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Department of the Environment and Heritage

Assessment of the Western Australian South Coast Crustacean Fishery

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Disclaimer

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

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Assessment of the ecological sustainability of management arrangements for the South Coast Crustacean Fishery

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EXECUTIVE SUMMARY

Background

The Department of Fisheries, Western Australia (DoF) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The document - *Final Application to the Australian Government Department of Environment and Heritage* (the submission) was received by the Department of the Environment and Heritage (DEH) in July 2004. The submission was released for a thirty-day public comment period that expired on 9 August 2004. One public comment was received and DoF 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 South Coast Crustacean (SCC) Fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comment and DoF's response to the comment.

Table 1: Summary of the South Coast Crustacean Fishery

Area	Commonwealth and State waters adjacent to the State of Western Australia, from Augusta to the Western Australia/South Australia border
Fishery status	Rock lobster stocks are considered fully fished. Status of deep-sea crabs is uncertain
Target Species	Champagne crab *Hypothalassia acerba* Crystal crab *Chaceon bicolor* Giant crab *Pseudocarcinus gigas* Southern rock lobster *Jasus edwardsii* Western rock lobster *Panulirus cygnus*
By-product Species	A variety of finfish species and octopus
Gear	Rock lobster pots and some purpose-built steel traps, all with escape gaps of prescribed dimensions
Season	rock lobsters: 15 November to 30 June; deep-sea crabs: year round
Commercial harvest 2001/02	91 tonnes
Value of commercial harvest 2001/02	$2.5 million
Recreational harvest	Annual rock lobster harvest believed to be < 10 tonnes No recreational take of deep-sea crabs
Commercial licences issued	42 (2 Windy Harbour/Augusta Rock Lobster Managed Fishery; 11 Esperance Rock Lobster Managed Fishery; 29 Albany and Great Australian Bight zones)
Management arrangements	Input controlled through: limited entry licensing; limited pot numbers and gear restrictions (rock lobster fishery only); closed season for rock lobsters; spatial restrictions; prohibition on take of berried and tarspot females; and minimum size limits
Export	Primarily live to Asian markets
Bycatch	Small numbers of finfish, hermit crabs, seastars, octopus and other invertebrates
Interaction with Threatened Species	Interactions with seals and sea lions are rare. Potential for interactions with whales, dolphins, seabirds and turtles

The area of the fishery includes waters adjacent to the coast of Western Australia (WA) and extending to the outer limit of the Australian Fishing Zone, between 34°24' south (south of Cape Leeuwin) and 129° east. Part of the fishery area is in Commonwealth waters however the entire fishery is managed by WA under an Offshore Constitutional Settlement between the Australian Government and the Government of WA. The inshore component of the fishing grounds, for rock lobsters, is characterised by granite and limestone reefs.

The SCC Fishery has been formed by combining four existing fisheries:

- Windy Harbour/Augusta Rock Lobster Managed Fishery (WHARLMF) south of 34°24' south around to 116° east;
- Esperance Rock Lobster Managed Fishery (ERLMF), between 120° and 125° east;
- the Albany (116° to 120° east) and Great Australian Bight (GAB) (125° to 129° east) fishery zones, both extending from the shore to the 200 m depth contour; and
- The "Condition 105" South Coast Deep sea crab fishery extending from 34°24' south latitude to 129° east longitude outside the 200 metre isobath, and excluding all waters between 120° east longitude and 125° east longitude.

The main rock lobster species targeted in the WHARLMF area is Western rock lobster, *Panulirus cygnus*; this area is considered the southern extremity of the species as a fishery resource. The other rock lobster species taken in the SCC Fishery is Southern rock lobster, *Jasus edwardsii*, which is thought to be at the western extremity of its range. Three deep-sea crab species are also taken: Champagne crabs, *Hypothalassia acerba*, Giant (or King) crabs, *Pseudocarcinus gigas*, and Crystal (or snow) crabs, *Chaceon bicolor*. A variety of scalefish species are taken in small numbers and retained as byproduct, along with small numbers of sharks and octopus. The main finfish species group retained is leatherjackets (family Monacanthidae). SCC Fishery licensees who do not hold Rock Lobster Pot Licences may not retain rock lobsters.

Western rock lobster occurs on the continental shelf off WA, from Northwest Cape to Albany. In the area of the SCC Fishery, Western rock lobsters mature at 6-7 years old and 90 cm carapace length. "Berried" females carry their fertilised eggs under their abdomens for 5-8 weeks then release the larvae or phyllosoma into the water. The larvae spend 9-11 months in a planktonic form, moulting and growing in a number of stages as they are carried by ocean currents before metamorphosing into a puerulus or transparent miniature rock lobster form. At this stage they swim to inshore reefs where they settle to the bottom and adopt a benthic lifestyle. In years when the Leeuwin Current is strong, larger numbers of puerulus reach the inshore reefs, resulting in strong recruitment to the fishery several years later. Puerulus settlement in the Augusta-Albany area is sporadic and is derived from broodstock off the west coast (ie outside the area of the SCC Fishery). Western rock lobsters are opportunistic omnivores feeding on various coralline algae, molluscs and crustaceans and may live for up to 20 years, reaching 5.5 kg.

Southern rock lobsters occur on the continental shelf from northern New South Wales (NSW) to Dongara, WA, and around New Zealand. Off WA, females appear to reach maturity at around 4-5 years of age and 112 mm carapace length. The reproductive and larval stages are similar to those of the Western rock lobster except that the fertilised eggs are carried for 4-6 months and the larval phase lasts for up to 23 months. Southern rock lobsters are carnivorous, feeding on molluscs, crustaceans, echinoderms and other invertebrates.

In the western parts of the SCC Fishery area, both rock lobster species are at the edge of their range, hence larval recruitment is more sporadic and some aspects of their biology are atypical compared to their respective stocks at the centre of their ranges. The stocks of both species are genetically homogeneous.

Very little is known about the biology of deep-sea crabs. Champagne crabs occur at depths around 200 metres from near Esperance to north of the Abrolhos Islands. Crystal (or snow) crabs are widely distributed at depths of 300-1600 m on the continental slope off northern and western Australia and off New Zealand. Off WA, they occur from Exmouth to the South Australian border at depths of 450-1220 m (Melville-Smith *et al.*, 2003). As most females mature at 86 mm carapace width the minimum size (120 mm) is estimated to protect over 95% of mature females. Males mature at a smaller size (84 mm) but grow to larger sizes and, hence, dominate the commercial landings. Crystal crabs have no distinct breeding season and females carrying eggs may be found throughout the year. Tagging studies suggest they are slow growing and capable of moving distances of up to 200 km.

The Giant (or King) crab is endemic to the waters of southern Australia, extending from Perth to the mid-NSW coast and the waters surrounding Tasmania at depths of 18-400 m. It is harvested in several trap or pot fisheries throughout its distribution. 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). The species is slow growing and long-lived and may require strict management controls to ensure sustainability of harvest (Yearsley *et al* 1999; Kailola *et al* 1993). 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. There is some evidence to suggest animal size decreases with depth (Gardner *et al* 2002). The warm Leeuwin Current is said to be a barrier to giant crabs at around Cape Leeuwin as they prefer temperatures of 7-11^{o} C.

In 2001/02, 91 tonnes of rock lobster and crabs were harvested in the SCC Fishery, with an estimated landed value of $2.5 million. The value of the rock lobster component was about $2.1 million, at mean landed prices of $31/kg and $26.75/kg for Southern rock lobsters and Western rock lobsters, respectively. The value of the crab component was around $0.5 million, at mean landed prices of $25/kg and $9.50/kg for Giant crabs and Champagne crabs, respectively. (Landing Crystal crabs has been prohibited until 15 November 2004 while research on the species is completed).

