



Australian Government

Department of the Environment and Heritage

Assessment of the
Tasmanian Giant Crab Fishery

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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 Tasmanian Giant Crab Fishery

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EXECUTIVE SUMMARY

Background

The Tasmanian Department of Primary Industries, Water and Environment (DPIWE) 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 *Assessing the Ecological Sustainability of the Tasmanian Giant Crab Fishery* (the submission) was received by the Australian Government Department of the Environment and Heritage (DEH) in December 2002. The submission was released for a thirty-day public comment period that expired on 31 January 2003. No public comments were received. A final submission was received in April 2003.

The submission reports on the Tasmanian Giant Crab Fishery against the Commonwealth *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission and associated documents.

Table 1: Summary of the Tasmanian Giant Crab Fishery

Area	Waters adjacent to the State of Tasmania (Commonwealth and State waters).
Fishery status	The target species is considered overfished.
Target Species	Giant crab (<i>Pseudocarcinus gigas</i>).
By-product Species	Not limited. Mainly finfish, octopus and southern rock lobster.
Gear	Traps (some modified rock lobster pot, some purpose-built steel traps). Includes escape gaps of prescribed dimensions.
Season	November-August (males) and November–April (females).
Commercial harvest 2001/02	98.2 tonnes of giant crabs.
Value of commercial harvest 2001	\$4 million in 2000-01.
Recreational harvest	Single record of recreational take.
Commercial licences issued	95 licences issued, only about 25 active fishers.
Management arrangements	Output controlled through a Total Allowable Commercial catch (currently 103.5 tonnes) and Individual Transferable Quotas. Quota season 1 March to end of following February. Input controlled through: <ul style="list-style-type: none"> • limited entry (fishers must also hold a rock lobster entitlement); • minimum and maximum size limits for both sexes; • prohibition on take of berried females; • limits on number, dimensions and structure of traps; • possession limits.
Export	Exported live primarily to Hong Kong and China.
Bycatch	Bycatch is low, consisting mostly of pink ling, hermit crab and antlered crab.
Interaction with Threatened Species	Considered low. Possible interactions with seals, cetaceans, seabirds, marine turtles.

The area of the fishery includes waters surrounding the state of Tasmania generally south of 39°12' and out to the outer edge of the Australian Exclusive Economic Zone. Part of the fishery area is in Commonwealth waters however the entire fishery is managed by Tasmania under an Offshore

Constitutional Settlement (OCS) between the Commonwealth Government and the Government of Tasmania.

The fishery targets giant crab (*Pseudocarcinus gigas*). There is no limit to the quantity or species that may be taken as byproduct by the fishery. Species currently retained by the fishery as byproduct are mainly finfish (pink ling), octopus and southern rock lobster. The take of octopus and southern rock lobster is assessed under the other relevant fishery submissions and therefore is not discussed significantly in this report.

The target species is endemic to the waters of southern Australia, extending from Perth in Western Australia to Victoria and the waters surrounding Tasmania. The species is harvested in several trap or pot fisheries throughout its distribution. The bulk of the harvest of giant crabs occurs at depth between 140 and 270m, although the depth range of the species is 18-400m (DPIWE 2002); it is very rarely found intertidally (Jones and Morgan 2002). Allozyme and DNA techniques have indicated a genetically homogenous stock structure that shows variable depth distribution based on sex and size (FRDC, 2002).

The species is slow growing and long-lived and may require strict management controls to ensure sustainability of harvest (Yearsley *et al* 1999; Kailoa *et al* 1993). Jones and Morgan (2002) suggest that giant crabs are not considered rare, but because they are a deepwater species they are found regularly on only offshore fishing operations. Along-shelf migrations into the current occur and are believed to be part of the species' reproductive strategy. Females are highly fecund, store sperm and usually spawn in years when they do not moult (FRDC, 2002). There is some evidence to suggest animal size decreases with depth (Gardner *et al* 2002).

Approximately 98 tonnes of giant crab were harvested in the Tasmanian Giant Crab Fishery in 2001-02, at an estimated value of A\$4 million. The fishery began in 1992, although giant crab had previously been taken as a bycatch in the rock lobster, shark and trawl fisheries. The fishery quickly expanded to a maximum take of 290 tonnes of giant crabs in 1994, with catch rates declining steadily for five years following this peak. The fishery was closed in 1998 to prevent a transfer of effort to the fishery during the introduction to the rock lobster fishery of an Individual Transferable Quota (ITQ) regime. Management measures since November 1999 have included the use of ITQs under a Total Allowable Commercial Catch (TACC) and controls over the gear that may be used. A recent stock assessment has revealed that a number of trigger limits have been exceeded and the giant crab stock is now considered growth overfished, i.e. more crabs are caught each year than recruit into the minimum legal size through growth.

Giant crabs are marketed alive in both domestic (mainly Melbourne and Sydney) and export markets. Although the species may reach 45cm carapace width (CW) and over 17.5 kg weight, market preferences mean it is commonly marketed at less than 20cm CW and less than 4kg (Yearsley *et al* 1999).

The fishery initially took giant crabs with modified rock lobster pots, but larger, heavier steel pots are being used in targeted giant crab fishing (Gardner *et al*, 2002). There are limits on the number, dimensions and structure of giant crab traps that can be deployed from each licensed vessel. Each trap must have one or two escape gaps of defined minimum dimensions. Fishery management arrangements include temporal closures, maximum and minimum size limits, and a prohibition on the take of berried females. In addition to gear limitations, there is limited entry to this fishery. Currently there are 95 licences.

Direct information on bycatch in the fishery is limited, but bycatch to target ratios in similar crustacean pot fisheries (notably rock lobster) are low. Some species that may be affected by this

fishery are currently listed protected species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Possible protected species interactions in this fishery include entanglement of marine turtles in pot lines and incidental capture of seals in pots, particularly those set in shallower waters. Interactions with cetaceans and seabirds may occur but do not appear to include mortality of these species. Limited evidence to date suggests that interaction with any protected species group is very low. These interactions are assessed under Principle Two of this report.

Take of giant crab by the indigenous and recreational sectors is not significant. Giant crab forms part of the bycatch of the Tasmanian Rock Lobster Fishery, where it is subject to a 5 tonne upper harvest limit in that fishery. Hence, take of 5 tonnes of giant crab in that fishery triggers a management response. Some species caught as byproduct and/or bycatch in the giant crab fishery, notably southern rock lobster, are targeted by these users and in other commercial fisheries.

