



Australian Government

Department of the Environment and Heritage

Assessment of the
Tasmanian Commercial Dive Fishery

December 2005

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ISBN: 0 642 55199 5

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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 Tasmanian
Commercial Dive Fishery**

TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
Background.....	4
Overall assessment (leave to last).....	9
Recommendations.....	10
PART I - MANAGEMENT ARRANGEMENTS	11
Conclusion	15
PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES. 16	
STOCK STATUS AND RECOVERY	16
<i>Maintain ecologically viable stocks.....</i>	<i>16</i>
Information requirements	16
Assessment	18
Management response.....	19
Conclusion	20
<i>Promote recovery to ecologically viable stock levels</i>	<i>21</i>
Conclusion	21
ECOSYSTEM IMPACTS	21
<i>Bycatch protection.....</i>	<i>21</i>
Conclusion	21
<i>Protected species and threatened ecological community protection.....</i>	<i>21</i>
Information requirements	21
Conclusion	22
<i>Minimising ecological impacts of fishing operations</i>	<i>22</i>
Information requirements	22
Assessment	22
Management response.....	23
Conclusion	23
REFERENCES	24
LIST OF ACRONYMS.....	25

EXECUTIVE SUMMARY

Background

The Tasmanian Department of Primary Industries, Water and Environment (DPIWE) has submitted documents for assessment of the Tasmanian Commercial Dive Fishery (CDF) under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft documents: *Draft Policy Document and Draft Fisheries Rules for the Tasmanian Commercial Dive Fishery* and *Cost-Benefit Statement for Reviewing the Tasmanian Commercial Dive Fishery Management Plan* (the submissions) were received by the Department of the Environment and Heritage (DEH) in August 2005. The document was released for a thirty-day public comment period that expired on 26 October 2005. One public comment was received. DPIWE provided a response to the issues raised and amended the submission where necessary. A final submission for assessment was received in November 2005.

The submission reports on the CDF against the Terms of Reference, including the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comments and DPIWE's response to the comments.

Table 1: Summary of the CDF

Area	Access to all State waters, excluding protected areas and research areas.
Fishery status	Unknown.
Target Species	The fishery targets sea urchins (<i>Heliocidaris</i> or <i>Centrostephanus</i>), periwinkles (<i>Turbo</i>) and whelks (<i>Buccinidae</i> or <i>Fascioliariidae</i>).
By-product Species	There are no byproduct species taken in the fishery.
Gear	Non-mechanical fishing methods such as tongs, a single prolonged hook or a gloved hand. Divers may use hookah gear operating out of small boats.
Season	All year round except for a 3-4 month area closure period (around January to May, excluding the undeveloped zone) following spawning. Fishing activity is greatest in December prior to spawning when roe quality and quantity is at its best.
Commercial harvest 2004	Sea urchins – 63.4 tonnes Periwinkles – 17.6 tonnes
Value of commercial harvest 2004	Sea urchins - AU\$66,582 Periwinkles – AU\$51,540
Recreational harvest	No catch or effort information available, although thought to be minimal.
Commercial licences issued	55 commercial dive licence holders.
Management arrangements	Input and output controls including: <ul style="list-style-type: none"> • limited entry; • three separate zones, each with a specific Total Allowable Catch (TAC) for sea urchins; • zones with TAC (17.6 tonnes) for periwinkles; • area closures over critical periods; • size limits for sea urchins and periwinkles;

	<ul style="list-style-type: none"> • gear restrictions; and • logbooks (diver docket).
Export	Yes, markets for urchins exist in South East Asia (mainly Japan) and Asian restaurants in Melbourne, Sydney and Brisbane.
Bycatch	Bycatch is considered minimal due to the highly selective nature of harvest.
Interaction with Threatened Species	Considered nil. At present, there has been no interaction between the fishery and any threatened species.

The area of the CDF includes all State waters defined in the Offshore Constitutional Settlement (OCS) Agreement of 1996, excluding marine nature reserves, national parks, research areas or marine resources protected areas. For the purposes of the CDF, ‘State waters’ means all waters, other than inland waters, to which the legislative powers of Tasmania extend.

The area of the CDF comprises three separate zones: the Central Eastern Zone, the South Eastern Zone and the Undeveloped Zone (Figure 1). The zones have been established to allow for greater management of the stocks and to allow for further exploration of largely undeveloped areas. The Central Eastern and South Eastern Zones are centred on areas already producing good returns of sea urchins while the Undeveloped Zone, which covers around 75% of State waters, is largely unexplored.

