



Australian Government

Department of the Environment and Heritage

Assessment of the
Victorian Sea Urchin Fishery

October 2005

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

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Assessment of the ecological sustainability of management arrangements for the Victorian Sea Urchin Fishery

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EXECUTIVE SUMMARY

Background

The Fisheries Victoria Division of the Department of Primary Industries, Victoria (Fisheries Victoria) has submitted a document for assessment under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Ecological Assessment of Victorian Sea Urchin Fishery* (the submission) was received by the Department of Environment and Heritage (DEH) in July 2005. The submission was released for a thirty-day public comment period that expired on 23 September 2005. No public comments were received. A final submission for assessment was received in October 2005.

The submission reports on the Victorian Sea Urchin Fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comments and Fisheries Victoria's response to the comments.

Table 1: Summary of the Victoria Sea Urchin Fishery

Area	Waters adjacent to the state of Victoria (state waters only). The areas of Port Phillip Bay and East Gippsland particularly Mallacoota are the main harvesting locations.
Fishery status	Thought to be underexploited in both harvesting locations.
Target Species	Black urchin (<i>Centrostephanus rodgersii</i>) and white urchin (<i>Heliocidaris erythrogramma</i>).
By-product Species	None.
Gear	Hand collection using compressed air diving equipment and long metal tongs to remove urchins from reefs.
Season	Collected prior to spawning when roe is at its best quality. June-January for <i>H. erythrogramma</i> and February-July for <i>C. rodgersii</i> .
Commercial harvest 2003/04	20 tonnes <i>C. rodgersii</i> ; 37 tonnes <i>H. erythrogramma</i> (live weight, rounded up to whole numbers).
Value of commercial harvest	AUD \$191,199 during 2003/04.
Recreational harvest	Unknown but thought to be negligible. <ul style="list-style-type: none"> • daily bag limit of 20 urchins for recreational use; and • prohibition on removal of roe or other soft tissue before being brought ashore.
Commercial licenses issued	Currently 14 permit holders: 11 for Victorian coastal waters east of Lakes Entrance; and 3 for Port Phillip Bay waters (except within the intertidal zone).
Management arrangements	Input controls: <ul style="list-style-type: none"> • policy to minimize latent effort; • low effort (currently 14 permit holders); • area conditions on permits; • gear restrictions (hand collection only); • prior notification of intent to fish required by Fisheries Victoria; • completion and return of Fisheries Victoria logbooks on a monthly basis; and • Fisheries Reserves and marine protected areas may exist in some areas of the fishing zone – these areas

	<p>may not be fished without appropriate permission.</p> <p>Output control:</p> <ul style="list-style-type: none"> voluntary Code of Practice by the industry group Eastern Victorian Sea Urchin Diver's Association Inc (EVSUDA) places size limits on both species in eastern Victoria.
Export	Predominant market for Victoria sea urchin roe is domestic. Incentive exists for industry to develop export markets, particularly in Asia.
Bycatch	None.
Interaction with Threatened Species	Negligible.

The fishery is divided into two areas. Permits authorize collection in either Victorian coastal waters east of Lakes Entrance or in Port Phillip Bay waters (except within the intertidal zone which is defined as less than two metres depth of water). There are no restrictions on the maximum depth to which sea urchins can be harvested, however the harvesting methods (being hand collection) limit access to certain areas and rely on good weather to access offshore islands and reefs. The majority of harvesting occurs in the areas of Port Phillip Bay and East Gippsland, particularly Mallacoota.

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 Victorian waters, the white urchin (*Heliocidaris erythrogramma*) and black urchin (*Centrostephanus rodgersii*). There is no allowable byproduct and no bycatch as a result of urchin harvest, although many urchin permit holders also hold commercial abalone fishery access licenses.

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).

C. rodgersii is dark purple in colour with hollow spines which may have a green iridescence. It is known to occur at depths of 0-30 metres however is most frequently reported from <10 metres depth. The maximum recorded size is 230 millimetres with spines of up to 90 millimetres in length.