The fishery is managed under the *Fisheries (Rock Lobster and Giant Crab) Rules 2001*, which obtains its authority from the Tasmanian *Living Marine Resources Management Act 1995*. The management plan is supported by the Giant Crab Fishery Policy Document of May 1999. A revised draft of this policy is due for release for public comment in 2003 and will cover both the giant crab and rock lobster fisheries.

Overall assessment

The material submitted by DPIWE demonstrates that the management arrangements for the Tasmanian Giant Crab Fishery meet most of the requirements of the Commonwealth *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 their impacts are minimised:

- Declining catch rates over the last 5 years;
- Recent assessment of the fishery as growth overfished;
- Confidence in the level of the annual total allowable commercial catch (TACC);
- The absence of a robust assessment model;
- Inadequate information on critical elements of giant crab biology; 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 TGCF has been in a developmental stage and has made considerable progress in developing sound management arrangements. 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. The recent assessment that stocks are growth overfished is being addressed through a recovery strategy. DEH is satisfied that there is a high degree of probability the stocks will recover. 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. Given the management arrangements specified in the Giant Crab Policy Documents, the existing review of management arrangements and the work towards rebuilding depleted stocks, 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 DPIWE to contain the environmental risks in the long term. Specifically, the WTO declaration would allow the export of product from the fishery under permits. This declaration would be effective 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.

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

Protected species occurring in the fishery area include marine turtles, seals and seabirds. While a small number of interactions with these species have been reported with fishing gear in Tasmanian waters, the interactions cannot be directly linked to the TGCF. The fishery has no recorded interaction with these species groups. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

As the management arrangements require 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, it is unlikely that fishing operations conducted in accordance with the management arrangements will adversely affect the conservation status of protected species or affect the survival and recovery of threatened species. DEH recommends that this fishery be accredited under Part 13 of the EPBC Act.

Recommendations

Before the next review of the fishery in three years time:

1. DPIWE to inform DEH of any changes to the Management Plan or to the Giant Crab Policy Document that may impact on the sustainability of the Giant Crab fishery.
2. Further research and analysis to be undertaken into giant crab biology, in particular: -
 - a) Estimation of recruitment to the fishery;
 - b) Completion of the analysis of existing growth rate information;
 - c) Estimation of fishing mortality;
 - d) Ecosystem and habitat research.
3. DPIWE to develop and implement an ongoing data collection and monitoring system to enable identification of long term trends in giant crab discards within two years.
4. DPIWE to participate in any cross-jurisdictional activities regarding the target species and any relevant by-product species. All available information regarding removals of giant crab by other jurisdictions and sectors (including Commonwealth trawlers) is to be factored into annual stock assessments.
5. DPIWE to develop and implement, within three years, meaningful performance indicators and trigger points relating to legal size biomass and egg production. If existing research yields sufficient biological data, this work should be undertaken as soon as possible.

6. DPIWE to continue to respond actively and without delay to the activation of trigger points in the policy document by developing and implementing specific management strategies in response to any sustainability issues that may be raised by the activation of trigger points.
7. DPIWE to develop and implement a recovery strategy within one year to actively promote the recovery of giant crab stocks to ecologically viable stock levels. DEH notes that the review and development of a rebuilding strategy as required under the Giant Crab Policy Document is underway. DPIWE to advise DEH of the outcomes of that review.
8. DPIWE to investigate strategies to assess, on an ongoing basis, changes in bycatch trends in the fishery within two years.
9. To support the implementation of the Protected Species Interaction Monthly Record, DPIWE to develop and implement an education program for fishers to promote the importance of protected species protection and accurate incident reporting within one year.
10. DPIWE, in collaboration with industry, to develop and encourage the adoption of an environmental code of practice that aims to minimise fishing effects on ecosystems, threatened species and threatened ecological communities within three years and develop and implement a means of monitoring fisher adoption of the code of practice.
11. DPIWE to collaborate with the Australian Fisheries Management Authority on collecting data and assessing the impact of harvest and incidental damage to giant crabs and their habitat by trawling activity in Tasmanian giant crab fishing grounds as defined under the Commonwealth's Offshore Constitutional Settlement (OCS) agreement with Tasmania.
12. DPIWE to initiate research to assess the risk of ghost fishing within one year and develop management strategies to address the risk of ghost fishing by lost giant crab pots within three years should the research indicate significant risk of ghost fishing.

PART I - MANAGEMENT ARRANGEMENTS

The Tasmanian Giant Crab Fishery is managed by the Tasmanian Department of Primary Industries, Water and Environment (DPIWE).

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

- The *Fisheries (Rock Lobster and Giant Crab) Rules 2001*;
- The Giant Crab Policy Document 1999;
- The draft Rock Lobster and Giant Crab Fisheries Policy Document (yet to be released for public comment);
- The Tasmanian *Living Marine Resources Management Act 1995*; and
- Relevant Gazetted notices and licence conditions.

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

The Crustacean Fisheries Advisory Committee (CFAC) consists of an independent chair, two DPIWE representatives (fishery manager and the Chief Fisheries Investigations Officer), two scientists from the Tasmanian Aquaculture and Fisheries Institute (TAFI), a representative of the Marine Police, eight commercial fishers (two giant crab operators, five rock lobster operators, one representative of the Tasmanian Fishing Industry Council), a representative of the processing sector and a representative of the Tasmanian Conservation Trust (TCT). The executive officer is provided by DPIWE. The CFAC is appointed by the Minister to provide advice about the management of the giant crab and rock lobster fisheries.

The Crustacean Research Advisory Group (CRAG) is appointed by the Director of TAFI to provide strategic research planning advice. It consists of scientists from TAFI, the Commonwealth Scientific and Industrial and Research Organisation (CSIRO) and the Australian Maritime College (AMC), the fishery manager, 3 representatives of industry and one community representative. A representative from the recreational fishing sector will be included in CRAG from 2003. Gardner *et al* (2002) note that a Giant Crab Assessment Working Group is planned for review of the next fishery assessment report.

