

**APPLICATION TO THE DEPARTMENT OF
ENVIRONMENT AND HERITAGE ON THE
WEST COAST DEEP SEA CRAB
INTERIM MANAGED FISHERY**

*Against the Guidelines for the Ecologically
Sustainable Management of Fisheries*

January 2007



Department of Fisheries
Government of Western Australia



Fish for the future

**DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA
168-170 ST. GEORGES TERRACE
PERTH, WESTERN AUSTRALIA, 6000**

TABLE OF CONTENTS

| | | |
|------|---|----|
| 1. | Overview of the Application..... | 3 |
| 2. | Description of the fishery..... | 4 |
| 2.1. | Target Species..... | 4 |
| 2.2. | Current Fishing Area..... | 4 |
| 2.3. | Governing legislation/fishing authority | 5 |
| 2.4. | Current Management Arrangements..... | 5 |
| 2.5. | Fishing Methods..... | 6 |
| 2.6. | Status of export approval | 7 |
| 3. | Management..... | 8 |
| 3.1. | A statement of the performance of the fishery against objectives, performance indicators and performance measures | 8 |
| 3.2. | New (Interim) Management Plan..... | 8 |
| 3.3. | Compliance risks present in the fishery and actions taken to reduce these risks | 9 |
| 3.4. | Consultation processes..... | 9 |
| 3.5. | Description of cross-jurisdictional management arrangements | 10 |
| 3.6. | Compliance with TAPs Recovery Plans | 10 |
| 4. | Research and Monitoring | 11 |
| 5. | Catch and Effort Data | 12 |
| 5.1. | Total Catch of Target Species..... | 12 |
| 5.2. | Total Fishing Effort on Target Species..... | 14 |
| 5.3. | Catch Per Unit of Effort for Target Species..... | 15 |
| 5.4. | Total catch of deep sea crabs in other fisheries | 16 |
| 5.5. | Bycatch species..... | 17 |
| 6. | Status of target stock..... | 18 |
| 7. | Interactions with protected species | 20 |
| 8. | Impacts of the fishery on the ecosystem in which it operates..... | 20 |
| 9. | Progress in implementing 2003-04 recommendations..... | 21 |
| 10. | References..... | 26 |

1. Overview of the Application

The West Coast Deep Sea Crab (Interim) Managed Fishery (WCDSCF) extends from the Western Australian/Northern Territory border to Cape Leeuwin, Western Australia. The fishery targets the giant crab, champagne crab, and crystal crab. The WCDSCF harvests approximately 300 tonnes per year with a landed value of around \$2.8 million.

The WCDSCF was assessed by the Department for Environment and Heritage (DEH) against the Commonwealth's Guidelines for the Ecologically Sustainable Management of Fisheries in 2003 and declared a Wildlife Trade Operation (WTO) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in March 2004. The WTO for the fishery will expire in March 2007.

This application will permit the re-assessment of the WCDSCF required to meet Part 13A of the EPBC Act, to enable its target species to be listed in section 303DB of species exempt from export regulations. This application should be considered in conjunction with the application lodged by the fishery in 2003 which is available on the DEH website.

The WCDSCF is in a transitional state from its current management controls to a new interim management plan, which will allocate individual transferable quota to each of the seven permit holders as well as equitable spatial and temporal access. The existing input controls (including limited entry, spatial closures, size limits and gear restrictions) will be combined with the new output controls (expected to be implemented in 2007). As a result the Department of Fisheries (DFWA) is confident in the maintenance of the key species stocks. The management arrangements for this fishery have and will continue to be refined through time and are subject to regular reviews to achieve the overall aim of successful management.

Consequently, the management regime for the WCDSCF should meet the *Guidelines for the Ecologically Sustainable Management of Fisheries*. Detailed justification for this conclusion is documented within the remainder of this application.

2. Description of the fishery

2.1. Target Species

The WCDSCF targets giant (king) crabs (*Pseudocarcinus gigas*), crystal (snow) crabs (*Chaceon spp.*) and champagne (spiny) crabs (*Hypothalassia acerba*) using baited pots operated in a longline formation in the offshore waters of the west coast.

Crystal crabs occurring off Western Australia were previously considered to be *Chaceon bicolour* a species which has a wide-ranging distribution extending to the east coast of Australia, New Zealand and New Caledonia. Recent unpublished information has shown the Western Australian population to be a new species of *Chaceon* (Davie, P.J.F., Queensland Museum pers. comm.), which is currently being described.

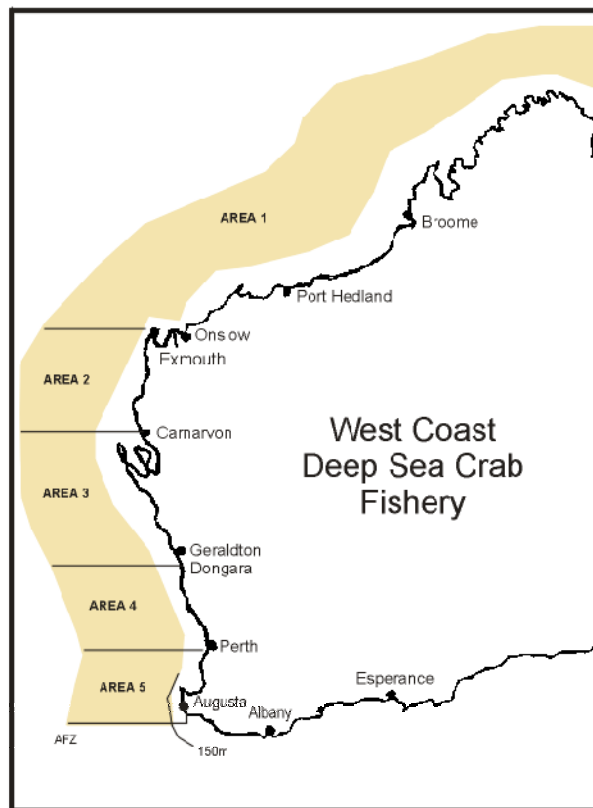
The fishery continues to receive research funding from the Fisheries Research and Development Corporation (FRDC), for the collection of biological and fisheries data for managing deep sea crabs in Western Australia. That work has resulted in a draft final report (Melville-Smith et al. unpub.) which will be available on the FRDC website in the near future. There is agreement that future funding for research will be contributed by licence holders in the WCDSCF.

