Western Australian Marine Stewardship Council Report Series
No. 4, 2015

West Coast Deep Sea Crustacean Managed Fishery

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Government of **Western Australia**
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Fish for the future

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Overview

This report provides a comprehensive description of the West Coast Deep Sea Crustacean Managed Fishery (WCDSCMF) and contains information relevant to assist the assessment of this fishery against the Marine Stewardship Council (MSC) standard (v1.3) for sustainable fishing. The WCDSCMF operates using baited traps off the west coast of Western Australia, on the seaward side of the 150 m isobath out to the extent of the Australian EEZ (200 nm), from the Northern Territory border to Cape Leeuwin (34° 24' S latitude).

The first part of this report (Sections 1 – 5) provides an overview of the WCDSCMF and the aquatic environment in which it operates, including information on the development of the fishery, fishing methods and gear used, the management system in place, external factors that may influence fishery operations and / or target species populations; and an overview of the biology of the target species, crystal crab (*Chaceon albus*). The remainder of document provides more detailed information for assessing the fishery against the performance indicators under MSC Principles 1, 2 and 3.

MSC Principle 1 (Sections 6 – 8) provides information to assess the condition of the target species stock. These sections provide information on the current stock status of crystal crabs and include a detailed description of the stock assessment approach and harvest strategy employed for ensuring the future sustainability of this stock.

MSC Principle 2 (Sections 9 – 13) relates to the impact of the fishery on the marine environment in which it operates. These sections provide information on the catch of retained non-target species, bycatch / discards, interactions with endangered, threatened or protected (ETP) species, as well as a detailed description of the habitats and ecosystem in which the fishery operates and all fishery-related impacts on these systems. Where detailed quantitative data are not available, a risk assessment approach has been used to assess the level of risk associated with any identified fishery-specific issues. The issues identified and their associated risk ratings are provided throughout the Principle 2 sections, where relevant.

MSC Principle 3 (Sections 14 – 15) provides information to assess the governance and management in place for the fishery. Governance information provided includes an overview of the local, national and international legal frameworks relevant to the management of the fishery; a description of the roles, responsibilities and consultation processes undertaken with fishery stakeholders; the long-term objectives; and the incentives in place for sustainable fishing. These sections also include information on the fishery-specific management system, including fishery-specific objectives; the decision-making process; compliance and enforcement; ongoing research; and an evaluation of the management system.

Although this document has been divided into MSC Principle-specific sections, it should be considered in its entirety as many sections provide supporting and complementary information. While this document is intended to provide a comprehensive account of the fishery, it is by no means meant to be the only source of information for assessing the fishery. If there is uncertainty regarding any parts of the descriptions and information herein, stakeholders should contact the Department so that any such issues can be addressed in subsequent updates of this document. This document should also be read in conjunction with the *WCDSCMF Harvest Strategy 2015 – 2020*.

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List of Abbreviations

AAC	Aquatic Advisory Committee
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AMM	Annual Management Meeting
ARMA	Aquatic Resources Management Act
ARMB	*Aquatic Resources Management Bill*
CALM	Conservation and Land Management (Act 1984)
CAMBA	China-Australia Migratory Bird Agreement
CBD	*Convention on Biological Diversity*
CDR	Catch and Disposal Record
CEO	Chief Executive Officer
CI	Confidence interval
CITES	Convention on International Trade in Endangered Species
CL	Carapace length
CoA	Commonwealth of Australia
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DG	Director General
DotE	Commonwealth Department of the Environment
DoF	Department of Fisheries, Western Australia
DoT	Department of Transport
DPaW	Department of Parks and Wildlife, Western Australia
EBFM	Ecosystem Based Fisheries Management
EEZ	Exclusive Economic Zone
EOI	Expression of Interest
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESD	Ecologically Sustainable Development
ETP	Endangered, Threatened or Protected (Species)
FAO	Food and Agriculture Organisation

FHPAs	Fish Habitat Protection Areas
FMO	Fisheries and Marine Officers
FMP	Fisheries Management Papers
FOP	Fisheries Occasional Papers
FRDC	Fisheries Research and Development Corporation
FRMA	Fish Resources Management Act 1994
FRMR	Fish Resources Management Regulations 1995
FRR	Fisheries Research Reports
GCB	Gascoyne Coast Bioregion
ICU	Industry Consultation Unit
IFM	Integrated Fisheries Management
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMP	Introduced marine pests
IUCN	International Union for Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
KPI	Key Performance Indicators
LENS	List of Except Native Species
LOW	Letter of Warning
LPOC	Last Port of Call
MAC	Management Advisory Committee
MCS	Monitoring, control and surveillance
MFL	Managed Fishery Licence
MSC	Marine Stewardship Council
NCB	North Coast Bioregion
NM	Nautical mile
NPWC Act	National Parks and Wildlife Conservation Act 1975
NT	Native Title
NTA	Native Title Act

NZ	New Zealand
OCP	Operational Compliance Plan
OCS	Offshore Constitutional Settlement
PAP	Prosecution Advisory Panel
PSA	Productivity-Susceptibility Analysis
PSM Act	Public Sector Management Act
RMAD Plan	Research, Monitoring, Assessment and Development Plan
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RSD	Regional Services Division
SAT	WA State Administrative Tribunal[1]
SCB	South Coast Bioregion
SCCF	South Coast Crustacean Fisheries
SOPs	Standard Operating Procedures
TAC	Total Allowable Catch
UNCLOS	*United National Convention on the Law of the Sea*
UoC	Unit of Certification
VMS	Vessel Monitoring System
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WAMSI	Western Australian Marine Science Institution
WC Act	Wildlife Conservation Act
WCB	West Coast Bioregion
WCDSCMF	West Coast Deep Sea Crustacean Managed Fishery
WCRLMF	West Coast Rock Lobster Managed Fishery
WDWTF	Western Deepwater Trawl Fishery
WRL	Western Rock Lobster
WTO	Wildlife Trade Operation

[1] http://www.sat.justice.wa.gov.au/

1. Aquatic Environment

The West Coast Deep Sea Crustacean Managed Fishery (WCDSCMF) operates off the west coast of Western Australia (WA), on the seaward side of the 150 m isobath out to the extent of the Australian Exclusive Economic Zone (EEZ; 200 nm boundary). The fishery covers three WA management bioregions[2]: North Coast, Gascoyne Coast and West Coast (Figure 1.1); however, the majority of fishing activities are centred in the Gascoyne and West Coast Bioregions.

The North Coast Bioregion (NCB) extends from just south of Onslow (114° 50' E) to the Northern Territory border. The NCB has a unique combination of features that distinguish it from other marine regions around Australia, including a wide continental shelf, very high tidal regimes, high cyclone frequency, unique current systems, warm oligotrophic surface waters and unique geomorphological features (Brewer *et al.* 2007). Ocean temperatures in the NCB range between 22° C and 33° C with localised higher temperatures in coastal waters, particularly along the Pilbara coastline. Fish stocks in the NCB are entirely tropical (Fletcher and Santoro 2014).

The Gascoyne Coast Bioregion (GCB) extends from the NCB boundary at Onslow to north of Kalbarri (27° 00' S). The GCB represents a transition between the fully tropical waters of the NCB and the temperate waters of the southwest region. The waters off the GCB are strongly influenced by the southward-flowing Leeuwin Current, a shallow, narrow (less than 300 m deep and 100 km wide) current that transports warm, low-nutrient water from the tropics southward (Church *et al.* 1989; Smith *et al.* 1991; Ridgway and Condie 2004). Although the Current flows year-round, it is strongest in the Austral autumn / winter (April to August). The current is variable in strength from year-to-year and is related to El Niño-Southern Oscillation (ENSO) events in the Pacific Ocean (Fletcher and Santoro 2014). The subsurface Leeuwin Undercurrent flows beneath the Leeuwin Current in the opposite direction along the west coast. The majority of fishing effort in the WCDSCMF has been concentrated in the GCB since 2011, following the introduction of Total Allowable Catch (TAC) limits for crystal, giant and champagne crabs.

The West Coast Bioregion (WCB) extends form 27° 00' S to the southern coast at 115° 30' E. Water temperatures range between 18° C and 24° C, which is higher than would be expected for waters at these latitudes and is largely due to the Leeuwin current (CoA 2008), which transports warm tropical water southward along the edge of the continental shelf. Fish stocks in the WCB are mainly temperate, becoming more tropical in the northern areas (Fletcher and Santos 2014). WCDSCMF fishing effort in the WCB has declined significantly since 2011, and presently, there is only one licensee operating in this area.

[2] A 'bioregion' refers to an area defined by common oceanographic characteristics in its marine environment and / or by climate / rainfall characteristics in its inland river systems (CoA 2006).

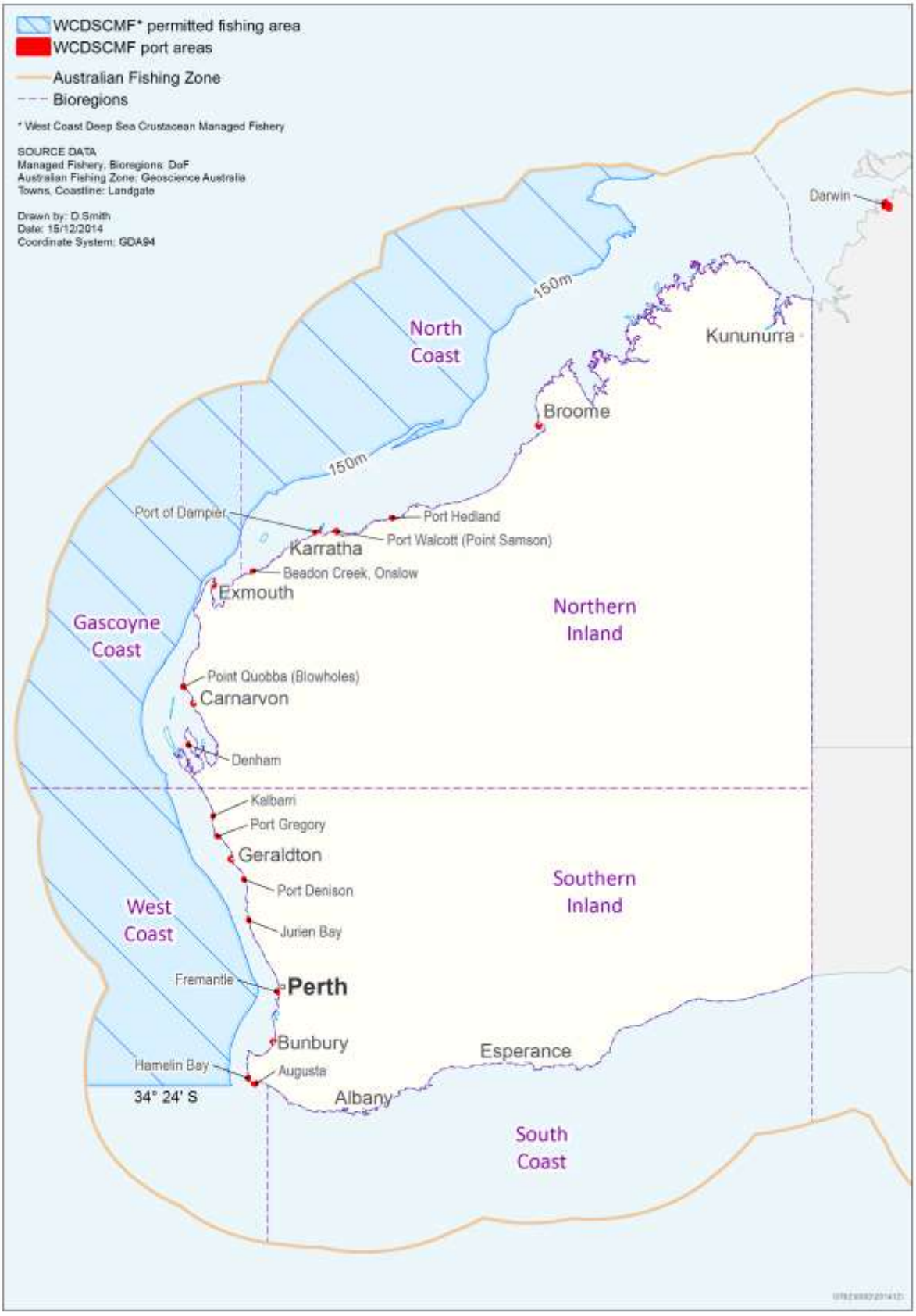

Figure 1.1. Western Australian fisheries bioregions and boundaries of the West Coast Deep Sea Crustacean Managed Fishery including permitted fishing area and port locations.