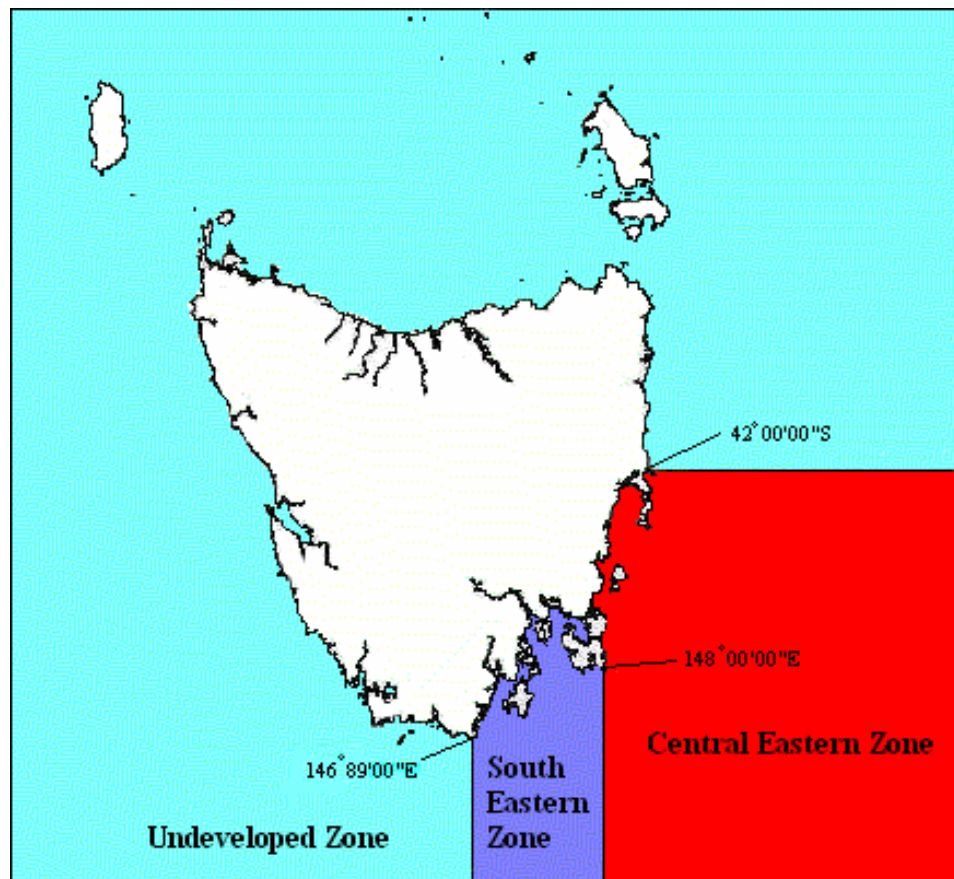


Figure 1: Map Indicating Zones for Sea Urchins.

The Central Eastern Zone is the area of State waters on the East Coast of Tasmania bounded on the north by the line of Latitude 42° 00' 00" S and on the south by the line of Longitude 148° 00' 00" E

(from in the vicinity of Friendly Point, to the southern tip of Tasman Island). The South Eastern Zone includes all State waters on the East Coast of Tasmania bounded on the north by the line of Longitude 148° 00' 00" E and on the south by the line of Longitude 146° 89' 00" E (from the southern tip of Tasman Island to Whale Head). The Undeveloped Zone includes State waters bounded by the line of Longitude 146° 89' 00" E in the south and extending in a clockwise direction to the line of Latitude 42° 00' 00" S (from Whale Head, up the west and along the north coasts and down to the northern border of Central Eastern Zone around Friendly Point).

Sea urchins are the principal target species in the CDF. Three species of urchins (Class Echinoidea, Phylum Echinodermata) are commercially harvested in Australia including *Heliocidaris erythrogramma*, *Centrostephanus rodgersii* and *Heliocidaris tuberculata* (Worthington & Blount, 2003). Two of these species are commercially harvested in Tasmanian waters, the white urchin (*H. erythrogramma*), which is the most valuable species harvested in the CDF and the purple urchin (*C. rodgersii*). The purple urchin has been observed in increasing numbers on the East Coast and Bass Strait over the last few years and should markets be established, harvest of this resources has the potential to substantially increase the amount of sea urchin roe exported from Tasmania. Currently, holders of a commercial dive licence have the authority to harvest *C. rodgersii* for which no TACs or zones have been applied.

A number of other species are harvested by commercial divers but catches of these species remain at relatively low volumes. These species include periwinkles of the genus *Turbo* and whelks of the families *Buccinidae* and *Fasciolaridae*. These species are usually sold live in-shell, although periwinkles have been cooked and packed with sauces for direct sale to the restaurant trade in the past.

There are also a number of species harvested by commercial divers under permit conditions including clams, native flat oysters, wild pacific oysters, the introduced Japanese seaweed (*Undaria pinnatifida*) and other mainly shallow water invertebrate species. These species can only be collected under special permit conditions and cannot be taken under a general Commercial Dive Licence. No byproduct species are allowed to be taken in the CDF and it does not currently harvest any species listed on the Convention on International Trade of Endangered Species of Wild Flora and Fauna (CITES).

H. erythrogramma is light purple, green or creamy white urchin with dark spines. It is the most common sea urchin found in southern Australian waters. The species is endemic to Australia and inhabits intertidal rocky reefs down to depths of 35 metres along southern Australian coasts.

H. erythrogramma is usually 60 to 90 millimetres in diameter but has been known to reach 140 millimetres, and spines are 10-25 millimetres long (Kailola *et al.*, 1993).

Sea urchins are free spawners, with both males and females releasing their gametes into the water column, triggered by environmental cues. Previous studies on *H. erythrogramma* have shown that fertilisation success is density dependent, therefore significantly higher when male and female urchins are located within a couple of metres of one another (Lawrence 2001). Generally, spawning occurs during early summer to late autumn. *H. erythrogramma* mature at a diameter of 23 millimetres, however may not spawn until they reach a diameter of 40-50 millimetres (Williams 2002) which is below the minimum size limit in the CDF of 60 millimetres.

H. erythrogramma is active at night and feed by grazing on filamentous algae and encrusting algae found on the substrate, or by capturing drift algae, and are considered a dominant herbivore in the southern Australian region. In Tasmania, it is common in kelp communities and in barrens where it feeds by grazing and capturing drift weeds (Williams 2002). They are preyed upon by southern rock lobsters, octopus, skates, wrasses and Pacific gulls (Williams 2002).

C. rodgersii (the purple urchin) has a subtropical distribution and is associated with hard corals in the north of its distribution and kelp communities in the south, where it forms extensive barrens (Williams 2002). Growth rates are moderate with individuals of 70 to 90 mm being between 4 to 10 years old. The maximum size of 120 mm corresponds with an age of up to 20 years. Sexual maturity is attained at 40 to 60 mm and spawning occurs in winter (Williams 2002).

Sea urchins are harvested for their gonads and are normally only taken from areas where the roe is produced in sufficient volumes and of a high quality. The amount of roe per individual urchin can vary both temporally and spatially and generally divers will not continue fishing when recovery levels fall below 2-3% of whole weight.