2.2. Current Fishing Area

The WCDSCF extends from Western Australia (WA)/Northern Territory (NT) border in the north to Cape Leeuwin in the south (Figure 1). The WCDSCF permit holders are not permitted to operate inside the 150 m depth contour (Figure 1). The fishery is further divided up into five fishing zones and these are described below:

- Zone 1 From the WA/NT border (129° east longitude), west and then south to the North West Cape (21°44' south latitude).
- Zone 2 From North West Cape (21°44' south latitude) to Carnarvon (25° south latitude).
- Zone 3 From Carnarvon (25° south latitude) to Geraldton (29° south latitude).
- Zone 4 From Geraldton (29° south latitude) to Fremantle (32° south latitude).
- Zone 5 From Fremantle (32° south latitude) to Cape Leeuwin (34°24' south latitude).

Figure 1: The Location of the Fishery and its Five Fishing Zones.



2.3. Governing legislation/fishing authority

- *Fish Resources Management Act 1994*
- *Fish Resources Management Regulations 1995*
- *West Coast Deep Sea Crab Fishery (Interim) Management Plan 2003*
- *Environment Protection and Biodiversity Conservation Act 1999*
- Approved Wildlife Trade Declaration for the West Coast Deep Sea Crab Interim Managed Fishery.

2.4. Current Management Arrangements

The WCDSCF is primarily managed under the *West Coast Deep Sea Crab Fishery (Interim) Management Plan 2003* as well as being subject to the relevant provisions of the governing legislation listed in section 2.3. It is a limited entry 'pot' (trap) fishery. The WCDSCF operates in depths of 150–1,200 meters with the only allowable method for capture being baited pots.

The WCDSCF is currently managed by input controls, which include limited entry, minimum size limits, biological controls, spatial and temporal closures and gear restrictions.

Access to the WCDSCF is limited to seven permits (five full-time [Class F] access and two part-time [Class P] access permits). Full-time permits may be utilised in the fishery for up to 12 months per year and part-time permits for a maximum of 3 months. There is one Class F permit for each of the zones 1 to 5 and a Class P permit for zones 3 and 4.

There are legal minimum size limits for the giant and champagne crab under the *Fish Resources Management Regulations 1995* (FRMR). In 2007 the FRMR will be amended to include a legal minimum size for crystal crabs. Until then a voluntary minimum size for crystal crabs is in place. These size limits are based on research findings and ensure sufficient egg production to avoid recruitment overfishing. The size limits are as follows:

- *Giant crab*- 140 mm carapace length.
- *Champagne crab*- 92 mm carapace length.
- *Crystal crab*- 120 mm carapace width.

Biological restrictions. All under size and egg bearing female crabs are to be returned to the water within five minutes of coming on board and before the next pot comes on board.

Area closures. All waters less than 150 metres depth are closed to commercial deep-sea crab fishing.

Gear restrictions. Each permit holder is permitted to use a maximum of 700 standard plastic pots with dimensions 782 mm length x 565 mm width and 470 mm height with one top entrance. A standard escape gap of 504 mm x 54 mm is required in each pot.

Access to fishing areas. Fishermen currently have access to one zone of the fishery but there may be more than one operator in each zone (one full-time and one part-time or two part-time). The proposed new management arrangements do not include zones and each operator will have equal spatial and temporal access within the fishery.

2.5. Fishing Methods

The WCDSCF is a pot fishery. Potting occurs from 150 meters to 1200 meters depth. The operators are required to use a standard plastic pot with specific dimensions (see Section 2.4).

Each permit allows the use of 700 pots in the fishery. Between 50 and 100 pots are attached to a main line marked by a float at each end. Baited pots are released (set) from boats in areas where crabs are thought to be. This is based upon a combination of information gained from depth sounders, global positioning system (GPS), previous experience and recent catch rates in the area. The pots are left at sea for one to four days during which time crabs are attracted to the baits and enter the pots. When the pots are

retrieved (pulled) legal crabs are placed into holding tanks and returned to on-shore processing plants where most are prepared for live shipments to overseas and local markets.

The gear used in this fishery generates minimal bycatch and the design of the pots (one entrance with escape gaps) is such that they are believed not to 'ghost fish' if lost. Although there is no empirical evidence to support this, the experience of the fishers is that the small crabs escape from the pots through the escape gaps, while they are convinced that the larger crabs are able to find their way out of the neck of the pot after the bait has been consumed (in the same way that rock lobster are able to leave/exit a pot where the bait has been consumed).

2.6. Status of export approval

The WCDSCF was assessed against the Commonwealth's Guidelines for the Ecologically Sustainable Management of Fisheries in 2003 and declared a WTO under the EPBC Act in March 2004. The WTO for the fishery will expire in March 2007.

This application will permit the re-assessment of the WCDSCF required to meet Part 13A of the EPBC Act, to enable the giant crab (*Pseudocarcinus gigas*), champagne crab (*Hypothalassia acerba*), crystal crab (*Chaceon spp.*) and other relevant species to be listed in section 303DB of species exempt from export regulations.

3. Management

3.1. A statement of the performance of the fishery against objectives, performance indicators and performance measures

The fishery is gauged against several performance indicators (catch, effort, CPUE and length frequency sampling). The fishery has a short history of exploitation and it is felt that these performance indicators are adequate for establishing the way that the stock is responding to the early stages of exploitation.

A more detailed description of the performance of the fishery against these indicators is provided later in the document (see 5 and 6). However, in summary, since 2001 total catch has been relatively constant, and CPUE and effort have both increased, but since stabilised. Mean size frequency has also stabilised in recent years. The fishery therefore appears to be responding well to the management measures that are currently in place.

