



**Australian Government**

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**Department of the Environment and Heritage**

Assessment of the  
**Victorian Giant Crab Fishery**

**March 2004**

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This document is an assessment carried out by the Department of 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 Giant Crab Fishery**

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## EXECUTIVE SUMMARY

### Background

The Victorian Department of Primary Industries (DPI) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Assessment of the Victorian Giant Crab Fishery against Commonwealth Guidelines for the Ecologically Sustainable Management of Fisheries: a submission to Environment Australia* (the Submission) was received by the Department of the Environment and Heritage<sup>1</sup> (DEH) in June 2003 after a period of discussion between DPI and DEH, during which a preliminary draft was refined. The Submission was released for a thirty-day public comment period that expired on 18 July 2003. One public comment submission was received and DPI provided a response to the issues raised. No changes were made to the Submission as a result of public comment.

The Submission reports on the Victorian Giant Crab (VGC) Fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission and associated documents, public comment and DPI's response to the comments.

**Table 1: Summary of the Victorian Giant Crab Fishery**

<b>Area</b>	State and Commonwealth waters on the continental slope and shelf off Victoria to depths of 400m.
<b>Fishery status</b>	Western Zone: uncertain but believed to be fully fished. Eastern Zone: close to the natural unfished state.
<b>Target Species</b>	Giant (or king) crab <i>Pseudocarcinus gigas</i>
<b>By-product Species</b>	Southern rock lobster ( <i>Jasus edwardsii</i> ), Octopus ( <i>Octopus maorum</i> ) and small quantities of scalefish, other crab species and potentially shark. Restrictions apply to some species.
<b>Gear</b>	Rock lobster pots – restrictions on design and use apply.
<b>Season</b>	16 November to 31 May (females) / 31 August (males)
<b>Commercial harvest 2001-02</b>	10t of giant crabs
<b>Value of commercial harvest 2001-02</b>	\$316,000
<b>Recreational harvest</b>	No recreational harvest.
<b>Commercial licences issued 2003</b>	42 (Western Zone), 1 developmental permit (Eastern Zone)
<b>Management arrangements</b>	Zonal management, limited entry licensing, Individual Transferable Quota (ITQ) system with a total allowable catch (TAC) for the Western Zone, legal minimum size (150mm), temporal closures and gear use restrictions.
<b>Export</b>	Substantial export of live product to Asian markets.
<b>Bycatch</b>	Giant crabs (undersize, egg-carrying, damaged), southern rock lobsters and small quantities of scalefish, shark and other invertebrates.
<b>Interaction with Threatened Species</b>	Potentially whales, dolphins, seals/sea lions and leatherback turtles but no significant interactions recorded.

<sup>1</sup> The Department of the Environment and Heritage was formerly named Environment Australia

The area of the fishery includes waters on the continental shelf and the continental slope to depths of over 400m. While giant crabs are occasionally taken from State waters in more shallow waters, the species is mainly targeted in Commonwealth waters (managed under Victorian jurisdiction) in depths greater than 50m.

The fishery targets giant crabs (*Pseudocarcinus gigas*). The major by-product species is southern rock lobster (*Jasus edwardsii*) that may only be retained and landed by rock lobster quota holders in accordance with rock lobster quota entitlements and fishing regulations. There are no limits on the quantities of octopus (the other main by-product species) or the main scalefish and sharks taken as by-product.

The giant crab is endemic to the waters of southern Australia, extending from Perth in Western Australia to Victoria and the waters surrounding Tasmania. Studies using allozyme and DNA techniques have indicated a genetically homogenous stock structure that shows variable depth distribution based on sex and size (Levings *et al.* 2001). While they are found on a variety of substrates from depths as shallow as 18m to over 400m, they are most abundant in water depths of 150-350m. Giant crabs are a slow growing, long-lived carnivorous species, which feed on a variety of other slow moving or sedentary species. Female giant crabs are highly fecund and reach sexual maturity at 125mm carapace length. It takes 7 and 4-5 years for females and males, respectively, to reach the legal minimum carapace length of 150mm.

In 2000-01, 20 tonnes of giant crab were harvested in the VGC Fishery, at an estimated value of \$0.57 million. In the following year, the catch was 10 tonnes, valued at \$0.32 million (DPI 2003). Most of the catch is held alive by processors prior to live export to Asian markets.

Victoria's giant crab fishery is a small fishery that has only recently been managed in its own right, separate from the rock lobster fishery with which it is closely linked in terms of its history and current management arrangements. For decades, giant crabs were caught by rock lobster fishers mainly off western Victoria. Under open access the fishery off western Victoria developed rapidly during the early 1990s with the annual catch peaking at 220 tonnes in 1992-93 when limited entry management was introduced. Jurisdiction passed from the Commonwealth to Victoria under an Offshore Constitutional Settlement agreement in 1997.

Sustainability concerns resulting from a significant decline in catch rates during the 1990s led Victoria to introduce output controls for the Western Zone in 2001. The Western Zone fishery is managed as a developed limited entry fishery in which fewer than five vessels targeting giant crabs account for most of the catch while the majority target rock lobsters and take giant crabs as byproduct. In June 2002, entitlements for 2,990 'giant crab pots' were available across the fishery but fewer than 500 were in active use. There has been no targeted giant crab fishing in the Eastern Zone in the past, with giant crabs being taken as byproduct by a few rock lobster fishers. This may change as one developing fishery permit has recently been issued for the Eastern Zone fishery.

The VGC Fishery is managed under the *Giant Crab Fishery Management Plan 2003* (GCFMP), the *Fisheries Act 1995*, the *Fisheries Regulations 1998* and other regulations and licensing conditions. These arrangements are administered by Fisheries Victoria, a division of the DPI. The management structure is discussed under Part I of this report. Specific management arrangements for the fishery are described and discussed under Part II.

Giant crabs are only harvested by the commercial fishing sector. There is no record of giant crabs being taken by the indigenous and recreational sectors, neither of which are legally able to use pots or any other gear capable of catching giant crab off Victoria. Within Victoria, giant crab may also be captured during rock lobster fishing operations, however a rock lobster operator must hold giant crab quota to be able to retain the product. Giant crab is also harvested in managed commercial fisheries in Tasmania, South Australia and Western Australia and is a by-product in the Southern and Eastern Shark and Scalefish Fishery.

Because of the duration, depths of fishing and pot construction, including escape gaps, the bycatch by rock lobster pots targeting giant crab is small. Bycatch comprises mainly non-legal (undersized, egg-bearing and out-of-season) giant crabs with small numbers of a variety of species of scalefish, sharks and invertebrates such as hermit crabs. There are no reports of protected fishes or invertebrates listed under Victorian or Commonwealth legislation being taken in crab or rock lobster pots. While the potential for entrapment and entanglement of seals, whales, dolphins and turtles in giant crab gear exists, the incidence is believed to be extremely rare. While there is limited information about ecosystem impacts, in particular the role of giant crabs in the ecosystem, given the small quantities of giant crab harvested in this fishery, DEH is satisfied that the fishery also poses limited risk to the general ecosystem. Bycatch, protected species interactions and ecosystem impacts are discussed under Part Two, Principle Two of this report.