The fishery began in the late 1960s, targeting rock lobster on inshore reefs (less than 50 m) in the Augusta and Esperance areas. Around 1987, rock lobster fishers in both areas discovered deep water rock lobster grounds at 100-250 m. As a result of this extension of rock lobster fishing, deep-sea crabs were harvested from the early 1990s. At the same time the establishment of a large processing factory enabled the fishery to move from supplying local markets with frozen product to exporting live product to Asian markets. Fishing effort and harvest levels rose as a result. Although management plans were implemented for the Esperance and Windy Harbour/Augusta rock lobster fisheries in 1987, the latter was found to have too much fishing capacity (14 licences and 1103 pots) and suffered a substantial decline in catch and economic hardship. A revision of the WHARLM Fishery in 1996 resulted in the reduction to two licences with a total of 350 pots. DoF is now working with industry to integrate the management arrangements for the WHARLMF, the ERLMF (11 endorsement holders) and fishing in the Albany and GAB zones (28 endorsement holders) and adjacent offshore waters into a single management plan for the SCC Fishery. DoF's aim is to have a draft management plan available for comment by December 2004 and a final plan in place by September 2005.

The SCC Fishery operates exclusively on the use of pots most of which are made with chicken wire mesh on steel frames. Regulations specify the design of pots used for rock lobster fishing, including overall dimensions and the numbers and size of escape gaps. Most of the pots used for crab fishing are similar although there are no restrictions on their design. Pot designs will be standardised under proposed new management arrangements. The numbers of pots which may be

used for rock lobster fishing by each licensee are limited by a combination of licence conditions and regulations. Apart from limited entry licensing, restricted pot numbers and escape gaps, the main management controls are legal minimum sizes for rock lobsters, Giant crabs and Champagne crabs (and a voluntary minimum size for Crystal crabs) as well as temporal and spatial fishing restrictions. All egg-bearing female rock lobsters and deep-sea crabs must be returned immediately to the water unharmed, along with all undersized rock lobsters and crabs. An analysis of the fishery management arrangements is presented in Part II (Principle 1) of this report.

As the gear and methods used in this fishery are very selective, there is very little bycatch. The more common bycatch species are finfish and invertebrates such as hermit crabs, seastars and octopus. Most of the finfish taken are either landed as byproduct or used as bait while undersized fish are released immediately on capture. Some species that may be affected by this fishery are currently listed protected species under the EPBC Act. Sea lions and seals have been reported as being drowned when trapped in pots while trying to take bait but such events directly linked to this fishery are extremely rare. There is potential for whales, dolphins and turtles to become entangled in pot ropes but there are no such reported incidents for this fishery. These interactions and the adequacy of bycatch reporting are assessed under Part II (Principle 2) of this report.

There is a small recreational fishery for rock lobsters conducted in shallow waters, mainly close to population centres. The depth and distance offshore, and the necessity for using pots, all militate against recreational involvement in the deep-sea crab component of the fishery. Some species of finfish caught as byproduct (eg gummy sharks and pink snapper) and/or bycatch are targeted by recreational fishers and in other commercial fisheries. No indigenous fishing for these crustacean species is reported in the submission.

The fishery is managed under the *Fish Resources Management Act 1994* and the *Fish Resources Management Regulations 1995*. There are also specific management plans for the WHARLMF and the ERLMF and other management regimes for the fisheries in the Albany and GAB fishery zones. The management of the SCC Fishery is in a transitional state as DoF undertakes the integration of these separate arrangements into a single cohesive management plan.

Overall assessment

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

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

- Potential for unchecked localised depletion of rock lobster and champagne crab stocks;
- Declining catch rates in some zones;
- Excess latent fishing capacity threatens the sustainability of the rock lobster fishery in the Esperance, Albany and GAB fishery zones;
- Fishery-dependent monitoring of catch and effort, by-product, bycatch and interactions with protected species requires substantial improvement;
- Concern regarding the assumption that recruitment to the Southern rock lobster stock is independent of the fishery; and
- Lack of clearly defined objectives linked to performance indicators and measures for target species, by-product, bycatch, protected species and ecosystem impacts.

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.

As DoF is currently assessing the possibility of bringing together four small separately managed fisheries, its management arrangements are in a transitional state. It is likely that these management arrangements will shortly be replaced by a single integrated management plan. In leading this process, DoF has made considerable progress in developing sound management arrangements. DEH welcomes the commitment to develop a consolidated management plan for the fishery. The current management regime aims to ensure that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. On balance, the fishery is being managed in an ecologically sustainable manner and is working to address existing problems and minimise environmental risks.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements specified in the submission, the current ban on harvesting Crystal crabs and DoF's proposals to integrate and strengthen the separate sets of management arrangements into a cohesive plan, DEH considers that the fishery will not be detrimental to the survival or conservation status of the taxa to which it relates in the short term. Similarly, due to its low intensity, 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 DoF to contain the environmental risks in the long term. DEH considers that the fishery, as managed in accordance with the management regime is not likely to cause serious or irreversible ecological damage over the period of the export decision. Specifically, the WTO declaration would allow the export of product from the fishery for a period of three years. The WTO declaration will require annual reporting on the progress of implementing the recommendations of this report and other managerial commitments. The implementation of the recommendations will be monitored and reviewed as part of the next DEH review of the fishery in three years time.

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 whales, dolphins, marine turtles, seals, sea lions and seabirds. A small number of interactions with seals and sea lions have been directly linked to the SCC Fishery. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the SCC Fishery management regime be declared an accredited management plan under Sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEH considers that the fishery to which the 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, cetacean species or listed marine species or a population of any of those species. DEH also considers that the regime requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and that the level of interaction under current fishing operations is low. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the regime, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

The implementation of recommendations and other commitments made by DoF in the submission will be monitored and reviewed as part of the next DEH review of the fishery in three years time.

Recommendations

1. The ESD Report, including all performance measures, responses and information requirements to be incorporated into the management regime and decision making process.

2. DoF to advise DEH of any material change to the fishery's legislated management regime that could affect the criteria on which EPBC decisions are based, within 3 months of that change being made.

3. DoF to ensure, where appropriate, that any relevant recreational and conservation interests in the fishery are considered through consultative mechanisms. In particular, in consolidating management arrangements for the sectors of the fishery and in the development of the proposed management plan, objectives, performance indicators and measures, DoF to specifically seek participation by conservation and recreational interests.

4. By December 2006, DoF to develop fishery specific objectives linked to performance indicators and performance measures for Southern rock lobster and all target deep-sea crab species and key by-product species. DoF to also incorporate into the management regime an objective to minimise protected/listed species interactions, to minimise or maintain at sustainable levels the take of other non-retained species and to minimise impacts on the marine environment.

5. DoF to conduct, within 12 months, a compliance risk assessment to determine the most effective use of resources and to specify the measures needed to ensure adequate compliance with the management regime. Within two years, DoF to develop and implement a compliance strategy for the fishery that includes clear management actions and the means of measuring the performance of the strategy on a defined and regular basis.

6. DoF, in its Annual State of the Fisheries Report, to report on the performance of the fishery against performance measures that relate to the sustainability of the fishery.

7. DoF to review the research information needs and priorities to meet the management information, stock assessment and performance measurement needs of the fishery. Analysis of research needs should take into account any gaps in the basic biological parameters required for stock assessment of southern rock lobster and the deep-sea crab species and the need to examine the appropriateness of the current legal minimum size limit for Southern Rock Lobster. DoF to develop a research strategy to address identified priority areas and explore ways to cooperatively share in or take advantage of research done in adjacent fisheries with shared stocks.