The fishery is managed according to the policy regime described in the Giant Crab Policy Document 1999. This document contains a number of objectives relating to harvest of the target species, namely maintaining biomass and fish recruitment; managing commercial fishing interactions; sustaining yield and reducing incidental fishing mortality; providing socio-economic benefits to the community; and providing high quality produce. Each objective has a number of management strategies.

This policy is currently being revised and will be released for public comment in 2003. The new document will cover both the giant crab and rock lobster fisheries. The draft of this new policy also set out a number of objectives, management strategies, reference points and triggers. The proposed objectives are broader in their focus and promote a more ecosystem-based approach to fisheries management. Performance indicators and trigger points are specified in the draft policy document. An assessment of the effectiveness of these measures is included in Part Two of this report.

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the documents discussed above to DEH's assessment of the fishery, an amendment could change the outcomes of our assessment.

Recommendation 1: *DPIWE to inform DEH of any changes to the Management Plan or to the Giant Crab Policy Document that may impact on the sustainability of the Giant Crab fishery.*

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

- A TACC and ITQs;
- Limited entry with 95 licences current;
- A requirement to hold a rock lobster entitlement and at least one giant crab quota unit attached to the giant crab fishing licence;
- Gear restrictions;
- Controls over overshooting quota including "payback";
- A seasonal closure for the whole fishery;
- Prohibition on the harvest of berried females; and
- Minimum (150mm CL) and maximum size limits (215mm CL) for both sexes.

Compliance and enforcement tools utilised in the fishery are based on the ITQ regime, which involves a detailed document trail including quota docketts, catch and effort records, unloading reports, fish cauf¹ reports and dispatch reports. The submission indicates that the quota system is accepted and supported by the majority of giant crab fishers. Compliance with by-product reporting requirements is also addressed. DEH is satisfied that these compliance measures contain the means of enforcing critical aspects of the management arrangements for the fishery.

The objectives contained in the draft Rock Lobster and Giant Crab Policy document are scheduled to be reviewed in 2007, or earlier if one of the trigger points contained in that document is breached. The giant crab fishery is subject to an annual stock assessment based on analysis of the fishery performance against trigger points. Other analyses are included in the annual stock assessment (eg bycatch and by-product trends). DEH is satisfied that a five year review of the entire fishery policy framework is suitable while critical aspects are reviewed annually through the stock assessment, and while DPIWE continues to act when adverse signals appear in the fishery. The annual reviews are discussed more fully in Part Two of this report.

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

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

DEH is satisfied that the current management arrangements are consistent with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. The *Living Marine Resources Management Act 1995* contains mechanisms that allow for amendments to management practices so that they comply with any future plans of these types.

¹ defined in the *Fisheries (Rock Lobster and Giant Crab) Rules 2001* as fishing gear used in State waters for holding fish

Conclusion

The TGCF has been in a developmental stage and has made considerable progress in developing sound management arrangements. 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. The recent assessment that stocks are growth overfished is being addressed through a recovery strategy. DEH is satisfied that there is a high probability that the stocks will recover.

The management regime is developed through a consultative process. The management arrangements are adaptable, underpinned by objectives and performance criteria by which the effectiveness of the management arrangements are measured, enforceable and reviewable.

Recommendations have been developed to ensure that the management of the fishery continues to improve and the risk of unacceptable impacts is minimised 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 daily logbooks. Logbooks are based on 30nm² squares, although DPIWE note that data are collected on a latitude/longitude basis. Data entry occurs within seven days of receipt of the logsheet. Commercial logbooks are validated against quota dockets during the annual assessment of the fishery. The logbooks contain information on daily and shot-by-shot target catch, hours fished and areas of operation. Fishers are obliged to record finfish by-product data on a separate logbook, which is under review. To date, logbooks have included a compulsory field on discards, however DPIWE have advised that recording of discards will now be voluntary under a revised logbook that requires more detailed information to be recorded. DPIWE are confident that higher quality data will be obtained from those fishers that currently report, resulting in more useful data for monitoring discard trends (discarding is discussed in greater detail under Principle Two of this report). DEH believes that data reliability for target species is reasonable and that compliance and enforcement activities have the capacity to ensure the ongoing reliability of data in the fishery.

Fishery-independent data collection is limited. DPIWE submit that this is because research fishing is prohibitively expensive, and typically generates low catch rates. While a small catch may be economic for fishers, the limited amount of data that can be obtained from small sample sizes will mean the data are of limited use. To date, validation of fishery dependent information has been conducted using two methods. First, observers were placed on vessels to provide validation of logbook records (mainly in 1998). The second method was to review data looking for outliers and aberrant patterns. This was conducted in 2002. DPIWE state that the second method is more rigorous and thorough and has been retained for ongoing validation of data. Routine checks have been developed.

DPIWE collects data from a wide range of sources (logbooks, processor records, quota management dockets, voluntary catch sampling and observer data) in an effort to counteract the lack of fishery-independent data. DEH considers this a useful approach given the economic and resource constraints under which the fishery operates. DEH is concerned however that the data validation mechanisms available in the fishery largely relate to landed target species and there is little validation of data relating to non-target species.

Gardner *et al* (2002) suggest that processor returns may be a useful second source of data, and may be used to validate by-product as well as target species data. DPIWE have recently advised that processor returns will be used on an ongoing basis to validate by-product data collected through the logbooks. DEH strongly encourages the monitoring of by-product data to ensure that any change in fisher targeting behaviour can be detected and addressed in a timely manner.

A crustacean research program exists which would include research into giant crab. Further fishery independent research would be conducted through current and new funding applications.

A program to develop giant crab assessment techniques has been funded by FRDC, commencing in 2001. The project involves sampling onboard commercial vessels to collect data on giant crab age and growth and therefore cannot be considered truly fishery-independent. The overall objectives of the research program include development of a low cost long term assessment and data collection methodology; quantify biases in historical data; obtain industry's observations on basic biological and marketing processes; and to develop the ability to investigate alternative harvest strategies (FRDC, 2003).

In addition, the submission indicates that the bulk of the harvest is taken by a relatively small number of fishers (only six of the 95 vessels), whose fishing behaviour is likely to vary. This is particularly the case in a fishery coupled so closely to another that in order to take giant crab the fisher must hold a rock lobster licence. The result is that changes in fishing behaviour by these operators may unduly influence data. DPIWE argues that the effect of individual fishers is overcome by standardisation of CPUE for the skipper, and that data are collected from a wide range of sources to ensure they can be fitted to more than catch rate. DEH is concerned that reliance upon fishery-dependent data to ensure the fishery is sustainable contains some risks, and believes DPIWE will need to ensure that there is an alternative means of obtaining fishery-independent data in the future.