Sea urchin stocks are generally at risk of localised and serial depletion due to their limited dispersal abilities, patchy distribution, ease of collection, slow recovery from overfishing and limited information on biological and spatial distribution available for management. There is a history of “boom-bust” cycles in a number of sea urchin fisheries internationally. The species therefore requires strict management controls to ensure the sustainability of harvests.

Periwinkles (or Warreners) are found at depths to 7 m in southern Tasmanian waters, particularly around Bruny Island. Periwinkles grow to a maximum size of 50 mm and weight of about 50 g (<http://www.tasea.com.au>). Whelks (or Spindle or Tulip Shells) are harvested from rocky reefs along the Tasmanian coast. The conical shells are about 150 mm long and weigh about 150 g. The shell ranges in colour from red, brown and green to white (<http://www.tasea.com.au>).

In 2004, 63,425 kilograms (landed weight) of sea urchins were harvested in Tasmania. Assuming a 3.6% average roe recovery rate and a price of \$29.16 per kilogram for roe, a value of \$66,582 has been estimated for sea urchins taken in the fishery. In 2004, 17,600 kilograms (landed weight) of periwinkles were harvested in Tasmania. Assuming an average price of \$2.92 per kilogram, a value of \$51,540 has been estimated. There was no catch for whelks in 2004 and no catch to date in 2005.

The CDF began in the 1980's and since those early days of the fishery, there have been large fluctuations in catch and levels of the activity in the fishery. Studies of Tasmania's commercial species of sea urchin (*H. erythrogramma*) were first conducted in the 1970's and showed potential for a specialised small fishery. Since that time, the fishery has experienced rapid growth. A period of substantial development was experienced during the 1980's, reaching a peak in 1998 with a reported landing of 358,633 kg live weight of sea urchin. Records since that time show an initial trend of decline in catch that has levelled out in recent years to catch figures in the vicinity of 100 tonnes annually.

Previously all holders of a fishing licence (commercial dive) had unlimited access to the main commercial dive species (urchins, periwinkles and whelks). The only regulation in the CDF has been the imposition of a moratorium on the issue of new licences in 1993. Despite the restructuring of the commercial dive industry, it should be recognised that no person holding a commercial dive licence in 2004/2005 will be asked to surrender their licence. There has however been a considerable reduction in the number of licence holders over past years through natural attrition. Since the inception of the fishery, the number of licence holders has dropped from 127 in 1993 to 55 in 2005. This alone has significantly diminished the threat posed by latent effort to a sustainable commercial dive industry. The management strategies proposed in this plan, such as closure by public notice, minimum size limits, performance indicators, trigger points and particularly the introduction of TACs go even further in mitigating the threat from latent effort.

Sea urchin roe is considered a delicacy in many Asian and some European countries. At present, most roe is chilled and exported fresh to Japan. There is also a small domestic market for sales to

Japanese restaurants in Sydney, Melbourne and Brisbane. In addition to the fresh chilled roe market, some research has been conducted into the use of lower grade roe for paté and other processed specialty foods.

Sea urchins and other targeted species are hand harvested by divers operating on hookah (compressed air) and operating out of small boats (<10 m in length). Sea urchins are collected by hand, long tongs or a single prolonged hook, placed in a catch bag and then emptied into bins onboard the fishing vessel for transport to the processing factory. Under the Fisheries (Commercial Dive) Rules 2005, 'tongs' is defined as an implement *consisting of two arms that each have a single prong or a flattened end no wider than 100 mm*. The Fisheries (Commercial Dive) Rules 2005 also stipulates that *a person must not dive or otherwise enter the water from a vessel that is being used by another person for fishing under the authority of a fishing licence (commercial dive) unless the person diving or otherwise entering the water is also the holder of a fishing licence (commercial dive)*.

Under the proposed management plan to be finalised in December 2005, rakes are not permitted in the CDF, as it is likely that their use may be impacting on the sea urchin habitat. The rakes are far less discriminatory than the prescribed methods of collection and can result in the take of rubble, undersized specimens and bycatch.

Due to the highly selective nature of harvest under the new management plan, bycatch in the fishery is limited to commensal organisms living on or within target species such as invertebrates. The impact of the CDF on bycatch species is likely to be minimal due to the small scale of harvest and management measures limiting the take of specimens likely to provide habitat for commensal organisms. At this stage, there has been no interaction between this fishery and any known endangered, threatened or protected species. This is further discussed under Principle Two of this report.

There is limited information on the take of commercial dive species by the indigenous and recreational sectors around the state, however it is believed to be at a low level. Recreational and indigenous harvest is further assessed under Part I and Principle One of this report.

Indications from police prosecutions are that levels of illegal fishing for commercial dive specimens are negligible.

The CDF is managed through the *Fisheries (Commercial Dive) Rules 2005*, under the *Tasmanian Living Marine Resources Management Act 1995* (the LMRM Act). The Minister administering the Act is the Minister for Primary Industries and Water, and the responsible Department is DPIWE. The CDF Management Plan is expected to commence on 21 December 2005, with the exception of Rule 11 (restrictions on other people using the licence) which will take effect from 1 September 2006. The CDF Management Plan – *Fisheries (Commercial Dive) Rules 2005* will continue to be in force for 5 years.

Overall assessment

The material submitted by DPIWE indicates that the CDF operates in accordance with the Australian Government *Guidelines for the ecologically sustainable management of fisheries*. DEH considers that the CDF 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 sophisticated management plan (to commence in December 2005) consisting of limited entry, TACs, zones and zone closures, size limits and gear restrictions, as well as a range of reviewable management objectives and performance indicators / measures and strategies underpinned by a detailed statutory management plan for the CDF suggests that the fishery is being managed in an ecologically sustainable way.