8. DoF to ensure that management arrangements to control the take of deep-sea crab stocks in the West Coast Deep Sea Crab Fishery and South Coast Crustacean Fishery provide consistent management arrangements for the species.. In addition, DoF to pursue opportunities to actively engage with other relevant jurisdictions in pursuit of collaborative or complementary management and research of shared rock lobster stocks.

9. By December 2006, DoF to review effort levels in the fishery and develop a strategy to ensure that fishery effort is managed at precautionary levels appropriate to the size of the rock lobster and deep-sea crab resources.

10. As part of the review of the fishery, DoF to assess the adequacy of monitoring and assessment arrangements for detecting change and trends in bycatch composition and quantity.

11. DoF to provide a mechanism, which allows fishers to record interactions with protected/listed species. DoF to implement an education program to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.

PART I - MANAGEMENT ARRANGEMENTS

The South Coast Crustacean Fishery (SCC Fishery) is managed by the Department of Fisheries, Western Australia (DoF).

The fishery is being managed under arrangements described in the following documents, all of which are publicly available:

- *Fish Resources Management Act 1994;*
- *Fish Resources Management Regulations 1995;*
- Windy Harbour/Augusta Managed Rock Lobster Fishery (WHARLMF) and Esperance Rock Lobster Managed Fishery (ERLMF) management plans;
- annual State of the Fisheries Reports; and
- relevant commercial fishing licence conditions.

A number of other documents, including research reports, scientific literature and discussion papers are integral to the management of the fishery. The submission states that any proposal to vary the management arrangements are distributed to stakeholders and made publicly available in document form and on the DoF website.

An Ecologically Sustainable Development (ESD) report, on which the submission is largely based, is also an integral part of the management regime. It examines benefits and costs associated with the fishery. It also identifies and assesses risks posed to the fishery and environmental components. When finalised the ESD Report will document the performance of the fishery and its management in terms of the ecological, economic, social and governance issues associated with the fishery. This report will be publicly available in document form and on the DoF website. The management commitments specified in this report have been fundamental in DEH's assessment and consequent recommendations. Although DEH is satisfied that this lack of a legislative base will not cause issues in the fishery in the short term, we recommend that the report be formally incorporated into the management regime and decision making process. DoF have advised that they propose to formally publish the management objectives and performance measures for the fishery as part of a series of Ministerial guidelines, as an adjunct to the management plan that is currently being developed. The Ministerial Policy Guidelines will provide the policy framework for the management for each fishery. This document will reflect the management objectives, philosophy and guidance for decision making including the upcoming legislated management plan, the ESD report, and as relevant, reference to other documents.

Recommendation 1: *The ESD Report, including all performance measures, responses and information requirements to be incorporated into the management regime and decision making process.*

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the management plan and documents referred to above to DEH's assessment of the fishery, an amendment could change the outcomes of the assessment and decisions stemming from it. Export decisions relate to the arrangements in force at the time of the decision. In order to ensure that these decisions remain valid, DEH needs to be advised of any changes that are made to the management regime and make an assessment that the new arrangements are equivalent or better, in terms of ecological sustainability, than those in place at the time of the original decision.

Recommendation 2: *DoF to advise DEH of any material change to the fishery's legislated management regime that could affect the criteria on which EPBC decisions are based, within 3 months of that change being made.*

The development of the parts which, together, make up the current management arrangements for the SCC Fishery have been developed through consultative processes that comply with the *Fish Resources Management Act 1994*. These include formal consultation with industry and invitation of submissions by industry groups, other stakeholders groups and the public. In addition, DoF holds an annual meeting in Albany to inform the public on issues and developments relating to the fishery, and local departmental officers hold public meetings annually to discuss fisheries in the region.

The submission states that DoF, the WA Department of Environment Protection, the WA Fishing Industry Council, industry members and the Conservation Council of WA contributed to its development. However, it gives no clear idea on how the current process for integrating the management arrangements for the fishery components will be undertaken in a way that ensures that a wider range of community interests and expertise are involved in fishery management committees, stock assessments and research planning processes. Currently, ongoing consultation by management occurs only with industry.

DoF has recently advised, that it is prepared to actively and formally engage with stakeholders including: Regional Recreational Advisory Committees, Recfishwest, the West Australian Conservation Council, the Marine and Coastal Community Network and professional fishing associations in both developing objectives and performance indicators and in pursuing the ongoing plan to manage all the fisheries as one SCCF. Currently, although there has been some relatively informal consultation with key stakeholders like Recfishwest and the Western Australian Conservation Council, the majority of ongoing formal consultation by management has only been with industry due to the lack of interest with other stakeholders. DEH believes that there should be demonstrated involvement of general community, recreational and conservation interests in any management committees or other consultation mechanisms and in stock assessment processes. In particular, these groups should be consulted in the consolidation of management arrangements proposed through the establishment of a single management plan for the fishery and in any further ESD workshops.

Recommendation 3: *DoF to ensure, where appropriate, that any relevant recreational and conservation interests in the fishery are considered through consultative mechanisms. In particular, in consolidating management arrangements for the sectors of the fishery and in the development of the proposed management plan, objectives, performance indicators and measures, DoF to specifically seek participation by conservation and recreational interests.*

The submission describes several operational objectives and their linked performance indicators and targets and states that work on additional operational objectives for the management of the fishery is still in progress. DEH has some concerns regarding the detail of some existing objectives and the absence of clear objectives for the management of target species. Specifically, the second objective set for Southern rock lobster exploitable biomass, (*'In the Albany, GAB, Windy Harbour/Augusta zones, to manage the fishery as an adjunct to fishers' other activities'*) provides no indication of how the fishable biomass in these zones is to be managed to ensure sustainability and without clear performance indicators and measures it is unclear how performance will be measured. In addition, DEH would expect to see an objective and performance measures to address the recovery of depleted rock lobster stocks in the Albany zone as a management priority.

Similarly, with the exception of Southern rock lobster, the target species of the SCCF are not adequately taken into account in objectives, performance indicators and measures and DEH sees this as a significant short coming in the future management of the fishery. Key by-product species are also not managed under clear objectives, performance indicators and performance measures.

While the submission indicates that work is continuing in these areas, DEH considers the development of strategic objectives, linked to performance indicators and measures as a crucial step in consolidating management arrangements across sectors and having the ability to effectively monitor the status of the fishery and its impacts. For those species where little data is available to inform biologically based performance measures (e.g. by-product species) precautionary based measures, which DoF has advised would be based on long term total catch levels, will identify the point at which a review of activities is required to ensure that any threats to sustainability can be addressed.

As a very small volume (~ 0.2 %) of Western rock lobsters at the limit of their distribution are taken in the SCC Fishery in comparison to that taken in the Western Rock Lobster Fishery (WRLF), DoF has indicated its focus will be on ensuring management of the SCC Fishery doesn't compromise the management of the WRLF and that management objectives, performance indicators and measures may not be needed. Recruitment of western rock lobsters to the SCCF is at the extreme end of the distributional range of this species and is therefore sporadic and based on the strength of the Leeuwin Current. The amount of egg production from this extreme southern edge of the distributional range is insignificant and from a management perspective this part of the resource can be considered to be unimportant to the long term productivity of the stock.

DEH recognises that the harvest of Western Rock Lobster in the SCC Fishery is small and that the fishery areas contributes little to overall recruitment of the species and that the overall objective of managing harvest so as to not negatively impact on the WRLF (and therefore the stock) is appropriate. DEH believes a clear articulation of such an objective is required and encourages DoF to incorporate the objective into the management plan for the fishery.

Management objectives have also not been established for bycatch, protected species interactions or impacts on the ecosystem. While the nature of pot fishing means bycatch and protected species interaction levels are generally low, as a minimum, the fishery should be managed in line with clear objectives that require that impacts on these species and groups be taken into account.