DEH is concerned that heavy reliance upon fishery-dependent data has limitations. Consequently DEH suggests that fishery-independent research and monitoring mechanisms be developed that address the harvest of giant crab. DPIWE should also regularly review the effect of a few high-performing skippers on overall data collection and assessment.

Assessment

The submission states that the status of the fishery is assessed against the performance measures every year, using fishery dependent and independent information. These annual assessments are published by TAFI. Catch and effort are assessed and are used to determine if decline has occurred and if triggers are reached. DPIWE advises that the fishery is in effect two fisheries, one east coast and one west coast, and regional stock assessment zones encompass four areas off each coast.

A monitoring and assessment regime has been operational in the giant crab fishery since 1995, with data from the commencement of ITQs (i.e. 1999) considered more reliable than previous data. Data for 1999 are considered to have limitations for assessment purposes because the fishery was closed for some of that year (Gardner *et al*, 2002), and standardisation of current and historical data has proven problematic.

Regional catch rates declined from 1995 in all areas except the southeast, but since 1999 have been stable. Regional CPUE data suggest that, as the trigger has been activated three times in the past three years for region 4 (the north-east), depletion may be occurring in that region. Temperature appears to be a determinant in distribution of giant crab, with the animal selecting to remain in a relatively cold zone of water. The East Australian Current appears to be coming further down the coast, bringing warmer water to the Tasmanian east coast (Andrew, 1999). It is possible that this shift in water temperature has an effect on the giant crab population of the east coast of Tasmania, and may have some bearing on the performance of the fishery in region 4. DPIWE submits that regional CPUE may be highly variable because catches are low. As a result DPIWE give less weight to this indicator than to others.

The primary management tool for the fishery is an annual total allowable commercial catch (TACC). An annual performance assessment of the fishery is conducted. The outcomes of the assessment are then used to determine the most appropriate TACC for the fishery.

An assessment model currently is in development. DPIWE anticipates this will deliver a spatially explicit size structured population model. The model is expected to provide estimates of legal-sized biomass and, at a later date, estimates of undersize biomass and egg production. The intention is to model the impacts of various TACCs on the legal-sized biomass as part of the assessment process.

Formal stock assessments commenced in 2000-01 and only two stock assessments are available for the fishery. Therefore a limited data-set is available with which to detect trends in catch and effort and environmental influences. Nonetheless, in the 2002-03 quota year, non-standardised data suggest a further decline of about 50% in catch rate. In the same year the TACC was not caught and a number of trigger limits were breached. DPIWE has advised that the species is now considered growth over fished in the fishery. As a consequence the fishery is under review and amendments to the management regime may result. A stock rebuilding strategy is being developed. The recovery of stocks is discussed in detail under Principle One, Objective 2 of this report.

It is likely that the original TACC for the fishery was set too high and has contributed to the decline in the stock. The submission argues that the TACC has been set conservatively, based on previous year's catches. DPIWE notes that a realistic assessment of the appropriateness of the TACC will be made as the data set improves, which DEH assumes will be some years off while the assessment model is developed. The main objective of the proposed assessment model is to obtain an estimate of recruitment into the fishery with a view to establishing a sustainable TACC. Further information on giant crab biology and ecology is required to ensure that the assessment model incorporates sound biological information and that an appropriate TACC that provides for the species to be harvested at ecologically sustainable levels can be set.

Recommendation 2: *Further research and analysis to be undertaken into giant crab biology, in particular: - a) Estimation of recruitment to the fishery; b) Completion of the analysis of existing growth rate information; c) Estimation of fishing mortality; d) Ecosystem and habitat research.*

DPIWE states that, during development of the assessment model, the management strategy is to assess the TACC with respect to catch stability as reported in the annual stock assessment. Catch rates are being monitored on a three monthly basis and the CFAC has recommended the implementation of management measures should there be any further decline. DPIWE has indicated that in this eventuality, the TACC will be changed.

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. The submission indicates that high levels of knowledge on the resource are available only for commercial catches and effort from 1995. A lot is known about giant crab reproduction but little is known about critical elements such as growth rates, natural and fishing mortality, recruitment, and ecosystem, and habitat.

Results of a large project by Deakin University into the fisheries biology of giant crab and funded by FRDC indicates a genetically homogenous stock structure that shows significant size structure variation with regard to depth, sex and region. The management regime makes no specific accommodation for this depth variation and relies on a minimum size limit to ensure sexual maturity throughout the fisheries area. Management also applies a maximum size limit to ensure

there is a sufficient population of large males in the system, on the principle that there is some scientific evidence to suggest females tend to mate with larger males.

Potential removals from the giant crab population include direct harvest by this fishery, recreational and indigenous harvest, 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.

The fishery operates under an ITQ system with an annual TACC. Fishers are required to record all giant crabs caught and retained, which are then decremented against the TACC. Logbook data is validated against processor returns. While the level of giant crab harvest in the fishery is known in terms of retained catch, there is some concern about the level of discarding in the fishery and the degree to which discards are factored into stock assessment and management.

Discard data are important for stock assessment purposes and to measure the overall impact the fishery may be having on not only the target species, but other components of the marine environment. Gardner *et al* (2002) suggests that the dataset dates from the introduction of ITQs in 1999, and show discards occurring in all regions of the fishery. The percentage of catch which is discarded because they are undersized varies between regions (approximately 10-40%) but has generally been stable since 1999. Fishers discard undersized, damaged or oversized crabs and to date have not been required to record numbers of discarded crabs.

Historically, giant crab discard information in the fishery has been collected on a purely voluntary basis, albeit from the majority of fishers. DPIWE has recently advised that a section on discards is proposed for new logbooks to be introduced to the fishery for the next fishing season. DEH considers the ongoing collection of data and monitoring for discards is an important component in providing confidence in the TACC and to enable changes in crab size and fisher behaviour to be detected overtime.