C. rodgersii has been linked to abalone declines and is known to have a voracious appetite for macroalgae that can create desolate habitats known as "white rock" or "urchin barrens", devoid of vegetation. Some evidence of the creation of urchin barrens is present in Victorian waters. In Tasmania, the decline of rock lobster (a natural predator of *C. rodgersii*) populations has been suggested anecdotally as the cause of increased urchin populations in the area, and concomitant declines in abundance of macroalgae (as a food source for urchin) and abalone (as a competitor for the same resources). Although now seen as a pest species in Tasmania, their potential role as habitat modifiers makes *C. rodgersii* a key component of the ecosystems they inhabit.

Urchins move mainly at night and feed by grazing on algae on the substrate, or by capturing drift algae, and are considered a dominant herbivore in the southern Australian region (Lawrence, 2001). Predators of sea urchins include southern rock lobster, octopus, Port Jackson sharks, leatherjackets, snapper and Pacific gulls (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). For *H. erythrogramma*, spawning occurs during early summer to late autumn – in Port Phillip Bay, between December and March (Constable, 1989 cited in the submission) – and is believed to be triggered by warm water (>17°C). *C. rodgersii* spawning occurs from June to September, when water temperatures are well below 17°C (EVSUDA communication to Fisheries Victoria). It is not known whether individuals spawn once or repeatedly over a single season (Kailola *et al.*, 1993). *H. erythrogramma* mature at a diameter of 23 millimetres, however may not spawn until they reach a diameter of 40-50 millimetres, which for Port Phillip Bay animals would be at about 3 years of age (Kailola *et al.*, 1993).

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.

In 2003/04, 57 tonnes (live weight) of sea urchins were harvested in Victoria. This was split between species – 20 tonnes of *C. rodgersii* were collected and 37 tonnes of *H. erythrogramma*. The commercial value of the catch in 2003/04 was AUD\$191,199. Industry advice is that the value of Victoria sea urchin roe sold directly to Victorian wholesalers ranges from an average of \$80 per kilogram for high grade *H. erythrogramma* roe to an average of \$40 per kilogram for *C. rodgersii* roe. This results in permit holders in the East Gippsland area (where both urchin species occur) targeting *H. erythrogramma* in preference to *C. rodgersii*, although *C. rodgersii* give a higher roe yield than *H. erythrogramma*.

Fisheries Victoria has issued experimental permits for the urchin fishery since the early 1970's. Several factors including the lack of a strong domestic market, variation in roe quality and the lack of an Asian export market for Australian urchin roe has led to marginal economic viability of the Victorian sea urchin fishery since it commenced. Catch rates have been relatively stable at around 50 to 60 tonnes (for both species combined) since 1998/99. A general trend exists for higher catches of *H. erythrogramma* than of *C. rodgersii*, with the exception of the year 2002/03 (Table 2).

Table 2: Victorian sea urchin harvest (live weight, tonnes)^A

Year	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04
<i>Centrostephanus</i> (Black urchin)	2	19	25	18	21	21	39	20
<i>Heliocidaris</i> (White urchin)	42	50	31	45	32	26	19	37
Total	44	69	56	63	53	47	58	57

^A
rounded up to whole numbers

H. erythrogramma is found in both areas of the fishery – Port Phillip Bay and east Victoria. Catch of the species declined in Port Phillip Bay for several years before recovering in 2003/04, while catch in east Victoria has been steadily low with the exception of the year 1999/2000. *C. rodgersii* is fished only in east Victoria. Catch increased in 1996/97 and again in 2002/03 but dropped the following year by about 10 tonnes. Catches for both species in both areas are reported on in the submission and are well below the biomass-based 5% reference points recently set by Fisheries Victoria (refer to Table 3 in Part II of this report).

In 1998 a Ministerial Direction declared the Victorian sea urchin fishery to be a Developing Fishery, and 24 general permits were issued for three years, with a minimum harvest requirement for each permit holder of 3000 kg/year as a permit condition. The fishery is still subject to the

conditions of the Developing Fishery Policy produced by Fisheries Victoria to guide the establishment of new fisheries. Every three years permits are reviewed with no guarantee of renewal.

Following an internal review of the fishery in December 2002 it was decided that failure to meet specified permit conditions (in particular the minimum annual catch condition) would result in the permit not being renewed. Ten permits were removed from the fishery in this way. Currently 14 permit holders are able to harvest urchin in Victoria, 11 of the permits were issued for the coastal waters east of Lake's Entrance and three for Port Phillip Bay waters (excluding the intertidal zone). The two areas of the fishery represent only a small percentage of overall urchin habitat in Victorian waters. The fishery is generally a supplementary fishery, with many permit holders also holding an access license in another fishery, such as abalone. Permit holders are required to advise Fisheries Victoria when they are planning to harvest and to fill in monthly logbooks and return these to Fisheries Victoria.