DoF has advised that it is currently prototyping the development of objectives and performance indicators for the fishery with an undergraduate Curtin University student project based on the ERLMF with the longer term intention of publishing the objectives and performance indicators for the SCCF in Ministerial Policy Guidelines. It is the intention to have these Ministerial Policy Guidelines available in a published draft form and out for public consultation by December 2006.

Recommendation 4: *By December 2006, DoF to develop fishery specific objectives linked to performance indicators and performance measures for Southern rock lobster and all target deep-sea crab species and key by-product species. DoF to also incorporate into the management regime an objective to minimise protected/listed species interactions, to minimise or maintain at sustainable levels the take of other non-retained species and to minimise impacts on the marine environment.*

DEH suggests that performance indicators and measures, once developed, should be capable of detecting and responding to changes in the fishery. This would require ongoing monitoring of the fishery against such performance measures and a clear process for responding to breaches of performance measures. DoF have advised that if there is a breach in a performance measure, this will be reported in the State of the Fisheries Report. If a breach materially affects the sustainability of the target species or negatively impacts on by-product, bycatch, protected species or the ecosystem, the breach will be reported to the Minister for Fisheries within 3 months for subsequent management review and action with timeframes for implementation.

Management of the fishery is based on a mixture of input controls and minimum sizes for the target species. The WHARLMF and ERLMF are both limited entry fisheries in which the numbers of licences and pots have been reduced to match fishing capacity to sustainable harvest levels. There are a total of 29 licences for the fishery in the Albany and GAB zones where the total number of pots which may be used for rock lobster fishing is limited to 3837, while the numbers used for crab fishing are not restricted. Only 10-12 licensees operate each year and the large amount of latent fishing capacity is a concern. The issue of latent effort is discussed in Part II (Principle 1) of this report.

In summary, management controls include:

- legal minimum carapace lengths for target species:
  - 98.5 mm for Southern rock lobsters;
  - 77 mm for Western rock lobsters (15 November-31 January), 76 mm (1 February-30 June);
  - 92 mm for Champagne crabs; and
  - 140 mm for Giant crabs
- temporary ban on retaining Crystal crabs until 14 November 2004 (pending research outcomes);
- protection of all female rock lobsters carrying eggs;
- protection of Western rock lobsters carrying spermataphores (tarspots);
- closed season for rock lobsters (1 July to 14 November);
- mandatory escape gaps of specified sizes in all lobster pots;
- crab fishing endorsement-holders may only fish in waters deeper than 200 m; and
- rock lobster fishers fishing for crabs during the rock lobster closed season and crab fishers at all times may not retain rock lobsters.

Critical aspects of the management arrangements are largely underpinned by compliance activities concentrated on in-port inspections of landings, fishing gear and licences. At-sea patrols are undertaken occasionally and are confined to the inshore rock lobsters fishery areas because of offshore seagoing limitations of DoF patrol boats. Offshore patrols are occasionally undertaken by officers accompanying commercial fishing boats. The performance measure specified for compliance in this fishery is the percentage of inspected landings having no illegal catch. The submission provides no summary of inspections and offences detected, instead refering to "a low level of non-compliance" during in-port inspections in 2001/02 and the detection of one offence during the single at-sea operation. The submission refers to the potential for using the mandatory installation of Vessel Monitoring Systems to all SCC Fishery vessels as a compliance aid, as currently used in other similar fisheries. DEH encourages DoF to pursue this and other initiatives to improve compliance levels in the fishery.

The submission also refers to DoF's intention to conduct a compliance risk assessment as part of the development of the management plan for this fishery. In view of the potential for localised depletion in some areas of the rock lobster fishery, the vulnerability of deep-sea crabs to over exploitation and the shortcomings in the current compliance regime, DEH believes that a compliance risk assessment is needed urgently. This assessment should be used as the basis for developing and reviewing annually a compliance strategy and appropriate monitoring arrangements.

Recommendation 5: *DoF to conduct, within 12 months, a compliance risk assessment to determine the most effective use of resources and to specify the measures needed to ensure adequate compliance with the management regime. Within two years, DoF to develop and implement a compliance strategy for the fishery that includes clear management actions and the means of measuring the performance of the strategy on a defined and regular basis.*

It is important that DoF not only has performance measures for its fisheries but that monitoring against performance measures and public reporting of the fisheries performance against stated measures is conducted on a regular basis. The performance of the Southern rock lobster component of the fishery is reviewed and reported annually in the State of the Fisheries Reports. These reports include results of annual stock assessments for the ERLMF and descriptions of the licensing and other management arrangement, catches, effort and catch rates for the other components of the fishery. These annual reports are reviewed periodically by the Office of the Auditor-General. The ESD component report contains the objectives, performance and status of most aspects of the fishery in varying levels of detail. DoF proposes to subject the ESD report to comprehensive external review every five years. DEH considers that a five-year review of the entire fishery policy framework is suitable while critical aspects are reviewed annually through stock and performance assessment. DoF have indicated to DEH that it will include in its annual reporting framework explicit reporting against performance measures for each fishery.

Recommendation 6: *DoF, in its Annual State of the Fisheries Report, to report on the performance of the fishery against performance measures that relate to the sustainability of the fishery.*

Fishery-dependent data relating to the target species has been collected on a regular basis for decades. It describes several past and current research programs which provide information on the biology, population dynamics and distribution of target species. Discussion of the information collection system can be found in Part II of this report.

The process used by DoF to identify and assess risks to the wider marine ecosystem is described in the submission. It concluded that no factor poses more than a minor risk, hence no specific monitoring arrangements or mitigation measures are considered to be necessary. This approach and DoF's conclusions are discussed under Part II (Principle 2) of this report.

The submission states that the SCC Fishery and its management regime take into account arrangements in adjacent managed fisheries and in other jurisdictions. Some of these matters are discussed under Part II (Principle 1) along with the implications of managing the harvesting of target species at the edge of their geographic range.

While noting that improved reporting of bycatch is needed (see **Recommendation 10**), DEH considers that the current management arrangements comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. DEH expects that DoF will also ensure compliance with any future plans or policies as they are developed.

No regional or international management regimes, to which Australia is a party, are of direct relevance to the fishery. The prime international regime affecting the fishery is the United Nations Convention on the Law of the Sea. The management regime essentially complies with this. Other international regimes are applicable to fisheries management but do not explicitly involve this fishery, for example the 1992 Convention on Biological Diversity and in particular the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the Submission, the fishery's compliance with their requirements can be assessed by examination of Part 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 considers that the SCC Fishery management regime is documented, publicly available and transparent, and is developed through a consultative process. DEH recognises that DoF is currently undertaking the difficult task of integrating the management arrangements established for four separate fisheries to form a single cohesive management plan for this fishery. Taking this into account, DEH considers that the current transitional management arrangements are adaptable and underpinned by objectives and performance criteria by which the effectiveness of the management arrangements can be measured, enforced and reviewed in the short term.

These management arrangements are capable of controlling the harvest through a range of legal minimum sizes and input controls appropriate to the size of the fishery. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements.

The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements.

DEH considers that there is scope to further refine the management arrangements and has provided a number of recommendations for improvements in the longer term.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

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

Maintain ecologically viable stocks

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

Information requirements

Fishery dependent data are obtained through compulsory catch and effort returns which fishers complete at the end of each month or completed trip and return to DoF. These returns provide for recording of details on all retained catch by species (in kilograms), fishing effort (days fished, pots pulled/day) and location (zone and 30x30 nautical mile block). Fishers have the opportunity to provide daily fishing details on a voluntary return but few do and the information provided is therefore of limited value for assessment purposes. The submission describes the robustness of the catch and effort data as "medium".