While the boundaries of the WCDSCMF are from the 150 m isobath to the edge of the Australian EEZ, most fishing is concentrated in deeper waters on the continental slope between 500 – 800 m depths (How and Nardi 2014). The continental slope is dominated by sand and mud substrates and is too deep for photosynthetic organisms, such as seagrass and algae due to light limitations (Australian State of the Environment Committee [ASEC] 2001). Sediments at depths greater than 300 m are mostly mud with macrobenthic fauna decreasing with increasing depth (Levings *et al.* 2001). The dominant large animals that are likely to live in the sediment and mud are marine worms, crustaceans, echinoderms (e.g. sea urchins) and shellfish. Epifauna includes hydroids, sea-pens, small bryozoans and sponges (ASEC 2001).

2. Target Species / Stock Description

2.1 Crystal Crab

2.1.1 Taxonomy and Distribution

The crystal crab (*Chaceon albus*), is a large (> 180 mm carapace width [CW]) decapod crustacean of the Geryoniidae family (Ng *et al.* 2008; Figure 2.1). This species was previously thought to be *C. bicolor* (Wadley and Evans 1991); however, was reclassified as the new species *C. albus,* which has distinctly shorter and stouter walking legs as well as its much paler colour (Davie *et al.* 2007). Morphological variations from *C. bicolor* and all Indian Ocean congeners are discussed in Davie *et al.* (2007), and all subsequent references pertaining to *C. albus* will include those previously described as *C. bicolor* when occurring within WA waters. *C. albus* is restricted to WA waters, (R Melville-Smith pers comm.; Davie *et al.* 2007).

Figure 2.1. Image of a crystal crab (*Chaceon albus*)

2.1.2 Stock Structure

There is little information on the stock structure of crystal crabs on the west or south coasts of WA. Most of the catch in the WCDSCMF comes from a relatively small geographic area and the stock is considered a single unit for management purposes.

Preliminary information on the movement of crystal crabs appears to be fairly small (< 50 km), although this is being re-examined (see Section 2.1.3.1).

There is no information on the larval duration of crystal crabs. A con-specific (*C. quinquedens* formerly *Geryon quinquedens*) progressed from a stage one zoea to a juvenile crab in 39 days (Perkins 1973). While this was at warmer temperatures than occurs on the fishing grounds off WA, it does suggest a fairly short larval duration.

2.1.3 Life History

Limited life history information is available for crystal crab. The commercial catch is dominated by males, with the legally-retainable catch (> 103 mm CL [120 mm CW]), of males being 5.5 times that of legally-retainable females (Figure 2.2).

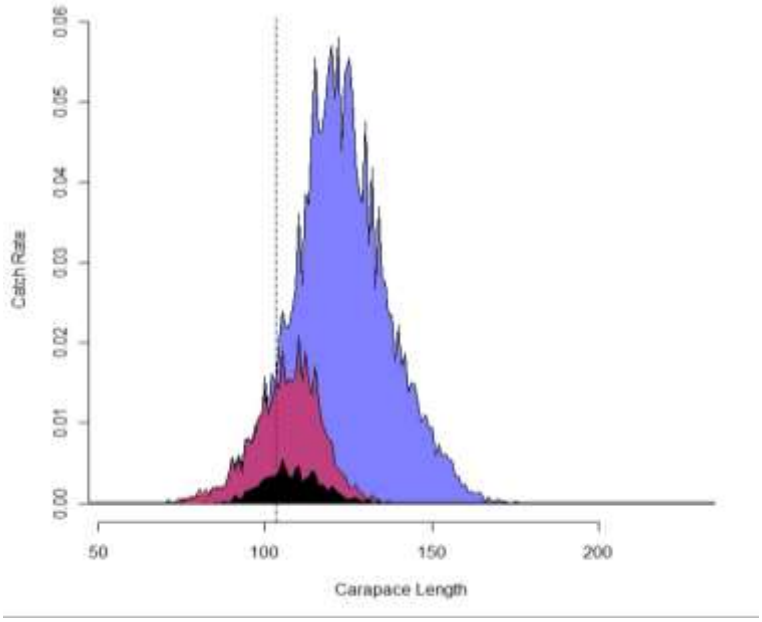

Figure 2.2. Size structure of males (blue), non-berried females (red) and berried females (black) by 1 mm CL length class in the WCDSCMF. Horizontal dashed line represents legal minimum size (DoF unpublished data).

Chaceon species in other parts of the world have shown a gradient of size or sex ratio with depth, however initial examination did not provide strong evidence of size or sex-mediated stratification in WA (Melville-Smith *et al.* 2007). More recent examination suggests that there may some size stratification with depth; a decline in the catch of undersize (< 103 mm CL [120 mm CW]) crystal crabs in apparent in depths < 600 m (Figure 2.3). Male crabs are also larger in the shallower water and mean size decreases with increasing depth (Figure 2.3). A similar pattern is not clearly evident in females.

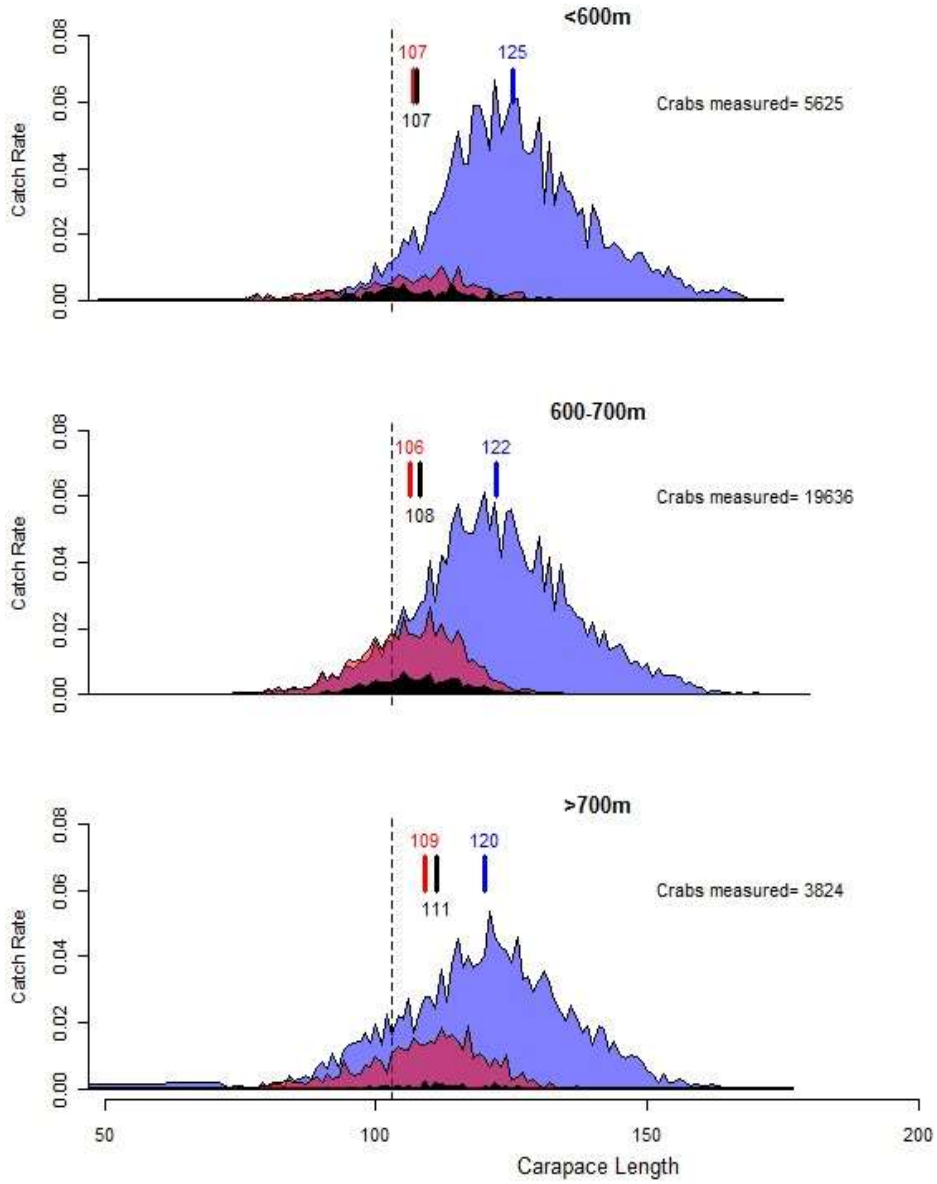

Figure 2.3. Size structure of males (blue), non-berried females (red) and berried females (black) by 1 mm CL length class, for each depth category in the WCDSCMF. Mean size for each sex category is indicated on plot in corresponding colour. Vertical dashed line represents legal minimum size (DoF unpublished data).

2.1.3.1 Movements and Important Habitats

Crystal crabs are a deep-water species occurring on the continental shelf at depths of 300 – 1200 m. On the west coast of WA crystal crabs are caught primarily in depths of 500 – 800 m, although they are found over a broader range on the south coast of WA (i.e. 400 – 900 m depths; Melville-Smith *et al.* 2006). The habitat within these depth ranges are generally sand / mud or broken shell (Wadley and Evans 1991; Jones and Morgan 1994).

Tag recapture work by Melville-Smith *et al.* (2007) examined the movement patterns of 5803 crystal crabs. Most crabs of both sexes moved less than 50 km, remaining within the mid-depth range when tagged there, or moving to that depth range when tagged shallower or deeper. The movements were classified as nomadic, with no apparent migratory or homing

behaviours; rather they were multidirectional and of varying distance (Melville-Smith *et al.* 2007). A large number of recaptured crabs have been returned since the completion of the aforementioned study. More detailed information on movement patterns associated with vertical (depth) migration is critical and likely to be the focus of future research.

2.1.3.2 Reproduction

For full details see Smith *et al.* (2004), Smith *et al.* (2004a) and Smith *et al.* (2004b).

2.1.3.2.1 Spawning Season

Reproductive development in crystal crab involves ovarian development before females become ovigerous. Ovarian development (late-stage vitellogenic oocytes) was found to be greatest in July-December compared to January to April. This was mirrored in standardised mean monthly gonad weights; however, ovigerous females were captured in each of the 11 calendar months sampled. Similarly, spent or recovering ovaries were present in eight months covering all four seasons. This indicates that there is only weak seasonality in the reproductive cycle of crystal crabs on the lower west coast of WA (Smith 2004b).

A preliminary examination of data from voluntary logbook returns (Section 8.4.2.3) indicates that there is seasonality to the capture of berried females, which is consistent at all depths (Figure 2.4). Peak catch rates of berried females occur from September to December, with the highest catch rates occur in the 600-649 m depth category. Catch rates in the adjacent depths categories (550-599 and 650-659 m) are similar to each other but lower than that of the 600-649 m depth category (Figure 2.4).