Urchins are hand collected by commercial fishers using compressed air diving equipment and long metal tongs to pick up urchins. There are no restrictions on the number of sea urchins that can be harvested. Permit conditions do not restrict collection by seasons, but urchins are collected prior to the spawning season each year (during June-January for *H. erythrogramma*; February-July for *C. rodgersii*) in order to collect the roe at its best.

In recent years several new applications for sea urchin harvest permits have been submitted to Fisheries Victoria. Fisheries Victoria has demonstrated a precautionary approach to the management of the fishery by rejecting these applications. Although current harvest levels may not fully exploit the urchin resource, little is known about the available biomass and sustainable harvest levels.

The main market for Victorian sea urchin roe is on the local market to seafood wholesalers, processors and restaurants, and privately to local individuals. Export markets to Japan and other parts of Asia would command a much higher price than the Australian domestic markets but are as yet undeveloped. It is currently believed that the development of sea urchin fisheries in Australia is limited by economical viability due to low recovery rates (percentage of roe per urchin). Sea urchins from other countries have a higher roe recovery rate, the species available are more desirable and established markets with reputable brand names already exist.

Currently, product development initiatives are underway to establish Victorian sea urchin roe on the international market. According to Fisheries Victoria, any impact on the international market is likely to develop at a steady pace that allows for concurrent development of fishery management measures.

The fishery has no bycatch as the hand collection method is target-specific. No information is currently available detailing the interaction between commercial sea urchin fishing and threatened, endangered, and protected species. Interaction with threatened, endangered and protected species is likely to be negligible due to the fishing methods employed and the low effort currently in the fishery. Both species of sea urchin interact heavily with their environment as grazers of algae on the substrate. Recent studies have suggested that sea urchin densities are higher where abalone and southern rock lobster numbers are low (Kailola *et al.*, 1993). Further information on broader ecosystem impacts of urchin harvesting is provided in Part II of this report.

The take of sea urchins for consumption or use by recreational and indigenous sectors is not known. The National Recreational and Indigenous Fishing Survey (Henry & Lyle, 2003) reported no urchin catch for Victorian recreational fishers, but there is anecdotal evidence for small harvests of sea

urchins from Victoria coastal waters (mostly close to Melbourne) by Victorians of Polynesian descent. A daily catch limit of 20 animals applies to recreational fishers and the removal of roe or soft tissues prior to landing is prohibited.

The Victorian sea urchin fishery is managed under the *Fisheries Act 1995*. The sea urchin fishery was declared a Developing Fishery in 1998 and three-year permits were issued under section 49 of the *Fisheries Act 1995*. Permits are revised every three years and are not renewed for holders who fail to meet permit conditions.

Overall assessment

The material submitted by Fisheries Victoria demonstrates that the management arrangements for the Victorian Sea Urchin Fishery meet most of the requirements of the Australian Government *Guidelines for the ecologically sustainable management of fisheries*.

While the fishery is relatively well managed, DEH has identified a number of risks that must be managed to ensure that its impacts are minimised:

- no timeframe for implementation of management action if reference point for either species is reached;
- potential for localised and serial depletion, given a lack of controls on the level of take in the fishery, mode of harvesting, use of area restrictions, and density dependent populations;
- limited information on take from other sectors, in particular recreational catch;
- limited verification of catch; and
- gaps in the understanding of sea urchin biology and ecology, and of effects of harvesting sea urchins on the wider ecological community.

Recommendations to address these issues 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.

The Victorian Sea Urchin Fishery is in a developmental stage and is managed as such under the Developing Fishery Policy. The management regime aims to ensure 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 fishery is being managed in an ecologically sustainable manner and is working to address existing problems and minimise environmental risks.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. DEH considers that the fishery 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 fishery be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be undertaken by Fisheries Victoria to contain the environmental risks in the long term. DEH considers that the fishery, as managed in accordance with the management regime is not likely to cause serious or irreversible ecological damage over the period of the export decision. Specifically, the WTO declaration would allow the export of product from the fishery for a period of three 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 fishery in three years time.