3.2. New (Interim) Management Plan

The Department undertook a review of the WCDSCF in 2004 to determine if the fishery should continue, and if so, under what management regime. The review determined that the WCDSCF should continue but that the management arrangements should be changed from input controls to primarily output controls (with supporting input controls).

The expiry date of the *West Coast Deep Sea Crab Fishery (Interim) Management Plan 2003* has been extended a number of times since the 2004 review in order to develop a new interim management plan through extensive consultation with industry.

The new interim management plan is currently being drafted by DFWA and is expected to be gazetted and implemented in 2007.

The primary purposes of the new interim management plan are to:

- a) Replace the existing interim management plan that expires on 31 December 2007;
- b) Provide for the introduction of a unitised quota-based management regime; and
- c) Meet a commitment to give all unit holders equal [quota, temporal and spatial] access to the fishery.

The WCDSCF is currently managed by input controls using limits on pot numbers (700 per permit holder), spatial separation between fishers (5 zones with a maximum of one full-time and one part-time or two part-time permits in each zone). While this approach has been relatively effective the new interim management plan will see a change to output based management in the form of a unitised quota.

Part of the driver for moving to output based management is the desire by both DFWA and permit holders to reduce the amount of latent effort (by rationalisation of the fishery) and encourage sustainable development of the fishery.

Under the current interim management plan there are five Class F permits and two Class P permits with Class P permit holders only able fish for three months of the year. Despite this, it was agreed that the new plan would allocate an equal level of time access to all permit holders.

Likewise, the new plan will provide equal spatial access to all permit holders. The current interim management plan provides five zones between Augusta and the Northern Territory border. The two zones around Geraldton and Carnarvon have proved to be the most productive. Permit holders desire to have more equitable access to the fishery and fish in the historically more productive zones of the fishery which means that the new plan will not define zones within the fishery.

3.3. Compliance risks present in the fishery and actions taken to reduce these risks

DFWA undertakes compliance risk assessments on all commercial and recreational fisheries to ensure adequate compliance service delivery. In 2006, an assessment of the current management and legislative arrangements of the WCDSF and the propensity for illegal activity was undertaken. This included inspections of commercial landings of crabs in the main fishing zone of Carnarvon and discussions with key industry members.

The assessment and inspections indicated that given the low number of participants in this fishery, the manner in which the crabs are captured, unloaded and transported to the processors, the fishery presents a low compliance risk.

Current compliance service delivery to this fishery is deemed to be adequate for the time being, but a formal risk assessment process for the Deep Sea Crab Fishery is planned for early 2007, when the new legislative framework for the fishery has been developed sufficiently to undertake a rational assessment.

3.4. Consultation processes

The *West Coast Deep Sea Crab Fishery (Interim) Management Plan 2003* requires that all permit holders of the Fishery must be consulted before the plan is amended or revoked. Regular meetings have occurred with permit holders over the past three years in developing the new interim management plan referred to in section 3.2.

Despite DFWA's attempts to include recreational and conservation interests in management discussions for the WCDSF these sectors have not demonstrated an interest in participating.

3.5. Description of cross-jurisdictional management arrangements

Crystal crabs have only been found in commercial quantities from Esperance to North West Cape on the west coast although individuals may occur in low density outside of those boundaries. Cross-jurisdictional management arrangements do not therefore involve management across states or territories.

Chaceon sp. are taken in both the West Coast Deep Sea Crab (Interim) Managed Fishery and the South Coast Crustacean Fishery however both fisheries are managed in conjunction by DFWA. A very small amount of crystal crabs are also taken in the Commonwealth managed Western Deepwater Trawl Fishery and this is taken into account in stock assessments.

3.6. Compliance with TAPs Recovery Plans

Not applicable.

4. Research and Monitoring

FRDC 2001/055 has provided for a research and monitoring program adequate for supplying management information for the fishery, while at the same time being tailored to the geographic size (Augusta to Northwest Cape), extreme depth (400-900 m) and value (\$2.6 million) of the fishery.

The project report, due for release in 2007, will provide catch and depth distribution of crystal and champagne crabs, as well as research results on movement patterns, growth rates, reproductive biology of crystal, and to a lesser extent champagne crabs. There will also be considerable discussion in the report, on sustainable catch levels in the crystal crab fishery. Much of the research and monitoring issues in this document are based on results in the draft version of the FRDC 2001/055 final report.

Most research, apart from the collection of catch statistics from the fishers and processors, has focussed in the last five or more years on crystal crab. This is also likely to be the case in the future, given that crystal crabs are the main target species. Crystal crabs are the main target species because they are more valuable and have generally higher catch rates than champagne crabs (Table 1).

The monitoring programme collects catch and effort data from several sources; compulsory catch and effort returns, as well as compulsory detailed logbook and processor returns. These different data sources provide opportunity to validate the information being returned and their generally close agreement suggests that catch and effort data for this fishery is very reliable.

Length frequency information is acquired from regular sampling trips undertaken by research staff on the commercial crab fishing boats. On these trips, data on carapace size, sex, breeding condition, shell state and numbers of animals per pot are collected.

During the course of at-sea monitoring trips, several thousand crabs have been tagged and released to obtain information on growth and movement.

Environmental data, in the form of temperature readings across sites and for different depths, have been collected using data storage tags.

5. Catch and Effort Data

5.1. Total Catch of Target Species

Table 1: Annual catches (in tonnes) of the three crab species taken by the West Coast Deep Sea Crab (Interim) Managed Fishery between 2001-2005. Data is from compulsory catch and effort (CAES) returns.

| Year | Crystal crab catch (t) | Champagne crab catch (t) | Giant crab catch (t) |
|------|------------------------|--------------------------|----------------------|
| 2001 | 221.8 | 0.1 | 0 |
| 2002 | 205.4 | 0.04 | 0 |
| 2003 | 196.4 | 0.1 | 0 |
| 2004 | 225.8 | 0.2 | 0 |
| 2005 | 201.8 | 0 | 0 |

Catches of the target species taken by the WCDSCF are presented in Table 1. Because of their depth, neither recreational nor indigenous fishers fish for these species. As noted in section 4 (above), given the size of crystal crab catches in this fishery relative to the other crab species, only results for crystal crabs will be presented.