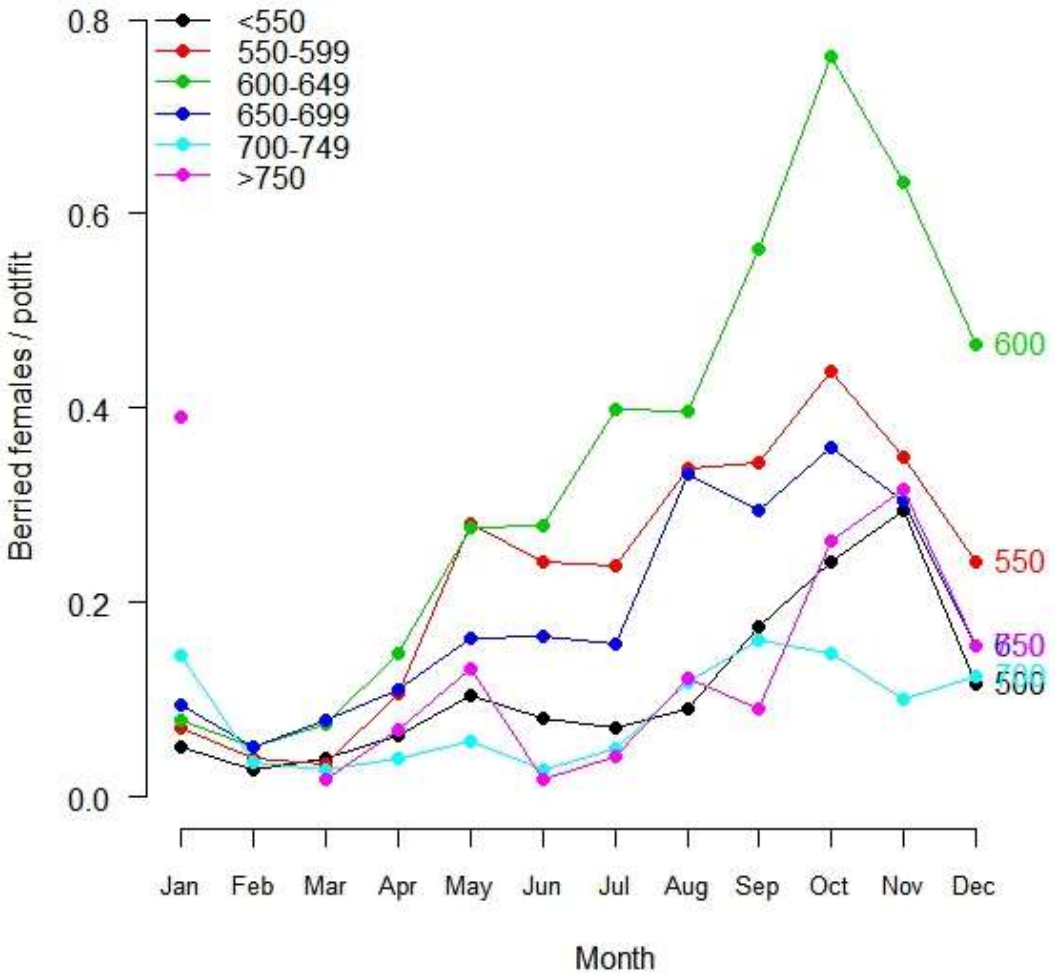

Figure 2.4. Number of berried female per traplift by month and depth category

2.1.3.2.2 Size at Maturity

Female maturity can be assessed through the shape of gonopores, which are elliptical and compressed in immature, and open and circular for mature females (Smith *et al.* 2004b). The use of these external characters revealed a size at maturity (CL_{50}) of 90.5 mm CL (89.7 – 91.2 mm CL, 95 % confidence interval [CI]). Ovigerous or egg remnant females had a mean CL of 108.2 mm (91 – 140 mm C [95% CI]; Smith *et al.* 2004b). Due to potential behavioural changes associated with maturity, these measures may represent an underestimate of the size of female maturity (Smith *et al.* 2004b).

Male crystal crabs attain physiological sexual maturity (CL_{50}) at 94.3 mm CL (93.7 – 94.9 mm CL [95 % CI]), with 95 % male maturity at 99.9 mm CL (98.2 – 101.6 mm CL [95 % CI]). There was no discernible morphological change in male crab chela associated with maturation (Hall *et al.* 2006).

2.1.3.3 Fecundity

Fecundity on crystal crabs ranged from 15 592 (CL = 98 mm) – 288 512 (CL = 133 mm), with a mean of 192 070 (± 33 640 [95 % CI]; Smith *et al.* 2004a). This is significantly less

than other local deep sea crab species (e.g. *H. acerba*) and may be a result of continued spawning and the lack of need to maximise egg production at a particular time.

The relationship between fecundity, *F*, and carapace length, *CL*, in crystal crabs can be described by a power function $F = aCL^b e^{\varepsilon}$ where $\varepsilon \sim N(0, \sigma^2)$, and where a, b and ε were estimated from the linear regression equation $\ln(F) = \ln(a) + bln(CL) + \varepsilon$ (Smith *et al.* 2004b):

$$\ln(F) = 1.686 + 2.957\ln(CL)$$

2.1.3.4 Length-Width Relationships

Carapace width (CW) is the widest point across the carapace between the two lateral spines (Figure 2.5) and is used as the measure for legal size. These lateral spines can wear down in inter-moult periods, and hence is not as accurate as the carapace length (CL) measure. Carapace length is taken from the posterior of the margin of the carapace to indentation between the base of the two anterior medial horns (Figure 2.5).

As CL is more accurate, it is this measure that is taken during commercial monitoring (see Section 8.4.2.5). There was no significant difference between the sexes (p = 0.34), with the following length-width relationship determined for both sexes: CL= -5.66 + 0.90* CW.

Figure 2.5. Dorsal view of a crystal crab showing the locations from which carapace width (CW) and carapace length (CL) are taken

2.1.3.5 Weight-Length Relationships

Data from a wide range of sizes (70 – 125 mm CL) and geographic areas of the fishery are used to determine the weight at length relationship in crystal crabs (DoF unpublished data). The weight at length relationship is $W_i = a(L_i)^b e^{\varepsilon_\ell}$ and the equation used in the fitting process was $\ln(W_i) = \ln(a) + b\ln(L_i) + \varepsilon_\ell$ where $\varepsilon_\ell \sim \mathrm{N}(0, \sigma_\ell^2)$. There is a significant difference in the weight length relationship between sexes ($p < 0.01$):

$$W_f = \exp(-7.62) L_f^{3.01}$$

$$W_m = \exp(-8.47) L_m^{3.21}$$

2.1.3.6 Age and Growth

The growth rate of crystal crabs was studied by Melville-Smith *et al.* (2007) using information from tag returns. Growth increments were consistent across the range of sizes sampled, with females increasing in size by 10-15mm CL per moult increment (size range 90-110mm CL). Males increased by 15-20mm CL for a moult increment across sizes of 90-120mm CL. As this is consistent across a range of sizes, it did result in a decreasing percentage growth increment (GI%) with size, though male GI% was greater than for females. Growth increments for males were then used to provide an estimate of age at maturity (12 years), age at legal size (14 years) and maximum age (25-30 years) through Hiatt growth curves.

Recent work on the several decapods species including the snow crab (*Chionoecetes opilio*) has established a new method by which age invertebrates (Kilada *et al.* 2012). A workshop with the primary author of this recent study (R. Kilada) occurred in late January 2013. This provided a very promising indication that ageing of *C. albus* is possible.

2.1.3.7 Diet

No dietary studies have been conducted on crystal crabs; however, studies from deep sea crabs species from the same family (Geryonidae), indicate that this species is likely to be highly opportunistic in its feeding habits, adopting strategies of both an active carnivore and a scavenger (Cartes 1993; Kitsos *et al.* 2005). Deep sea crab species tend to display highly-diversified diets and low feeding activity relative to shallow-water species, an adaptation to deep bathyal zones where resources are scarce. Prey categories for those species where diets have been studied include ascidians, octocorals, decapods, amphipods, gastropods, polychaetes and fish (Cartes 1993; Kitsos *et al.* 2005). Results of these studies indicate that crystal crabs are likely to be low in the food chain of these deep water ecosystems.

2.1.3.8 Natural Mortality

There are no estimates of natural mortality for the crystal crab.

3. Fishery Information

3.1 Fishery Development and Current Activities

Interest in establishing commercial fishing operations for giant (*P. gigas*) and champagne (*H. acerba*) crabs in WA began the 1960s, but significant catches of these deep sea crabs have only been reported from the late 1980s onwards. Champagne crabs were extensively targeted for three years between 1997 and 1999; however, a decline in the abundance of champagne crabs in 1999 has led to the targeting of crystal crabs (*C. albus*) in waters deeper than 500 m since this time (DoF 2003).

In 2003, management arrangements for deep sea crabs were formalised by the introduction of the West Coast Deep Sea Crustacean (Interim) Managed Fishery Management Plan. The Plan limited fishing activity to seven permit holders, with effort divided into five zones along the west coast. Fishers were only permitted to operate in specific zones, with one or two fishers permitted to operate in each zone. Between 2003 and 2007, catches of crystal crabs were maintained around 200 tonnes (t) annually, with a peak of 227.5 t in 2007.

In 2008, a quota system was introduced with an annual TAC set at 140 t for crystal crabs. This TAC was set using the precautionary approach, as the species is known to be slow to mature and long-lived (Melville-Smith *et al.* 2007). Fishing zones were removed when quota was introduced, meaning that fishers were no longer restricted to specific areas. Consequently, fishing effort is no longer spread along the entire west coast but is concentrated in a few areas (Figure 3.1). The fishery has recorded catch across 177 10'x10 blocks with 113 blocks recording catch during the reference period (2003-2012). Currently (2014), catch was only recorded from 53 blocks, which represents 30 % of the historical extent of the fishery. This was a slight increase from 2013 where only 35 (20 %) blocks recorded catch, due to some exploratory fishing by one vessel in 2014. It should be noted that one vessel does not supply volunteer logbooks and as such it is not possible to include there activities in this assessment. However, this vessel catches < 10 000 kg and generally operates over a few blocks off Fremantle.

The fishery transitioned from an interim to a fully-managed fishery on 1 January 2013. The TAC for crystal crabs has remained at 140 t since its introduction in 2008, and an annual combined quota of 14 t was introduced for giant and champagne crabs under the new (current) management plan. There are currently seven license holders in the WCDSCMF, with the units spread evenly across the licenses and fully-transferable between licence holders. Currently, the quota is consolidated on three vessels.

Two of the licensees fish within the GCB and catch approximately 90 % of the TAC. This region has the greatest area of depths between 500 – 800 m along the WA coast, which is the target depth for crystal crabs (Melville-Smith *et al.* 2007). One vessel also operates off the Perth metropolitan region, and only fishes for a few months per year, primarily targeting crystal crabs but also fishing for giant crabs on occasion.

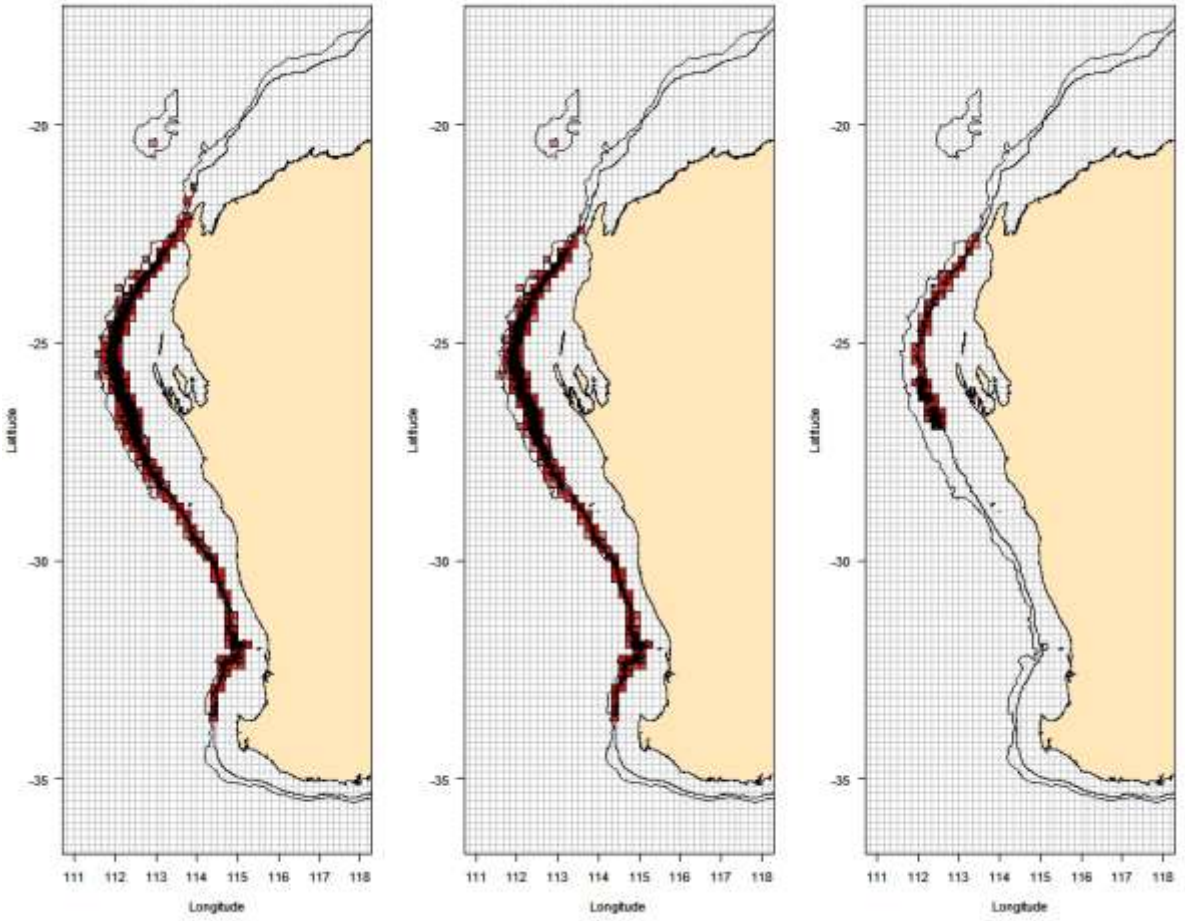

Figure 3.1. Location of effort for crystal crabs (line start GPS location) from volunteer logbook (black dots) and the associated 10' x 10' blocks in which catch was recorded (right) since it began (1999-2014) (centre) during the reference period (2003-2012) and (left) 2014. Note a small amount of fishing occurs off Fremantle but is not recorded by volunteer logbook.

