation and planktonic larvae. Some species move to form localised spawning aggregations in favourable sites within an area. In other species, synchronous spawning may be triggered by local conditions. Recruitment success is locally variable, episodic and dependent on a series of external influences during the larval phase. There is a risk of lowered fertilisation rates at reduced population densities and increased risk of localised recruitment failure.

Genetic analysis of samples from Black teatfish throughout the GBR indicates that the entire GBR population is panmictic (Benzie and Uthicke 2003). Their report suggests that the panmixia assumption could also be extended to the Coral Sea and it is possible that the entire population could be managed as one stock. Certainly the management implications that Benzie and Uthicke identify in their report should be applied to the CSF in the absence of a more detailed investigation.

Taking into account the sea cucumber life history characteristics described above, and their vulnerability to localised and broad scale overfishing, adaptable management with regular and effective monitoring is crucial in the management of sea cucumber resources.

Several management measures designed to avoid localised depletions are to be found in the literature. These include:

- development of a move-on provision that is an appropriate percentage of the individual species quota rather than a single overall tonnage;
- imposition of a trip limit of a suitably precautionary catch rate or tonnage;
- spatial management, in the form of reef specific quotas or the use of zones; and
- temporal management in the form of restricted harvest seasons (sea cucumber are generally winter spawners).

Conversions given in Conand (1989) equate a harvest rate of 2-3 animals per hour taken on snorkel with a density of around 5 individuals  $\text{ha}^{-1}$ . Benzie and Uthicke (2003) concluded that this rate of harvest was unsustainable on the GBR. As a guide, permit holders could be urged to monitor their catch rates to ensure that they do not take more than 2-3 animals per hour (by snorkel).

DEH considers that limiting the number of operators in the CSF to the current limit of two will have the effect of minimising the risk of over-fishing these species. DEH also believes that AFMA has put in place a good management basis with move-on provisions, size limits, individual catch limits for high value species and an overall harvest cap. While existing measures provide an appropriate starting point, DEH has concerns about the ability of management measures to detect, respond to and guard against localised and serial depletion of sea cucumber stocks.

Although the use of a move-on provision is a precautionary management measure designed to protect target stocks, DEH considers that the 5 tonne move-on provision for the sea cucumber sector is inappropriate for the more vulnerable species it was designed to protect. The move-on provision is inadequately defined to ensure the avoidance of localised depletions. The current 5 tonne limit per permit, in effect, allows an individual permit holder to take their entire individual species quota of both Black and White teatfish from one reef before the move-on provision would be applied. DEH strongly recommends that AFMA review the existing move-on provision and adopt management measures that have the capacity to ensure that localised or serial depletion of high value species does not occur.

**Recommendation 6:** *AFMA to implement management measures to avoid localised or serial depletion of vulnerable species of sea cucumber by the end of 2006.*

AFMA has reviewed the minimum sizes guidelines for the five high value species. Their submission concludes that these measures are not enforceable as holothurians demonstrate great plasticity in size and shape. DEH concurs that while size at capture is not an enforceable management measure it is a useful guide to ensure the maximum reproductive potential of Individual animals can be reached. DEH supports the size guidelines adopted by AFMA.

Stutterd and Williams (2003) contend that at present scientists and fisheries managers do not have all the information needed to manage sea cucumber fisheries in order to produce maximum or optimum sustainable yields. They state that life history parameters (growth, size at maturity, mortality rates, reproductive behaviours, seasonality, burrowing behaviours), habitat requirements and recruitment and juvenile ecology are required to enable fisheries managers to establish management regimes where the stocks can be maintained at ecologically viable levels. They believe that for those species where such biological parameters as spawning time and size at first maturity are not known then the strict application of the precautionary principle should be utilised and the species should not be harvested. While this may technically be an option, it is unlikely that the worldwide demand for sea cucumber would suddenly decline, consequently, fishing for the species is likely to continue, making it increasingly important that the species are taken from fisheries that are managed in an ecologically sustainable way and that precaution is exercised to fullest possible extent.

Biomass estimates may be one of the most effective means of managing the sea cucumber sector. Logbooks can provide relative abundance estimates but must be monitored closely and, ideally, be coupled with independent surveys. The first signs of overfishing can be detected by monitoring the abundance of stocks, catch rates, and to a less extent CPUE. Changes in catch composition (serial depletion) also provide an indication of overfishing.