Small amounts of crystal crab have been reported since 1993 but significant landings of this species were not reported until 1998. Catches escalated rapidly until 2001 after which they plateaued around 200 t. The total catch peaked in 2004 (Table 1).

Detailed catch and catch rates, are presented in Table 2. The data have been accessed from two different sources – logbooks and compulsory catch and effort (CAES) data for which there are some discrepancies. Logbook data are completed by the skipper on board the fishing vessel and papers are occasionally misplaced in that sort of environment. CAES data by comparison, are generally completed by the permit holder at home. In recent years, it has been noticed that processor return data equates more closely to logbook data than CAES returns and therefore logbooks may now be a more accurate estimate of the total catch than CAES data. This may be because fishers have become more accustomed and, possibly more diligent, in completing logbooks than in the past.

Logbook data provides a far more accurate estimate of effort than CAES data, because of assumptions that need to be made in order to calculate effort from CAES data. Consequently, catch rate has only been calculated in Table 2, from logbook data.

Table 2: Reported logbook and CAES data for catches targeting crystal crab on the West Coast using detailed logbook CPUE.

| Year | Logbook | | | CAES | |
|------|------------|--------------------|--------------------------|------------|--------------------|
| | Catch (kg) | Effort (pot lifts) | Catch rate (kg/pot lift) | Catch (kg) | Effort (pot lifts) |
| 1997 | - | - | - | 689 | - |
| 1998 | 1,144 | 500 | 2.29 | 7,077 | 3,093 |
| 1999 | 10,563 | 8,780 | 1.20 | 24,792 | 20,607 |
| 2000 | 146,497 | 51,227 | 2.86 | 143,337 | 50,122 |
| 2001 | 206,126 | 87,329 | 2.36 | 221,832 | 93,983 |
| 2002 | 196,747 | 98,179 | 2.00 | 205,423 | 102,508 |
| 2003 | 188,745 | 124,057 | 1.52 | 196,433 | 129,110 |
| 2004 | 233,085 | 135,446 | 1.72 | 225,794 | 131,209 |
| 2005 | 207,377 | 109,588 | 1.89 | 201,819 | 106,651 |

The most reliable catch and effort data sets have been used to generate, by Zone, Table 3 and Figures 2-6, with CAES data used for 1997 - 1999, but logbook data in subsequent years. Zones 2, 3 and 4 have been consistently fished since 1999 but Zone 5 has been less frequently fished. Because most of the limited catch and effort for Zone 5 has been near to Zone 4, these two zones have been combined in most subsequent analyses.

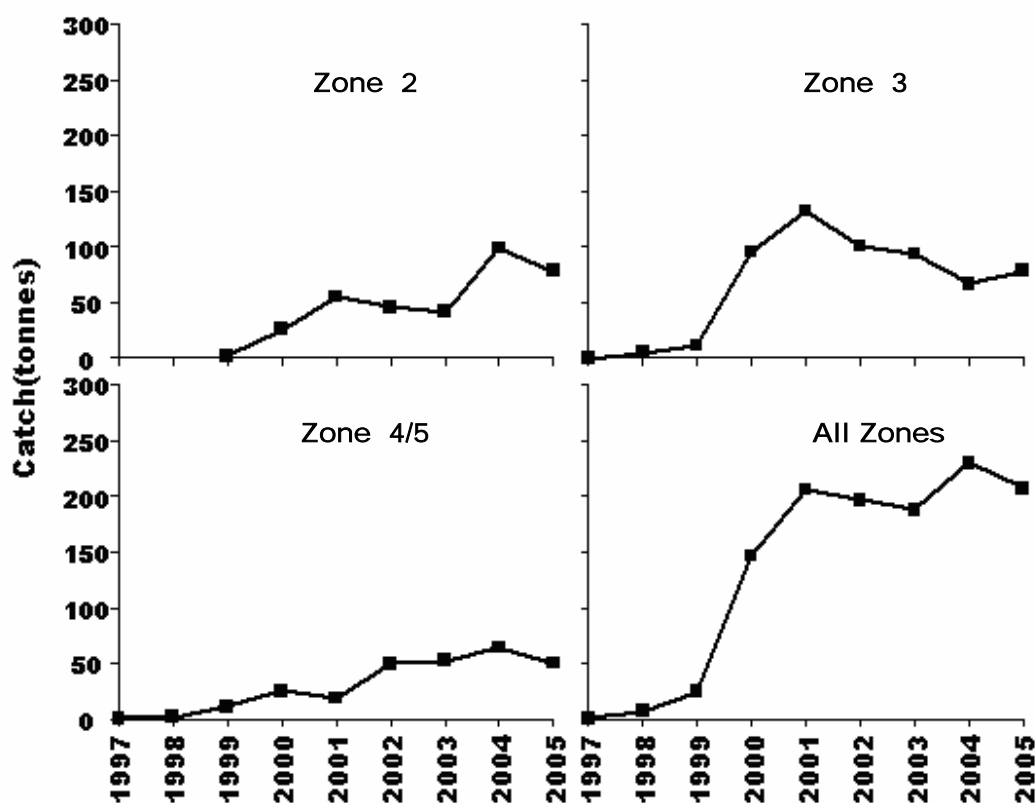
Table 3: Crystal crab catches (tonnes) and effort (in 1000's of pot lifts) for each zone in the fishery between 2000 and 2005.

| Zone \ Year | 2 | | 3 | | 4 | | 5 | |
|-------------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|
| | Pot lifts | Catch | Pot lifts | Catch | Pot lifts | Catch | Pot lifts | Catch |
| 1997 | 0 | 0 | 5.3 | 0.05 | 19.1 | 0.2 | 8.4 | 0.4 |
| 1998 | 0 | 0 | 42.2 | 5.0 | 20.9 | 2.1 | 0 | 0 |
| 1999 | 3.2 | 2.2 | 25.8 | 11.4 | 31.0 | 11.2 | 0 | 0 |
| 2000 | 8.4 | 26.1 | 31.0 | 95.4 | 11.8 | 25.1 | 0 | 0 |
| 2001 | 26.2 | 55.1 | 51.0 | 132.2 | 2.3 | 4.4 | 7.7 | 14.4 |
| 2002 | 28.1 | 46.2 | 35.1 | 101.0 | 30.8 | 42.8 | 4.2 | 6.8 |
| 2003 | 26.7 | 41.9 | 51.9 | 93.5 | 36.9 | 45.0 | 8.0 | 7.5 |
| 2004 | 46.8 | 99.0 | 39.2 | 67.0 | 34.2 | 47.0 | 13.0 | 17.2 |
| 2005 | 32.8 | 78.6 | 38.5 | 78.6 | 37.6 | 49.3 | 0.8 | 0.9 |

No data for Zone 1 are presented, because catches by exploratory fishing were minimal and it is assumed that there are no commercial quantities in that Zone.