3.2 Fishing Methods and Gear

Fishers in the WCDSCMF are only permitted to fish using traps. Currently, fishers use moulded plastic rock lobster traps with a 5 – 10 kg flat piece of metal wired to the base of the trap to act as ballast. It is a legislated requirement that each trap has two escape gaps (294 × 54 mm) to allow undersized crabs to escape (Figure 3.2).

Traps are operated in long-lines, which have between 80 and 150 traps attached to a main line marked by a weighted float at each end. There is little movement of the traps once they are in contact with the benthos. The traps at each end of the lines are heavier, with additional ballast to 'anchor' the ends of the line. The rope used to connect the traps in a line is positively buoyant and is not in contact with the benthos. This prevents any damage that may occur from rope movement across the benthos such as occurs from 'anchor scaring' in seagrass meadows. The traps soak for three to seven days before retrieval and approximately 400 – 500 traps are pulled per day (DoF 2003, 2009).

Figure 3.2. Deep sea crustacean vessel "Napoleon" alongside the Denham fisherman's jetty (top) and Crab traps used by fishers in the WCDSCMF

The WCDSCMF is open to fishing all year; however, most fishing effort is focused between January and June, when weather conditions are typically more favourable. Greater concentration of fishing effort also tends occur around the Chinese New Year (January / February) due to market demands. Traps remain in the water throughout the year and are only retrieved to collect the catch and for rebaiting. On some occasions traps can be left in the water for between 10 – 14 days if weather conditions are unfavourable for fishing. Depending on where they are operating, most fishers tend to spend around 12 hours steaming to the fishing grounds, leaving in the late afternoon and retrieving the traps at first light.

Traps are retrieved using a hydraulic winch, and crabs are removed by hand, placed on a sorting tray, sexed and measured. The claws of the crabs are bound to their bodies using a cable tie to minimise the risk of injury to both fishermen and other crabs. Legal-sized crabs are placed in a 5° C brine holding tank for transport back to port. Any undersize crabs are

returned to the water as soon as possible. Retrieved traps are re-baited and stacked at the back of the vessel. Once all traps have been retrieved from one longline, the traps are reset before the next longline is retrieved. Due to the low productivity of the fishery, fishermen typically re-set traps on different ground to where they were retrieved.

Fishers generally spend two days retrieving traps before returning to port where they are met by a processor with a refrigerated truck to transport the catch. Catches are unloaded from the vessel and weighed before being transported to a processing facility, where they are re-weighed. In accordance with the management plan the weight of landed catch is recorded in triplicate in a CDR form before being dispatched to the processor. Comparison of landed weights and processor weights are used for validation by the Department.

3.3 Catch and Effort

While interest in deep sea crab fishing started in the 1960's, significant catches were only reported from the 1980's onwards. Initially landings were dominated by champagne crabs (*H. acerba*), although catches were relatively low, generally less than 10 t annually (Table 3.1, Figure 3.3). Catches of champagne crabs in recent years have been low, with less than 1 t retained in 2012 and zero retained in 2013.

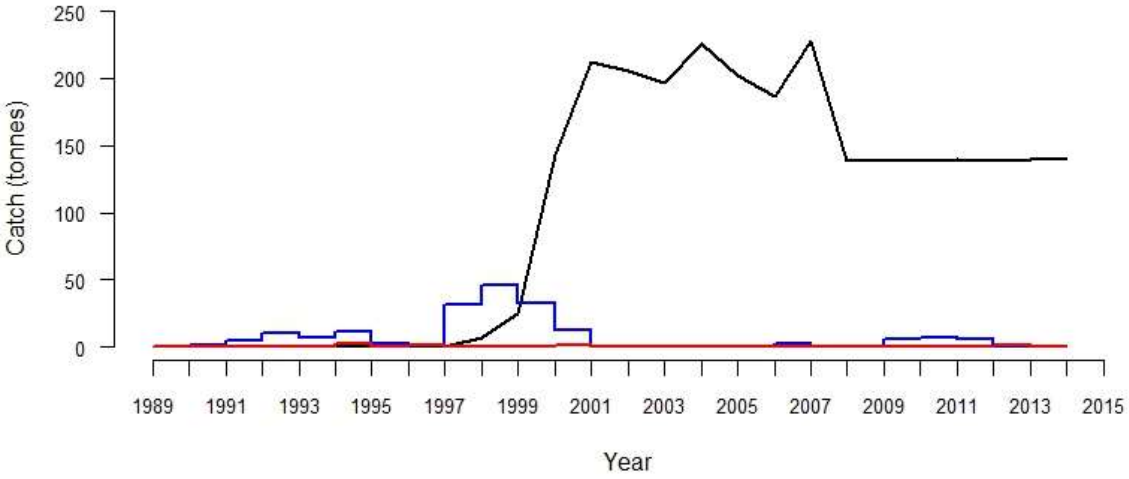

Figure 3.3. Catch of deep sea crustacean species; crystal (black), champagne (blue) and giant crab (red) in the WCDSCMF 1989 – 2014

Commercial fishing interests in crystal crabs (*C. albus*) started in the late 1990's, with catches around 200 t per annum in 2001 – 2007. The introduction of the TAC in 2008 has led to catches of crystal crabs stabilising around 140 t per annum (Table 3.1, Figure 3.3).

The first landings of giant crabs (*P. gigas*) were in 1994; however, catches of this species have always been minimal. Between 1989 and 2013, most giant crab landings were less than 3 t per annum, with no catch reported for the majority of years (Table 3.1).

Table 3.1. Annual catches (tonnes) of crystal (*C. albus*), champagne (*H. acerba*) and giant (*P. gigas*) from 1989 – 2014

Year	Crystal crab (t)	Champagne crabs (t)	Giant crabs (t)
1989	0.0	0.2	0.0
1990	0.0	1 .27	0.0
1991	0.0	5.1	0.0
1992	0.0	9.8	0.0
1993	0.0	7.3	0.0
1994	0.0	11.0	2.3
1995	0.0	2.8	0.0
1996	0.0	1.4	1.0
1997	0.7	30.9	0.4
1998	7.1	45.6	0.0
1999	24.8	32.4	0.1
2000	143.3	12.4	0.9
2001	212.8	0.1	0.0
2002	205.4	0.0	0.0
2003	196.4	0.1	0.0
2004	225.8	0.3	0.0
2005	201.8	0.0	0.0
2006	185.6	2.2	0.0
2007	227.1	0.0	0.0
2008	139.1	0.0	0.0
2009	138.5	5.2	0.0
2010	138.7	6.3	0.1
2011	139.7	5.5	0.0
2012	138.7	0.0	0.8
2013	139.5	0.0	0.0
2014	139.8	0.0	1.5

4. Fishery Management

An overview of the fishery-specific governance and management relating to the WCDSCMF is presented below. More detailed information, including a description of the long- and short-term management objectives for these fisheries, is provided in the MSC Principle 3 Sections 14 and 15.

4.1 Management System

The WCDSCMF operates under the following legislation, which can be accessed via the Department's website[3]:

- *Fish Resources Management Act 1994* (FRMA)[4];
- *Fish Resources Management Regulations 1995* (FRMR);
- FRMA Part 6 — *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012*; and
- FRMA Section 7 Exemptions.

Fishers must also comply with the requirements of:

- The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Western Australian Marine Act 1982*; and
- Western Australian *Wildlife Conservation Act 1950*.

4.1.1 FRMA

The FRMA provides the overarching legislative framework to implement the statutory management arrangements for the WCDSCMF and contains the head powers to determine a management plan (section 54). WA management plans (see below) are subsidiary legislation which set out the operational rules that control managed commercial fishing activities and should be viewed in conjunction with other specific relevant subsidiary legislation and strategies in place for the fishery. The management plan provides the power (pursuant to section 58) to issue and restrict the number of authorisations and regulate other conditions and grounds relating to fishing. There is also power to set the capacity of the fishery under a management plan (section 59). The FRMA also sets out the procedure for determining and amending a management plan (sections 64 and 65). Under section 43 the Minister may prohibit fishing by order published in the Government Gazette.

4.1.2 FRMR

The Department has minimum size limits and specific regulations in place to protect breeding females (i.e. berried females must not be retained as per Schedule 2 of the FRMR). The following minimum size limits also apply to deep sea crabs (under Division 5 of the FRMR):

- Crystal crab: 120 mm carapace length (CL);
- Champagne crab: 92 mm CL; and

[3] http://www.fish.wa.gov.au/About-Us/Legislation/Western_Australian_Fisheries_Legislation/Pages/default.aspx
[4] Note the FRMA will be replaced by *Aquatic Resources Management Act* once enacted.

- Giant crab: 140 mm CL.

All fishers are required (under r.64 of the FRMR) to report catches in monthly Catch and Effort Statistics (CAES) forms to the Department's Research branch.

4.1.3 Management Plan

A fishery management plan sets out the operating parameters of the fishery, such as when and where people can fish (open and closed areas); who can fish (licences required); how they may fish (e.g. gear types and dimensions); how much they can catch (e.g. quota allocations for commercial fishers) and what they can catch (species restrictions).

The *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012* (the Management Plan) is the primary statutory management instrument for the WCDSCMF. The current management plan replaced previous Interim Management Plans when the fishery transitioned from an interim managed fishery to a managed fishery on 1 January 2013. The current Management Plan implements the following set of statutory measures in order to meet the management objectives for the fishery:

- **Fishery Boundaries and Closed Areas:**
  The WCDSCMF boundaries include all WA waters of the Indian Ocean and the Timor Sea north of 34° 24' S latitude (to the Northern Territory border), on the seaward side of the 150 m isobath out to the extent of the EEZ (referred to as the Australian Fishing Zone).

- **Limited Entry:**
  As a managed fishery, access to the deep sea crustacean resource is limited to fishers holding a managed fishery licence (MFL) issued pursuant to the Management Plan. There are seven MFLs in the WCDSCMF.

- **Fishery Capacity:**
  The maximum quantity of crystal crab that may be taken from the Fishery during any licence period is 140 000 kg whole weight (7000 units).

  The maximum quantity of champagne and giant crabs combined that may be taken from the Fishery during any licence period is 14 000 kg whole weight (700 units).

- **Allocation of Units:**
  Class A units confer an entitlement (under the authority of a licence [MFL]) to take an amount (20 kg) of crystal crab (*Chaceon* spp.) from the waters of the Fishery in a licensing period, while Class B units confer an entitlement to take an amount (20 kg) of champagne crab (*H. acerba*) and giant crab (*P. gigas*) from the waters of the Fishery in a licensing period.

  The licensing period runs from 1 January to 31 December annually.

- **Gear / Method Restrictions:**
  A person fishing in the Fishery is only permitted to use a fish trap. The traps must comply with the following restrictions:

- Have an internal volume that is less than 0.257 m^3; and
- Have two escape gaps, with each gap being (as nearly as practicable) rectangular in shape and when measured internally are ≥ 294 mm in length by 54 mm in height.