Recommendations

1. Fisheries Victoria to advise DEH of any material change to the Victorian Sea Urchin Fishery's management arrangements that could affect the criteria on which EPBC decisions are based, within three months of that change being made.
2. Within 18 months Fisheries Victoria to develop a fishery specific objective linked to performance indicators and performance measures for impacts on the ecosystem.
3. Fisheries Victoria to monitor the status of the target species and ecosystem of the fishery in relation to the reference points. Within three months of becoming aware of a reference point being triggered Fisheries Victoria to finalise a clear timetable for the implementation of appropriate management responses.
4. Fisheries Victoria to develop and implement a robust system to validate commercial logbook reporting of catch and effort in the fishery within 2 years.
5. Fisheries Victoria to continue to develop and implement research strategies to address key gaps in the knowledge of sea urchin biology and ecology, and of the effects of harvesting sea urchins on the wider ecological community. Should new information lead to the realisation that current take is unsustainable, or is having harmful effects on the target species or on the wider ecological community, Fisheries Victoria should implement strategies to address these issues.
6. Within 18 months, Fisheries Victoria to develop a process to improve estimates of recreational and Indigenous take and factor these into management arrangements.
7. Within 2 years Fisheries Victoria to develop and implement finer scale data collection and reporting and management measures to mitigate the risk of localised and serial depletion of sea urchins in the fishery.

PART I - MANAGEMENT ARRANGEMENTS

The Victorian Sea Urchin Fishery is managed by Fisheries Victoria.

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

- Victorian *Fisheries Management Act 1995*;
- Developing Fishery Policy 1998; and
- Relevant Gazetted notices and permit conditions.

A number of other documents, including research reports, scientific literature and discussion papers are integral to the management of the fishery, including the EVSUDA Code of Practice (EVSUDA, 2003).

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Because of the importance of the management plan and documents mentioned 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: *Fisheries Victoria to advise DEH of any material change to the Victorian Sea Urchin Fishery's management arrangements that could affect the criteria on which EPBC decisions are based, within 3 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 Victorian Sea Urchin Fishery. Instead, consultation with the urchin industry occurs via informal structures. Consultation on management issues for the Victorian Sea Urchin Fishery is through Seafood Industry Victoria, permit holders for Port Phillip Bay and the EVSUDA. DEH considers the level of consultation to be currently adequate given the small size of the fishery and is confident that the management agency will continue to ensure interested parties are consulted appropriately.

The Victorian Sea Urchin Fishery was established as a developmental fishery and is still managed as such under Fisheries Victoria's Developmental Fishery Policy.

Management of the fishery is primarily based on input controls. Such controls include:

- policy to minimise latent effort;
- low effort (currently 14 permit holders);
- area conditions on permits;
- gear restrictions (hand collection only);
- prior notification of intent to fish required by Fisheries Victoria;
- completion and return of Fisheries Victoria logbooks on a monthly basis; and
- Fisheries Reserves and marine protected areas may exist in some areas of the fishing zone – these areas may not be fished without appropriate permission.

The EVSUDA is an industry body established in 1997 and representing eight of the 13 members in the East Gippsland component of the fishery. EVSUDA has produced a draft Code of Practice

(EVSUDA, 2003) for sea urchin harvesting to maintain sustainability in the eastern part of the fishery. Industry initiated actions stated in the Code of Practice include:

- Divers shall make every reasonable effort to not harvest urchins below the following sizes:
 - *Heliocidaris* – minimum test size 65 mm
 - *Centrostephanus* – minimum test size 100 mm
- EVSUDA shall seek to develop an appropriate measuring device that divers shall be required to have on board their fishing vessel by mid 2005.
- Divers to select urchin that are likely to produce roe of high quality and yield, so as to obtain the greatest benefit from urchins harvested.
- Processing on board will assist in ensuring that urchins of high quality and yield are being selected and utilization of the resource is being maximized.

DEH recognizes the contribution that EVSUDA is making to the management of the fishery by producing a Code of Practice for sea urchin harvesters. DEH recommends that long term management arrangements are developed in consultation with, and with regard to the Code of Practice of EVSUDA.

Compliance and enforcement is carried out by the Department of Primary Industries, Victoria. Fisheries Officers are employed to ensure compliance with fishing regulations. The submission detailed enforcement, fines and penalties, education, and offence-reporting systems used by the Department to protect Victorian fisheries. DEH considers that these compliance measures contain the means of enforcing critical aspects of the management arrangements for the fishery.