While the total catch for all zones has been relatively steady over recent years (Table 3 and Figure 2), the contribution made by individual zones has been quite variable. All three show increases and plateau. The plateau occurs in 2004 in Zone 2, 2001 in Zone 3, and 2002 in Zone 4/5.

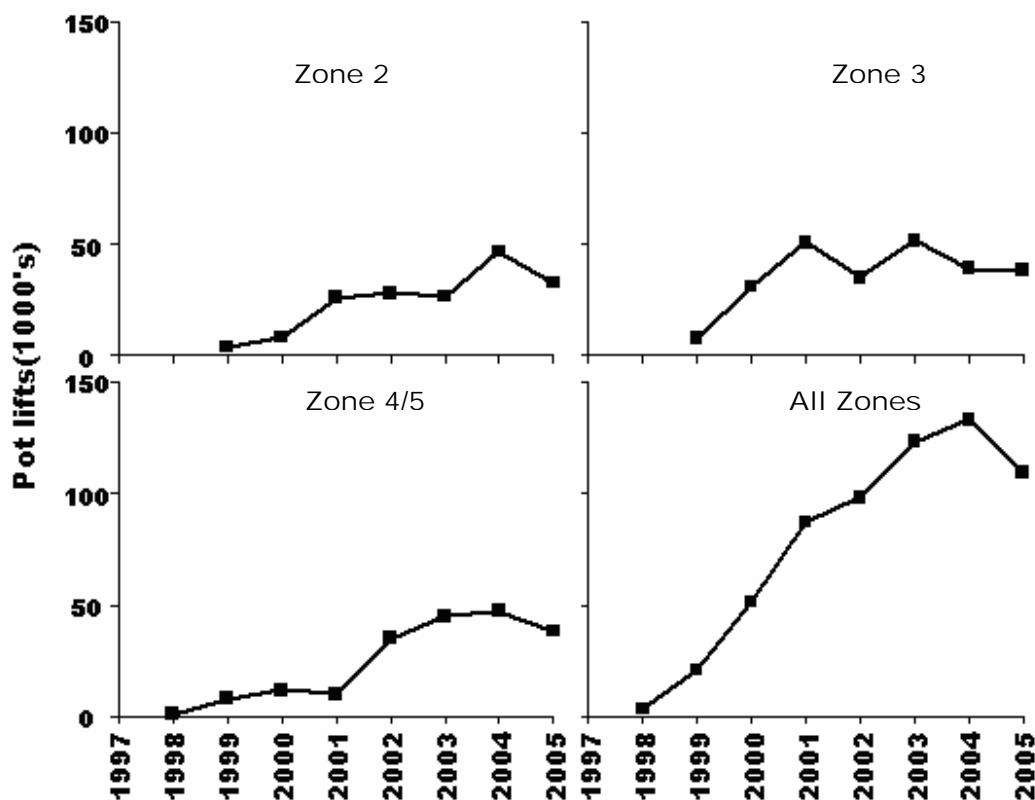
Figure 2: Total catch of crystal crabs (in tonnes) reported by zone from CAES data (1998 and 1999) and logbooks (2000 – 2005).



5.2. Total Fishing Effort on Target Species

Effort directed at crystal crab (expressed as number of pot lifts per day) for each of the management zones, is presented in Figure 3 and Table 3. Effort increased rapidly and maximum levels were reached in 2004. The 2005 calendar year was the first since 1997 to see a downturn in effort, in this case by 17.6% over the 2004 figure (Table 1, Figure 3). Effort decreased in 2005 in all fishing zones except Zone 4.

Figure 3: Total effort for crystal crab fishing in 1000's of pot lifts, reported by zone from CAES data (1998 and 1999) and logbooks (2000 – 2005).