In making its assessment, DEH considers that the management arrangements and objectives are sufficient to ensure that the fishery is conducted in a manner that does not lead to over-fishing. Considering the management arrangements in place and the particular 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. Management of this fishery has a history of reacting appropriately to threats to sustainability and DEH is confident that DPIWE 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 plan to commence in late 2005 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, either temporarily or permanently, may include marine turtles, cetaceans, sharks, seals, syngnathids and seabirds. To date, the fishery has no recorded interaction with these species groups. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the CDF management plan (under the Fisheries Commercial Dive Rules 2005) 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 plan 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 plan 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 plan, 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 management plan have, will have or are likely to have on the marine environment. DEH also considers that actions approved or taken in accordance with the management plan 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 CDF management plan be accredited under section 33 of the EPBC Act for the matter of national environmental significance “the marine environment”.

Recommendations

Recommendation 1: *DPIWE to advise DEH of any material change to the CDF management arrangements that could affect the criteria on which EPBC Act decisions are based, within three months of that change being made.*

Recommendation 2: *DPIWE to monitor the status of the target species in relation to performance indicators. Within 3 months of becoming aware of one or more of the performance indicators being triggered, DPIWE to develop a clear timetable for the implementation of appropriate management responses.*

Recommendation 3: *DPIWE, within 18 months, to establish and implement an appropriate formal consultative mechanism for the CDF and consider, where appropriate, any relevant community, conservation, indigenous and recreational interests.*

Recommendation 4: *DPIWE to develop and implement mechanisms to validate commercial catch and effort data in the fishery within 12 months.*

Recommendation 5: *Within 18 months, DPIWE to develop a process to improve estimates of take from all sectors and factor these into management arrangements.*

Recommendation 6: *DPIWE to develop and implement targeted research and management strategies to address key gaps in the knowledge of sea urchin and periwinkle biology and ecology.*

PART I - MANAGEMENT ARRANGEMENTS

The CDF is managed by the DPIWE.

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

- DPIWE website <http://www.dpiwe.tas.gov.au>;
- the Tasmanian Recreational Sea Fishing Guide;
- the *Policy Document, Fisheries Rules and Cost Benefit Statement for Commercial Dive Fishery, 2005*;
- the LMRM Act (which can be viewed at www.thelaw.tas.gov.au); and
- relevant Gazetted notices and licence conditions.

The *Fisheries (Commercial Dive) Rules 2005* under the LMRM Act 1995 provide the legislative basis for the preparation of a management plan for the fishery; a draft plan was released for public comment, ending 7 November 2005. It was indicated in the submission that this management plan should be finalised and commence in December 2005. 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 plan 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. Decisions resulting from this assessment 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: *DPIWE to advise DEH of any material change to the CDF management arrangements that could affect the criteria on which EPBC Act decisions are based, within three months of that change being made.*

There is currently no formal consultative mechanism in place for the discussion of issues relating to the management of the CDF. Instead, consultation with the urchin industry occurs via informal structures. Consultation on management issues for the CDF is through DPIWE and licence holders. In carrying out their management of natural resources, the Tasmanian Government has the responsibility of ensuring that the basis for the sharing of the resource among all users is clearly understood and accepted as equitable, and that the allocation of fisheries resources and their level of utilisation are consistent with the needs of present and future generations.

The submission refers to the concept of co-management to encourage sustainable industries. This is largely achieved by initialising all licence holders on equal terms at the outset of the new management arrangements. The proposal is for all licences to be transferable and have access to the same resource base making it in the best interests of all stakeholders to ensure the industry is run in a sustainable manner.

DEH considers this current approach for consultation in the fishery to be less than adequate and should be developed further for a fishery such as the CDF, which, although small, has been developed over a number of years and currently exports overseas. With 55 endorsements in the CDF and the current low value, it is important that all relevant persons are effectively consulted. DEH recommends that a more formal process for consultation be developed for the fishery that is

transparent and publicly available to ensure that any relevant community, conservation, indigenous and recreational sectors are informed and to assist in ensuring sustainability of the fishery.

Recommendation 2: *DPIWE, within 18 months, to establish and implement an appropriate formal consultative mechanism for the CDF and consider, where appropriate, any relevant community, conservation, indigenous and recreational interests.*

The policy objectives of fisheries management for the CDF are complementary to the stated resource management and planning objectives described in Schedule 1 of the LMRM Act. The objectives for TMAF and some strategies to achieve these objectives include:

- 1) *Maintaining Biomass and Fish Recruitment*
To maintain sea urchin and other commercial dive species populations at levels which are able to generate acceptable recruitment.
 - limiting the number of participants, introducing TACs and the establishment of zones
- 2) *Sustaining Yield and Economic Returns*
To optimise the yield able to be gained from the fishery by requiring or encouraging appropriate fishing practises.
 - promote research into enhancing roe recovery, initiate closures and encourage expansion of the fishery.
- 3) *Commercial Fishing Interactions*
To mitigate any conflict that results from competition between different fishing methods for access to shared fish stocks and/or fishing grounds
 - allow equal rights among fishers, allow commercial divers access to other species having development potential under permits.
- 4) *Access to Fish Stocks by Recreational Fishers*
To maintain or provide reasonable access to commercial dive species for recreational divers
 - continue to allow recreational divers access to species such as sea urchins, periwinkles and mussels for non-commercial purposes.
- 5) *Marine Farming Interactions*
To provide for areas within which marine farming can develop.
 - to prohibit or restrict commercial diving in those waters that are occupied by marine farms.
- 6) *Environmental Interactions*
To minimise activity which is detrimental to the marine environment, particularly in areas of special ecological significance.
 - to promote ongoing research, introduce rules or regulations, gear restrictions and prohibit the taking of protected or endangered species.
- 7) *Recovery of Management and Research Costs*
To recover revenue from licenced commercial divers sufficient to cover the costs of management and the research needs of the fishery.
 - equal costs among participants, determine costs of management and necessary research.
- 8) *Quality Assurance*
To promote the world's best practice in the transport, handling and processing of Tasmanian marine resources for human consumption.
 - promote high standards and the use of accountable records submitted by divers and processors.

There are fishery specific objectives, performance indicators and triggers in place for the fishery. DEH considers that fishery specific objectives and indicators are important to ensure that the performance of the fishery can be monitored and management action taken as required, particularly

given the limited knowledge on biological characteristics of the species and the vulnerability of the main species to localised and serial depletion.