The commercial catch in the Sea Urchin Fishery is monitored annually and produced in Fisheries Victoria’s annual *Commercial Fish Production Information Bulletin*. Any noticeable increase or decrease in total catch across the fishery triggers an informal review of management measures in consultation with industry. Under sections 67 and 152 of the *Fisheries Act 1995*, Victorian fisheries can be closed quickly on a spatial, temporal or gear-specific basis by ‘Fisheries Notice’.

Given the scale and developmental nature of the fishery, performance measures are currently restricted to reference points for the two areas of commercial harvest using information gained from a study on density, size-structure and roe quality of sea urchins (Worthington & Blount, 2003). The findings from that study suggested annual catches of 1 to 5% of biomass of both urchin species should be sustainable. After consultation with industry, Fisheries Victoria has decided to implement a 5% reference point for both species (Table 3), recognizing the developmental nature of the fishery and the opportunity for industry growth.

Table 3: Reference points as estimates of total biomass (tonnes)^A

Area		Area Code 11	Area Code 24
<i>H. erythrogramma</i> (White urchin)	Total biomass	4,800 ^B + 4,300 ^C	1,500
	5% reference	240 ^B + 215 ^C	75
<i>C. rodgersii</i> (Black urchin)	Total biomass	Not estimated	3,300
	5% reference		165

^A biomass estimates for reference points assume that the estimates of total biomass made by Blount and Worthington (2003) are close to unexploited levels.

^B biomass on reef with macroalgae, including Portarlington

^C biomass on bare reef

DEH considers that this reference point should 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 species to localised and serial depletion.

While preliminary reference points are in place for harvesting of the target species, there are currently no other fishery specific performance measures or indicators in place. Fisheries Victoria have acknowledged the importance of the potential ecosystem role of urchins by developing a new research project that will examine the relationships between abalone, urchins and other ecosystem components. Given the likelihood that urchin populations play a role as key habitat modifiers and may affect abundance of macroalgae and other organisms that rely upon algae, DEH considers that the monitoring of ecosystem impacts should be formally built into the fishery's management arrangements through the development of a fishery-specific objective, supported by preliminary performance indicators and performance measures, on the impacts of urchin fishing on the broader ecosystem. The outcomes from current or planned research and monitoring programs could be used to inform these performance measures and respond appropriately to any significant changes detected.

Recommendation 2: *Within 18 months Fisheries Victoria to develop a fishery specific objective linked to performance indicators and performance measures for impacts on the ecosystem.*

Performance measures (which may include review events and reference points) 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 reference point.

Recommendation 3: *Fisheries Victoria to monitor the status of the target species and ecosystem of the fishery in relation to the reference points. Within three months of becoming aware of a reference point being triggered Fisheries Victoria to finalise a clear timetable for the implementation of appropriate management responses.*

The fishery currently consists of 14 harvesters in two different areas (many of whom also hold abalone harvesting permits). Permit holders operating in the fishery are required to submit harvest data to Fisheries Victoria. There is no fishery-specific ongoing independent monitoring of the Victorian Sea Urchin Fishery that quantifies catches, although fishery-independent abundance estimates of urchins are carried out annually.

Fisheries Victoria has indicated that they will investigate potential options to improve spatial management in the fishery, and investigate the feasibility of a pilot project with dual endorsed abalone-urchin divers in Port Phillip Bay and the eastern part of Victoria to gain fishery dependent information at finer spatial scales. Discussion of the information collection system for the fishery 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.

It is unlikely that harvesting sea urchins in Victoria would have a significant impact on sea urchin populations in other jurisdictions due to their limited dispersal ability. Harvesting is limited to two areas in Victorian coastal waters as described in 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 Fisheries Victoria will also ensure compliance with any future plans or policies as they are developed.

No regional or international management regimes, to which Australia is a party, are of direct relevance to the fishery. The prime international regime affecting the fishery is the United Nations Convention on the Law of the Sea. 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 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.