### **Overall assessment**

The material submitted by the DPI demonstrates that the management arrangements for the fishery meet most of the requirements of the Australian Government *Guidelines for the ecologically sustainable management of fisheries*.

The fishery has been in a developmental stage and has made considerable progress in developing sound management arrangements. Of particular note is the establishment of an Individual Transferable Quota system, real time reporting and monitoring of fishing activity, temporal closures and data validation systems. The recently developed management plan is comprehensive and provides for the continued development of the fishery with sound goals, objectives and strategies. DEH also recognises the recent removal of significant numbers of pot entitlements, commitments in the management plan to implementing a bycatch and discard monitoring program with independent validation and the identification of information needs for the fishery.

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

- Inadequate information on critical elements of giant crab biology, including stock recruitment relationships;
- The absence of a robust stock assessment model and robust indicators of stock status;
- Confidence in the annual total allowable commercial catch level set for the fishery in the absence of robust indicators;
- Spatial contraction of the giant crab stock in the Western Zone; and
- Impact of trawling operations in the fishery area on the giant crab population and habitat.

Recommendations to address these issues have been developed to ensure that the risk of impact is minimized 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 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 has identified areas for future work to address existing knowledge gaps/areas for improvement and minimize environmental risks. The recent history of this developing fishery shows that DPI has reacted appropriately to threats to sustainability and DEH is confident that the DPI will continue to provide this high quality management.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. DEH is satisfied 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 DPI to contain the environmental risks in the long term. DEH is satisfied 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.

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.

A number of protected wildlife species occur in the fishery area, including marine turtles, seals, cetaceans and seabirds, however the fishery has minimal interaction with these species. DEH considers that the fishery is unlikely to have an unacceptable impact on protected species. DEH recommends that the management regime be accredited under Sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEH considers that the fishery to which the regime relates does not, or is not likely to, adversely affect the survival in nature of listed threatened species or population of that species, or the conservation status of a listed migratory species, cetaceans or listed marine species or a population of any of those species. DEH also considers that the management regime requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and the level of interaction under current fishing operations is low. On this basis, DEH is satisfied that an action taken by an individual fisher, acting in accordance with the management regime, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

## Recommendations

1. DPI to inform DEH of any future amendment to the Management Plan, related management documents or managerial commitments made in the submission.
2. DPI to ensure that the Compliance Strategy currently being developed includes clear management actions and the means of measuring the performance of the strategy on a defined and regular basis. DPI to also ensure that the following issues are specifically addressed in the development of the Compliance Strategy for the fishery:
  - Compliance with pot number restrictions and the total allowable catch
  - Compliance with prescribed size limits for giant crab
  - Potential for and management of illegal catch
  - Catch and effort data reliability (target species, bycatch and by-product data)
3. In conducting its assessment of the compliance of the VGC Fishery and its management arrangements with relevant government plans and policies, including threat abatement plans and strategies, recovery plans, bycatch policies and relevant international and regional regimes to which Australia is a party, DPI to ensure that a mechanism to require compliance with any future plans or policies is developed and included in the management regime.
4. Within 2 years, DPI to develop and implement an ongoing monitoring and assessment program to quantify bycatch and giant crab discards to ensure that changes in bycatch quantity and/or composition can be detected and monitored over time and to determine trends in giant crab discards for inclusion in stock assessments. Information is to be collected on an ongoing basis and independently validated.
5. Within 12 months, the Giant Crab Fishery Assessment Group to review the research information needs and priorities to support management in the areas of sustainable use of the giant crab stock and protection of the ecosystem. In particular, analysis of research needs in areas including, but not limited to, recruitment to the fishery, fishing mortality, habitat characterisation and ecosystem impacts should be considered. A research strategy to address identified priority areas will also be developed and will include clear and achievable timeframes for implementation.
6. Develop and implement, in conjunction with other relevant jurisdictions where possible, a robust stock assessment model that incorporates reliable information on stock recruitment relationships and is informed by independent information to facilitate the setting of an annual TAC and determination of the stock status.
7. DPI to seek and participate in a formal and regular dialogue with other Australian jurisdictions responsible for managing giant crab fisheries to ensure that research and management arrangements are complementary. All available information regarding removals of target and by-product species by other jurisdictions and sectors (including Commonwealth trawlers) is to be fully accounted for in stock assessments.
8. DPI to implement within twelve months a mandatory system for the reporting of all interactions with protected species. An education program for fishers on species recognition, interaction minimisation/mitigation measures and the importance of reporting is to be developed in conjunction with the reporting system.

9. DPI to conduct an ecological risk assessment focussed on interactions of the fishery with bycatch and protected species, ecological communities, deepwater habitats and the marine environment to confirm assumptions that the fishery poses minimal risk to these components. The risk assessment should also include assessment of the risk of ghost fishing by lost or discarded giant crab pots in the fishery. Performance measures, targets and responses for the ongoing management of high risk areas will also be developed.
  
10. DPI to collaborate with the Tasmanian Department of Primary Industries, Water and Environment and the Australian Fisheries Management Authority in any future research or data collection programs to assess the impact of harvest and incidental damage to giant crabs and their habitat by trawling activity in giant crab fishing grounds.

## **PART I - MANAGEMENT ARRANGEMENTS**

The Victorian Giant Crab (VGC) Fishery is managed by the Victorian Department of Primary Industries (DPI).

The management regime is described in the following publicly available documents:

- the *Giant Crab Fishery Management Plan 2003* (GCFMP);
- the *Fisheries Act 1995*;
- the *Fisheries Regulations 1998*; and
- relevant government gazettal notices, ministerial directions and quota orders.

A number of other published documents, including research reports and stock assessment reports are integral to the management of the fishery. For example, the results of extensive studies of the giant crab fishery and biology off Victoria are published in a report to the Fisheries Research and Development Corporation (FRDC) (Levings *et al.* 2001) and the status of the fishery is summarised in the Fisheries Co-Management Council's 2001-02 annual report. In addition, the DPI website outlines the giant crab fishery's assessment objectives and management measures and will, in future, include summaries of fishery assessment information, total allowable catch (TAC) reviews and management decisions.

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 our assessment and decisions stemming from it.

**Recommendation 1:** *DPI to inform DEH of any future amendment to the Management Plan, related management documents or managerial commitments made in the submission.*

Management arrangements for this fishery have developed rapidly, particularly during the past five years, leading to the move to quota management for the Western Zone in 2001. These arrangements have been developed through a range of mandated regulatory and consultative processes. Giant crab and rock lobster industry input to proposed regulations, ministerial directions and quota orders has been made through the Fisheries Co-Management Council (the Council), consultation with the peak industry body Seafood Industry Victoria and directly with industry. The Council comprises an independent chair and nine members who, collectively, have knowledge and expertise relating to fisheries management, commercial fishing, fish processing, fish marketing, recreational fishing, indigenous fishing, aquaculture, conservation and fisheries science. The Council's role includes overseeing the preparation of fisheries management plans and providing advice and recommendations to the Minister in relation to fisheries policy and management.