To date, reliable indicators of sea cucumber stock status have not been defined in the CSF. DEH believes there is an urgent need for such indicators to be defined for the sector so that sea cucumber stocks can be monitored and any concerning trends detected and implemented in a timely manner. While DEH notes that catch limits have been established for the high value species, this does not negate the need for monitoring of the fishery against true indicators of stock status. This point is strengthened by the fact that existing catch limits were not set based upon biological information about the species and may not be appropriate for the long term management of these species.

**Recommendation 7:** *Within 3 years, AFMA to develop an indicator of stock status for the sea cucumber sector and establish and implement an ongoing process to determine target species catch limits for the sea cucumber sector based on estimates of total stock size.*

## **Conclusion**

A clear strategy to rebuild sea cucumber stocks in the CSF has not been developed. However, **Recommendations 6 and 7** should substantially improve the management of the sector and provide greater confidence in management's ability to protect stocks from overfishing. The reliance on geographical isolation and a limited number of operators may not be adequate for these vulnerable species. DEH strongly encourages AFMA to review its management strategy for the sector and place greater emphasis on monitoring stock status. Given the significant concerns about the overall management of the sector, and in comparison to the remaining sectors of the fishery, DEH recommends that separate overall assessment decisions are required that explicitly recognise the greater level of concern regarding the sea cucumber sector.

## **Ecosystem impacts**

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

### **Protection of bycatch and endangered, threatened or protected (listed) species**

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

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**

Historically, fishers have not been required to report bycatch but have collected some protected species interaction information in the CSF. Consequently, limited information exists on the level and nature of bycatch in the fishery. The current logbook requires recording of bycatch and protected species interaction information, but is inconsistently filled out.

Under the CSF SoMA, fishers are now required to provide a fishing report following each fishing trip, including reporting of discarded catch composition by species, common name and the estimated weight and number of individuals caught and the percentage released alive. The fishing report must also provide details of all protected species interactions, including the species involved, a description of the incident, whether the animal was killed, injured or unharmed and what steps were taken to give aid to injured wildlife and prevent recurrence of the incident.

In addition to logbooks and fishing reports, data on bycatch and protected species may be obtained through observer coverage of trawl, line and trap operations. Observers are expected to provide valuable and robust baseline data that should be useful for the future management of bycatch and protected species interactions in these sectors.

The submission states, and DEH agrees, that the hand collection sectors of the CSF target highly visible species and are, by their nature, extremely selective. DEH considers that both the take of bycatch and interactions with protected species are unlikely in these sectors. Consequently, the development of a bycatch and protected species interaction reporting system for these sectors is not necessary.

The nature of line, trawl and trap fishing means that potential exists for these sectors to take bycatch and to interact with protected species. DEH believes that if new fishing report requirements are complied with, the quality of bycatch and protected species interaction data should improve. DEH believes it incumbent on AFMA to ensure that data collected in logbooks and fishing reports by these sectors is monitored and that any changes in frequency or composition of bycatch or interaction is investigated and appropriate management action taken where required.

### **Assessment**

The potential impact of the CSF on bycatch or protected species has not been assessed. DEH notes, however, that an ERA for the CSF is scheduled and will form the basis for identifying species at risk from fishing operations across all sectors. AFMA has advised that the final report is due in May 2006 and expects that the ERA will highlight the species/areas of high risk that will need priority management focus.

A number of protected marine mammals and reptiles are known to occur in the Coral Sea. These include the Green turtle (*Chelonia mydas*), the Hawkesbill turtle (*Eretmochelys imbricata*), the Humpback whale (*Megaptera novaeangliae*), the spinner dolphin (*Stenella longirostris*), striped

dolphin (*S. coeruleoalba*), spotted dolphin (*S. attenuate*), bottlenosed dolphin (*Tursiops truncatus*) and common dolphin (*Deplhinus delphis*). Sea snakes have also been recorded in the Coral Sea. There are no listed threatened ecological communities within the CSF.