Traps may be set individually or in a series that are joined together by a line underwater, unless that trap or series is attached by a line to a surface float that

- Is ≥ 150 mm diameter; and
- Is branded or stamped with the initial letter and licensed fishing boat (LFB) number of the boat that is being used to fish.

- **Other Species Restrictions:**

  Rock lobster (*Jasus* or *Panulirus* spp.) or finfish, must release be released within five minutes of being brought onto the boat and before any other trap is pulled.

  When fishing in the waters of the Fishery east of 126° 58‘ E, any scampi (Family Nephropidae) or white tailed bug (*Ibacus* spp.) brought on board must be released within five minutes of being brought on board the boat and before any other trap is pulled.

- **Specification of Port Areas:**

  All crustaceans or bycatch[5] are to be unloaded from a boat at the following specified port areas: Darwin, Broome, Port Hedland, Port Walcott (Port Samson), Port of Dampier, Beadon Creek (Onslow), Exmouth, Point Quobba (Blowholes), Carnarvon, Denham, Kalbarri, Port Gregory, Geraldton, Port Denison, Jurien Bay, Bunbury, Fremantle, Hamelin Bay and Augusta (see Figure 1.1).

- **Specification of Approved Fish Processors:**

  All crustaceans or bycatch taken under the authority of a WCDSCMF MFL must be sold or transferred to an approved fish processor[6].

- **Reporting:**

  All fish must be landed whole. Within 90 minutes of landing ashore, the master of the boat must accurately determine:

  - The number of containers which contain crustaceans or bycatch; and
  - The total gross weight of both the container and the crustaceans or bycatch being held in the container.

  This information must be reported to the Department within 48 hours of landing ashore, with a separate Catch and Disposal Record (CDR; see copy in Appendix A) for each species of crustacean and bycatch landed.

[5] Under the Management Plan to mean: "*any species of fish other than a crustacean or a finfish (other than baitfish) taken by a person fishing in the Fishery under the authority of a licence*."
[6] As determined by the CEO via the *WCDSCMF Notice of Approved Processors* (see Section 4.1.3.1)

Upon receiving any crustacean or bycatch from the WCDSCMF, a fish processor must also accurately determine the weight of each species of crustacean and each species of bycatch and compare the weight determined with that recorded in the CDR which accompanied the consignment.

Upon determination of the weight of the crustacean and / or bycatch, the processor must also record the weights on an approved form and forward the form to the Department within 24 hours.

Catch information reported on CDRs is used by the Department's compliance team to assess catches against the licence entitlements for each species. Where there is a discrepancy between the CDR and the processor returns, the amount reported on the processors returns is used for catch entitlement purposes.

4.1.3.1 CEO Notices

The CEO may publish a notice in the Gazette pursuant to the relevant clause in a management plan. For example, the *WCDSCMF Notice of Approved Processors*[7] lists the persons nominated by the CEO of the Department as approved processors in respect of champagne crabs, crystal crabs, giant crabs and other species taken in the WCDSCMF.

4.1.3.2 Fishing Boat Licence (FBL) Conditions

In addition to providing the unit allocations, an MFL also lists the name, registration number and length of the licenced fishing boat that may be used by the licence holder to operate in the fishery.

There are currently three conditions listed on each FBL that is permitted to operate in the fishery:

- Condition No. 16: Not to engage in fishing between Pt. Maud and Tantabiddi Well;
- Condition No. 17: The crew of this vessel shall not live ashore at the Abrolhos Islands; and
- Condition No. 18: No river or estuarine fishing.

4.1.4 FRMA Notices and Orders

The Fish Trap Restrictions Notice 1990[8] (made by the Minister under the *Fisheries Act 1905* and still in force) prohibits the taking of fish by means of fish traps by all persons except for licensees in the WCDSCMF, licensed boats taking octopus, licensed rock lobster traps and the taking of crabs in restricted areas.

Under the FRMA, Orders pursuant to section 43 can be determined by the Minister for a number of purposes, although none are applicable to the WCDSCMF at this time.

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7 http://www.slp.wa.gov.au/statutes/subsiduary.nsf/0/32F183B72CC2BF3148257D2500038794/$file/29.07.14.+approved+processor+notice.pdf

8 http://www.slp.wa.gov.au/statutes/subsiduary.nsf/0/6BC8FD3464AB89B14825776500166CA7/$file/3.26[6].pdf

4.1.5 FRMA Section 7 Exemptions

There are currently three exemptions in place under section 7(2)(a) of the FRMA for research purposes. The first exemption (no. 2369) allows two licence holders to set two modified traps, without escape gaps, per line up to a maximum of six lines (traps must be set according to instructions from the Department's research staff) in order to assist in the collection of size range data for crystal crabs at various depths and areas of the fishery.

In conjunction with the above exemption, two additional exemptions (no. 2368 and 2447) allow one fisher (each) to retain undersize crystal crabs, numbers and dates they are to be retained must be specified in writing by Departmental research staff. This information is used to determine the age structure of crystal crabs.

4.2 Harvest Strategy

The *WCDSCMF Harvest Strategy 2015 - 2020* (DoF 2015a) outlines the long- and short-term fishery-specific management objectives; a description of the performance indicators used to measure performance against these objectives; reference levels for each performance indicator; and associated harvest control rules, which articulate pre-defined, specific management actions designed to maintain each resource at target levels and achieve the management objectives for the fishery (see also Section 8 for more information).

4.3 Marine Protected Areas

Marine protected areas in WA exist in both State and Commonwealth waters and are gazetted accordingly with the State and Federal governments.

4.3.1 State Marine Protected Areas

Biodiversity and fish habitats in WA-waters are protected through a network of marine protected areas gazetted under the FRMA and the *Conservation and Land Management Act 1984* (CALM Act). Jurisdiction and management responsibility for protected areas under these pieces of legislation lie with two state government departments: the Department of Fisheries and the Department of Parks and Wildlife.

Current and proposed marine protected areas within WA State waters are illustrated in Figure 4.1. As all waters within the 150 m depth contour are closed to the WCDSCMF, fishing activities does not overlap with any state-managed protected areas.

4.3.2 Commonwealth Marine Protected Areas

There are four existing Commonwealth marine reserves in WA; Ningaloo, Mermaid Reef, Ashmore Reef and Cartier Island (Figure 4.1). In 2012, the Commonwealth Government's Department of the Environment (DotE) extended the coverage of Commonwealth marine reserves, with 17 newly-declared reserves in WA. However, due to a change of federal government in 2013, the management plans and permitted activities within the reserves are currently under independent review. While the review is being undertaken, no restrictions have been put in place for the 17 new reserves (DotE 2014). Regardless, activities of the WCDSCMF currently do not overlap with existing Commonwealth reserves.

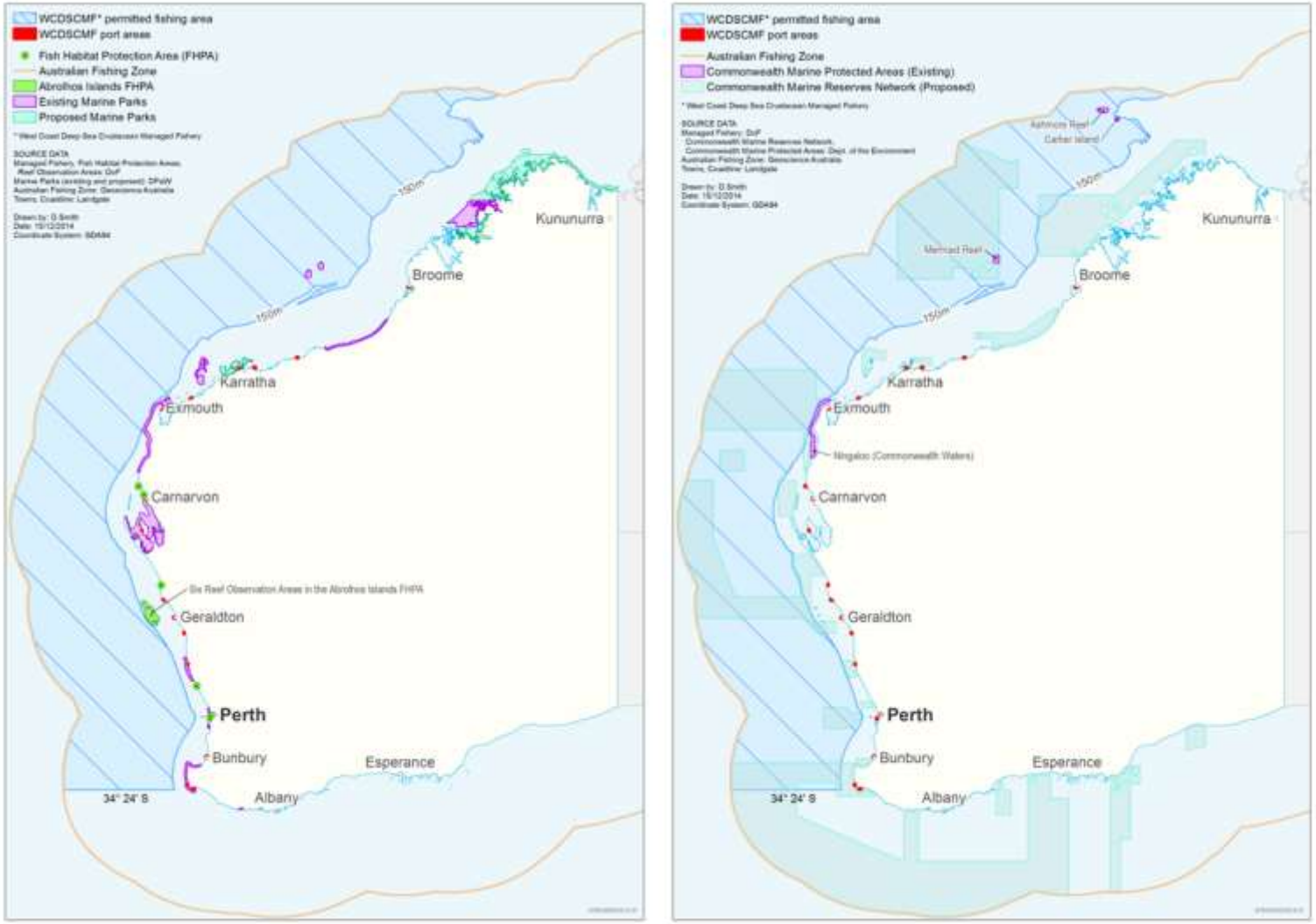

Figure 4.1. Marine protected areas in State-managed (left) and Commonwealth-managed waters off the coast of WA. Note proposed Commonwealth marine protected areas included here for informational purposes

4.4 Risk Assessments

The potential ecological risks associated with the WCDSCMF have been assessed.

The annual *Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher & Santoro 2014) reports on the evaluation of performance of the WCDSCMF against the measures identified during risk assessments. The identified issues and their associated risk ratings (in both 2002 and 2014) are also provided throughout the remainder of the document, where relevant.

4.4.1 2002 Internal Ecological Risk Assessment

An internal Ecological Risk Assessment (ERA) took place as part of the initial assessment of the fishery under the provisions of the EPBC Act for export approval in 2002 (see Section 4.5). As part of this process, issues were determined through an external workshop held for the West Coast Rock Lobster Managed Fishery (WCRLMF) and an internal workshop held for the South Coast Crustacean Fisheries (SCCF), due to the similarities between the three fisheries (i.e. fishing methods, species caught, habitats the operate over and location). Following issue identification, a risk assessment/prioritisation process was completed to determine which issues required specific management actions (e.g. moderate risk or above) (DoF 2003).

The risk assessment framework applied was consistent with the Australian Standard AS/NZS 4360:1999 Risk Management. The general Risk Assessment process is well documented and considers the range of potential consequences of an issue/activity and how likely those consequences are to occur. The combination of the level of consequence and likelihood is used to produce an estimated level of risk associated with the particular hazard / issue (DoF 2003).

4.4.2 2014 Internal Risk Assessment

In 2014, an internal risk assessment was conducted for the WCDSCMF using productivity-susceptibility analysis (PSA) methodology. This semi-quantitative approach examines productivity or susceptibility attributes to provide a relative measure of the risk to the scoring element from fishing activities.