DEH has serious misgivings about the lack of detail required and the scope for what detail there is to be diminished on returns that provide for data entries to be made on a monthly or trip basis. Our concern is heightened by the absence of any form of ongoing effort validation or fishery-independent monitoring. This is of special concern given the degree of reliance on catch and effort data for stock assessment and fishery performance measurement. Given the potential for fishing-induced localised depletions of target species, it is unclear whether the level of detail required for reporting fishing localities is adequate for detecting the occurrence – or recovery – of such depletions. In view of the high degree of reliance placed on fishery dependent – particularly catch and effort - data in routine monitoring of the fishery and fishery performance measurement, catch and effort data validation is critical. While catch information is validated against processor records, effort is unvalidated.

Overall, DEH considers the fishery-dependent information collection system to be inadequate and – in the absence of validation – of questionable reliability as the principle basis for stock assessment and performance measurement. DEH strongly urges DoF, as part of the management planning process, to review compulsory catch and effort reporting requirements and amend these as necessary to ensure that fishery-dependent data is sufficiently complete and reliable to provide confidence in the fishery's performance and status assessments. In doing so DoF should also develop a system to ensure that effort data is validated on a periodic basis sufficient to give a high level of statistical confidence in the reports generated by this data.

SCC Fishery management arrangements and stock assessments are underpinned by several past and present fishery-independent research programs. In addition, research on Western rock lobsters off the West Coast and Southern rock lobsters and Giant crabs off South Australia, Victoria and Tasmania has been drawn on and extrapolated where appropriate. The submission outlines several recent and current programs conducted on the South Coast crab stocks and the nature of the information provided. Among these are projects aimed at estimating natural mortality rates, age and growth, and fecundity of deep-sea crabs (eg Levings *et al.,* 2001). Of particular importance to this fishery are current studies to determine:

- yield-per recruit and egg-per-recruit models for Champagne crabs and the appropriateness of the current legal minimum size, and
- the distribution, abundance, movements and population characteristics of Crystal crabs and the appropriateness of the voluntary minimum size, 120 mm (Melville-Smith *et al.*, 2003).

Given the small size and low value of this highly dispersed fishery, there are limitations on the fishery independent data available and the amount of dedicated research historically conducted in the fishery. While DEH notes these constraints, there remains the need for greater understanding of deep-sea crab stocks and the Southern rock lobster population and DEH considers that targeted and strategic research in priority areas is needed. DEH welcomes the current efforts being made to address gaps in the knowledge of deep-sea crab biology – particularly for Crystal crabs – and encourages DoF to complete current research programs.

DEH also notes that the submission gives no indication of a current or proposed strategic research plan to identify and address remaining critical research needs. While extensive research on the target species may not be possible, DoF should have a clear idea of what research is essential for improved management of the fishery. DEH suggests that DoF identify the research and stock assessment needs and priorities for the fishery and clearly articulate these in a strategic research plan that can be used to direct research efforts into the future. DEH notes that the strategic research plan will need to be implemented within the constraints of available funds.

Recommendation 8: *DoF to review the research information needs and priorities to meet the management information, stock assessment and performance measurement needs of the fishery. Analysis of research needs should take into account any gaps in the basic biological parameters required for stock assessment of southern rock lobster and the deep-sea crab species and the need to examine the appropriateness of the current legal minimum size limit for Southern Rock Lobster. DoF to develop a research strategy to address identified priority areas and explore ways to cooperatively share in or take advantage of research done in adjacent fisheries with shared stocks.*

Assessment

The stocks and fishery performance are reviewed annually for each of the target species. The results are published in the annual State of the Fisheries Report. Stock and fishery performance assessments are based on commercial fishery catch and effort data for the Western rock lobster, Southern rock lobster and deep-sea crab species components of the fishery. Neither those reports nor the submission provide details of the delay-difference biomass dynamic model used for assessing Southern rock lobster status or other stock assessment tools or explain whether data other than commercial catch and effort (eg recreational rock lobster catch) are analysed.

In the Windy Harbour/Augusta zone of the fishery, Western rock lobsters are at the southern limit of their range. Consequently, annual post-larval recruitment is highly variable and may be low for several years on end. As a result, the fishable biomass and, hence, species targeting by fishers and the harvest vary markedly over time. DoF's assessments indicate that less than 0.1% of the spawning biomass occurs in this area; hence the fishery has no impact on the reproductive capacity of the Western rock lobster stock. DEH acknowledges the impracticality of estimating productivity and sustainable yield in these circumstances. However, the complete absence of management objectives and performance measurement for this target species – in terms of maintaining a productive fishery and balanced ecosystem – is unsatisfactory and should be addressed under **Recommendation 4**.

Southern rock lobsters are at the western limit of their range, with most of the suitable habitat and stocks occuring in the Esperance zone. Unlike the situation for Western rock lobster and deep-sea crabs, as a result of the long history of Southern rock lobster fishing in this zone, there is a time

series of catch and effort data. This has enabled DoF to develop the biomass dynamic model as the basis for the annual stock assessment process. The model indicates that the recent stock biomass in the Esperance zone, estimated at 350 tonnes, has withstood fishing pressure and is capable of sustaining annual harvests of up to 40 tonnes. This appears to be a limit reference point for the ERLMF, but it is not stated as such. In the light of DoF's recognition that the activation of latent effort in the zone would likely result in unsustainable levels of exploitation, the need for formalised objectives, performance indicators and performance measures– if not an immediate plan to aggressively reduce excess fishing capacity – is clear.

DEH notes that the catch from the GAB zone has grown steadily over the last 15 years, recently reaching 30 tonnes. The submission refers to stock assessments for the Albany and GAB zones, indicating that sustainable yields are small but gives no details on how these compare with current harvest levels. It refers to how the Albany catch has "stabilised" at around 7 tonnes (after a 10-year decline) despite increasing annual fishing effort.

While DEH recognises that a sound biomass dynamic model to assess the status of Southern rock lobster in the Esperance Zone is in place, the same assessment process is not applied in the GAB and Albany zones and estimates of biomass are less reliable. Despite data limitations and other confounding factors affecting the application of biomass dynamic model to the Albany and GAB Zones, DEH believes a reliable approach to estimating the stock status and sustainable yields for these sectors should be developed.

DoF has advised that it will not be possible to use catch and effort data to model Southern rock lobster biomass in the GAB and Albany Zones. The reason for this is that in the Albany Zone fishers target both crabs and lobsters, but the compulsory catch and effort data does not distinguish between target and bycatch species. Therefore, when all data for the season are combined to generate catch rates for, for example Southern rock lobsters, catch per unit effort (CPUE) data will be biased (downward) by including pot settings where fishers were targeting crabs and only caught lobsters incidentally. In the GAB zone lobsters are only caught inshore in shallow water in a few different localities on the coast. These localities are spaced well apart and are unrelated apart from probably sharing a common source of recruitment. Combining these localised catches and CPUEs to generate a single model result for this Zone is therefore artificial.

DoF propose to overcome this problem by using catch triggers as catch information is considered reliable. Trigger levels will be set for southern rock lobster, champagne and giant crabs, based on the variability in annual catch for these species taken over recent years. Reaching this level would trigger an examination of the causes and a report outlining what response (if any is considered necessary) will be taken to deal with any potential sustainability issue. A precise trigger mechanism for crystal crab has not been defined as there is currently a moratorium on exploitation of this species while research is underway. Once the research is complete, DoF advise that it will be possible to consider an appropriate trigger point for any fishery that develops for this species.