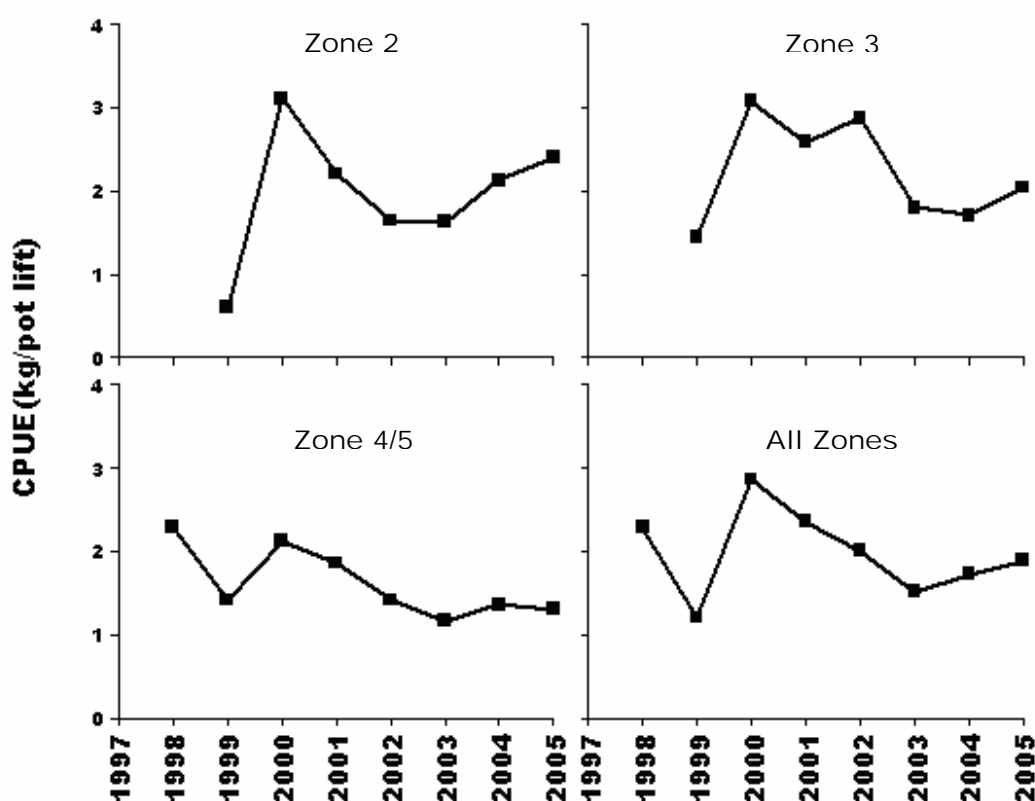


5.3. Catch Per Unit of Effort for Target Species

CPUE, expressed as kg/pot lift are presented for crystal crab fishing in each of the zones in the WCDSF from 1998 onwards (Figure 4).

Catch rates were relatively low in some Zones before 2000, probably as skippers learned the best fishing locations and how best to deploy the gear. Catch rates (unadjusted for efficiency increases) were very high in all zones in 2000 (Figure 4), possibly due to increased experience of the skippers, combined with the accumulated biomass of crabs in a previously unexploited fishery. As with most new fisheries, catch rates have declined for a few years as the accumulated biomass of legal sized individuals was reduced by fishing (Figure 4). Since 2003, CPUE has been relatively stable in all but Zone 2, where it has shown an increasing trend.

Figure 4: Catch per unit of effort for crystal crab (kg/pot lift) from 1998-2005. Data determined from logbook data.



5.4. Total catch of deep sea crabs in other fisheries

Very occasional catches of crystal crabs are made by trawlers operating under the Commonwealth managed Western Deepwater Trawl Fishery but this amounts to insignificant numbers of animals compared to what is taken by the pot fishery. Actual landings of crystal crab by trawlers are not available in this document because the number of boats reporting crystal crab catches is below the minimum number for which AFMA permits disclosure under the confidentiality provisions of Commonwealth legislation. The comparatively small catches can be accounted for by a combination of factors, the most important of which are that the trawl fishery operates outside of the depths and zones where crystal crabs occur commercially and furthermore, trawling is a less efficient way of catching crystal crabs than pots.

Champagne crabs, not currently targeted by the WCDSCF, are also caught by rock lobster fishers when working in the depth limits of the western rock lobster fishery. This only occurs over a short period in the year which is usually around mid-January. While catches made by rock lobster fishers are small, DFWA intends to introduce “byproduct legislation” which in this case would limit the amount of crystal crabs that rock lobster fishers are allowed to retain under the *West Coast Rock Lobster Management Plan 1993*.

5.5. Bycatch species

Pot fishing in depths at which crystal crabs are targeted, using the type of pots used in this fishery, seldom produces any bycatch. Table 4 shows the total quantities of bycatch that have been reported in logbooks over the last 5 years. Because of difficulties in identifying the bycatch species taken by this fishery (see 9.12. Progress in implementing 2003-04 recommendations), it has only been possible to record bycatch species as in broad taxonomic categories.

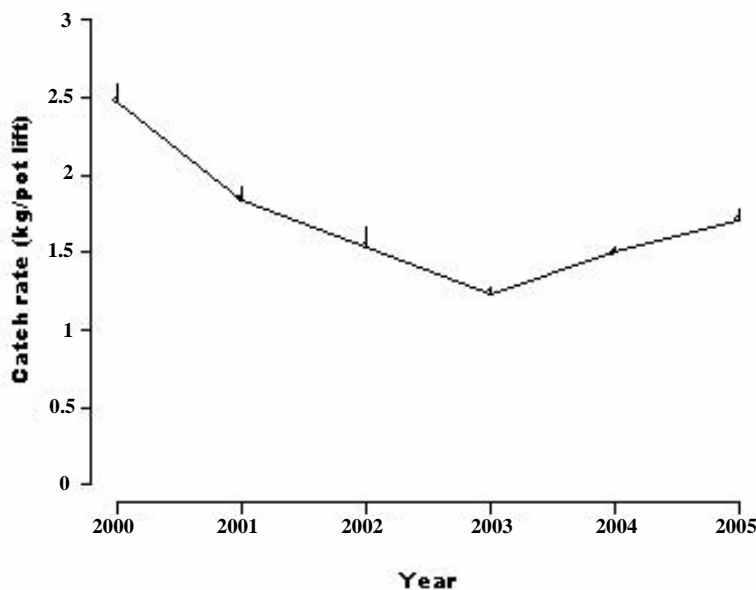
Table 4: Bycatch taken in the fishery between 2000 and 2005.

| Species category | Number of animals reported |
|-------------------------|-----------------------------------|
| Fish | 4 |
| Sharks | 7 |
| Eel | 1 |
| Crab | 120 |
| Octopus | 48 |
| Prawn | 1 |
| Scampi | 1 |
| Starfish | 2 |
| Glass coral | 9 |

6. Status of target stock

Spatial and temporal changes in catch, effort and CPUE are discussed in Section 5. It was outlined above that total catch in the fishery has stabilised over the last five years at around 200 tonnes per annum and that effort increased until 2004, but declined in 2005. Overall, this translated into a decrease in CPUE in the early years of the fishery, which has stabilised and now even shows signs of increasing (Figure 5), so the relative abundance of crabs is not being affected to an unacceptable degree.

Figure 5: Standardised CPUE of legal crystal crabs (kg/pot lift) for 2000 – 2005 with standard errors included.