The Commercial Rock Lobster and Giant Crab Fishery Committee (the Fishery Committee) is responsible for advising the Council on the preparation of the GCFMP and other issues related to management of the fishery. It comprises an independent chair, a DPI member, a conservation member and two industry members each from the Eastern and Western zones. Like the Council it is expertise based.

In addition, a special Rock Lobster and Giant Crab Management Plan Steering Committee with an independent chair was set up to assist the Council with the development of the GCFMP and extensive consultation on its development followed. A TAC Forum has also

been established to provide stakeholders with an opportunity to be involved with the TAC setting and review process. The Forum has an independent chair and comprises members of the Fishery Committee, peak bodies and DPI.

In general, the VGC Fishery management arrangements are constituted in such a way as to ensure that a range of expertise and community interests are involved in individual fishery management committees and stock assessment processes. However, while broad based community input and involvement is noted in many areas, there is no apparent direct involvement of general (ie non-aligned) community interests in management structures. Stakeholder involvement appears to be limited to industry, peak bodies, research and management interests. DEH believes that there should be demonstrated involvement of general community interests in management committees and in stock assessment processes. DEH suggests that the composition of key management structures, in particular the Rock Lobster and Giant Crab Fishery Committee, should be amended or redefined to provide for the inclusion of general community interests. Greater efforts should also be made to increase general community involvement in stock assessment, TAC review and research priority setting processes.

The strategic nature of the management arrangements is demonstrated in the Submission and the GCFMP, which set out comprehensively the management goals, objectives and strategies for the fishery in all areas of concern under the Guidelines. The management goals and objectives are consistent with the *Fisheries Act 1995*, the EPBC Act and the Guidelines with major emphasis placed on the health and integrity of the giant crab stock and associated marine ecosystem. DEH considers that these goals and objectives are appropriate as the basis for managing the fishery.

The management arrangements include performance measures, triggers and management responses in relation to the goal of rebuilding the giant crab biomass off western Victoria. The Submission indicates that the performance of the fishery and the effectiveness of the management arrangements are “discussed broadly” at annual stock assessment workshops and that these matters will be considered further by the proposed TAC Forum. An assessment of the effectiveness of these measures is included in Part Two of this report.

Zonal management is a critical component of the management regime. The fishery is divided into two zones - the developed limited entry commercial fishery in the Western Zone and the developing fishery in the Eastern Zone. In addition to zonal management, the management regime is also based on a mixture of input and output controls. These controls, which are discussed in detail under Part One, Principle 1 of this report, include:

- Quota management system (QMS) using individual transferable quota (ITQ) and a TAC (Western Zone only);
- Real time pre- and post-landing reporting via an Integrated Voice Response telephone system (Western Zone only);
- Catch disposal records at the time and point of landing (Western Zone only);
- Minimum giant crab size limit (150mm);
- Limited entry (maximum of 42 Giant Crab Fishery Access Licences (GCFAL));
- Gear restrictions;
- Seasonal closures; and
- Prohibition on the harvest of berried females.

The critical aspects of these management arrangements are underpinned by compliance activities comprising enforcement, education and liaison with industry. Key features of the enforcement arrangements are the QMS and the recently expanded numbers of coastal-based Fisheries Officers in conjunction with the introduction of Marine Parks. The Submission states that the QMS has been operating since November 2001 and has wide industry support and that compliance rates are high. This situation is made easier as there are currently less than five active fishing operations targeting giant crabs in the Western Zone and one permit holder in the Eastern Zone. The QMS, associated legislation and other compliance arrangements are subject to regular internal DPI reviews.

DPI has commenced development of a Rock Lobster and Giant Crab Compliance Strategy, which is expected to be implemented by June 2004. DEH encourages the timely completion of the strategy and believes that the compliance strategy should focus particularly on a number of areas. Specifically, compliance risks with this fishery include effort data validation and non-compliance with the TAC, pot number restrictions, size limits and season closures. Poor compliance in these areas could negatively impact on stock assessment and stock status. There is also a need for the strategy to be reviewable and its performance measurable.

**Recommendation 2:** *DPI to ensure that the Compliance Strategy currently being developed includes clear management actions and the means of measuring the performance of the strategy on a defined and regular basis. DPI to also ensure that the following issues are specifically addressed in the development of the Compliance Strategy for the fishery:*

- *Compliance with pot number restrictions and the total allowable catch*
- *Compliance with prescribed size limits for giant crab*
- *Potential for and management of illegal catch*
- *Catch and effort data reliability (target species, bycatch and by-product data)*

The GCFMP is intended to provide the basis for managing the fishery for the next five years (i.e. to 2008). In addition to being reviewed comprehensively (starting in 2007), any significant changes necessitated in the current plan in the interim will be made by the Minister following public notification and formal consultation with stakeholder groups. Until now the fishery has been assessed annually since 2000 and fishery assessment information compiled and distributed. The condition of the fishery is reported in the Council's annual report, however this particular reporting has been of a general nature, lacking in detail.

The Submission indicates that in future annual reviewing of the performance of the management arrangements set out in the GCFMP will include:

- annual fishery assessment workshops conducted by Primary Industries Research Victoria (PIRVic) formerly the Marine and Freshwater Resources Institute (MAFRI) to provide essential inputs to performance reviews;
- monitoring of fishery management performance by an internal DPI Rock Lobster/Giant Crab Project Team (also responsible for coordinating implementation of the plan); and
- annual reviews of the implementation of the plan by the Fisheries Committee which reports to the Council.

The newly developed management plan and associated objectives and strategies should provide a sound basis for future performance reviews of the fishery. DEH is satisfied that a five year review of the management plan is suitable while critical aspects are reviewed annually through the stock assessment and implementation reviews.

Fishery-dependent data relating to the target species is collected on a regular basis in the fishery. Limited fishery independent information is also collected. In addition, explicit strategies in the GCFMP outline information gathering, assessment, interpretation and response steps which are proposed towards improving Victoria's capabilities in avoiding, remedying or mitigating impacts on the wider ecosystem. Discussion of the information collection system and future work, both proposed and required, can be found in Part Two of this report. A full 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 also contained Part Two of this report.

While committing to do so in future, the Submission indicates that there has not yet been an examination of the degree to which the VGC Fishery and management arrangements comply with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. It indicates DPI's intention to examine and where necessary amend the management arrangements to achieve compliance. Specific references are made to the need for consultation and collaboration with relevant State and Commonwealth government agencies. The results of a bycatch monitoring program, to commence in 2004, will be examined to indicate the need for and nature of a bycatch strategy.

DEH acknowledges the recent rapid development of this fishery and its management arrangements and the likelihood that they will be shown to comply with these plans and strategies. DEH welcomes DPI's commitment to undertake an assessment of the compliance of these arrangements. DEH considers that such an assessment should also ensure that the management regime includes a mechanism to require and ensure compliance with any future government plans or policies, including international or regional regimes to which Australia is a party.