As noted above, bycatch and protected species interactions in the hand collection sectors are not an issue. Operators in the line, trawl and trap sectors have a greater potential for the take of bycatch and for protected species interaction. Operators in the line sector particularly have the potential to take shark and have been issued with species identification booklets to enhance the quality of bycatch data collected. The trawl sector is likely to take significant amounts of finfish bycatch and has a high potential for interaction with marine turtles and sea snakes. The trap sector is unlikely to take significant amounts of bycatch or interact significantly with protected species but nonetheless, traps are not discriminatory and some finfish and other invertebrates would be taken as bycatch. Marine turtle and cetacean interaction could also occur with baited traps and trap float lines.

The submission states that both the proposed Data Collection and Monitoring Strategy and the ERA will help fishery managers to identify bycatch or protected species at risk. The submission also states that given the small amount of catch and effort in the CSF, it is unlikely that overfishing of bycatch species will occur. DEH believes this assumption may be correct but that the ERA should provide added certainty in this area. The ERA will be a crucial step in future assessment and management of impacts on bycatch and protected species.

**Recommendation 8:** *AFMA to immediately commence monitoring of all catches including target, by-product and bycatch species or species groups in the line, trawl and trap (trial) sectors. AFMA to consider any trends in this catch information as part of the ecological risk assessment process and develop management responses as appropriate.*

### **Management response**

The small number of operators permitted to access the fishery provides a first step across all sectors of the CSF in minimising impacts on bycatch and protected species. AFMA has, to date, relied to a large extent on the low number of operators for minimising impacts on bycatch and protected species. While small numbers of operators provides some protection, DEH considers that active management of impacts on these groups by the line, trawl and trap sectors is required.

The compulsory use of turtle excluder devices (TEDs) while crustacean fishing in the trawl sector is the only specific measure to minimise impacts on bycatch and protected species in the CSF. As TEDs have only been required since 1 June 2004, and there are currently no trawl fishers targeting crustacean species, it is difficult to assess the success or otherwise of TEDs in the fishery. DEH urges AFMA to assess the efficacy of TEDs in the trawl sector once some data is available and to present the outcomes of the assessment to the annual stakeholder meeting.

While not considered a specific management measure, operators in both trawl and line sectors of the CSF are required to comply with any Recovery Plans, Threat Abatement Plans or National Plans of Action. The CSF SoMA makes specific provision for the protection of seabirds by requiring auto-longline fishing vessels to adhere to the *Threat Abatement Plan for the Incidental catch (or by-catch) of seabirds during oceanic longline fishing operations*. AFMA also require permit holders taking shark as by-catch to adopt any requirements in accordance with the *National Plan of Action for the Conservation and Management – Sharks*.

The absence of specific objectives to take explicit account of impacts on bycatch, protected species and the ecosystem is a shortcoming in the management of the CSF. DEH believes that objectives relating to minimising impacts on bycatch and protected species is required for the trawl, line and trap sectors and that objectives requiring protection of the ecosystem from fishing impacts are

required across all sectors to provide driving mechanisms for ensuring that the fishery is managed in an ecologically sustainable way. See Principle 2, Objective 3 of this report for a full discussion of ecosystem impact management.

**Recommendation 9:** *AFMA to develop objectives that take explicit account of fishery impacts on bycatch species, protected species and the ecosystem for the line, trawl and trap (trial) sectors by the end of 2006. Objectives that take explicit account of fishery impacts on the ecosystem to also be developed for the trochus and lobster, aquarium and sea cucumber sectors of the CSF by the end of 2006.*

Furthermore, no indicator group of bycatch species is monitored and there are no decision rules, reference points or triggers that would result in additional management measures or reviews should this be warranted. DEH recognises that monitoring of all bycatch species across the CSF may not be practical, particularly in the trawl sectors where bycatch may be high in diversity and quantity. Therefore, identification and monitoring of key bycatch indicator species is suggested as a means of detecting changes in fisher behaviour and impacts on bycatch species. DEH expects that the ERA and improved bycatch data, through the proposed Data Collection and Monitoring Strategy and observer coverage, should yield sufficient information to identify indicator species.

## **Conclusion**

DEH considers that, under current levels of catch and effort, there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species. DEH also considers that there are minimal interactions with protected species in this fishery and 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 the ERA indicate otherwise, DEH expects that AFMA would undertake appropriate actions to ensure that the fishery does not threaten bycatch species and that the fishery avoids mortality or injury to protected species and avoids or minimises impacts on threatened ecological communities. Recommendations have been developed to ensure that the risk of unacceptable impact on bycatch and protected species are detected and minimised in the longer term.