The performance of the CDF Management Plan in meeting the objectives of maintaining biomass and recruitment will be measured and reviewed through a combination of performance indicators relating to the sustainability of the major species in the fishery. This is further discussed under Part II of this report.

Performance indicators should be capable of detecting and responding to changes in the status of the fishery. When one or more of the fishery performance indicators have been reached or exceeded their respective trigger point, the Tasmanian Secretary will consult with industry as required and initiate actions to best address the issue. While some management options were identified in the submission, there is currently no time frame for implementation of action following the triggering of a performance indicator.

Recommendation 3: *DPIWE to monitor the status of the target species in relation to performance indicators. Within 3 months of becoming aware of one or more of the performance indicators being triggered, DPIWE to develop a clear timetable for the implementation of appropriate management responses.*

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

- limited entry (restricted to 55 licence holders);
- three separate zones (see Figure 1), each with a specific TAC for sea urchins: Central Eastern Zone – 39 tonnes, South Eastern Zone – 44 tonnes and Undeveloped Zone – 83 tonnes (Total: 166 tonnes);
- zones with a specific TAC for periwinkles: Developed Zones (Central Eastern Zone and South Eastern Zone) - 17.6 tonnes and Undeveloped Zone – 17.6 tonnes (Total: 35.2 tonnes);
- area closures for the two developed zones for a three to four month period following spawning;
- minimum size limits for sea urchins (60mm) and periwinkles (30mm); the Tasmanian Minister has power to apply size limits to other species;
- gear restrictions (non-mechanical, hand-held fishing methods); and
- compulsory logbooks (diver docket).

The smaller nature of the periwinkle fishery makes it more appropriate to allocate a single TAC across the two developed zones with a separate TAC for the undeveloped zone introduced to encourage further exploration and development in the industry. In addition, the three zone strategy applied to periwinkles will maintain consistency within the commercial dive industry and provide for more precise management as the fishery moves toward its full potential. Similar to the TAC set for urchins, the TAC for periwinkles will be based on 75% of average catches over the past 5 years.

A single licence type in the CDF was proposed to promote an even playing field and a sense of equal ownership within the industry. All fishers therefore will treat their licence as a true asset which will greatly benefit the industry with all operators conducting business in a more sustainable manner, thus reducing the need for enforcement.

Although divers have provided catch records since 1987 as a means of monitoring fishing catch and effort, the submission did not adequately refer to the compliance and enforcement aspects of the fishery. A means of enforcing critical aspects of the management arrangements includes the obligation that all fishers must have a copy of their permit with them when collecting, and count

and accurately record specimens at catch sites onto Section A of the logbook. The entries in the logbook must be completed before any specimens are removed from the point of landing for transport, and when completed, must be forwarded to DPIWE within 48 hours of collection. Processors are required to complete Section B of the logbooks, with information relating to landed weight, roe grade and recovery, and provide the document to the DPIWE at the end of each month.

It is noted in the *Cost-Benefit Statement for Reviewing the Tasmanian Commercial Dive Fishery Management Plan* that there would be an increase in monitoring requirements by compliance officers and managers to ensure certain management arrangements are upheld. This includes increasing monitoring requirements to ensure the catch is kept within the limits set (TAC), to check for rakes (gear restrictions), to monitor size of species captured (size limits) and to enforce zone closures. However, the submissions do not identify how this will be conducted. DEH encourages DPIWE to develop compliance management options for the fishery to ensure the above arrangements are enforced in order to ensure the sustainability of the industry.

All policies and rules presented in the submissions will be upheld under the services of the Tasmanian Marine Police. To date, there have been no compliance issues with the logbooks provided to DPIWE and no breaches have been reported within the CDF.

The Minister may, during the period that the CDF Management Plan is in force, ask the Secretary to review the management plan. Before conducting the review, the Minister must be satisfied that a review is necessary as a result of new information relating to the management plan becoming available or that circumstances have changed to such an extent that the effect of efficiency of the plan has been significantly reduced. The fishery management plan, once implemented, will be reviewed every five years and modified annually where necessary, as required under the *Fisheries (Commercial Dive) Rules 2005*.

Emergency changes may be made to the CDF Management Plan when the Minister considers that an emergency has arisen, or is likely to arise, making it necessary or advisable to make changes to the provisions of the plan. The Minister may also, by order, revoke a management plan if the Minister, after receiving advice from the Secretary, considers that it is necessary to do so because ecological, economic or other factors have arisen that make it impossible, difficult or unsafe for any reason, for fishing to be conducted in accordance with the CDF Management Plan.

The legislative process to be followed during the review of the CDF Management Plan is set out in Part 3 of the LMRM Act.

Fishery dependent data relating to the target species is collected in the fishery through compulsory logbooks. 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.

There are urchin fisheries in South Australia, Victoria and New South Wales. It is unlikely that the impact of harvesting sea urchins, periwinkles or whelks in Tasmania would have a significant impact on similar species in other jurisdictions due to their limited dispersal ability. There is very limited information about the distribution of stocks in Tasmania, however the biology of urchin species is relatively well known as a result of studies undertaken elsewhere, although gaps still exist. As urchins have limited dispersal abilities, DEH encourages DPIWE to pursue complementary management arrangements and joint research opportunities with relevant States,

where appropriate. The CDF does not operate in Commonwealth waters. The spatial management of sea urchin stocks is discussed further in Part II of this report.

DEH considers that the current management arrangements comply with all relevant threat abatement and recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. Bycatch for CDF, due to its nature and the method of fishing, is considered negligible. DEH considers that DPIWE will comply with all relevant future plans and policies.

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

Conclusion

DEH considers that the CDF management arrangements are documented and were developed through a process suitable to the current status of the fishery.