**Recommendation 3:** *In conducting its assessment of the compliance of the VGC Fishery and its management arrangements with relevant government plans and policies, including threat abatement plans and strategies, recovery plans, bycatch policies and relevant international and regional regimes to which Australia is a party, DPI to ensure that a mechanism to require compliance with any future plans or policies is developed and included in the management regime.*

No regional or international management regimes, to which Australia is a party, are of direct relevance to the fishery. The prime international regime affecting the fishery is the United Nations Convention on the Law of the Sea (UNCLOS). The management regime essentially complies with this. Other international regimes are applicable to fisheries management but do not explicitly involve this fishery, for example the 1992 Convention on Biological Diversity and in particular the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the Submission, the fishery's compliance with their requirements can be assessed by examination of Part Two of this report. The application of the International Convention for the Prevention of Pollution from Ships (MARPOL) to vessels operating in the fishery is explicitly discussed under Principle 2, Objective 3.

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

## **Conclusion**

DEH is satisfied that the VGC fishery management regime is documented, publicly available and transparent, and is developed through a consultative process. The management arrangements are adaptable and underpinned by appropriate objectives and performance criteria by which the effectiveness of the management arrangements can be measured, enforced and reviewed.

The management arrangements are capable of controlling the harvest through a combination of input and output controls appropriate, to the size of the fishery. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements. The management regime also 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 refine the management arrangements in some of these areas 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 catch and effort returns (Giant Crab Daily Catch Records), daily telephone based reporting (before and after landing) of catches, and catch disposal records. The detailed written daily records include catch of giant crabs (numbers and weight), byproduct, fishing effort, location, depth and quota management details, entered on logbook sheets which all operators complete for each day fished and submit to the DPI each month. All three forms of reported data are validated randomly by DPI Fisheries Officers.

Given the reliance on fishery dependent data in the fishery, confidence in catch and effort data recorded by fishers and used in stock assessment is critical. Compliance with reporting requirements is therefore an important consideration for overall management of this fishery. Recognising that some data validation already exists, DEH has sought specific consideration of catch and effort data reliability in the development of a compliance strategy for the fishery (see **Recommendation 2**).

As part of an FRDC project conducted jointly between Victoria and Tasmania, onboard survey data are collected and used to standardise fishing effort. Commercial catch sampling has also been carried out at sea or at processors at different times since 1990 to determine the size composition of the catch plus biological condition details.

Because of the relatively small scale and value of the fishery, its operation in remote offshore waters and the high cost of research and surveys, MAFRI is establishing a voluntary at sea sampling program. Commercial operators will record size, sex and condition details for all giant crabs caught in a number of pots on each fishing trip. Considering the small number of specialised giant crab fishers, DEH considers that provided there is adequate instruction, liaison and feedback, such an arrangement should be capable of providing essential information satisfactorily.

Under current catch and effort reporting and the proposed voluntary sampling program there are no requirements for reporting the numbers of discarded undersized, damaged, out of season or berried crabs. Monitoring discards can provide valuable information for estimating fishing-induced mortality, effectiveness of escape gaps and trends in reproductive success and recruitment. Quantifying discards is also an important strategy towards minimising discard

mortality under the management objective of rebuilding the stock. DEH notes the proposal to develop a monitoring program for discards and bycatch. DEH considers this work essential for future management of the fishery. Similar monitoring needs are apparent for bycatch and thus included in the following recommendation. A full discussion of bycatch monitoring needs is under Principle Two.

**Recommendation 4:** *Within 2 years, DPI to develop and implement an ongoing monitoring and assessment program to quantify bycatch and giant crab discards to ensure that changes in bycatch quantity and/or composition can be detected and monitored over time and to determine trends in giant crab discards for inclusion in stock assessments. Information is to be collected on an ongoing basis and independently validated.*

Fishery independent data collection is limited. Apart from the use of pots there is no effective way of sampling the giant crab stock and the operation of these pots is a demanding and specialised task. Consequently, during the period since 1990 information on the stock has largely been obtained from giant crab potting undertaken from commercial giant crab fishing vessels. The independence of data collected on the distribution, abundance and characteristics of giant crabs has relied upon researchers working on these vessels. Onboard survey data and large scale tagging studies conducted during the 1990s are still being used in the assessment of the stock and fishery in terms of movement and growth and a joint Victorian/Tasmanian FRDC project has gathered further data (in particular, critical size composition data) for use in the development of a new reliable and cost-effective stock assessment model.

Significant work is being undertaken through a joint Victorian/Tasmanian FRDC funded project to improve understanding of recruitment relationships and develop a robust assessment model that will be applicable to other giant crab fisheries. DEH considers this work fundamental to the future management of the fishery and strongly encourages the timely completion of the project and uptake of its results.

The Submission includes an outline of monitoring and research priorities for the fishery featuring increased industry involvement in data collection, quantitative risk based assessments and reduction of the numbers of giant crabs which are discarded and damaged. The focus of the 5-year research plan is provision of information essential for implementing the Victorian Government's policies on ecologically sustainable development of fisheries.

The Submission indicates that a Giant Crab Fishery Assessment Group will be set up to guide future research priorities. DEH understands that a meeting has been scheduled in June 2004 for this group to meet. The assessment group should be in the best position to redefine these priorities based on its determination of those poorly understood areas of giant crab biology and ecology that most hinder assessment and management of the fishery.

DEH supports the commitment to annual reviews of implementation of the GCFMP by DPI and also by the Committee. DEH notes that information on critical elements of giant crab biology is inadequate and may impede further development of the fishery, especially in relation to the development of a robust stock assessment model. Recognising that a number of research needs have been identified in the submission and management plan, have been prioritised, and will be reviewed each year as part of the annual review of the GCFMP, DEH considers there is a need for a clear set of research priorities for the fishery.

**Recommendation 5:** *Within 12 months, the Giant Crab Fishery Assessment Group to review the research information needs and priorities to support management in the areas of sustainable use of the giant crab stock and protection of the ecosystem. In particular, analysis of research needs in areas including, but not limited to, recruitment to the fishery, fishing mortality, habitat characterisation and ecosystem impacts should be considered. A research strategy to address identified priority areas will also be developed and will include clear and achievable timeframes for implementation.*

Taking into account the recent emergence of this fishery as a State managed fishery and its recent separation from the rock lobster fishery, DEH is satisfied that the current information system is reliable, appropriate to the nature and scale of the fishery. Provided the recommendations above are addressed, DEH believes that the proposed monitoring and research program can meet the requirements of managing the fishery on a productive and sustainable basis.

### **Assessment**

Stock assessments against stated performance measures have been conducted annually since 2000. In view of the recent nature of the specifically targeted and managed giant crab fishery and the consequent lack of an adequate time series of fishery independent data, these assessments rely heavily on commercial fishery data.

Commercial catch and effort data have been collected on a fine spatial scale (10 minutes longitude by 1 degree latitude) since 1978 and provide the catch rates used as an index of stock abundance. Results of these assessments are incorporated into the Fisheries Co-Management Council's annual reports and are used to determine an annual TAC.

Following the boom period in the early 1990s and the subsequent introduction of a legal minimum length in 1993-94, the annual catch rate has stabilised and shown a recent increase. Until improved modelling capabilities are developed, the 25 tonne TAC has been set conservatively at 50% of the mean annual catch during the period 1990-2001 and an upward trend in annual catch rates has been set as the performance measure for the fishery.