Sixteen species/groups were assessed, with most species/groups scored as low risk. Three species/groups were medium risk and none were high risk. Most of the species/groups that obtained a medium risk score were due to low productivity scores, not due to direct threats from the WCDSCMF. PSA tables generated as part of this risk assessment process are provided in Appendix B.

4.5 Assessments and Certifications

The WCDSCMF has been assessed under the EPBC Act for the purposes of the protected species provisions (Part 13 of the Act) and the wildlife trade provisions (Part 13A of the Act). The initial assessment resulted in the declaration of the fishery as an approved Wildlife Trade Operation (WTO) and an amendment to the List of Exempt Native Species (LENS) in March

and October 2004, respectively. The fishery was reaccredited under Parts 13 and 13A as an approved WTO in 2007 and 2010. The latest accreditation in 2013 resulted in an amendment of the LENS (from export controls) and expires in May 2018[9].

[9] Full details of the current and previous assessments are available at: http://www.environment.gov.au/topics/marine/fisheries/wa/deep-sea-crab.

5. External Influences

External influences include other activities and factors that occur within the fishery area that may or may not impact on the productivity and sustainability of fisheries resources and their ecosystems. The main external influences outlined here for the WCDSCMF are (1) market influences, (2) environmental factors, (3) other fishing activities, (4) other activities, such as oil and gas exploration, and (5) introduced marine species.

5.1 Market Influences

The majority of the catch from the WCDSCMF is exported to China, although there are some domestic sales in Sydney and Perth restaurants. Market demand strongly influences the fishery, particularly the Chinese New Year (in February). Fluctuations in the Australian dollar and changes in the global economic climate can also impact the economic performance of the fishery. On occasion, the Chinese Government closes the market for deep sea crabs, which results in all sales completely stopping during this time.

The fishery is also affected by changes in the cost of fishing, particularly the price of fuel.

5.2 Environmental Factors

The WCDSCMF operates in waters up to 2000 metres deep, although the majority of fishing is focused in depths of 500 – 800 m (How and Nardi 2014). Weather strongly influences fishing practices with two-thirds of the catch caught between January and June, when conditions are favourable. Traps are typically pulled on a four to seven day basis, but on rare occasions fishers may wait for up to two weeks if conditions are unfavourable.

5.3 Other Fishing Activities

5.3.1 Commercial Fishing

There are approximately 47 different state-based commercial fisheries in WA, which capture a range of crustacean, molluscs, scalefish and shark species (Fletcher & Santoro 2014). Most of these fisheries are focused in shallower waters i.e. < 100 m depth and do not overlap with the fishing activities of the WCDSCMF.

The only other fishery in WA that has a substantial catch of deep sea crustaceans is the South Coast Crustacean Fisheries (SCCF), an amalgamation of four trap-based fisheries that operate in the waters off the south coast of WA (from Augusta to the South Australian border) that are managed under a licence condition (How and Oliver 2014). Relative to the WCDSCMF, catch of deep sea crustaceans by the SCCF is small and in recent years the combined SCCF catch has ranged between approximately 15 and 20 t annually (Table 5.1).

Linkages between stocks on the west and south coast are unknown. However, there is little evidence of large scale movements by deep sea crab species therefore they are thought to be largely separate stocks (Melville-Smith *et al.* 2007).

Table 5.1. Catch (tonnes) of deep sea crustaceans by the South Coast Crustacean Fisheries (SCCF) in 2011/12 and 2012/13

Species	Catch (t)	
	2011/12	2012/13
Crystal crab	1.6	5.0
Champagne crab	5.5	4.0
Giant crab	6.9	13.7

There are some state-managed fisheries that have an outer boundary which extends to the 200 nm limit and therefore overlap the management boundaries of the WCDSCMF. These include:

- the West Coast Rock Lobster Managed Fishery,
- the West Coast, Gascoyne Coast and North Coast demersal scalefish fisheries,
- the West Coast Purse Seine Fishery,
- the Mackerel Managed Fishery and
- the Kimberley Prawn Managed Fishery.

With the exception of the West Coast Rock Lobster Managed Fishery (WCRLMF), there is little operational overlap of these fisheries with the WCDSCMF as the fisheries operate in different areas e.g. the northern part of the state or different depths (with most of these fisheries concentrated in waters < 250 m deep). The West Coast Rock Lobster Managed Fishery generally occurs in waters between 0 – 200 m depth and uses the same type of traps as the WCDSCMF. Incidental catches of deep sea crabs do occur, and licensees in the WCRLMF are permitted to retain a maximum of 12 deep sea crabs per boat per day. Champagne crabs are the only species of deep sea crab captured by the WCRLMF although few have been caught in recent years (Bellchambers *et al.* 2012). The 2014 catch of champagne crabs by the WCRLMF was 0.3 t.

There are five Commonwealth-managed fisheries along the WA coast that overlap with the WCDSCMF: the Northern Prawn Fishery, the North West Slope Trawl Fishery, the Southern Bluefin Tuna Fishery, the Western Deepwater Trawl Fishery and the Western Tuna and Billfish Fishery. While the boundaries of these fisheries overlap with the WCDSCMF, fishing effort is typically focused in areas away from where the WCDSCMF operates. For example, the Southern Bluefin Tuna Fishery typically operates in South Eastern Australia (Patterson *et al.* 2011a), the North West Slope Trawl Fishery occurs in the north west of Australia in depths of 200 m (Chambers *et al.* 2011) and the Northern Prawn Fishery is focused across the north of Australia, primarily in the Gulf of Carpentaria (Woodhams *et al.* 2011).

The Western Deepwater Trawl Fishery (WDWTF) operates off WA in the GCB, similar to the WCDSCMF. The WDWTF is an opportunistic fishery, without a specific target species. Therefore, the main species taken has changed over time, alternating between finfish and bugs (AFMA 2009). Within the GCB, key species currently include scampi, bugs, boarfish (all species), ruby snapper, tang snapper and longtail ruby snapper (Rodgers *et al.* 2011;

AFMA 2011). While the boundaries of the WDWTF and WCDSCMF overlap, the actual overlap of operational fishing areas is minimal due to the fisheries focusing effort in different depths. Most fishing for the WCDSCMF is concentrated in the 500 – 800 m depth range (Melville-Smith *et al.* 2007), whereas most catches for the WDWTF are at the 200 m isobath (Rodgers *et al.* 2011). A very small amount of crystal crabs are taken in the WDWTF, typically < 0.25 t annually (AFMA 2009).

5.3.2 Recreational Fishing

Recreational catch of deep sea crab species is considered to be negligible, due to low offshore fishing effort by the recreational sector and different target species.

5.4 Other Activities

5.4.1 Oil and Gas Industry

Offshore oil and gas is a large and growing industry in the northern part of WA. The Exmouth, Northern Carnarvon, Browse and Bonaparte Basins all hold large quantities of natural gas, and multiple projects are in various stages of development, production and exploration in these regions (Figure 5.1; International Risk Consultants Pty Ltd [IRC] 2007; Pilbara Development Commission 2011; Kimberley Development Commission 2011).

There is some oil and gas activity in the GCB and WCB, but not at the same intensity as northern Western Australia (Figure 5.1). The Australian government has recently released two areas in for oil and gas exploration (W13-19 and W13-20) and two new petroleum titles (WA 492-P and WA 493-P) in the GCB (Gascoyne Development Commission 2010). Limited 2-D seismic exploration has also been conducted over most the area, although only one well (Pendock 1A) has been drilled, which was dry.

Other petroleum based activities in the WCB include the exploration of the WA-481-P area off the coast of Geraldton (Figure 5.1) by Murphy Australia Oil Pty Ltd. Within this area, a number of 2-D and 3-D seismic surveys are being conducted in the offshore Commonwealth waters of the area (Murphy Exploration 2013). In addition, a number of wells have been drilled in the Perth Basin.

The main disturbances associated with oil and gas exploration and production include noise pollution from seismic surveys, potential for fish movement/impact arising from seismic surveys, disturbance to the marine habitat through drilling and/or dredging activities, release of produced formation water, shipping and transport activities and oil spill incidents.

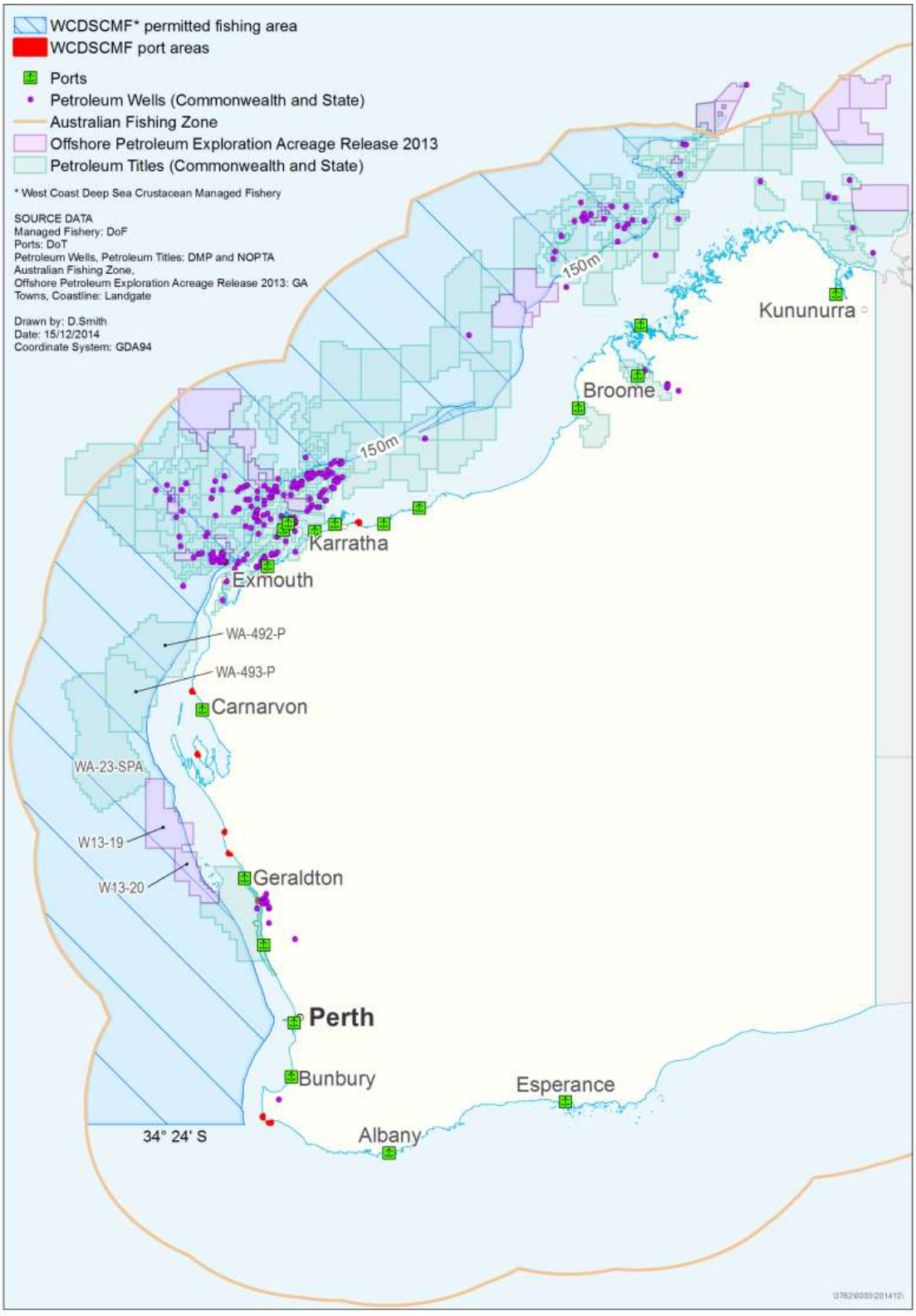

Figure 5.1. Oil and gas industry activity including exploration leases, petroleum titles and existing wells within the WCDSCMF

5.4.2 Ports and Shipping Routes

The major ports within the WCSDCMF area are Fremantle, Bunbury, Geraldton, Dampier and Port Headland and Broome. In the GCB, where the majority of fishing effort is focused for the WCDSCMF, commercial and recreational fishing vessels use Carnarvon Boat Harbour (DoT 2014). Shipping activity is typically low in the GCB, where the majority of WCDSCMF fishing effort is focused (Figure 5.2).