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 some 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 are obtained through compulsory logbooks (Section A - diver’s docket), which are completed for each dive collection by the permit holder and are provided to DPIWE within 48 hours of the collection date. These logbooks must be filled in prior to the catch being passed onto the processor. The logbooks contain the following catch data:

- species code;
- zone of collection;
- area name;
- entitlement number;
- date of fishing trip;
- hours diving;
- depth of dive; and
- weight of catch per species.

Processors are also required to provide DPIWE with information regarding the landed weight, and in case of sea urchins, the roe grade and recovery, in the form of Processors Return. Processors must also complete the appropriate section of Section B of the Diver’s Docket immediately after taking possession of fish from the holder of a fishing licence (commercial dive). The processor or their representative is then given the yellow copy of the docket which must be retained by the processor for a minimum of five years.

The penalties for breaching a licence condition by not completing or incorrect completion of logbook information as required (Grade 2 penalty) are a significant deterrent to overfishing or under declaring catch. To date, penalties have never been imposed on any licence holder in the CDF. DEH believes that data reliability for target species is reasonable, however, compliance and enforcement activities need to be closely monitored and developed to ensure the ongoing reliability of fishery dependent data in the CDF.

Targeted fishery independent information is not currently being collected in the CDF due to the small size of the fishery and the marginal returns, making little funding available for independent stock assessment. However, the proposed management plan introduces a research levy, which may provide for the commencement of independent research in the CDF.

DPIWE closely monitors information collected from the fishery (such as logbooks) in an effort to counteract the lack of fishery independent data. Limited compliance checks are conducted by compliance officers, management officers and Tasmanian marine police officers statewide, however

the submission fails to address this in an informed manner. The lack of formal data validation is an issue that needs to be addressed.

Commercial dive licence holders operating in the CDF are required to submit logbook data to DPIWE, within 48 hours of completion of the dive. There is currently no validation of catch information, except the ability to compare diver docketts with processor returns or records however, there is no indication if this currently or frequently occurs.

Fishery dependent data for the fishery is currently the best source of fishery information, due to the limited fishery independent data available. As management of the fishery heavily relies on accurate fishery dependent data there is a need to improve data validation and ensure compliance. Given the uncertainty of stock status of sea urchins there is an ongoing need for sound fishery dependent catch and effort data. DEH therefore recommends that DPIWE develop and implement a mechanism to validate commercial catch and effort (logbook) data.

Recommendation 4: *DPIWE to develop and implement mechanisms to validate commercial catch and effort data in the fishery within 12 months.*

Research plays a major role in developing fisheries to their full potential. A part of the principle of cost recovery and in line with the concept of co-management, a research levy will be incorporated as part of the annual licence fees for all licence holders. The levy will be set aside in a specific trust fund to be used in research projects to improve the CDF, which will ensure that funds are invested in areas that licence holders consider to be a high priority. These funds also have the opportunity to be heavily subsidised by other research interests, including the Fisheries Research Development Corporation (FRDC).

Although certain research has become a focus for the CDF, little fishery independent research has been conducted on the ecology and status of Tasmanian sea urchin stocks. A public comment received stimulated the importance of research needed for the CDF due to the lack of scientific information. However, the public comment questioned the worth of the AU\$100 research levy and whether it would be sufficient for significant research in the fishery. DEH commends DPIWE for implementing this arrangement which will be beneficial for the CDF, however suggests DPIWE to review the research levy amount and determine costs required for significant research.

Although no timeframes have been developed, DPIWE has proposed that the main focus for study in the CDF is to refine sustainable TAC's for sea urchins and periwinkles. This would involve mapping available stocks, biological triggers, growth rates and age at maturity studies. While the TAC is conservatively based on historical records (75% of average catch over 4 years), the stock status of the main target species is uncertain, as much of the state's waters are yet to be explored. It should also be noted that a TAC does not apply for *C. rodgersii*, which has been observed in increasing numbers and has the possibility of being increasingly harvested should markets be established.

DEH is concerned that no formal research strategies are currently in place to address the key gaps in the knowledge of sea urchin and periwinkle biology and ecology or to ensure that the current level of take of targeted species is sustainable. In addition, too little is known about how harvesting sea urchins and periwinkles affects the wider ecological community and population dynamics, particularly of other important fisheries species. Strategies to further improve the understanding of sea urchin and periwinkle ecology, including the development of a research program to establish stock estimates for targeted species would be valuable.

Recommendation 5: *DPIWE to develop and implement targeted research and management strategies to address key gaps in the knowledge of sea urchin and periwinkle biology and ecology.*

Another important consideration that needs to be investigated is the sampling processes for sea urchin roe. Processors generally classify roe as A or B grade. B grade roe gains very little return for the fishers and is generally considered to be a waste of the resource. Unfortunately, at present it is not possible for divers to know the quantity or quality of roe in an urchin without killing the fish. The problem is accentuated by the high level of variability in roe over short intervals both temporarily and spatially. This has led to sampling techniques being largely ineffective resulting in considerable waste of the resource.

Sea urchin densities are highest in barrens, however productivity and individual growth is lower due to competition for food and possibly due to inferior nutrition (Williams 2002). The CDF would therefore benefit significantly by a sampling or harvesting technique being devised that would allow fishers to collect only specimens that would provide a worthwhile return. Those with sub standard roe could be left unharvested until their condition improves.

Overall, given the fishery dependent data gathered by DPIWE and the suggested recommendations, DEH considers that there is a reliable information collection system in place appropriate to the scale of the fishery. Continuation of existing data collections and research programs, combined with some extension and refinement of such activities will be important for the future management of the fishery.

Assessment

Minimal formal stock assessments have been undertaken for the CDF. Although various independent studies have been conducted on sea urchin density, biomass and roe quality in New South Wales and Victoria by Worthington & Blount (2003), there have been minimal studies to quantify the number of sea urchins and periwinkles available for harvest in Tasmania. The information from diver docket and processor returns is processed and may be used to cross reference information. This will be beneficial in providing information for the assessment of stocks and catch trends, although it is not known if this frequently occurs. The submissions state however, that at no time has the catch effort indicated any threat to existing stock levels. As a result safety precautions established as trigger points have not been approached to date.