In 2001-02 – the first year under the 25 tonne TAC – the reported catch was 10 tonnes, valued at \$349,000 (Anon., 2003). This is the lowest catch recorded during the 13-year period in which the VGC Fishery has been managed as a fishery in its own right. The Submission states that the decline in annual catch is the result of redirection of effort, low prices and responses to changed management of the fishery and not to stock decline. If so, continued low annual catches should have the beneficial effect of accelerating progress towards the management goal of rebuilding the stock and be reflected in the upward trend in annual catch rates. However, persistence of annual catches below the TAC under these circumstances will negate the use of the catch-to-TAC ratio as a secondary indicator of stock status if existing work on improving stock assessment does not yield more biologically based indicators.

According to the submission, there is evidence to suggest that a spatial contraction of the fishing grounds in the Western Zone has occurred as a result of fishing activity in the early years of the fishery. While the management regime, and in particular the TAC setting process, is conducted in a precautionary way in the absence of sound stock assessment, DEH believes that DPI should remain diligent in ensuring that further contraction of grounds is avoided. The development of a robust stock assessment model will provide greater confidence that fishing is being conducted at sustainable levels.

The development of a cost-effective long term monitoring program and risk based assessment model are high priority outcomes expected to flow from the current FRDC project which is scheduled for completion in early 2004. When applied to Victorian data, a model which uses fishery independent data provides estimates of yield-per-recruit and egg-per-recruit indicating that the current legal minimum length is conservative and should allow for future increases in yields.

DEH is satisfied that the current assessment approach has been adequate to enable the status of the fishery and stock to be followed during the development phase of the fishery and to develop and implement robust management controls. Noting (a) the absence of fishery independent data in the fishery, (b) uncertainties in the stock assessment process, (c) a reliance on CPUE data but a lack of effort validation, and (d) that there is no reliable indicator of stock abundance or recruitment; a robust stock assessment model is needed that takes into account inherent uncertainties and provides a reliable estimate of stock status. DEH is aware that work is underway with Tasmania on stock recruitment and abundance indices and believes that where possible this work should be included in future stock assessment work in the VGC Fishery. Provided the proposed outcomes of the current joint Victoria/Tasmania study are met and the States continue to work closely in their assessments DEH believes that the assessment framework set out in the Submission will prove capable of identifying any reduction in sustainability of the fishery and reproductive capacity of the stock.

**Recommendation 6:** *Develop and implement, in conjunction with other relevant jurisdictions where possible, a robust stock assessment model that incorporates reliable information on stock recruitment relationships and is informed by independent information to facilitate the setting of an annual TAC and determination of the stock status.*

Electrophoretic studies have been made of giant crabs from different localities across southern Australia and indicate genetic homogeneity across the whole species range (Levings et al., 2001). While dedicated research and assessments of the giant crabs have only occurred during the last decade or so, fine-scale catch by location and depth information has provided a good picture of the distribution and spatial structure off Victoria. This information has helped in the development of separate management regimes in the Western and Eastern zones. As outlined above, in the Western Zone the distribution of the majority of giant crabs has contracted away from the continental shelf to the shelf break and slope at depths of 150-270m. This knowledge, the recent move to quota, and provision for an additional fleet of pots for qualifying GCFAL holders has enabled a degree of separation of targeted giant crab fishing - with a small number of dedicated fleets of additional rock lobster pots permitted to be set at depths beyond 150m - from rock lobster and giant crab fishing in shallower waters on the continental shelf. The fishery in the Eastern Zone is managed under a permit system designed to provide information on the distribution and spatial structure of the giant crab stock there.

Dedicated giant crab fisheries are also operating in other jurisdictions. Ideally, management arrangements affecting a single stock should be under a single jurisdiction, or at least complementary across jurisdictions. DEH believes it would be beneficial, for both giant crab stocks and DPI governance, for DPI to be involved in cross-jurisdictional actions to address shared stock concerns. Furthermore, removals of the species in other jurisdictions should be factored into stock assessments in the VGC fishery.

The Submission and GCFMP refer to DPI's commitment to cooperative research and management for stocks shared with other jurisdictions. In keeping with this there is some discussion by management, research and industry in the southern states in relation to matters of mutual interest. As part of this there has been a trend towards closer collaboration and information sharing between Victoria, South Australia and Tasmania in the areas of research and assessment of the rock lobster and giant crab stocks and fisheries in each jurisdiction. Quota management arrangements in Tasmania and South Australia were taken into account in the establishment of Victoria's arrangements and relevant information relating to giant crab fisheries in other southern states is taken into account as part of Victoria's stock assessment process. However, there is no apparent attempt to achieve complementary management arrangements designed to effectively protect minimum biomass and egg production levels at the level of the whole Australian stock. In addition the uncertain influence of trawling activities in giant crab fishing grounds on the giant crab stock, directly through harvesting and indirectly through habitat impacts, is not factored into assessments. As a result there remains a risk that fishing in one jurisdiction could impact on that part of the stock and fishery in another. Victoria's assessment suggests that giant crabs are particularly vulnerable to overfishing, adding to DEH's concern about the lack of an integrated whole-of-stock focus on the assessment and management of giant crab fisheries.

**Recommendation 7:** *DPI to seek and participate in a formal and regular dialogue with other Australian jurisdictions responsible for managing giant crab fisheries to ensure that research and management arrangements are complementary. All available information regarding removals of target and by-product species by other jurisdictions and sectors (including Commonwealth trawlers) is to be fully accounted for in stock assessments.*

Potential removals from the giant crab population include direct harvest by this fishery, direct harvest and mortality from damage caused by trawling operations, harvest of the species by other giant crab fisheries and discarding of the species in this fishery. Due to the offshore, deepwater nature of the fishery, recreational and indigenous take of giant crabs is not significant.

Catch and effort information from the fishery are factored into the management and stock assessment and take account of all giant crab landings in the fishery. Giant crab discards are not factored into assessment and management, however a recommendation has been made to ensure that this occurs in the future (see **Recommendation 4**). Giant crab harvest by other jurisdictions, including as by-product from trawling operations, is not factored into stock assessments however; greater collaboration among jurisdictions will enable greater complementarity in future management and assessment to ensure that all removals can be taken into account (see **Recommendation 7**).

### **Management response**

The current VGC Fishery management regime aims to maintain ecologically viable stock levels through a range of input controls and, in the Western Zone, output controls. These measures were outlined in Table 1 and Part One of this report.

The primary management tool for controlling the level of take in the Western Zone fishery is the TAC system administered by the DPI. The TAC is currently set at 25 tonnes allocated as 500 quota units set at 50 kg each. A range of effective complementary input controls supports the TAC system. In the Eastern Zone, the use of input measures under a developing fishery permit system provides adequate scope for controlling the take.

Giant crabs are taken in rock lobster pots, additional fleets permitted for targeting giant crab (by GCFAL holders which have more than 3 tonne of quota) may only be set in depths greater than 150m. Rock lobster pots must not be larger than 150cm by 150cm wide and 120cm high, may have only one entrance and one chamber, must have an escape gap and in relation to giant crab fishing may be set with up to 20 pots on a single longline which is buoyed at at least one end. Rock lobster pots are usually hauled and reset daily while pots targeting crabs may be set for 2-4 day periods. A variety of fish are used for bait along with cattle hocks.