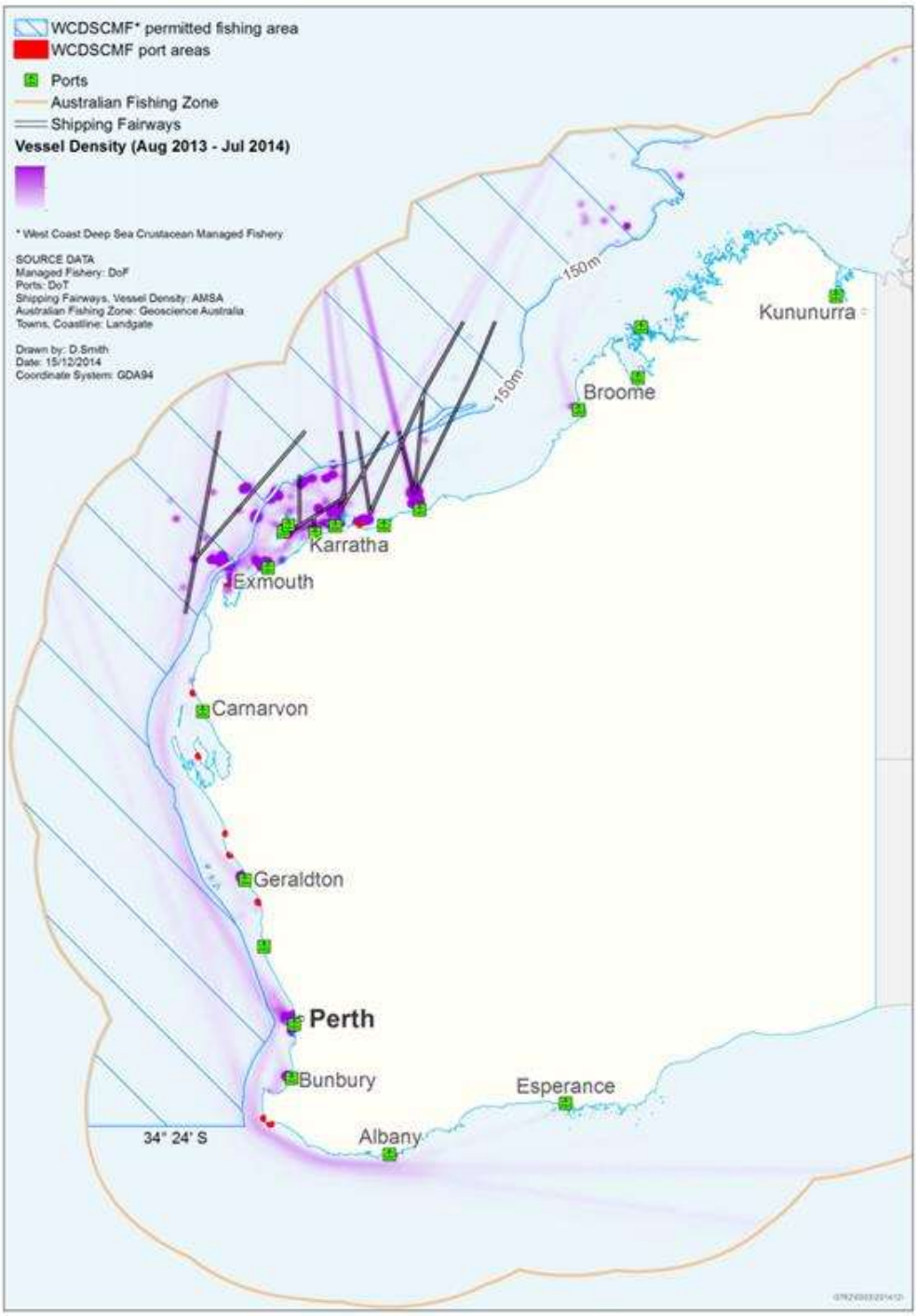

Figure 5.2. Major ports, port areas and shipping activities (based on 2013 to 2014 ship density data) for Western Australia

5.5 Introduced Marine Species

The introduction and spread of marine pests in WA waters poses a threat to native biodiversity and can have widespread effects on both the economy and public health. To detect potential incursions, the Department has developed a marine pest monitoring program for the major ports along the WA coast (Fletcher & Santoro 2014). Marine pest monitoring programs have recently occurred in major ports along the WA coastline including Fremantle (2014), HMAS Stirling (2014), Geraldton (2014), Dampier and Port Headland (2014). Monitoring is not presently undertaken in the GCB, due to this region not having any major port areas. However, monitoring may occur in the future due to an increase in vessel movements associated with offshore oil and gas mining activity.

MSC Principle 1

MSC Principle 1 (P1) focuses on maintaining fishing activity at a level that is sustainable for the targeted populations (MSC 2013).

6. Current Stock Status

Four formal performance measures are used to evaluate the status of the crystal crabs stock in the WCDSCMF:

- the annual retained catch of crystal crabs (measured against the TAC),
- the standardised catch rate of legally-retainable crystal crabs,
- the standardised catch rate of berried female crystal crabs, and
- the standardised catch rate of undersized crystal crabs.

A number of additional performance measures are also examined to provide a weight-of-evidence assessment of the status of the crystal crab stock. These include data from Commercial Monitoring (Section 8.4.2.5), Processor Returns (Section 8.4.2.4) and Volunteer Logbooks (Section 8.4.2.3).

Spawning stock

Female crystal crabs mature below the legal minimum size (L_{50} – 90.5 mm [Smith *et al.* 2004b], LMS – 103 mm CL) and constitute a small proportion of the retained catch (Figure 2.2). In addition, berried females must be returned to the water, further increasing the protection of the spawning stock. Sperm limitation is not believed to be a factor with the male legal minimum size (L_{50} – 94.3 mm CL; Hall *et al.* 2006) above the size at maturity. Males are mature for around 2 years before they recruit to the fishery (103 mm CL). Currently (2014), fishing occurred in 53 10'x10' blocks, which is 30 % of the historical extent of the fishery (Figure 7.1), resulting in a large proportion of the spawning stock not being exposed to fishing pressure. Finally, the standardised catch rate of breeding females is above the threshold reference point with a high degree of certainty (Figure 6.3a). Therefore, the spawning stock of crystal crabs in the WCDSCMF is likely to be above the level that would sustain the maximum biological productivity of the stock (i.e. $>B_{MSY}$) and above the point of recruitment impairment.

Legally-retainable Biomass

The standardised catch rate of legally-retainable crystal crabs is within the target range and in the past three seasons has remained toward the top of the target range (Figure 6.2). Coupled with this has been an increase in the mean size of retained males (Figure 8.4) and increasing dominance of larger sizes in the processor size grades (Figure 8.3). Increasing sizes of captured crabs and the maintenance of a high catch rate that is adjusted for changes in depth, location, fisher, month and soak time indicate that the stock is not being over-fished.

Conclusion

All performance measures indicate that the stock status is above the point where recruitment would be impaired and that the stock has been at or above target levels in recent years. This is further confirmed by the standardised catch rate of undersize (pre-recruit) crabs which has remained stable in recent years (Figure 6.3b).

6.1 Retained Catch of Crystal Crabs

In 2014, the catch of crystal crabs was 139.8 t, indicating that the 140 t TAC was effectively met i.e. > 90 % of the TAC caught (Figure 6.1). The TAC has been met each year since it was introduced in 2008.

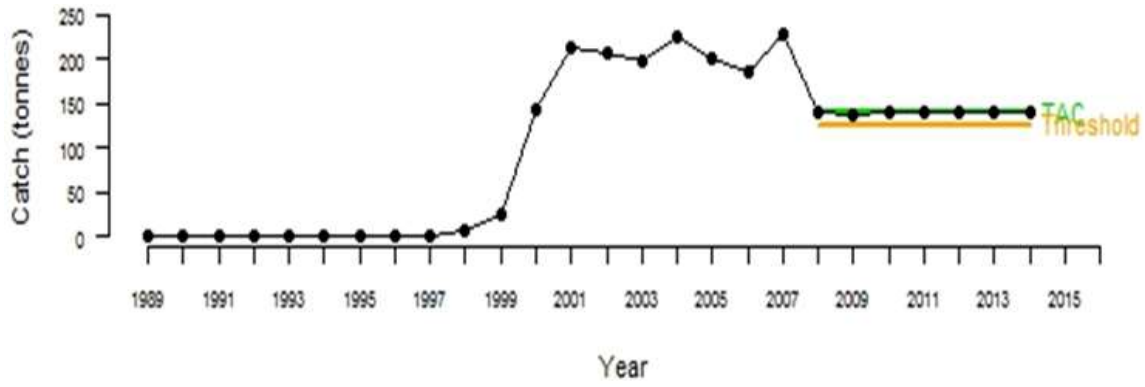

Figure 6.1. Annual catch (tonnes) of crystal crabs relative to the target (140 t TAC) and threshold (126 t) reference points.

6.2 Standardised Catch Rate of Legal-Size Crystal Crabs

The standardised catch rate of crystal crabs has progressively increased since the fishery moved to interim management status in 2003. Since 2010, standardised catch rates have remained high and relatively stable, with the 2014 catch rate of 2.31 kg/traplift being toward the upper target range level of 2.54 kg/traplift (Figure 6.2).

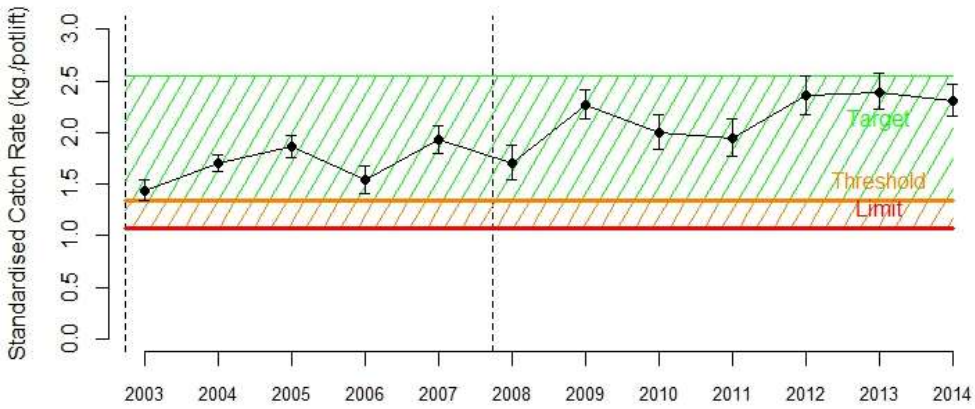

Figure 6.2. Standardised catch per unit effort (± 95 CI) since 2000 for crystal crabs. Area between vertical dashed lines indicate period when management required fishing in all zones. Horizontal lines represent the limit (red) and threshold (orange) reference points. The target range is the green hashed area and is bounded by the threshold and upper target reference points for crystal crabs in the fishery.

6.3 Standardised Catch Rates of Berried Female and Undersize Crystal Crabs

The standardised catch rate of berried female crystal crabs has remained relatively stable since 2003, noting fluctuations from 2009 to 2012 (Figure 6.3a). Over the last three seasons the standardised catch rate of berried female crabs has regained stability ranging from a high of 3.46 (in 2012) to 3.08 crabs / traplift in 2014. This catch rate is still well above the threshold reference point of 1.74 crabs / traplift (Figure 6.3a).

The catch rate of undersize crystal crabs has declined since 2003, with the exception of 2005 when there was a slight increase in undersize crab catches. Since 2010, there has been a slight increase and stabilisation in the catch rate albeit at a lower level than that of pre quota (Figure 6.3b). The decline in undersize catch rates since 2005 may be a result of a shift in fishing effort. Anecdotal information from fishers suggests there is a vertical stratification of crabs according to size, with larger crabs occupying shallower depths, which are now the preferred fishing grounds. Preliminary information suggests that this may be the case (Figure 2.3), due to clear change in the depths fished and an increase in the mean size of crystal crabs captured. Further investigation of this issue is currently being assessed by several research projects (see Sections 8.4.2.6.1 and 8.4.2.7). However, the current catch of undersized crabs is 3.42 crabs / traplift, well above the threshold level of 2.57 crabs / traplift.