The annual harvest of Champagne crabs has risen slowly over the last decade, averaging 20 tonnes in the last five years, with most of the landings occuring in the Albany zone. In contrast, the trend in the annual harvest of Giant crabs has been slight but downwards averaging 14 tonnes in the last five years. The operational objectives for each species are to maintain stocks "above levels that might risk recruitment overfishing" by setting appropriate legal minimum sizes. DEH notes that additional objectives and strategies will be needed if stocks are to remain productive as well as viable and that the existing information collection system will be inadequate to meet the necessary monitoring and assessment needs (see **Recommendation 4**). Current research on both species is expected to provide yield and egg production models and an assessment of the appropriateness of

the legal minimum sizes. DEH encourages the completion of this research and its application to the development of appropriate management and performance measures.

The recent high level of commercial interest in Crystal crabs, the lack of information on the resource and the species' vulnerability to over-fishing led DoF to temporarily prohibit the landing of this species in 2002 (Melville-Smith *et al.*, 2003). Assessments of the status and dynamics of Crystal crabs, including protection of their reproductive capacity, all depend on the completion of the current research program and improvements to catch and effort reporting requirements.

Because most components of the fishery have developed relatively recently and it is considered not to be a high value fishery, research into the distribution and spatial structure of the stocks off southern WA has not been extensive. The main target species, Southern rock lobster, is genetically homogeneous throughout its range, from WA across southern Australia and around New Zealand (Kailola *et al.,* 1993). It occurs on rocky habitats on the continental shelf, with the main concentrations off WA occurring in the Esperance zone. The Western rock lobster is also a single genetic stock, occuring only off WA on coralline and rocky substrates on the continental shelf. On the South Coast, the species occurs mainly in the Windy Harbour/Augusta zone with small numbers extending into the Albany zone.

Giant crabs occur as a single genetic stock from southern WA to central NSW at depths from 18-400 m (Levings *et al*., 2001). Seasonal movements related to reproduction, size and gender are also known from studies off south-eastern Australia (Levings *et al*., 2001). The Champagne crab is caught at depths of 30-550 m on rock and sand substrates and is distributed around southern Australia from Geraldton to NSW (Yearsley *et al.*, 1999). The Crystal crab is found off Australia's west, north and east coasts. Off WA it occurs at depths of 200-2000 m on sand, mud and shell substrates (Jones and Morgan, 2002), with most fishing concentrated at depths of 600-800 m. Current research programs are expected to shed further light on the spatial structure of Champagne crabs and Crystal crabs off south-western WA. While endorsing this research, DEH encourages DoF to also examine the potential for collecting additional data as part of its review of the compulsory catch and effort returns.

Potential removals from the rock lobster and deep-sea crab populations include direct harvest by the commercial, recreational and indigenous sectors of this fishery, discarding of the species in this fishery, and harvest of the species by fisheries in other regions and jurisdictions. Commercial removals in the form of harvest of all species are reported on mandatory catch and effort returns which make no provision for recording discarded catch. Harvest data reporting on a fine scale and discarded catch summary data are reported on voluntary returns by some fishers. DEH has recommended improvements in the quality and reliability of commercial harvest information and bycatch data (see **Recommendation 10**). Fishing opportunities for other sectors are limited to rock lobsters. The recreational harvest is estimated by mail survey and the submission gives no indication of an indigenous fishing sector. The impacts of other fisheries for rock lobster and deep-sea crab species off the West Coast and the south-eastern states are monitored, assessed and managed under arrangements that are being subject to separate assessments by DEH.

The West Coast Deep Sea Crab Fishery (WCDSCF) and the SCC Fishery are based on the same three species and stocks, using similar gear and subject to similar – in some cases identical – regulations. DEH considers that management arrangements for the species should be consistent and for stock assessment purposes at least, these two deep-sea crab fisheries should be treated as a single fishery as a priority.

Similarly, Western rock lobster is the principal species taken in the WRLF and Southern rock lobster is harvested by other jurisdictions, including South Australia, Victoria, NSW and Tasmania.

DEH considers it important for DoF to manage the Western rock lobster harvest in this fishery in a manner consistent with the WRLF and engage with all relevant jurisdictions on issues relating to Southern rock lobster harvesting to ensure that management arrangements are complementary. In addition, the removal of rock lobsters and deep-sea crabs by other fisheries and jurisdictions should be factored into assessments of stock status for these species and the proportion that may be sustainably harvested from the SCC Fishery. While it may be desirable to manage deep-sea crab stocks in the SCC Fishery and the WCDSCF in a totally consistent manner DEH recognizes that the differences in relative abundance in the two fisheries and their varying histories of development may mean that they will be managed under different systems. Nonetheless, DoF will need to ensure that the biological objectives, performance indicators and measures are consistent and that differences in management regimes do not compromise the ecological sustainability of the fisheries.

Recommendation 8: *DoF to ensure that management arrangements to control the take of deep-sea crab stocks in the West Coast Deep Sea Crab Fishery and South Coast Crustacean Fishery provide consistent management arrangements for the species.. In addition, DoF to pursue opportunities to actively engage with other relevant jurisdictions in pursuit of collaborative or complementary management and research of shared rock lobster stocks.*

Management response

The key stock conservation measures for the target species are the minimum size limits which, in the case of the deep-sea crabs, are intended to maintain spawning stock biomass above specified levels intended to prevent recruitment overfishing. Current research programs will determine the appropriateness of the legal minimum sizes for Champagne crabs and Giant crabs and of the voluntary minimum size for Crystal crabs. DEH encourages the completion of this research and the application of results to the management of the fishery. DEH also endorses DoF's approach in suspending the harvesting of Crystal crabs until this task is completed. The underlying rationale for this research on the three deep-sea crabs species is that sustainability of the fishery depends on maintaining viable stocks of mature crabs in the area fished. DEH agrees but expects that the management regime will also aim to maintain stocks at productive levels, requiring that appropriate objectives, performance indicators, performance measures and responses will be set to prevent recruitment overfishing (to which these species are vulnerable). Under present arrangements, with the extent of latent effort and unrestricted pot numbers, the regime lacks the potential to identify appropriate harvest limits and to contain annual harvests within those limits.

The approach to managing Western rock lobster harvesting is based on the assumption that recruitment originates from the West Coast region. DEH accepts that there is sufficient known about recruitment processes and spawning stocks to justify this assumption and that management arrangements for this species are sound.

DEH has some concerns regarding the management of Southern rock lobster in the fishery. Given the distribution of the species, risks of localised depletion, high latent effort, declining catch rates in some areas and lack of certainty in stock assessments, DEH believes improvements are needed to ensure that stocks are being harvested within sustainable limits. Management relies on the assumption that recruitment originates from south-eastern Australia but DEH believes there is insufficient known about recruitment processes and spawning stocks to justify this assumption. Until otherwise determined, DEH considers that the prudent course of action is to assume that local stocks contribute significantly to recruitment to local stocks, at least in some years (an approach adopted in the South Australian Rock Lobster Fishery). Furthermore, the submission acknowledges recent modelling work suggesting that local reproduction may be more important to recruitment than previously believed and indicating that, while the legal minimum size is 98.5 mm, female Southern rock lobsters mature at around 112 mm off WA. Southern Rock Lobsters are at the western limit of their range and biological characteristics (e.g. growth rates) may be different from

those found in the eastern states. Taking all of these factors into account, DEH believes that it is imperative for DoF to investigate the appropriateness of the current legal minimum size and other restrictions (eg closed season) for Southern rock lobsters. This should be specifically addressed through the review of research priorities and needs sought in **Recommendation 7**.