Conclusion

DEH considers that the Victoria Sea Urchin Fishery management regime is documented and is developed through a process suitable to the current developmental 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 the means of enforcing critical aspects of the management arrangements. The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements. DEH considers that there is scope to further refine the management arrangements and has provided a number of recommendations for improvements in the longer term.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

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

Maintain ecologically viable stocks

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

Information requirements

Fishery dependent data is obtained through compulsory logbooks. Sea urchin permit holders are required as a permit condition to submit accurate records once a month to Fisheries Victoria. Information collected includes boat identification, date of collection, time of fishing, area of fishing (including area code, port code and reef code), number of divers, water depth, water temperature and catch data (number of individuals, whole weight and weight of roe). There is currently no validation of commercial catch data.

As part of its annual fishery-independent surveys of abalone communities, PIRVic (Primary Industries Research Victoria) provides quantitative estimates of sea urchin abundance at 190 fixed monitoring sites on rocky reefs along the Victorian coastline.

Another project, the “Victorian Marine National Parks and Sanctuaries Intertidal and Subtidal Reef Monitoring Program” provides additional information on urchin abundance and monitors changes in reef communities. The subtidal reef monitoring program includes comparison of flora and fauna inside and outside 13 marine national parks and marine sanctuaries, whilst the intertidal program includes sites inside and outside eight marine national parks and sanctuaries (most of which are restricted to the central Victorian coast). Both monitoring programs use visual census techniques along transects 10’s to 100’s of metres long.

A new research project by PIRVic, to begin in July 2006, will carry out surveys measuring interactions among abalone and other ecosystem components (including urchins) at a fine scale (2 metre x 2 metre quadrats placed randomly on individual reefs within each of the major fishery regions). For comparison of species interactions, sampling will also be conducted in marine parks. DEH considers that this information will be extremely useful in assisting with understanding the ecological role of sea urchins and in developing management arrangements for the sea urchin fishery.

A recent study collected information on density, biomass and roe quality of sea urchins in Port Phillip Bay and eastern Victoria (Worthington & Blount, 2003). Information collected included density of each species based on surveying fixed sites in each region and combining with existing information to derive biomass estimates for each commercial species in eastern Victoria and the one species (*H. erythrogramma*) found in Port Phillip Bay.

Fisheries Victoria has indicated that they will investigate potential options to improve spatial management in the fishery, in recognition of the risk of serial depletion of sea urchins. Fisheries Victoria will investigate the feasibility of a pilot project to gain fishery dependent data at finer spatial scales in Port Phillip Bay and the eastern part of Victoria.

Although some information is now available on distribution and abundance of target species of the Victorian Sea Urchin Fishery, available studies do not validate catch rates in the fishery. 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 Fisheries Victoria develop and implement a system to validate commercial logbook data.

Recommendation 4: *Fisheries Victoria to develop and implement a robust system to validate commercial logbook reporting of catch and effort in the fishery within 2 years.*

Assessment

A variety of previous studies and current/future projects provide information on abundance, safe harvest levels and roe quality of sea urchins in Victorian coastal waters. DEH encourages Fisheries Victoria to pursue methods to continue to obtain reliable estimates of stock abundance in the near future in order to set and monitor catch effectively.

In the independent study of sea urchin density, biomass and roe quality by Worthington & Blount (2003), the biomass of *C. rodgersii* was estimated to be 3,300 tonnes in eastern Victoria. *C. rodgersii* is not harvested in Port Phillip Bay. The biomass of *H. erythrogramma* in Port Phillip Bay was estimated to be 9,100 tonnes, including 4,800 tonnes on reef with macro-algae and an additional 4,300 tonnes on bare reef. In eastern Victoria, *H. erythrogramma* biomass is estimated at 1,500 tonnes.

The study by Worthington & Blount (2003) suggested safe levels of harvest in Victoria of 1 to 5% of virgin biomass for *H. erythrogramma* and *C. rodgersii*. Fisheries Victoria has determined that 5% of the above biomass estimates will be the proposed reference points for each species found in each area (see Table 3, Executive Summary). In the context of these estimates, and given the 2003/04 estimates of commercial catch (20 tonnes for *C. rodgersii* and 37 tonnes for *H. erythrogramma*) the Victorian sea urchin fishery is currently underexploited.

Studies have shown that *H. erythrogramma* larvae have a limited ability to disperse, with fertilization success relying on males and females being in close proximity to each other. This trait limits recruitment and replenishment of depleted stocks from another location. For this reason *H. erythrogramma*, in particular, should be managed on small spatial scales and reference points developed for each fishing ground.