Recommendation 3: *DPIWE to develop and implement an ongoing data collection and monitoring system to enable identification of long term trends in giant crab discards within two years.*

Recreational and indigenous take of the target species is insignificant. A five tonne giant crab bycatch limit is in place for the rock lobster fishery and has not been breached in the three years of quota management. The compliance data, combined with the small number of operators and their involvement in managerial decisions, suggests that illegal activity in the fishery is very low.

A significant issue facing the giant crab fishery is the recent expansion of effort by Commonwealth licensed trawl operators into shallower waters utilised by giant crab and its apparent impact upon the giant crab fishery.

DPIWE is concerned about the amount of giant crab taken by trawlers and the possible under-reporting of this catch. Species-specific data are not available on the trawl bycatch, since trawlers do not differentiate between the different species of crab taken. DEH concurs that there is a risk that significant amounts of giant crabs are taken by the trawl fishery and that these removals are not factored into the management and assessment of the stock. The management regime for the Commonwealth fishery allows for the retention of 5 giant crabs on a fishing trip (AFMA, 2002), but as crab species are not differentiated the level of compliance with this possession limit is unclear.

Trawlers operating in the area of the fishery can also potentially damage giant crabs and their habitat without actually taking them. Fishers licensed to fish in the giant crab fishery report rates of capture of live damaged animals, which suggest that not all interactions result in mortality.

In order to ensure the sustainability of the giant crab off Tasmania, the total mortality of giant crab due to fishing should be taken into account in management of the giant crab fishery.

DEH is concerned that the combined impacts of direct harvest and habitat damage may adversely affect the sustainability of the giant crab fishery. DEH notes that DPIWE and the Australian Fisheries Management Authority are attempting to resolve the issue and DEH recommends that the two agencies work together to identify and manage any impacts of trawling on the resource. A recommendation relating to this can be found under Principle 2, Objective 3 of this report (see **Recommendation 12**).

Dedicated giant crab fisheries are also operating in other jurisdictions. Existing information on the spatial distribution and structure of giant crab stocks suggests that one homogeneous stock exists. 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 DPIWE governance, for DPIWE 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 Tasmanian fishery.

Recommendation 4: *DPIWE to participate in any cross-jurisdictional activities regarding the target species and any relevant by-product species. All available information regarding removals of giant crab by other jurisdictions and sectors (including Commonwealth trawlers) is to be factored into annual stock assessments.*

Management response

The current Tasmanian Giant Crab Fishery management regime aims to maintain ecologically viable stock levels through a range of input and output controls. These measures were outlined in Table 1 and Part I of this report.

DEH is satisfied that the combination of the input controls should ensure adequate protection of the target stocks, but notes that this is contingent upon the TACC being set at a sustainable level. In addition, DEH is concerned that the unknown mortality of giant crab due to other fishing operations, notably Commonwealth-licensed trawling, may have the potential to seriously undermine the effectiveness of DPIWE's management strategies. As outlined above, there is a clear need for collaboration between DPIWE and AFMA to identify and effectively manage any impacts of trawlers on the species and its habitat. This issue is discussed in detail under Principle Two, Objective Three of this report.

The Giant Crab Fishery Policy document contains a series of performance indicators and trigger points relating to the harvest of giant crab. They include triggers relating to decline in total landed catch and increase in giant crab bycatch in the rock lobster fishery, CPUE (both statewide and regionally) and change in size distribution. Additional performance indicators and trigger points are included in the draft Rock Lobster and Giant Crab Policy document. These relate to declines in legal size biomass and egg production, and changes bycatch and byproduct. The submission suggests that one issue that may confound the use of these triggers is the fact that the bulk of the harvest is taken by only a few vessels.

Those relating to legal size biomass and egg production are important in the management of the target species and are under development. These would be expected to provide critical information on the validity of the TACC. DEH considers their development to be an important factor in the assessment of the fishery.

Recommendation 5: *DPIWE to develop and implement, within three years, meaningful performance indicators and trigger points relating to legal size biomass and egg production. If existing research yields sufficient biological data, this work should be undertaken as soon as possible.*

CPUE triggers are based on the previous two years' CPUE. Catch and bycatch triggers are based on a reference year, set at two years prior to the year of assessment. DEH believes that there are risks associated with having a rolling series of reference years, rather than a fixed point against which the fishery progress can be measured. DPIWE argues that the use of a fixed reference year is inappropriate, as catch rate in such a young fishery would be expected to decline while the virgin biomass is fished down and they need to see that the decline does not continue. DPIWE agrees that a fixed year reference point may be appropriate in the future. DEH suggests that DPIWE regularly reviews the mechanism for establishing reference years for CPUE assessment, undertakes assessments with a clear understanding of the risks involved in a rolling series of reference years, and works towards fixed longer-term reference points.

DEH notes that in the event that a trigger point is breached, a review into the fishery status and management options is required. The results of the review must be forwarded to the Minister within three months, and must include proposed management options. The submission outlines a number of potential generic management responses. These include the introduction of regional TACCs, regionally based size limits, closures or additional gear restrictions. Management options must have at least a 50% probability of rebuilding stocks to above the trigger level within a single year.

DEH is concerned that, given the recent determination that the species is growth over-fished and the breach of a number of trigger points, clear and timely management responses to address sustainability issues should be a priority. DEH notes that a review of the management arrangements is underway in response to the recent assessment results. DPIWE have undertaken to provide DEH with the results of the review.

Recommendation 6: *DPIWE to continue to respond actively and without delay to the activation of trigger points in the policy document by developing and implementing specific management strategies in response to any sustainability issues that may be raised by the activation of trigger points.*

The distribution of catch appears to separate the fishery into two regions – east coast and west coast. Catch rates vary significantly between the regions and external influences on the stock are also different. For example, the east coast is influenced by the East Australian Current while the west coast is affected by trawling pressures on the stock and fishing grounds. The two regions are not subject to separate management arrangements.

DEH believes that the specific management requirements for one coast may not be appropriate for the other. DPIWE has advised that the principal objective of the review of the Management Plan for the Giant Crab Fishery is to introduce separate TACs for the west and east coasts, to ensure continued ecological sustainability off each coast. DPIWE expects that this will be supported by licensing/quota arrangements that prevent the transfer of effort between the west and east coasts while minimising economic disruption of the fishery. DEH strongly encourages DPIWE to implement separate management arrangements for the western and eastern regions of the fishery.