DEH notes the recent removal of significant numbers of giant crab pot entitlements from the fishery as an important management step taken to remove latent effort in the fishery. The entitlement to use 'giant crab pots' was removed from all 42 GCFALs and only those operators holding 60 or more quota units (currently equivalent to 3 tonnes) are now permitted to use additional rock lobster pots and then only while their quota holding is maintained. This reduced the potential use of pots from around 3000 to less than 200. DEH understands that there is currently only one GCFAL holder using 50 additional rock lobster pots to target giant crab in waters deeper than 150m deep.

Target and limit reference points are set for the fishery in the developed Western Zone fishery so as to trigger management responses. The annual catch rate limit reference point is set at 0.38 kg/24 hr potlift - that is the mean catch rate for the period 1998-99 to 2000-01. A reduction of the TAC will be triggered if the rate falls below 80% of this level and a review of the TAC will be triggered if the rate trends downwards in successive years. The target reference point is set at 50% of the mean catch rate between 1990-01 and 2000-01 (ie ~0.85 kg/24 hr potlift).

The submission states that when voluntary onboard size composition recording is implemented, changes in size composition will be used as a secondary performance indicator. The ratio of the annual catch to the TAC will also be used as a secondary indicator, with allowances made for factors other than changes in abundance (such as changes in markets or fishing practices). TAC reviews will take place following annual stock assessments, or in response to a management trigger, and will include consideration of the need for variations to input controls. If necessary, the *Fisheries Act* 1995 provides that urgently needed controls can be implemented by the use of Fisheries Notices, ministerial directions or changes to quota orders as appropriate. Fishery permits for the Eastern Zone can be altered or cancelled at any time.

DEH is confident that the combination of input and output controls, reference points and consequent management actions specified in the Submission are appropriate to ensure viable stock levels with acceptable levels of probability in the short term. The small number of specialist giant crab fishers and their high level of compliance with fishery dependent monitoring arrangements, as reported in the Submission, add confidence in the effectiveness of the management controls. However, the development of reliable stock indicators in addition to catch rates, underpinned by robust ongoing monitoring and assessments is a matter requiring urgent action and recommendations have been made to address these deficiencies.

The Submission states that the level of byproduct catch is very low because of the nature of rock lobster pots and the depths and manner in which they are used. All pots must be fitted with escape gaps and it is common for pots targeting crabs in deeper water to be set for 2-4 days at a time, hence it is possible for most of the few non-target individuals that enter the

pots to escape. Catch statistics show that while the mean annual catch of byproduct species (excluding rock lobster) by all rock lobster pots was 44 tonnes, the mean catch by pots targetting crabs was 80 kg. The mandatory daily catch records required to be completed include quantities of all byproduct by species. Byproduct data are reviewed as part of the annual giant crab stock assessment process.

The primary by-product species is octopus (*Octopus maorum*, *O. pallidus*) and the current level of take has been assessed as sustainable. Southern rock lobster is also taken as by-product due to the commonality of gear and fishing seasons and the overlap in fishing grounds, access licensing and quota holding between the giant crab and rock lobster fisheries. Lobsters retained by giant crab operators (who must hold lobster quota) are deducted from the lobster fishery TAC. Daily by-product limits of 8 wrasse and 2 banded morwong apply and abalone, jellyfish, scallops and sea urchins may not be taken.

EA is satisfied that fishing for giant crabs is conducted in a manner which poses no threat to by-product species.

### **Conclusion**

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

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. Trigger points and management responses are in place to avoid the risk of overfishing the giant crab stock off Victoria. As a result of the decline in stock abundance during the period of rapid growth of the fishery in the early 1990s, recent annual catch rates have been just above the limit reference point. A precautionary management strategy, aimed at rebuilding the stock abundance, is in place.

DEH is satisfied that the giant crab 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'*

### Information requirements

Bycatch information in the fishery is sparse and largely anecdotal. Bycatch levels are likely to be low due to the scale and nature of the fishery. The submission states the main species is likely to be octopus and discarded giant crabs. While octopus is generally retained as by-product some animals may be discarded. Some scalefish species may also be captured.

As most of the bycatch is released immediately alive, DPI has not required or made provision for reporting of bycatch on daily commercial catch records, hence most of its information is anecdotal. DEH has previously noted the lack of discard monitoring in the fishery and considers ongoing monitoring of bycatch and discards an important component in the future management of this fishery. The ability of the fishery to quantify bycatch will be an important consideration in the next assessment of this fishery in three years time.

DEH recognises that the management plan proposes a bycatch and discard monitoring project to be introduced in 2004. The project is to include independent data validation and is intended to provide inputs to annual stock assessments and to ecological risk assessments. DPI are yet to secure funds for this program despite it being considered a high priority by DPI. A recommendation requiring the development and implementation of this program to enable the detection and management of changes in bycatch and discard quantity and composition was made under Principle 1 (see **Recommendation 5**).

### Assessment

No assessment of the vulnerability of bycatch species to giant crab fishing operations has been conducted in the fishery. As with by-product, the numbers and variety of bycatch from targeted giant crab fishing are extremely small because of the small size of the fishery, the nature of the gear and its use, and the depth and substrate of fishing grounds.

Survival rate of released giant crabs and other invertebrates is believed to be high. However, while the numbers of scalefish released may be small, most may suffer lethal barotrauma resulting from ascent from great depths. The lack of specific bycatch data makes it difficult to confirm assumptions that risks to individual species and species groups are acceptable. Accordingly, DEH believes a risk assessment, based on the best available information, is required (see **Recommendation 9**). The required bycatch and discard monitoring project should provide adequate information to inform such a risk assessment. Furthermore, any risk to bycatch species can be expected to be reduced significantly as the result of improved escape gaps and reduced overall entitlements for additional fleets of pots.

### Management response

Some management measures are in place that serve to minimise bycatch in the fishery. The management regime requires that escape gaps of a prescribed size are fitted to all rock lobster pots. The escape gaps, while originally designed to minimise retention of undersized rock lobsters, which are rare in the waters over 150m deep where additional rock lobster pots are

permitted, allow undersize giant crab, other species of crab and other fish species to escape. A review of optimum escape gap sizes for targeting giant crab is to be conducted in 2005/06.

The recent removal of pot entitlements will also serve to reduce the potential impact of the fishery on bycatch by reducing the number of pots actively fishing. Pot numbers were reduced from approximately 3000 to less than 200, resulting in a significant reduction in latent effort in the fishery. Improvements in escape gaps could also be expected to reduce bycatch.

Future measures to manage bycatch in the fishery are outlined in the GCFMP. These measures include a review of seasonal closures, development of a code of conduct for discarding and a research program aimed at quantifying discards. Consideration is also being given to the development of a bycatch action plan.

As reported, the limited numbers and species range of bycatch is such that there is no apparent species or group that might be used as indicators of the impact of the fishery on the ecosystem in which it operates. While appearing unlikely, the proposed bycatch monitoring and resulting assessments may suggest such a species or group in the future. Until such a time, there is no framework of performance measurement, decision rules and management responses.