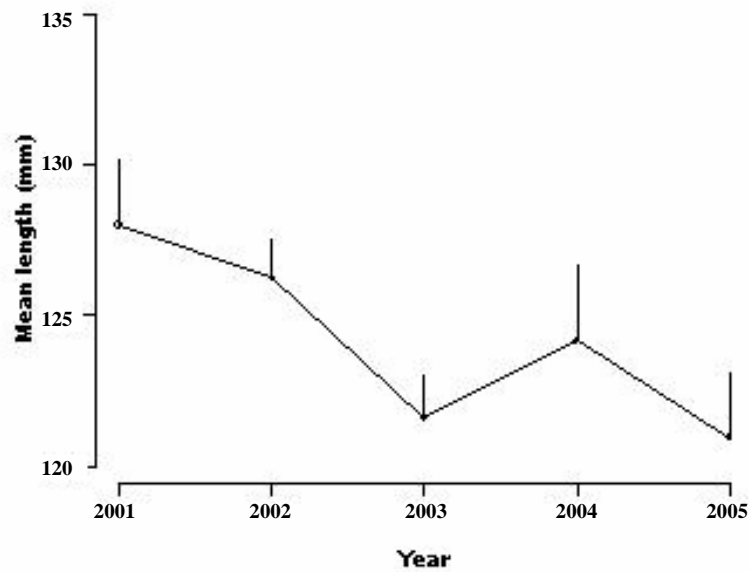
Size at maturity for both sexes is well below the legal minimum size [size at maturity for females is 90.5 mm CL (Smith *et al.* 2004) and for males 94.3 mm CL (Hall 2006)], and therefore it is considered that the brood stock is well protected.

This combination of indicators point to the current catch by this fishery being sustainable and suggests that the relatively simple management measures in place (legal minimum size, effort limitations) are doing an effective job in guarding the fishery from overexploitation.

Nonetheless, when this fishery moves to a new interim management plan in 2007, it will have the additional protection of output controls. Landings over recent years have consistently been around 200 tonnes. It is anticipated that a precautionary TAC of around 140 tonnes will be set in the first year under the new plan.

Because there is a big biological difference in the size of the two sexes in crystal crabs, with male crabs growing much larger than females, catches in the fishery are highly male dominated. Spatial and temporal changes in male size frequency structure since 2001 show that there was an initial downturn in mean size in the first couple of years of fishing, but there are indications that this may now have stabilised (Figure 6) but a longer time series will be important to confirm this trend.

Figure 6: Mean length (mm) of male crystal crabs by year with standard error bars.



7. Interactions with protected species

No interactions with protected species have been recorded.

8. Impacts of the fishery on the ecosystem in which it operates

As noted, the crystal crab (*Chaceon* spp) fishery catches only small quantities of bycatch. The pots are set and hauled on longlines and cause minimal disturbance to the benthos.

Any possible effects on the ecosystem would therefore result from the removals of crabs above the legal size limit. *Chaceon* spp are known to be scavengers, capable of feeding on a wide range of food sources. Given our limited knowledge of deep-water benthos, it is unknown what impact reduced densities of large crystal crabs might have on the ecosystem. Given that the bulk of the crab population are below the legal size limit and given that the numbers of legal size crabs being removed are relatively small compared to the size of the grounds, it is considered unlikely that their removal would impact the deep water ecosystem in which they are found.

Because of the depths involved, identifying any impact of the reduced numbers of large individuals in the crab population on the ecosystem would be well beyond practical possibilities for this fishery.

9. Progress in implementing 2003-04 recommendations

1. **DFWA to inform DEH of any future amendments to the management regime for the West Coast Deep Sea Crab Fishery or managerial commitments made in the submission.**

DFWA informed DEH of its intention to develop a new interim management plan in 2004. It is expected that the new plan will commence in 2007.

2. **DFWA to formally incorporate the ESD report, including all performance measures, responses and information requirements, into the management regime and decision making process, with a clear timeframe for implementation, within one year.**

DFWA intended to incorporate these requirements into policy guidelines known as Ministerial Policy Guidelines (MPGs) under section 246 of the *Fisheries Resources Management Act 1994*. However recent legal advice has indicated that a policy guideline under section 246 may not be the appropriate policy vehicle to deliver these requirements. DFWA is currently considering alternative options to incorporate the ESD report, including all performance measures, responses and information requirements, into the management regime and decision making process.

3. **DFWA to ensure that a mechanism to require compliance with any future plans or policies and international or regional regimes relevant to the fishery is developed and included in the management regime.**

The governing legislation, as outlined in section 2.3, provides the necessary mechanisms.

4. **DFWA to ensure that the composition of interim and subsequent bodies set up to advise on the management of the fishery provide for the inclusion of conservation and general community interests. Greater efforts to also be made to increase general community and conservation interests involvement in stock assessment and research priority setting processes for this fishery.**

The *West Coast Deep Sea Crab Fishery (Interim) Management Plan 2003* requires that all permit holders of the Fishery must be consulted before the plan is amended or revoked. Despite DFWA's attempts to include broader interests in management discussions for the WCDCSF there has been a lack of interest from peak bodies (Conservation Council and Recfishwest) in participating.

5. **DFWA 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, DFWA 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.

See Section 3.3.

- 6. As part of the review of the interim management plan during 2004, DFWA to review the research information needs and priorities to meet the management information, decision-making and performance measurement needs of the fishery. In particular, analysis of research needs in areas including, but not limited to, recruitment to the fishery, appropriateness of existing size limits, fishing mortality, habitat characterization and ecosystem impacts should be considered. DFWA to develop a research strategy to address identified priority areas, which includes clear and achievable timeframes for implementation.**

DFWA has reviewed research information needs on multiple occasions over the last three years. It is clear, given the value of the fishery and the difficult deepwater offshore environment in which it is located, that there are limitations as to what is practical in terms of research information needs. Even so, the capacity to address any needs is limited in such an environment.

With this in mind, it is considered that the existing sampling regime should be retained. Priorities from 2007 onwards will be to prepare the research output from FRDC Project 2001/055 for publication in peer reviewed journals. This is a young fishery and now that we are starting to have a longer time series of catch and effort data, it will be reasonable to examine the stock status using a biomass dynamic model approach. Tagged crabs continue to be returned, many of them having been at large for several years. The growth data from those tags that have been at large for long periods will provide good information on growth rates of these long-lived animals.