## **Minimising ecological impacts of fishing operations**

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

### **Information requirements and assessment**

The submission describes the paucity of data in this fishery and the implications this has on AFMA’s ability to undertake any sort of assessment of the impact of fishing operations on the environment. The submission claims that the fishery is not considered to have a significant impact on the major components of the ecosystem, but provides no data on which to base this claim. DEH acknowledges that the developmental nature of some sectors of the fishery and its geographical isolation hinders dedicated ecosystem research in the CSF. The ERA is expected to provide an initial assessment of likely impacts of the fishery on the ecosystem.

DEH is concerned at the lack of information collection and research covering the fishery’s impact on the ecosystem and environment generally. However, 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.

Ecological impacts of the various sectors on the CSF can be inferred from data on ecological impacts in other jurisdictions. For example, research conducted by the Australian Institute of Marine Science (AIMS, 2002) on the role of sea cucumber in the overall ecology of coral reefs has shown that Black and White teatfish and the Sandfish (*H. scabra*) play an important ecological role as detritivores and appear to increase the productivity of reef communities.

For the other hand collection sectors, the most likely impact on the ecosystem is expected to be through the removal of the target species on ecologically related or dependent species and by affecting the species ability to fulfil its ecological function. The line, trawl and trap sectors would be expected to have similar impacts on food chains but additional impacts may be expected on benthic habitat by trawl and trap gear and on a broader range of species in the line sector.

AFMA contends that the ERA will increase ecosystem impact knowledge across all sectors and provide more information for management decisions. DEH looks forward to the completion of the ERA. Management strategies for high risk species identified through the ERA process should be implemented as a priority.

**Recommendation 10:** *Within two years of completion of the ERA, AFMA to identify and implement appropriate management strategies to address/mitigate impacts identified through the ecological risk assessment of the CSF.*

### **Management response**

The submission refers to management responses currently in place in the fishery (refer Table 4) as some of the means by which fishery managers can ensure that the fishery is conducted in a manner that minimises impacts on the ecosystem generally. DEH believes that the limited number of operators and remote locality of the fishery are main factors in minimising impacts on the ecosystem, rather than any of the management responses listed in Table 4. Nonetheless, DEH believes that explicit recognition, through management objectives, of the need to minimise fishery impacts on the ecosystem is part of good ecosystem based fisheries management and this need should be addressed for all sectors of the CSF (see **Recommendation 9**).

The submission explicitly addresses the MARPOL Convention and outlines a number of measures that are in place in the CSF to ensure compliance with this Convention. The submission states that all vessels are required to retain plastics and non-biodegradable waste on board for unloading at port and that observers include MARPOL related information in their reports.

There are no biologically based decision rules relating to ecosystem impact management that would trigger a review or management action in the CSF. The submission reiterates that it relies on the geographical isolation and limited number of operators in the CSF to ensure significant ecosystem damage does not occur. It is DEH's view that the ERA will go part of the way to identifying ecosystem level risks and provide the foundation for AFMA to address any identified risks.

### **Conclusion**

This fishery is conducted, by virtue of geographical isolation and limited number of operators 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.

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## Acronym List

AFMA .....	Australian Fisheries Management Authority
CPUE .....	Catch per unit Effort
CSF .....	Coral Sea Fishery
CSF SoMA.....	<i>Coral Sea Fishery Statement of Management Arrangements 2004/05</i>
CSIRO.....	Commonwealth Scientific and Industrial Research Organisation
DEH .....	Department of the Environment and Heritage
DPI&F.....	Queensland Department of Primary Industries and Fisheries
EPBC Act.....	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ERA.....	Ecological Risk Assessment
FM Act.....	<i>Fisheries Management Act 1991</i>
GBR .....	Great Barrier Reef
GBRMP.....	Great Barrier Reef Marine Park
Harvest MAC .....	Queensland Harvest Fisheries Management Advisory Committee
ICVMS.....	Integrated Computerised Vessel Monitoring Systems
MARPOL.....	International Convention for the Prevention of Pollution from Ships
OCS.....	Offshore Constitutional Settlement
SCUBA .....	Self Contained Underwater Breathing Apparatus
TED.....	Turtle Excluder Device
WTO .....	Wildlife Trade Operation