DPIWE have indicated that over the course of the Management Plan, it is intended that the TAC will be further refined (**Recommendation 5**) by research into growth rates, size at first maturity, roe condition and a more detailed stock assessment. DEH encourages DPIWE to pursue methods to obtain more reliable estimates of stock abundance in the near future and use this information to refine sustainable TAC's for the fishery.

Research into the distribution and spatial structure of species targeted in the CDF has not been extensive, apart from data collected through logbooks. In NSW and Victoria a number of studies have been completed. Studies have shown that *H. erythrogramma* larvae have a limited ability to disperse, with fertilisation success relying on males and females being in close proximity of one another. This trait limits recruitment and replenishment of depleted stocks from another location.

Although zones apply in the CDF with allocated TACs to reduce the risk of localised depletion for *H. erythrogramma*, it should be noted that a TAC does not apply for *C. rodgersii*. Although the catches for *C. rodgersii* species have been low, DEH is concerned that the potential for localised depletion is possible for this species and encourages DPIWE to closely monitor this issue and when implementing **Recommendation 5**, and develop management options if necessary.

The recreational, indigenous and illegal take of sea urchins in Tasmania is currently unknown. There are no size limits set for any species of sea urchin for recreational purposes. The daily bag

limit for the recreational take of periwinkles is 100 specimens (prescribed by *Fisheries Regulations 1998*). Harvest by the recreational and indigenous sector is considered to be low due to the low demand for sea urchins on the domestic market and the difficulty in harvesting significant numbers of sea urchins without appropriate gear. However, there is anecdotal evidence that the recreational harvest of sea urchins is becoming increasingly popular. As well as recreational catch for human consumption, anecdotal evidence suggests that divers may collect and crack sea urchins to feed reef fish.

The level of waste in the fishery is uncertain. Currently, it is impossible for divers to know the quantity or quality of roe in a sea urchin without killing the fish. This has led to ineffective sampling techniques resulting in considerable waste of the resource. DEH encourages DPIWE to implement an information collection system that takes into account the number of sea urchins being discarded at processing to enhance knowledge in this area and improve future management of this problem. DEH is concerned that take from all sectors is not currently being taken into account in management of the fishery and considers that take from all sectors should be considered in relevant aspects of the management of the fishery.

Recommendation 6: *Within 18 months, DPIWE to develop a process to improve estimates of take from all sectors, including the level of waste before and after processing, and factor these into management arrangements.*

Management response

The current management arrangements of the fishery aims to maintain ecologically viable stock levels through the input and output controls outlined in Table 1 and Part I of this report. DEH considers that the combination of current management controls and the implementation of recommendations should ensure adequate protection of the target stocks.

The performance of the CDF Management Plan (to commence late 2005) in meeting the objectives of maintaining biomass and recruitment will be measured and reviewed through a combination of performance indicators relating to the sustainability of the major species in the fishery. This plan aims to maintain the major species in the CDF such that the following performance indicators remain at or above average levels as assessed for the period 2000-2004 inclusive. The performance indicators are:

1. Catch per unit effort (CPUE); and
2. Relative abundance of cohorts in samples of commercial catches.

DPIWE has indicated that for those species or areas where time series data does not exist, they will be developed over the life of the plan.

Trigger points for management review have also been developed for the CDF. When one or more of the following trigger points have been met, the Tasmanian Minister will review the management of the CDF. These trigger points may be reached by themselves or in combination. There may also be additional factors, such as those relating to the environment or market, or requests from sectors of the fishery that could lead to a review of the management of the CDF.

1. Changes in the catch rates for sea urchin or other commercial dive species (CPUE), where there is a decline of;
 - (a) 20% in each of two consecutive years; or
 - (b) 35% in a year.(Note: The measure of variation in CPUE from past data has been used in the determination of the CPUE trigger);
 2. Where quantifiable, an undesirable change in size or age composition of the catch.
- Similar criteria will be used to determine whether a change in size limits and catch limits for other commercial dive species is required.

When one or more of the fishery performance indicators has been reached or exceeded their respective trigger point, the Secretary will undertake the following actions:

1. Notify the Tasmanian Minister and participants in the fishery as appropriate;
2. Undertake an examination of:
 - (i) the status of the CDF or the species in question; and
 - (ii) the implications and options for the management of the fishery or the species;
3. Consult with industry and the community on the development of the management options; and
4. Report to the Minister and industry, within three months of the initial notification, on the outcomes of the examination of the fishery and the proposed management options.

Some of the management options that are available and may be applied either on a State-wide or regional basis include: introducing or changing size limits; introducing or changing seasonal closures; introducing area closures; introducing period catch limits (eg. daily or weekly bag limits); or introducing TACs for any species, on either State-wide or regional, competitive or allocated basis.

Under the LMRM Act, the Tasmanian Minister may review the management plan, undertake emergency changes to the management plan, or revoke the management plan and introduce an interim plan.

Performance indicators should be capable of detecting and responding to changes in the status of the fishery. There is currently no time frame for implementation of action following the triggering of a performance indicator (see **Recommendation 3**).

No byproduct is permitted to be taken in the CDF, therefore no information, assessment or management response regarding byproduct is needed for this fishery. DEH considers that the fishery does not directly threaten stocks of species inhabiting the same area.

There are a number of other species that may be harvested by commercial divers, including wild pacific oysters, native oysters, clams and cockles but only under special permits. The brown macroalgae *Undaria pinnatifida*, also known as wakame, may also be collected by CDF fishers, but only under a special licence. *Undaria* is an introduced seaweed that grows and spreads very quickly. DEH commends DPIWE in dealing with this noxious species and encourages DPIWE to continue to support harvesting of this species. These special permits and licences are managed under rigorous conditions as a trial fishery and not by the commercial dive management plan. Assessment for the export of these species will be assessed under a separate process.