The recommended risk assessment (see **Recommendation 9**) should enable broadly defined performance measures and indicators for bycatch to be developed. For example, monitoring gross change in bycatch composition and quantity, linked to a specific measure of change, could be used as a trigger for management action. Recognising that current assumptions suggest low bycatch levels, large changes in the percentages can occur with small changes in bycatch. Individual fisher behaviour may also affect changes in bycatch. For these reasons gross measures of change would seem appropriate in the absence of data. Over time, and using data collected through the monitoring program, refinements could be made to bycatch performance measures.

DEH considers a focus on implementing bycatch monitoring and stock and ecological risk assessments, and acting to further reduce bycatch, are likely to ensure that the fishery continues to operate in a way that does not threaten bycatch species. These arrangements should be incorporated in a formal performance measurement and response framework.

## **Conclusion**

DEH is satisfied 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 that DPI would undertake appropriate actions to ensure that this fishery does not threaten bycatch species.

DEH considers that there is scope to further refine some of the existing information collection, assessment, performance measurement and management responses and has recommended improvements in the longer term.

## 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 information is routinely collected on protected species interaction in the VGC Fishery. The only information relating to interactions between the fishery and protected species is anecdotal and indicates that the occurrence of entanglement of species in ropes and entrapment in rock lobster pots targeting giant crab is extremely rare. There are no listed ecological communities in the fishery area.

DPI proposes to commence an ongoing fishery dependent program to monitor fishery interactions with protected wildlife, commencing in 2003-04. The Submission refers to the likelihood that this may entail a mandatory monthly wildlife interaction form to be included in new daily catch record books to be issued in 2004. Alternatively, DPI may conduct an anonymous survey of giant crab fishers. DEH believes that wildlife interaction reporting should be an ongoing part of the mandatory reporting requirements of the fishery, with an emphasis on clear instructions, illustrated species guides and timely reporting. DEH understands that all fishery independent research and onboard monitoring will also record protected species interactions.

**Recommendation 8:** *DPI to implement within twelve months a mandatory system for the reporting of all interactions with protected species. An education program for fishers on species recognition, interaction minimisation/mitigation measures and the importance of reporting is to be developed in conjunction with the reporting system.*

### Assessment

Apart from informal discussions with industry members at giant crab stock assessment workshops there has been no assessment of threatened species and wildlife interactions or the associated risks. The Submission proposes that the combination of the small number of crab pots used, the practice of longlining crab pots, the wide and remote offshore extent of fishing grounds and the absence of reported interactions add up to a very low risk.

There are no threatened marine fish, invertebrates, flora or communities listed under Victorian or Commonwealth legislation in the area of the VGC Fishery. Protected wildlife species occurring in the fishery area include seals/sea lions (mainly Australian fur seals *Arctocephalus pusillus doriferus*), whales and leatherback turtles *Dermochelys coriacea*), all of which may become entangled in pot ropes. Seals and seabirds also feed on discarded bait and bycatch. Seals are at risk of injury or drowning if they become wedged in pots while trying to remove bait, however the depth of fishing activity means that this risk is likely to be very low in the main area of the fishery. DEH notes however that seals may potentially be captured in pots during rock lobster fishing in the inshore areas of the fishery. Entanglement or ingestion of discarded rubbish can also injure seals, seabirds and other marine wildlife. No incidents resulting in injury or mortality of protected species linked to giant crab fishing have been reported.

While DPI believes that the likelihood that the fishery poses significant risk to protected species and bycatch species is low, there is little data to confirm this assumption. Noting that

a bycatch and discards monitoring program is to be implemented (**Recommendation 4**), and that **Recommendation 8** requires the ongoing collection of information on protected species interactions, information to enable an assessment of risks to these species groups will be available in the coming years. DEH considers that an ecological risk assessment designed to test assumptions of low risk will be possible and should be conducted using this information (see **Recommendation 9**).

### **Management response**

Interactions with protected species are indirectly managed through restrictions on the number of pots and pot lines permitted in the fishery. The small number of targeted giant crab fishing operations and the common practice of longlining pots also provide for some reduction in the risk of injury or death of protected species in the fishery.

Significant numbers of pot entitlements were removed from the fishery in 2003 to remove potential effort. While this action was not specifically designed for protected species interaction management, the effect will be a reduced likelihood of interaction due to reduction in the amount of gear available for interaction.

DEH understands that DPI proposes to aid the development of an industry code of practice to minimise wildlife and other ecological interactions of the fishery. The code will encourage fishers to set all crab pots in longlines and to shorten pot ropes to match water depth so as to minimise the exposure of wildlife to ropes near the surface and reduce the risk of entanglement. The Submission also refers to a workshop proposed for 2004-05, involving industry, fisheries officers, conservation groups and fisheries managers. While the focus will be reduction of wildlife interactions with the rock lobster fishery the results will be applied to the giant crab fishery where possible. Furthermore, the submission states that ecological risk assessment and development of robust environmental sustainability indicators is a high priority for the giant crab fishery in the context of a 5-year research plan.

The interaction of seals with rock lobster fishing gear is well documented and has been raised in the EPBC Act assessment of a number of rock lobster fisheries to date. Given the proximity of the inshore component of the VGCF to seal colonies and feeding areas, where giant crabs form a byproduct of rock lobster fishing, DEH considers the risk of interaction with seals is of greater concern than other protected species and may require specific management action. Noting that seal interaction is not an issue in the dedicated giant crab fishery in offshore waters, risk assessment and mitigation for seal interaction in inshore waters should be undertaken as part of Victoria's rock lobster fishery management regime.

### **Conclusion**

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

A recommendation has been developed to ensure that the risk of unacceptable impact on protected species is minimised in the longer term.

## Minimising ecological impacts of fishing operations

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

### Information requirements

Targeted giant crab fishing occurs on fine muddy substrates on the continental slope characterised by fragile bryzoan communities and knowledge of these habitats is limited.

DEH notes that there is no real data collected on the impact of the fishery on the marine environment generally. The only information on the impact of giant crab fishing on this ecosystem is scant and anecdotal. 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. The Submission and the GCFMP acknowledge the need for increased knowledge of the communities and interactions between giant crabs and other species and the impacts of fishing on the ecosystem. DEH recognises the identification of research needs in the GCFMP and the habitat and ecology related research priorities identified within the GCFMP (Appendix 5). **Recommendation 5** should enable ecosystem impact related research to be further identified and included in the research strategy.

### Assessment

As in most pot fisheries, the potential of the giant crab fishery to impact unacceptably and unsustainably on the environment generally is considered quite low. As a consequence, DPI has not conducted a risk assessment of these issues in this fishery.

The fishing gear generally is not regarded as posing a significant risk to the physical environment. The small number of pots used and the manner in which they are set and hauled (ie lifted, not dragged) is said to impact on an extremely small percentage of the bottom habitat and communities. This is likely to be true even acknowledging that – as pointed out in public comments on the Submission - crab fishing is not random but focused on certain depths and bottom features within the overall region covered by the fishery.