The submission indicates that low levels of by-product are recorded by giant crab fishers on a daily catch record for general fishing (the same logbook as used by Tasmanian scalefish operators). Currently any species may be retained as by-product if the operators are able to find a market and, in the case of rock lobster, the fisher has appropriate quota. All retained species must be recorded in

logbooks. In the case of rock lobster, by-product is recorded on the fisher's rock lobster logbook and deducted from quota. The four main by-product species in this fishery (pink ling, two octopus species and southern rock lobster) are target species in other fisheries which are currently, have been or will soon be under assessment by DEH. DEH concurs with the assessment that by-product levels in this fishery are low. DEH notes that better data collection and validation will help to confirm this assessment.

The requirement to have one or two escape gaps in giant crab pots should reduce by-product harvest. The submission argues that the depth of giant crab fishing should also reduce the levels of interaction. Although total levels of by-product appear low research suggests that under-reporting may occur and pots are capable of catching many species of reef fish and macroinvertebrates (Frusher and Gibson, 1999).

DPIWE has recently advised that recorded by-product information is to be validated against processor returns on an ongoing basis. While validation of by-product is important and may address under-reporting, it is still reliant on fishery dependent sources and true validation of by-product catchability in the fishery would be of benefit. DEH believes that a more prudent approach would be to investigate the capacity of giant crab traps to take by-product species. DEH suggests that fishery-independent research be undertaken into the harvest of by-product (and bycatch) species to validate current assumptions.

Conclusion

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'*

Recent assessment of the giant crab stock has revealed that a number of trigger limits have been breached and the stock is considered growth over-fished. DPIWE immediately moved to review the fishery status and management arrangements as required under the Giant Crab Policy Document, as the first step in developing a stock rebuilding strategy.

While it appears that the TACC has historically been set too high, and pressure on the stocks may have been exacerbated by impacts of trawling operations in the fishery area, DPIWE is legislatively unable to reduce the TACC mid-season. DPIWE has advised that the rebuilding strategy will ensure that the TACC for the coming season is set at a precautionary level. Other management options are being investigated as part of the stock rebuilding strategy.

In light of the recent stock assessment results, DEH believes it is crucial that prompt and effective action is taken to recover stocks to ecologically viable levels. DEH recognises that DPIWE is addressing the issue and is working to promote the recovery of the stock.

Recommendation 7: *DPIWE to develop and implement a recovery strategy within one year to actively promote the recovery of giant crab stocks to ecologically viable stock levels. DEH notes that the review and development of a rebuilding strategy as required under the Giant Crab Policy Document is underway. DPIWE to advise DEH of the outcomes of that review.*

As discussed under Objective 1 of this report, a lack of crucial biological information and other confounding factors have resulted in an apparently inappropriate TACC that has impacted heavily on the giant crab stock. DEH is confident that, through DPIWE's responsible approach to management of the fishery and the implementation of the recommendations made in this report, the giant crab stock can be recovered to ecologically viable stock levels and these levels can be maintained through precautionary management measures.

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

Information on bycatch is collected from catch sampling work done as part of the FRDC-funded fisheries independent research. As noted above, data obtained from this project are not fishery-independent. Some fishery-dependent data are obtained through fishers completing the scalefish catch and effort logbook (relating to bycatch of scalefish only) and the section on their giant crab logbooks relating to discards of crabs. There is no mechanism for collecting bycatch data for other species. The general fish logbook currently is under review.

DEH is satisfied that a degree of bycatch information is collected for the fishery. Much of the bycatch data presented in the submission relates to the rock lobster fishery rather than the giant crab fishery, but is extrapolated to the latter fishery because the same gear is utilised. DEH is concerned that this system may not be sufficiently sensitive to ensure that significant impacts on bycatch species can be detected.

The species assemblages in shallower waters at depths where giant crabs and rock lobster are both taken may be similar and the bycatch extrapolation valid. However, the giant crab fishery tends to operate at greater depths, and, species assemblages at these depths may be different. Furthermore, Gardner *et al* (2002) indicate that the gear being used in the Giant Crab Fishery is changing from the traditional rock lobster pot, becoming heavier to deal with drag. Hence it is possible that the assumption that this gear will take the same or similar suite of bycatch species is also in error. DEH notes that some directed work to assess bycatch would be prudent.

Assessment

The submission states that there are no specific assessments. Some bycatch data are available for rock lobster operations. The submission indicates the potential impact of giant crab pots is believed to be less, due to the greater depths at which they are set. The most numerous bycatch species recorded from giant crab pots (through the catch sampling program) were antlered crab and hermit crabs, followed by pink ling (Gardner *et al* 2002). The survival rates of the crab species after interaction with giant crab pots are largely unknown but most animals were released alive. Finfish bycatch was moribund, presumably as a result of the change in pressure experienced during hauling.

The submission indicates no formal risk analysis of bycatch in the giant crab fishery has been undertaken. The rationale for this is that the impact is believed to be low. DEH is satisfied that a very general assessment has been done of the risks of the impacts of the fishery on bycatch species. The general fisheries management measures that are in place will have the additional effect of reducing capture and mortality of bycatch species. Furthermore, collection and monitoring of information on bycatch levels and the degree of target species discarding will allow for the detection of changes in fishing behaviour should they occur.

Recommendation 8: *DPIWE to investigate strategies to assess, on an ongoing basis, changes in bycatch trends in the fishery within two years.*

Management response

Some management measures are in place that serve to minimise bycatch in the fishery. The management regime requires one or two escape gaps to be installed in all giant crab pots. This is to allow the escape of small giant crab, but research in the rock lobster fishery (Frusher and Gibson, 1999) suggests escape gaps reduce bycatch by approximately 80% in that fishery. Since the gear is similar to that used in the giant crab fishery, DPIWE assume a similar level of bycatch reduction. DPIWE see no need for specific trials into pot design to reduce bycatch. In the event that future bycatch assessment reveals that the use of heavier steel pots increases bycatch in the fishery, DPIWE will need to develop appropriate management measures.

No bycatch indicator species is monitored because the low level and low frequency of recorded bycatch has prevented the development of effective indicators. At this stage DPIWE does not propose to develop indicator species, but will continue to collect bycatch information through the catch sampling program.