Fisheries Victoria have proposed measures to overcome these issues. Firstly (as discussed above), to investigate the feasibility of a pilot project to collect fishery dependent data on urchin collection at finer spatial scales. Secondly, a PIRVic research project set to commence in July 2006 will study the relationships between abalone, urchins and other ecosystem components within marine reserves and in areas fished commercially, as discussed above.

DEH is concerned that no formal management strategies are currently in place to address the key gaps in the knowledge of sea urchin biology and ecology or to ensure that the current level of take is sustainable. However Fisheries Victoria appears to be keen to ameliorate this problem. In addition, too little is known about how harvesting sea urchins affects the wider ecological community and population dynamics, particularly of other important fisheries species. DEH considers that the new PIRVic project described above will be instrumental in addressing these knowledge gaps. Strategies to further improve the understanding of sea urchin ecology, including the development of a research program to establish stock estimates for sea urchins would be valuable.

Recommendation 5: *Fisheries Victoria to continue to develop and implement research strategies to address key gaps in the knowledge of sea urchin biology and ecology, and of the effects of harvesting sea urchins on the wider ecological community. Should new information lead to the realisation that current take is unsustainable, or is having harmful effects on the target species or on the wider ecological community, Fisheries Victoria should implement strategies to address these issues.*

The recreational and indigenous take of sea urchins in Victoria is currently unknown. There are no size limits set for any species of sea urchin. The bag limit for recreational take of urchins is 20 specimens (prescribed by *Fisheries Regulations 1998*) and there is a prohibition on the removal of roe or soft tissues before being brought ashore. 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. Although the National Recreational and Indigenous Fishery Survey (Henry & Lyle, 2003) did not report any urchin catch specific to Victorian recreational fishers, 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. DEH is concerned that this take is not currently being taken into account in management of the fishery and believes that take from all sectors should be considered in relevant aspects of the management of the fishery.

Recommendation 6: *Within 18 months, Fisheries Victoria to develop a process to improve estimates of recreational and Indigenous take and factor these into management arrangements.*

Management response

The current management regime of the fishery aims to maintain ecologically viable stock levels through the input controls and reference points outlined in Table 1 and Part I of this report.

Because the fishery has developed relatively recently and is considered not to be a high value fishery, research into the distribution and spatial structure of the stock has not been extensive. Until recently, the level of harvest in the fishery was contained by limiting the numbers of entitlements and restricting the level of take through input controls. Fisheries Victoria has now implemented a 5% of biomass reference point for both species of urchin in the areas fished. While voluntary size limits are in place for the fishery in eastern Victoria as part of EVSUDA's Code of Practice, not all fishers belong to EVSUDA, and it would be valuable in the future for size limits to be incorporated by Fisheries Victoria into formal management arrangements for the fishery.

As outlined above, the low dispersal capabilities of sea urchin populations, combined with fishing effort, may lead to localised depletion. The nature of hand-collection intuitively leads to serial harvesting in confined areas as divers are restricted by distance they travel from their vessel. The population dynamics of sea urchins being density-dependent spawners and the limited scale of catch and effort data currently available add further to the danger of sea urchin stocks being locally depleted and potentially not recovering. DEH considers that the risk of localised and serial depletion of the target stock and on the wider ecosystem has not as yet been adequately addressed in management arrangements. Fisheries Victoria has proposed to increase fine scale information through fishery dependent data collection to reduce the risk of serial depletion of urchin stocks. DEH considers that this would be an appropriate step forward for the fishery, and encourages Fisheries Victoria to pursue the proposal, and to closely monitor the status of local stocks and develop further measures as required to prevent significant localised stock impacts.

Recommendation 7: *Within 2 years Fisheries Victoria to develop and implement finer scale data collection and reporting and management measures to mitigate the risk of localised and serial depletion of sea urchins in the fishery.*

No byproduct is permitted to be taken in the Victorian Sea Urchin Fishery, 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.

Conclusion

DEH considers that the management regime in the Victorian Sea Urchin Fishery is appropriately precautionary at the current scale of fishing and provides for the fishery to be conducted in a manner that does not lead to over-fishing. 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 in a developmental stage with a small number of operators, relatively low level of harvest and is of relatively low value. Through the implementation of the recommendations within this report, DEH believes that Fisheries Victoria will be adequately prepared to implement a recovery strategy should sea urchin stocks fall below reference points. The implementation of **Recommendation 3** should assist with meeting this objective.