DEH notes that the number of commercial licences, while limited, includes a high proportion of inactive licences that represents a significant latent effort issue in the fishery. In addition, in some areas existing effort may be too high for the limited size of the resource. While DoF has demonstrated its preparedness to actively reduce what were clearly excessive numbers of licences and pots in the WHARLMF and to temporarily suspend harvesting of Crystal crabs while management controls are developed, they appear reluctant to take similar decisive actions in other regions where there are signs of stock depletion and excessive fishing capacity. Effective management of potential and existing effort in the fishery is needed to avoid localised depletions.

DoF has argued that the existence of inactive licences and latent effort has had a positive effect in discouraging over-capitalisation in the fishery and discouraging the development of specialist operators operating on an intensive basis (ie diversified operators with licences in numerous fisheries that target rock lobster according to their seasonal abundance rather than licensees only targeting rock lobster and deep-sea crab dominate the SCC Fishery). However, DoF have so far not provided any evidence to support this argument, nor have they shown why action to remove latent effort should not be instigated. Consequently, DEH recommends that DoF review effort in the fishery with a view to identifying the impact of effort levels on the fishery resources and any management or monitoring responses that may be needed to ensure that effort is managed at precautionary levels appropriate to the size of the rock lobster and deep-sea crab resources.

Recommendation 9: *By December 2006, DoF to review effort levels in the fishery and develop a strategy to ensure that fishery effort is managed at precautionary levels appropriate to the size of the rock lobster and deep-sea crab resources.*

For the spawning stock of the primary target species in this fishery, Southern rock lobster, there are no specific performance measures. DoF argues that such measures are not required as the fishery was assessed as posing a negligible risk to the species, despite indications of:

- declining catch rates and localised depletions;
- considerable latent fishing capacity;
- poor understanding of the adequacy of the 98.5 mm legal minimum size; and
- the possibility that the local spawning adults may make a significant contribution to local stock recruitment.

The submission implies a limit reference point of 40 tonnes for the annual ERLMF harvest. It indicates that the effort now applied to take this harvest is similar to that used to take 60 tonnes a decade ago. Along with the factors listed above, this indicates that annual catch alone is not an adequate performance indicator.

For Champagne crabs and Giant crabs, the submission indicates that the performance indicator is annual harvest and that no reference points or triggers are necessary. Given the factors, other than stock abundance, which may affect annual harvest levels in a diversified fishery, DEH considers this inadequate (see **Recommendation 4**). As most Giant crabs are caught at less than 120 m (Levings *et al.,* 2001), Champagne crabs are caught around 200 m and Crystal crabs are caught at over 450 m, it should be possible to determine catch rates and use these as indicators for targeted crab fishing, particularly during the rock lobster closed season. Part of DoF's confidence in reliance on the current legal minimum sizes for Champagne crabs and Giant crabs is based on estimates that they maintain the spawning biomass at 85% and 35% of unfished levels, respectively.

No assurance is given on the adequacy of the 35% level for Giant crabs, nor is any performance measure proposed (eg percentages of females carrying eggs or sex ratios). Similarly, no performance measure is proposed for Western rock lobsters.

DEH is concerned that the ESD reporting and risk assessment process is inadequate for assessing the need for performance indicators and performance measures. DEH reiterates the need for these matters to be properly addressed in the development of the draft SCC Fishery management plan.

The design of pots, including the requirement for escape gaps in rock lobster pots, contributes to the low incidence of by-product and the low likelihood of "ghost fishing" by lost pots, according to the submission. Although no by-product landings data are given, the main by-product species are reported to be leatherjackets (Family Monacanthidae). Fishers report that the few scalefish and sharks that enter pots escape readily, along with undersized rock lobsters, octopus and other small invertebrates. On coastal reefs, while the species range is wide the numbers retained in pots are small. In offshore waters (over 180 m), the main by-product comprises Chinaman leatherjackets *Meuschenia galii*, Rock ling *Genypterus tigerinus* and Pink snapper *Pagrus auratus*. Catch returns show wide variations in by-product composition the most consistent component of which is leatherjackets (3 tonnes pa).

DoF's risk assessment concludes that the SCC Fishery poses negligible risks to by-product species, therefore no specific ongoing monitoring is required. DEH's view is that, while DoF's conclusion may be correct, complete and accurate reporting of all by-product species should be undertaken and at least a basic level of annual assessment undertaken. The recommended improvements in data collection and validation will help to confirm DoF's assessment capability.

Conclusion
DEH considers that the management regime in the SCC Fishery is sufficiently precautionary and provides for the fishery to be conducted in a manner that will not lead to over-fishing in the short term. DEH considers that the information collection system, 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 in the short term. DoF has the necessary management tools available to ensure that the exploited stocks remain viable and productive, but require improved monitoring, assessment and responses to achieve this in the medium to long term.

DEH considers that there is a clear need to improve 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'*

Current monitoring and assessments indicate that - overall - neither of the rock lobster stocks is overfished. The submission reflects DoF's awareness that there are indications of localised stock depletion, to the point that fishing is no longer economically viable in some areas. Until current research on the deep-sea crab stocks is completed, there is insufficient information to conclude, with any confidence, that none is growth overfished. Integrated objectives, performance indicators, triggers and management responses have not yet been developed to the degree necessary as a

confident basis for management. In line with earlier recommendations DEH believes it is crucial that DoF:

- takes prompt and effective action to improve the information base and assessment processes;
- clarifies the extent and causes of localised depletions;
- implements appropriate remedial action; and
- sets in place appropriate management objectives, performance indicators and performance measures; and
- strategically analyzes effort levels in the fishery to ensure that latent effort poses no threat to the sustainability of any species if activated.

DEH is confident that, if these steps are taken, the SCC Fishery stocks can be recovered to more productive levels, with greater certainty of their ecological viability.

Conclusion

DEH considers that, overall, the rock lobster and deep-sea crab stocks remain sufficiently viable and productive to continue supporting the fishery while a more appropriate management regime is set in place. Should it be found that one or more stocks is below defined reference points, the management regime has the necessary tools to respond in a way that would ensure 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

There is no requirement or provision in place for SCC Fishery operators to report bycatch on mandatory catch and effort returns. The voluntary logbook forms provide for reporting the numbers of berried female or under-sized deep-sea crabs caught per day and of the bycatch species composition caught per trip or month, however the submission gives no statistical summary of any information collected to date.

While acknowledging that the risks posed by the SCC Fishery to fish and invertebrates are likely to be negligible, DEH is concerned that there is no systematic collection and analysis of information on bycatch composition and abundance. This is an essential – and minimum – requirement for effective assessment of fishery impacts on bycatch. There is also is no data collection and analysis of the numbers of berried female and under-sized rock lobsters and deep-sea crabs released in this fishery. As well as overlooking a vital bycatch component, this omission deprives DoF of crucial performance measurement opportunities in terms of tracking egg production, recruitment, spawning stock biomass, sex ratios and other population parameters. From the apparent low incidence of bycatch, monitoring of bycatch, including discards should not be onerous and DEH understands that DoF is considering mandatory reporting of such data in the development of a new SCC Fishery Management Plan. It is also important that monitoring data be used in the future to develop specific performance measures for key species that are known to be susceptible to pot fishing.

Recommendation 10: *As part of the review of the fishery, DoF to assess the adequacy of monitoring and assessment arrangements for detecting change and trends in bycatch composition and quantity.*

Assessment

The submission reports the use of anecdotal information in assessing risks posed by the fishery to finfish and invertebrates as negligible. Most fish caught in pots are retained for sale or used as bait. The few undersized fish are mainly caught in shallow waters where they are released unharmed. Most potential invertebrate bycatch escapes while the pots are on the bottom or during hauling. The few seastars, hermit crabs, spider crabs and mollusks caught are released unharmed. There is no reference to whether barotrauma is a problem for released fish and high survival rates appear to be assumed but not known with any certainty.