DEH notes that DPI has identified the need to conduct an ecological risk assessment and develop robust sustainability indicators for the fishery. In cases where it is impossible to obtain comprehensive information on which to base a decision, a risk assessment implemented in a precautionary way can provide a suitable decision making system and guide for future actions including management and information collection. As previously discussed, there is a need for risk assessment with respect to bycatch and protected species, as well as more general ecosystem impacts. Given the deepwater nature of the fishery and lack of knowledge of these habitats, there is also a need to consider impacts on deep water habitats.

Key inputs for the risk assessment will be the information resulting from the bycatch and discard monitoring program (**Recommendation 4**) and the protected species information collection program (**Recommendation 8**). These recommendations should enable the

collection of sound information to enable the ongoing monitoring of fishery impacts and allow confirmation of assumptions that risks to these ecosystem components are low. Once the risk assessment has been conducted DPI should be in a position to develop appropriately precautionary performance measures, targets and management responses for the ongoing management of any high risk species or ecosystem components. DEH considers completion of this work essential if the fishery is to demonstrate ecological sustainable management of ecosystem impacts in the future.

**Recommendation 9:** *DPI to conduct an ecological risk assessment focussed on interactions of the fishery with bycatch and protected species, ecological communities, deepwater habitats and the marine environment to confirm assumptions that the fishery poses minimal risk to these components. The risk assessment should also include assessment of the risk of ghost fishing by lost or discarded giant crab pots in the fishery. Performance measures, targets and responses for the ongoing management of high risk areas will also be developed.*

The GCFMP identifies ecological relationships within giant crab populations and with other species and their habitats as an area requiring investigation. A review of information on deepwater habitats and communities and a deepwater habitat assessment workshop are proposed for the next 2-3 years in conjunction with other states. Public comments on the Submission drew attention to the possibility that some targeted habitats may be particularly susceptible to damage by crab fishing and may be incapable of recovery in the face of continuing fishing. DEH agrees that these are matters that should be addressed as part of the risk assessment, research planning and priority setting and the proposed habitat assessment workshop.

One aspect that is not addressed in the submission is the extent of and risks posed by ghost fishing by lost crab traps. Arguments have been raised during other assessments of potting fisheries that a trap without bait will not attract other marine life, but it is equally argued that a lost trap may 're-bait' itself as animals become entrapped and die. Various measures have been proposed in the literature to address ghost fishing by crab traps, such as the use of galvanic timed releases or escape sections of the trap closed by cotton twine (Stevens, 1995). DEH argues that specific analysis of the risk of ghost fishing in the fishery should be incorporated into the ecological risk assessment discussed above.

Despite the lack of information the Submission suggests that the impacts of litter and discharges from giant crab fishing vessels and risks associated with using imported bait are likely to be small. The high degree of reliance on cattle hocks as crab bait suggests that risks associated with discarded packaging (including plastic strapping) are low compared to the rock lobster fishery which has a much larger reliance on packaged fish for bait.

The Submission refers in very general terms to the application of the International Convention for the Prevention of Pollution from Ships (MARPOL) to vessels operating in the fishery in relation to the disposal of wastes. It also refers to domestic controls on waste disposal and requirements for commercial vessels to meet standards of seaworthiness. DEH considers that the VGC Fishery complies with MARPOL requirements.

The submission recognises that while impacts of giant crab gear with the ecosystem are likely to be minimal, the most significant impact in the fishery area may be the physical disturbance to the bryozoan substrate caused by demersal trawlers from the Commonwealth South East Trawl Fishery (SETF), a component of the Southern and Eastern Shark and Scalefish Fishery.

The SETF has operated over much of the same region as the VGC Fishery for more than 20 years, towing nets with boards, wire cables and chain over the bottom, resulting in what is likely to have been extensive damage to giant crab habitat. DEH notes DPI's concerns about the impact of historical and continuing use of the fishery area by trawlers and the impacts that may have on giant crab habitat, as well as the potential for increasing damage to and harvest of the species. DEH notes that the issue is not confined to the VGC Fishery but is also a concern in the Tasmanian Giant Crab Fishery. The Tasmanian Department of Primary Industries, Water and Environment (DPIWE) and the Australian Fisheries Management Authority (AFMA) are attempting to resolve conflicts. Research has already commenced, and more is planned, to determine the extent of impact by trawling activities and to identify ways of minimising impacts on the marine environment. DPI should participate where possible in any future work in this area and incorporate measures as necessary to ensure that trawling impacts are taken into account in the management of fishery.

**Recommendation 10:** *DPI to collaborate with the Tasmanian Department of Primary Industries, Water and Environment and the Australian Fisheries Management Authority in any future research or data collection programs to assess the impact of harvest and incidental damage to giant crabs and their habitat by trawling activity in giant crab fishing grounds.*

### **Management response**

The annual stock assessment and TAC setting processes are the main current management actions that contribute to protecting the ecosystem from damage from fishing impacts. However, there are no specific management actions to avoid fishery impacts causing significant damage to the ecosystem. A number of actions are proposed and are generally accorded high priority. The Submission and the GCFMP recognise that, however small the impacts of giant crab fishing might be compared to rock lobster fishing and trawling, its impacts should be identified, quantified and where necessary addressed. Minimising the environmental impacts of fishing is prominent among the management goals, strategies and research priorities for the fishery. Information collection, development of industry codes of practice and conducting risk assessment and habitat assessment workshops are features of the programs proposed during the five years to 2008. DEH recognises and encourages DPI's proposal to undertake assessment of giant crab fishery impacts on the ecosystem jointly with other states, and including the SETF trawl sector and Victoria's rock lobster fishery.

The lack of any current environmental performance measurement, targets and response framework is of concern and a recommendation has been made to address this. DEH believes that through the implementation of a number of key recommendations the fishery will be in a better position to demonstrate specific management of ecosystem impacts at the next review of the fishery.

### **Conclusion**

DEH is satisfied that the fishery is conducted in a manner that minimises the impact of fishing operations on the ecosystem generally. DEH notes that should circumstances alter significantly in the fishery appropriate assessments and additional actions will be developed by DPI.

Recommendations have been developed to ensure that the risk of significant impact by the fishery on the marine environment generally is minimised in the longer term.

## REFERENCES

Levings, A, Mitchell, B D, McGarvey, R, Mathews, J, Laurenson, L, Austin, C, Heeron, T, Murphy, N, Miller, A, Roswell, M, and Jones, P 2001. Fisheries biology of the giant crab *Pseudocarcinus gigas*. FRDC Final Report 93/220 and 97/132, 390 pp.

## LIST OF ACRONYMS

AFMA	Australian Fisheries Management Authority
DEH	Department of the Environment and Heritage
DPI	Department of Primary Industries, Victoria
DPIWE	Department of Primary Industries, Water and Environment (Tasmania)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FRDC	Fisheries Research and Development Corporation
GCFAL	Giant Crab Fishery Access Licence
GCFMP	Giant Crab Fishery Management Plan
ITQ	Individual Transferable Quota
MAFRI	Marine and Freshwater Resources Institute
MARPOL	International Convention on Marine Pollution
PIRVic	Primary Industries Research Victoria
QMS	Quota Management System
SETF	South East Trawl Fishery
TAC	Total Allowable Catch
UNCLOS	United Nations Convention on the Law of the Sea
VGC	Victorian Giant Crab (Fishery)
WTO	Wildlife Trade Operation