The draft Rock Lobster and Giant Crab Policy Document includes an objective that the fishery be conducted in a manner that minimises the effect on bycatch species. Coupled with this are two management strategies: limits on the duration traps can be set (to reduce mortality), and fishery-independent research to collect data on bycatch species. The document includes general reference points relating to impact on bycatch and by-product (change in total abundance and change in species assemblage, shown through catch sampling work).

DEH notes that the bycatch trigger in the draft Rock Lobster and Giant Crab Fishery Policy Document is a very gross measure of change (25%, 30% and 50% change, depending on the time interval and what is measured). Recognising that current data 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 are appropriate.

The Tasmanian *Living Marine Resources Management Act 1995* provides for amendments to the management plan and emergency responses that could be used, should a bycatch species be considered to be under threat from the fishery. In the absence of a specific program monitoring bycatch species such threats would be detected either through the catch sampling program or anecdotally. DPIWE considers the establishment of a specific monitoring program to be unnecessary and costly beyond the value of the fishery. As recommended above, a monitoring system to detect changes in bycatch over time would seem appropriate for the future management of the fishery.

Conclusion

DEH is satisfied that there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species, although data demonstrating this are limited. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that DPIWE would undertake appropriate actions to ensure that bycatch species are not threatened by this fishery.

A recommendation has been developed to ensure that the risk of unacceptable impact on bycatch species is detected and minimised 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

Information on bycatch generally is collected from catch-sampling work undertaken as part of the FRDC project (see Principle One) which should include information on the take of protected species. The fishery logbook, which would be an additional source of information, does not contain fields for recording interactions with protected species. From March 2003 fishers have been required to report interactions with seals, marine turtles, seabirds and cetaceans on a specific Protected Species Interaction Monthly Record (Attachment 3 to the submission). In addition, a field has been included in the fishers' logbook from March 2003 to indicate if interactions with protected species occur.

Management of protected species interactions in the fishery relies upon the limited number of fishers and pots, combined with the depth of operation. This should limit the risk of incidental capture of most protected species. Data on protected species interactions in this fishery are not very robust, as they are largely an extrapolation of data obtained from the rock lobster fishery. DEH recognises that the introduction of the Protected Species Interaction Monthly Record should address this gap, but notes that one of the biggest barriers to successful commercial reporting of protected species interactions is the capacity of the fishers to identify the species involved. In addition, many operators may not be aware of the importance of this reporting. Both of these barriers can be reduced through education programs and opportunistic advice from observers and researchers as appropriate.

Recommendation 9: *To support the implementation of the Protected Species Interaction Monthly Record, DPIWE to develop and implement an education program for fishers to promote the importance of protected species protection and accurate incident reporting within one year.*

Assessment

Data arising from the protected species logbook are to be analysed in future as part of the annual fishery assessment. DEH recognises that the minimal data collection and analysis of protected species interactions to date is due to the relative youth of the fishery and the relatively benign fishing method.

Of the protected species likely to interact with the fishery, the most likely negative interactions appear to be entanglement in buoy lines by marine turtles, seabirds and seals. The incidence of this is expected to be low (eg the period 1988-1998 only 4 turtle deaths occurred in Tasmanian waters as a result of entanglement in fishing gear, not necessarily giant crab gear (Bone, 1998). Actual

capture in the fishing gear appears unlikely. The depth at which giant crab pots are set is likely to mitigate against most protected species (eg seals, seabirds) becoming caught in pots. Although seals may become captured in the associated rock lobster fishery, this is a shallower fishery (operating at depths 10-150m as opposed to 130-400m) and the risk of capture should be less in deeper water.

Interactions between seals and discarded fishing-associated rubbish and rope have been identified, but not specifically in relation to the giant crab fishery. Positive interactions, such as seabirds resting on fishing vessels, also may occur.

Management response

Interactions with protected species are managed by controls over the number of pots that may be set and prescribed soak times. Fishers are required to allow pots to soak no longer than 48 hours in waters less than 120m deep, and in deeper waters no more than 50 pots (or the number allowed on the licence, whichever is the lesser) may be set.

The draft Rock Lobster and Giant Crab Policy Document contains management strategies to address the impact of the fishery on protected species. In addition to the proposed Protected Species Interaction Monthly Record, these strategies include monitoring of interactions to establish a baseline; the development of a code of practice to encourage fishers to consider potential impacts of protected species, the requirement of a wooden crossbar fitted across the mouth of pots to prevent access to the pots by seals, and the development of representative marine protected areas to protect any threatened ecological community. DPIWE notes that as data accumulate, trends may be established which will enable the development of appropriate management responses.

Entanglement by protected species in discarded rubbish and rope is addressed through fishers being encouraged to retain all rubbish on board. Closures (e.g. marine protected areas) within the fishery area also should reduce the potential for interactions with protected species. The submission is silent on what proportion of the fishery area is subject of closures.

DEH notes that the management strategies to address catch of protected species include the development of a code of practice to encourage fishers to consider potential impacts on protected species. DEH supports the development of the code of practice but believes adoption and implementation of the code needs to be monitored and complemented by mandatory management measures.

Recommendation 10: *DPIWE, in collaboration with industry, to develop and encourage the adoption of an environmental code of practice that aims to minimise fishing effects on ecosystems, threatened species and threatened ecological communities within three years and develop and implement a means of monitoring fisher adoption of the code of practice.*

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 a 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

DEH notes that no data is collected on the impact of the fishery on the marine environment generally. DEH accepts that this requirement is relatively recent and that management agencies are focusing on collecting data for fisheries, which are known or believed to have a greater impact on the marine environment, such as trawling. DEH nonetheless believes some research into the impact of the fishery on the marine environment would be prudent and would place the fishery in a better position to demonstrate ecological sustainability.

While no firm data have been collected on the impact of the fishery on the marine environment generally, DPIWE suggests that the high catches during the 1990s, by reducing crab biomass, will have changed the relative abundance of predator and prey species. Given that females aggregate on bryozoan substrates (FRDC, 2002), changes in crab abundance caused by fishing could have the potential to affect the communities in this zone.

The submission suggests that changes in biodiversity may be detected in future if appropriate assessment methodologies are developed, although the increasing biomass of rock lobster may mask biodiversity changes that are a result of the giant crab fishery. No undertaking is given by DPIWE to explore potential methodologies. DEH considers this an area for investigation in the longer term.