While the ESD workshop included a risk assessment of the vulnerability of bycatch species in this fishery, little information was available to inform the assessment. Noting the requirement under **Recommendation 10** to ensure monitoring systems for bycatch are adequate, and DoF's consideration of compulsory bycatch data collection by fishers, DEH expects that any future assessments would rely on more robust data and provide greater confidence in the assessment that the fishery poses negligible risk to bycatch species.

Management response

The pot designs and, in particular, the mandatory escapes gaps in rock lobster pots contribute to the low rate of bycatch in the SCC Fishery. From the limited information in the submission and from observations from similar pot/trap fisheries elsewhere, DEH concurs with DoF's observation that the design, construction and use of pots used in the fishery result in a low incidence of bycatch. We encourage consideration of further means of reducing bycatch when DoF comes to standardise the pots used throughout the fishery and has greater information on bycatch. For example, purpose-designed escape gaps in deep-sea crab pots may reduce the incidence of undersized crabs and other bycatch.

Under current reporting arrangements, no specific indicator species are being monitored. The recommended improvements to bycatch monitoring may reveal the need for and identity of an indicator species or species group for the fishery in the future.

Conclusion

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

The Western Australian Department of Conservation and Land Management (CALM) has collected data on SCC Fishery operators' interactions with turtles since 1973 and data on general fisheries interactions with whales between 1985 and 2002. Researchers have also studied interactions with seals and sea lions on the South Coast between 1980 and 1996. However, as with bycatch, there is no requirement or provision in place for SCC Fishery operators to report interactions with protected species on mandatory catch and effort returns. DEH notes that the voluntary logbook forms provide for reporting interactions, in the form of deaths or entanglements, with marine mammals, turtles and birds per trip or per month but that use of the voluntary logbooks is limited. DEH considers the development and implementation of an ongoing mechanism to enable accurate protected species interaction reporting and monitoring to be a high priority for the future management of the fishery. An education program to promote the importance of accurate incident reporting should also be implemented.

Recommendation 11: *DoF to provide a mechanism, which allows fishers to record interactions with protected/listed species. DoF to implement an education program to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.*

Assessment

The ESD workshop included an assessment of the likelihood of unacceptable risk to protected species by the fishery and concluded that there was low to negligible risk posed to all species.

Available information indicates that, over the period 1980 to 1996, on average one pinniped (mainly sea lion) death every two years could be attributed to gear used in the SCC Fishery. Most of these interactions occur in shallow waters where young seals and sea lions may become trapped while removing bait from pots. Between 1985 and 2002, CALM recorded 18 interactions between WA pot fisheries and whales; none of these incidents resulted in mortality. No interactions with dolphins were reported for WA pot fisheries between 1985 and 1994. Acknowledging the likelihood of under-reporting, DoF assessed the fishery's impact on pinniped and turtle populations as low and on whale and dolphin populations as negligible.

DEH concurs with DoF's assessment, however, DEH is concerned that there is no systematic collection and analysis of fishery-dependent data on the occurrence and nature of interactions with protected species. This is an essential – and minimum – requirement for effective assessment of fishery impacts on these species and any future assessment should be informed by more reliable information. There is also no articulation of objectives relating to the minimization and mitigation of protected species interactions (see **Recommendation 4).**

Management response

Because of their extremely low incidence and impact, interactions between the SCC Fishery and protected species are not being actively managed. DoF is confident that, should current and proposed monitoring indicate increases in these interactions, they are capable of detecting them and responding appropriately. **Recommendation 11** should greatly improve DoF's ability to monitor, assess and manage protected species interactions into the future.

Conclusion

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

A recommendation has been developed to contribute to the improved reporting, assessment and management response to fishery impacts on protected species 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

DoF's ESD workshop has drawn upon information on the scale, nature and operations of the fishery and the ecosystem in which it operates to identify potential threats and assess risks to the ecosystem generally. The main information sources are fishery-dependent reports on catch, effort, bycatch, stock assessments, recreational fisher surveys, gear characteristics and extrapolation from other pot or trap fisheries. The submission also refers to current studies on the biology and population characteristics of deep-sea crabs as additional sources of information relevant to this area of ecosystem impact assessment.

DEH notes that there is no information gathering program of either short term or ongoing nature specifically directed towards the assessment of the fishery's impact on the ecosystem. The information used in DoF's ESD workshop and risk assessments is anecdotal, inferential or extrapolated. DEH is concerned at the lack of information collection and research covering the fisheries impact on the ecosystem and environment generally. However, we understand that this lack of information is the case across a range of Australian and International fisheries and until appropriate research techniques and programs are developed and implemented this will continue to be the case. DEH strongly supports research in this area.

Assessment

As in most pot fisheries, the potential of the SCC Fishery to impact unacceptably and unsustainably on the environment generally is considered to be low. This conclusion is supported by DoF's assessment of risks posed to the ecosystem by discarding bycatch and bait, ghost fishing by lost pots, impacts of pots on coral and rock substrates, trophic impacts and discarding of debris. All of these impacts were assessed as negligible.

The fishing gear and the way it is set and hauled is not regarded as posing a significant risk to the physical environment, including rock substrates and associated corals in the shallow waters. Lost pots that are eventually recovered are usually empty and observations in other pot fisheries show that fish, rock lobsters, crabs and other invertebrates readily escape from pots. DEH accepts that the net impact on populations of byproduct and bycatch species is likely to be negligible and that, provided target species stocks are maintained at viable and productive levels the fishery impacts on benthic communities can be regarded as acceptable.

The impact of the fishery on ecological communities, related species and the structure and productivity of food webs is unknown. Little work has been done on the trophic role of rock lobsters and deep-sea crabs. DEH considers that the most likely ecosystem impact of the fishery

would be the removal of the target species from the food web. Under current harvest levels, and taking into account the minimum size limits in place for the target species, DEH considers it unlikely that impacts on food chains would be significant but notes that given the absence of specific information on trophic roles of the species that this statement is as yet unproven.

Management response

The submission states that the most important management action needed to minimise ecosystem impacts is to ensure that rock lobster and deep-sea crab stocks are maintained at viable levels. The selective and passive nature of pots, combined with mandatory escape gaps, which have proved to be highly effective, result in negligible impacts on benthic communities. DEH accepts the broad conclusion that this fishery has negligible impacts on the ecosystem. We believe that implementation of improved catch, effort, bycatch and protected species reporting and assessment will significantly improve DoF's ability to confidently assess these impacts in future. DEH cautions that unrestricted fishing effort in the offshore crab fishery (including unrestricted pot numbers) and localised stock depletions pose potential threats to the benthic ecosystem. Impacts on water quality through the discharge of plastic wastes and pollution from vessels are controlled under MARPOL legislation. Operators are required to comply with the legislation and are encouraged through their own code of practice to retain any plastic and other waste and dispose of it only when the vessel returns to port.

Conclusion

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

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LIST OF ACRONYMS

CALM	Department of Conservation and Land Management
CPUE	catch per unit effort
DEH	Department of Environment and Heritage (formerly Environment Australia)
DoF	Department of Fisheries, Western Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERLMF	Esperance Rock Lobster Managed Fishery
ESD	Ecologically Sustainable Development
GAB	Great Australian Bight
MARPOL	International Convention on Marine Pollution
NSW	New South Wales
SCC	South Coast Crustacean (Fishery)
WA	Western Australia
WCDSCF	West Coast Deep Sea Crab Fishery
WHARLMF	Windy Harbour/Augusta Managed Rock Lobster Fishery
WRLF	Western Rock Lobster Fishery
WTO	Wildlife Trade Operation