A DFWA review of research needs considered the need for information (and ways that information might be obtained) on recruitment to the fishery, fishing mortality, habitat characterization and ecosystem impacts. While this information would be useful, it was considered that it was beyond the capabilities of this fishery to fund such research and it was not considered to be practical or possible to do this work in the short to medium term.

- 7. DFWA to ensure that management arrangements to control the take of joint deep sea crab stocks in the WCDSCF and South Coast Crustacean Fishery are consistent and stock assessments ensure that all removals from both fisheries are taken into account. In addition, DFWA to ensure that removals of deep sea crabs and impacts on these species' habitat by trawling operations are factored into stock assessment and management.**

Management arrangements and stock assessments have and will continue to take into consideration the total take of deep sea crabs from the WCDSCF, South Coast

Crustacean Fisheries and the Commonwealth managed Western Deepwater Trawl Fishery.

- 8. By December 2004, DFWA to review catch and effort reporting requirements, and amend these requirements as necessary, to ensure that the completeness and reliability of fishery dependent information is maximised. DFWA to also ensure that catch and effort data collected is validated on an ongoing basis.**

DFWA has reviewed catch and effort reporting requirements on multiple occasions over the last three years. Processor returns have been used as an additional data source to assist in the validation process. Compulsory logbook sampling forms have also been amended to obtain more accurate information on the positions and depths where the gear is set.

- 9. DFWA to determine estimates of the potential productivity and sustainable yield of the crystal crab resources and develop robust and biologically meaningful performance measures and reference points, linked to defined actions for the crystal crab and champagne crab resources within three years. As an interim measure, by December 2004, DFWA to incorporate catch rates (ie CPUE) into the monitoring, assessment and performance measurement arrangements for the crystal crab component of the fishery.**

CPUE is used as a proxy for crab abundance. The crystal crab fishery has been fished since 1998, but the first two years of fishing were very much a learning experience for the fishers and their low catch rates reflected their inexperience.

Because catch rates in the first years were low due to fishers learning fishing techniques, it has only been possible to assess the sustainability of this fishery using catch rates from 2000 onwards. A fishery needs to be fished for several years before one has sufficient information on how it is responding to fishing pressure. As with any previously unexploited stock there was a decline in catch rates in the first few years of fishing, but there are indications from the data that this has stabilized (see previous discussion under section 6). CPUE is, and will remain as, a very important part of the assessment and performance management arrangements in this fishery.

- 10. In reviewing the sustainability prospects and management regime at the end of 2004, DFWA to review effort levels in the fishery and develop a strategy to ensure that the fishery effort is maintained at precautionary levels appropriate to the size of the deep sea crab resources and the species' vulnerability to over fishing.**

DFWA has reviewed effort levels in this fishery on several occasions. There was an initial increase in effort and meetings with fishers and other stakeholders indicated the need to prevent any further increase. As a result of these meetings and discussions, a decision was taken to manage the fishery by a total allowable catch quota in the future (under the management plan to be introduced in 2007). The recommended TAC (140

t) will be below the tonnage that has been taken by this fishery over the last few years (~200 t).

Considering that indicators are pointing to a stabilisation, and even increase in catch rates in recent years, it would seem logical to conclude that future fishing at levels of the recommended TAC, will should be sustainable.

11. DFWA to pursue identification of all non-commercial bycatch species and seek advice from the WA Museum and CALM on the possibility that these species may be vulnerable to fishing despite the low capture rate. Findings should be incorporated into future risk assessments and management responses.

DFWA has pursued identification of all non-commercial bycatch species, but has not been successful in these efforts. It had been our intention to build up a manual for fishers that would allow them to identify species that occasionally come up in their pots as bycatch. We requested fishers to freeze any bycatch, together with depth, location and date of capture. We then photographed each specimen and gave it a reference number. The specimens were sent the Western Australian Museum for identification and the intention was that when they provided an identification to the numbered specimens, that the species name would then be attached to the photographic image. Unfortunately, the Museum has to date only supplied species names to very few of the specimens. It appears that many of these species, whilst not necessarily rare, are only infrequently sampled because of their depth distribution. It therefore takes international experts to identify the specimens and the WA Museum has not been very enthusiastic about pursuing this task.

In short therefore, it is our view that achieving identification of bycatch specimens and building up a photographic field guide for fishers, is not an achievable objective in the short to medium term.

12. In reviewing the sustainability prospects and management regime at the end of 2004, DFWA to include a rigorous review of bycatch and protected species reporting monitoring and assessment arrangements to ensure that such arrangements are adequate and capable of detecting change and trends in bycatch and species interactions. DFWA to also develop performance measures linked to management responses and species identification guides for bycatch and protected species in the fishery.

I refer to the response under recommendation 11. It has not been possible to review the bycatch in a scientifically rigorous way. Furthermore, as has already been indicated, there are only extremely low numbers of bycatch specimens retained in the crab pots (Table 4). Given the low numbers of bycatch retained in the pots, it would not be possible to detect change and trends in by-catch and species interactions. No interactions with protected species have been recorded by this fishery. Given the above situation, it has not been seen as necessary or feasible to develop performance

measures linked to management responses and species identification guides for bycatch and protected species in this fishery.

10. References

Hall, N.G., Smith, K.D., de Lestang, S. and Potter, I.C. 2006. Does the largest chela of the males of three crab species undergo an allometric change that can be used to determine morphometric maturity? *ICES Journal of Marine Science* **63**: 140-150.

Melville-Smith, R., Norton, S.M.G. and Thomson, A.W. (unpub.) Biological and fisheries data for managing deep sea crabs in Western Australia. Fisheries Research and Development Corporation Draft Final Report, Project 2001/055: 108 pp.

Smith, K.D., Hall, N.G., de Lestang, S. and Potter, I.C. (2004). Potential bias in estimates of the size of maturity of crabs derived from trap samples. *ICES Journal of Marine Science* **61**: 906-912.