Assessment

As in most pot fisheries, the potential of the giant crab fishery to impact unacceptably and unsustainably on the environment generally is considered to be low. As a consequence, DPIWE 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 introduction of heavier steel pots to overcome drag by buoy lines (Gardner *et al* 2002) would be expected to reduce the impact of dragging on the substrate, but may increase the impact of the pot striking the sea floor. DEH believes such an increase is likely to be marginal.

DEH notes DPIWE's concerns about the impact of recent expansion by Commonwealth-licensed trawlers into the fishery area. This development may be adversely affecting the giant crab fishery by damaging giant crab habitat (as well as damaging and taking unknown quantities of giant crabs). In particular, DPIWE is concerned at the impact on juvenile giant crab microhabitat, as juveniles may be associated with large sponges that are considered vulnerable to trawling.

DEH believes that if this issue must be resolved to minimise the risk of serious damage to giant crab habitat and subsequent impacts on recruitment levels.

DEH recognises that DPIWE and the Australian Fisheries Management Authority (AFMA) have discussed this matter and are attempting to resolve the issue. Further work is required to determine the extent of impact by trawling activities and DEH notes that surveys are proposed for 2002-2003 to examine the impact of Commonwealth-managed trawlers on giant crab benthic communities. Completion of this work should provide valuable information in determining the extent of impact caused by trawling and guide future management of the issue to ensure impacts on the marine environment are minimised.

Recommendation 11: *DPIWE to collaborate with the Australian Fisheries Management Authority on collecting data and assessing the impact of harvest and incidental damage to giant crabs and their habitat by trawling activity in Tasmanian giant crab fishing grounds as defined under the Commonwealth's Offshore Constitutional Settlement (OCS) agreement with Tasmania.*

The submission does not address 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).

Recommendation 12: *DPIWE to initiate research to assess the risk of ghost fishing within one year and develop management strategies to address the risk of ghost fishing by lost giant crab pots within three years should the research indicate significant risk of ghost fishing.*

Management response

No management action currently is in place to ensure significant impacts do not occur. While area closures may be useful in managing the impact of the fishery on the marine environment, because the fishery operates in Commonwealth waters under an OCS arrangement, DPIWE can only close areas to giant crab fishing and not to other activities which may impact on the environment. DPIWE are maintaining a dialogue with AFMA regarding the trawl fishery and how the interaction between trawlers and giant crab habitat should be managed. **Recommendation 11** addresses this matter. DPIWE has commissioned TAFI to define and map giant crab habitat; detail giant crab distribution in relation to habitats; evaluate the vulnerability of habitat to fishing; and obtain fishery-independent data on abundance, sex ratio, condition and size of giant crabs.

DEH has commented under Principle 2, Objective 2 on the development of a code of practice. This code will encourage fishers to consider potential impacts on the ecosystem and employ fishing methods, which minimise impacts. DEH suggests that more measurable and enforceable strategies for future management should also be investigated in the longer term.

In addition to the proposed code of practice, impacts on the environment are minimised through the current restrictions on vessel numbers and fishing gear. The submission is silent on the risk to the environment from marine and air pollution from fishing operations and on current monitoring, assessment and management arrangements of such impacts. This risk may be considered low, given the limited number of vessels.

Conclusion

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

REFERENCES

- AFMA (2002). *Strategic assessment report: Southern and Eastern Scalefish and Shark Fishery*. Draft for public comment.
- Andrew, NL (ed.) (1999). *Under Southern Seas: the ecology of Australia's rocky reefs*. University of New South Wales, Sydney
- Bone, C (1998). *Preliminary investigation into Leatherback turtle *Dermochelys coriacea* distribution, abundance and interactions with fisheries in Tasmanian waters*. Unpublished report to Environment Australia (project no SOMS97-06). Parks and Wildlife Service, Tasmania
- DPIWE (2002). Commercial Giant Crab Fishing.
<http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/ALIR-4YZVRH?open>.
- FRDC (2002). Research Results 93/220 & 97/132. Fisheries Biology of the Giant Crab, *Pseudocarcinus gigas*. http://www.frdc.co.au/pub/reports/files/93-220_97-132.htm.
- FRDC (2003). Extract from project database relating to project 2001/042.
- Frusher, SD. and Gibson, ID (1999). Bycatch in the Tasmanian rock lobster fishery. In *Establishing meaningful targets for bycatch reduction in Australian fisheries*. Edited by Buxton, CD and Eayrs, SE. Australian Society for Fish Biology Workshop Proceedings, Hobart, September 1998. Australian Society for Fish Biology, Sydney.
- Gardner, C., Bermudes, M and Mackinnon, C (2002). *Fishery Assessment Report (draft) Tasmanian Giant Crab Fishery 2001/2002*. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania, Hobart.
- Jones, D and Morgan, G (2002). *A Field Guide to Crustaceans of Australian Waters*. New Holland Publishers (Australia).
- Kailoa, PJ., Williams, MJ., Steward, PC., Reichelt, RE., McNee, A., and Grieve, C (1993). *Australian Fisheries Resources*. Bureau of Resource Sciences, Canberra.
- Poulsen, K (1995). Bering Sea Red King Crab: resolving bycatch equals stock rebuilding? In *Solving Bycatch: Considerations for Today and Tomorrow*. Alaska Sea Grant College Program Report no. 96-03. University of Alaska, Fairbanks.
- Yearsley, GK., Last, PR., and Ward, RD (eds) (1999). *Australian Seafood Handbook: domestic species*. CSIRO Division of Marine Research, Tasmania.

LIST OF ACRONYMS

AFMA	Australian Fisheries Management Authority
AMC	Australian Maritime College
BRD	Bycatch Reduction Device
CFAC	Crustacean Fisheries Advisory Committee
CL	carapace length
CPUE	catch per unit effort
CRAG	Crustacean Research Advisory Group
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CW	carapace width
DEH	Australian Government Department of the Environment and Heritage
DNA	Deoxyribose nucleic acid
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
ITQ	individual transferable quota
OCS	Offshore Constitutional Settlement
TACC	total allowable commercial catch
TAFI	Tasmanian Aquaculture and Fisheries Institute
TCT	Tasmanian Conservation Trust