Conclusion

DEH considers that the Victorian urchin stock is not below a defined reference point but should that occur in the future, the fishery is conducted such that there is a high degree of probability the stock would recover 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 as minimal bycatch is taken, due to the highly selective fishing techniques employed by fishers. The limited scale of the fishery within a large area and the small number of operators also helps to avoid bycatch. 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 Fisheries Victoria 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’*

Currently, there is no information collected on the interaction between commercial sea urchin harvesting and endangered, threatened and protected species. DEH considers that the current small number of fishing vessels, low number of divers and target specific harvesting methods are likely to have a low impact on endangered, threatened and protected species. As fishing effort to date has been minimal, benthic damage and interaction is considered to have been minimal. No threatened ecological communities have been identified as occurring in the area of the fishery.

Conclusion

DEH notes that there are negligible interactions with protected species in this fishery and considers that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species. 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 is not regularly collected for the fishery, however Fisheries Victoria’s submission suggests that current and future research programs will help to remedy the current scarcity of information on the subject.

The existing research program that has great potential to identify the ecological effects of removing sea urchins is the “Victorian Marine National Parks and Sanctuaries Intertidal and Subtidal Reef Monitoring Program”. This program was established by Parks Victoria and the Marine Strategy Unit of the Victorian Department of Environment and Sustainability, and has begun to accumulate baseline data to provide information on the ecology of Victorian reefs. The program monitors survey sites inside and outside of marine national parks and marine sanctuaries in subtidal and intertidal reef areas. DEH recommends that data from this program be collected and analysed in such a way as to identify any changes to reef communities that may be the result of harvesting sea urchins. Similarly, the new PIRVic research project described previously, identifying interactions

among abalone and other ecosystem components (including urchins) on a smaller scale to the existing project, will provide valuable data on urchins and their ecosystems.

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, and implementation of **Recommendation 3** will require data to produce and support objective and performance measures for impacts on ecosystems.

Assessment

Sea urchins can play an important role in the ecology of reefs. Increases and decreases in sea urchin populations may have enormous consequences for the diversity and abundance 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 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 harvesters. Implementation of **Recommendation 5** should also take into account effects of sea urchin harvesting on the wider marine ecosystem to assist in addressing this issue.

Due to the fishing methods employed in the fishery direct impacts to habitats are considered to currently be minimal. However, changes in the abundance of sea urchins may have significant consequences for the diversity and abundance of algae, fish and other organisms found on reefs. As is evidenced by the occurrence of urchin barrens in areas where their populations are large, the species can play a major role in determining the structure of benthic communities.

If large numbers of urchins are removed without allowing sufficient stock recovery, there is likely to be an increase in the amount of macroalgal cover, which could increase the abundance of species that compete with sea urchins, 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.

As fishing effort increases, impact from anchor damage and engine emissions in popular areas will need to be taken into consideration. Presently, fishing usually takes place using small, boat-based, hookah diving operations. Given the small number of operators in the fishery impact is likely to be negligible. EVSUDA's draft Code of Practice (EVSUDA, 2003) includes actions to avoid such environmental impacts including:

- waste management to include the return to shore of all rubbish and other goods taken out on the fishing vessel;
 - re-fuelling and oil changes to be carried out on shore to prevent spills;
- and actions related to monitoring and reporting including:
- reporting of any noticeable change in marine ecology eg. marine pests, species population changes to the local DPI office.

Management response

Due to the current level of effort in the fishery, impacts to the wider marine ecosystem are expected to be low. DEH is concerned about the potential impact of localised and serial depletion of urchins on the ecosystem given there is currently limited monitoring of fine-scale sea urchin abundance or changes to the ecosystem, although measures to amend this situation have been suggested by Fisheries Victoria. DEH considers that the implementation of **Recommendation 7** will mitigate this risk.

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

EPBC Act	Environment Protection and Biodiversity Conservation Act
EVSUDA	Eastern Victorian Sea Urchin Diver's Association Inc
DEH	Department of Environment and Heritage
WTO	Wildlife Trade Operation
PIRVic	Primary Industries Research Victoria