Conclusion

DEH considers that the management arrangements in the CDF are appropriately precautionary at the current scale of fishing and provides for the fishery to be conducted in a manner that does not lead to overfishing. 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. The fishery is currently small with a relatively low level of harvest and relatively low value. Through the implementation of the recommendations within this report, DEH believes that DPIWE will be adequately prepared to identify and implement a recovery strategy should target species stocks fall below reference points.

Conclusion

DEH considers that the Tasmanian sea urchin stock is not below a defined reference point but should that occur in the future, DPIWE 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'*

No formal bycatch risk assessment has been completed for this fishery and is not required due to the highly selective fishing techniques employed by fishers. It is possible that there may accidentally be some small invertebrates entangled in urchin spines or occasionally included with periwinkles gathered into bag. The incidence of bycatch is likely to decrease even more with the introduction of TAC management as any incidental catch will detract from the weight available for the more sought after resources. For these reasons, there are no threat abatement plans, recovery plans or bycatch reduction strategies relevant to the fishery. DEH does not consider that specific bycatch minimisation measures are necessary for the fishery.

Conclusion

DEH considers that there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects DPIWE 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

No interactions with endangered, threatened or protected species have been reported to date in the CDF. Certain protected species could however occur in the area of the CDF, either temporarily or permanently. These may include: cetaceans, sharks, syngnathids, sea snakes and possibly marine turtles.

Interactions between CDF divers and protected species is very unlikely as the diver's means of targeting the resources are quite specific (hand collection, non-mechanical instruments). The boats used are generally small, have no cabin allowing for unimpeded views and are weighed down with hookah gear keeping speeds low, which assist in minimising the threat of interactions. The areas where the harvesting is conducted is generally in shallower waters to improve access time and diving is undertaken generally where visibility is reasonable, further detracting from the probability of interactions with protected species.

The method of fishing in the CDF has meant that interaction with protected species is most unlikely and has not warranted a compulsory reporting forum. However, DPIWE have suggested that the newly developing Commercial Dive Association is likely to incorporate a reporting protocol in the proposed Code of Practise.

No listed ecological communities are found in the fishery area.

Conclusion

DEH notes that interactions with protected species in the CDF are negligible and considers that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that appropriate actions will be undertaken to ensure the fishery avoids mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

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

Fishery independent information on possible ecosystem impacts arising from this fishery has not been collected for the fishery and fishery dependent information is low. Impacts are believed to be minimal due to the relatively benign method of fishing and the range of external drivers that prevent harvest in certain locations of the fishery area, such as protected areas and zone closures.

DEH is concerned at the lack of information collection and research covering the fisheries 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.

Assessment

H. erythrogramma can play an important role in the ecology of reefs. Increases and decreases in sea urchin populations may have enormous consequences for the types and number of algae, fish and other organisms found on reefs (Andrew 1999). In New South Wales, Victoria and Tasmania high densities of sea urchins have caused devastating impacts on important ecological communities by creating sea urchin barrens. Large areas of kelp and seagrass meadows have been destroyed in short periods of time when sea urchins have formed high density feeding fronts.

There is evidence that the removal of sea urchins can impact on the ecology of the surrounding area. DEH considers that at current levels of effort this impact is likely to be low, however is concerned

at the lack of appropriate measures to monitor localised disturbance and the potential for expansion of current harvest. Implementation of **Recommendation 5** to take into account effects of sea urchin harvesting on the wider marine ecosystem will assist in addressing this issue.

Due to the fishing methods employed in the fishery direct impacts to habitats are considered to currently be at a minimum. However, changes in the abundance of sea urchins may have significant consequences for the types and numbers of algae, fish and other organisms found on reefs. As is evidenced by the occurrence of urchin barrens in highly populated areas, the species can play a major role in determining the structure of benthic communities. If large numbers of urchins are removed there is likely to be an increase in the amount of algae cover, which could increase the abundance of other species, but reduce space for benthic organisms (Lawrence 2001). In the long term, a reduction in habitat space may reduce the ability for sea urchin numbers to re-establish in an area due to a reduction in space to settle and a possible increase in predators of young urchins.

DEH note that one of the policy objectives of fisheries management for the CDF includes Environmental Interactions - minimising activity which is detrimental to the marine environment, particularly in areas of special ecological significance. DEH considers it important to gain more information on the long term effects of removing large numbers of sea urchins. Incorporation of research into the role that sea urchins and periwinkles play on local ecological communities into the research plan developed as part of the implementation of **Recommendation 5** will assist in addressing this issue.

The impact of vessel discharge on the ecosystem is considered to be low and there have been no issues with vessel discharge from the fishery to date. Fishing gear is not regarded as posing a significant risk to the physical environment in the fishery as harvesters are limited to hand collection only or tongs, with the assistance of scuba or hookah breathing apparatus.

Management response

Due to the current level of effort in the fishery, impacts to the wider marine ecosystem are expected to be low. Management measures such as zones with specified TACs and zone closures will assist in reducing the risk of localised and serial depletion. However, species targeted in the CDF should be carefully monitored by DPIWE to ensure that effort is not concentrated in any particular area.

Presently, there are no management measures in place to specifically minimise the effects of harvesting CDF species on the wider ecosystem. However, management measures to protect the target species, including limited entry, gear restrictions, TACs, zones and zone closures may provide some mitigation for the ecosystem effects of harvesting target species in the fishery.

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.

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LIST OF ACRONYMS

CDF	Commercial Dive Fishery
CITES	Convention on International Trade of Endangered Species of Wild Flora and Fauna
CPUE	Catch per Unit Effort
DEH	Department of the Environment and Heritage
DPIWE	Department of Primary Industries, Water and Environment
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FRDC	Fisheries Research Development Corporation
LMRM Act	<i>Living Marine Resources Management Act 1995</i>
MARPOL	International Convention for the Prevention of Pollution from Ships
OCS	Offshore Constitutional Settlement
TAC	Total Allowable Catch
UNCLOS	United Nations Convention on the Law of the Sea
WTO	Wildlife Trade Operation