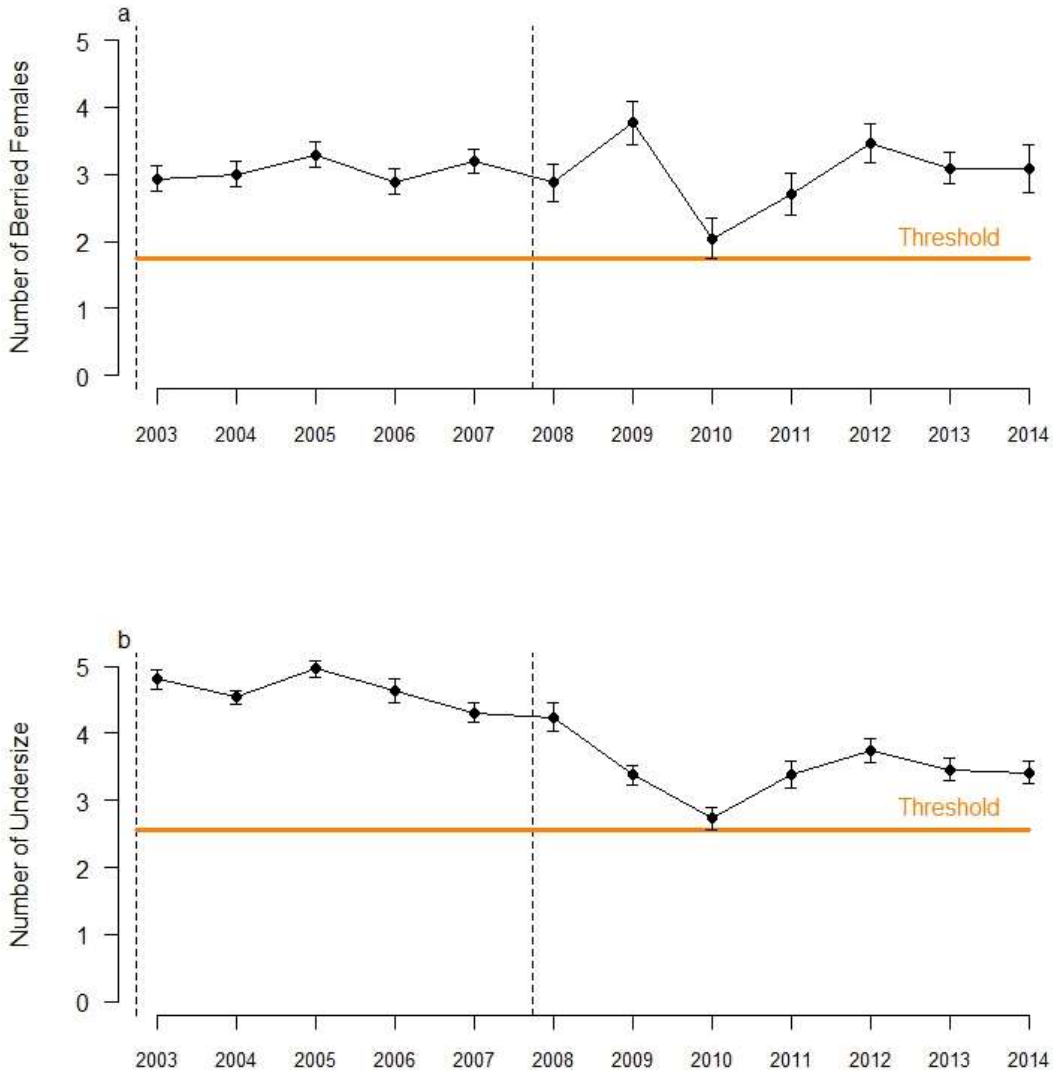

Figure 6.3. Standardised annual mean catch rate of (a) berried female and (b) undersized crystal crabs (± 95 % CI) and their respective threshold reference points. The first dotted line represents the introduction of zones to the fishery (2003), where the second signifies the removal of zones and the introduction of quota (2007/08).

7. Stock Assessment

7.1 Assessment Description

The status of the west coast crystal crab stock is assessed annually using both retained commercial catches of crystal crabs and standardised catch rate models that provide proxy indices of abundance of legal, undersize and berried female crystal crabs.

These standardised catch rate models are used to derive several empirical reference points for the fishery (see Section 8.2).

7.1.1 Catch Rate Standardisation

Catch rates of legal crabs are standardised for a range of variables using generalised linear models (GLMs) of the form: $\log_e(U + c) = \sum_{j=1}^{p} x_j \beta_j + \epsilon$, where U is catch rate (kg/traplift), c is an additive constant for logarithmic transformation, x_j are the p explanatory variables including quantitative and qualitative variables and interactions, β_j are estimated coefficients and $\epsilon \sim N(0, \sigma^2)$ is the error term. For the count data recorded for berried females and undersize crabs, a negative binomial GLM was used, with an offset of $\log_e$(effort) to account for variation in traplifts.

The catch rate standardisation models have been refined over the development of the fishery to incorporate additional information as it has become available. The current models include six factors as explanatory variables (Table 7.1).

Table 7.1. Factors and associated levels included in the GLM analysis for catch rate standardisation of crystal crabs

Factor	Levels
Year	2003: current
Month	Jan – Dec
Vessel	A, B, C
Depth (m)	< 550; 550 – 599; 600 – 649; 650 – 699; ≥ 700
Soak (days)	1:12
Latitude	23; 24; 25; 26; 27;

A stepwise reduction of model complexity was undertaken using AIC for model selection. The resultant models (in the syntax of the program used for statistical analysis) were:

Legal-size crystal crabs:

log(U+1) ~ Year + Soak + Vessel + Month + Latitude + Depth + Year:Soak + Year:Month + Year:Depth + Soak:Month + Soak:Latitude + Vessel:Month + Vessel:Depth + Month:Depth + Latitude:Depth

Berried female crystal crabs:

Berried females~ Year + Soak + Vessel + Month + Latitude + Depth + Year:Soak + Year:Month + Soak:Vessel + Vessel:Month + Vessel:Depth + Month:Depth + offset($\log_e$(Effort))

Undersized crystal crabs:

Undersize crabs ~ Year + Soak + Vessel + Month + Latitude + Depth + Year:Soak + Year:Month + Year:Depth + Soak:Latitude + Soak:Depth + Vessel:Month + Vessel:Depth + Month:Depth + Latitude:Depth + offset($\log_e$(Effort))

where ':' denotes two-way interactions between variables.

7.1.2 Factors Affecting Catch Rates

The standardisation of catch rate indices takes into account information provided from statutory catch and effort returns, as well as detailed additional information from volunteer logbooks that are currently being completed for over 90 % of the landed catch on a line-by-line basis.

Catch and effort statistics for the fishery highlight the expansion of fishing activities from 1996 and the impact of interim management in 2003, which led to a progressive decline in the number of traplifts (Figure 7.1a). With the changes in management and the removal of zones in 2008, there has also been a spatial contraction of fishing effort to the waters off mid-west coast between 24 and 27^o S (Figure 3.1), as documented via volunteer logbooks. There has also been a reduction in the number of blocks (10' x 10') fished, from a high of 113 in 2003 to 53 in 2014 (Figure 7.1b).

As well as a spatial contraction of fishing effort there has also been a change in the depths fished (Figure 7.2). Since 2000, fishing has moved into progressively shallower waters; mean depth in 2000 was 678 m, compared with 603 m in 2014 (Figure 7.2).

The mean soak time (period traps were left between being set and retrieved) has also changed substantially over the development of the fishery. In 1999, traps were typically pulled after approximately two days. From 2000, there was a clear change to leaving traps for five to eight days. Since 2004, soak time has continued to increase from an average of 4.7 days to 7.6 days in 2014 (Figure 7.3).

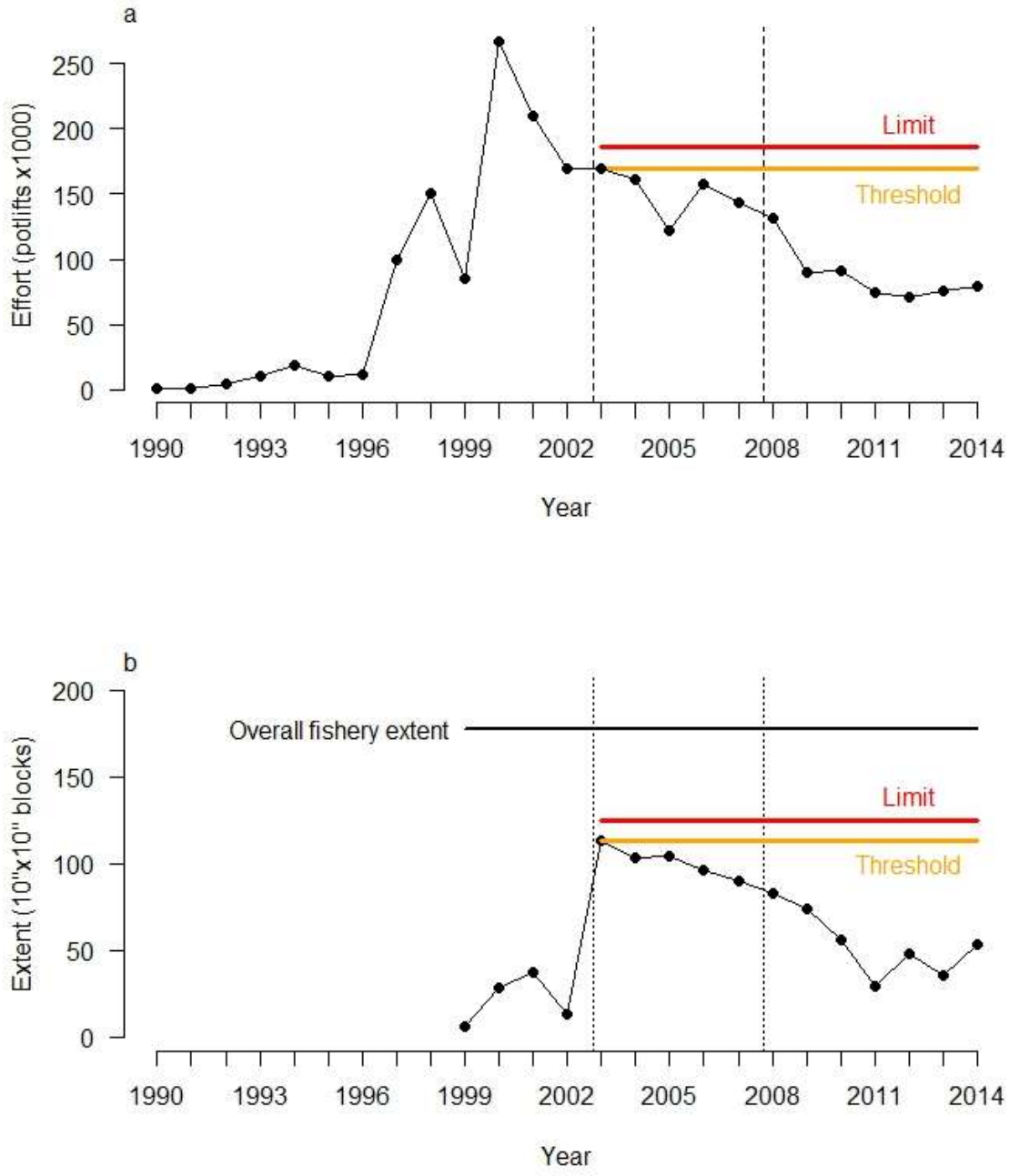

Figure 7.1. a) Fishing effort in traplifts (x 1000) and b) spatial extent of fishing (10 x 10 NM blocks) for crystal crabs. First dotted line represents the introduction of zones to the fishery (2003), where the second signifies the removal of zones and the introduction of quota (2007/08). Limit and threshold lines denote reference levels of habitat and ecosystem performance indicators (see Section 9). Overall fishery extent is all (10 x 10 NM) blocks where catch has been recorded in the fishery

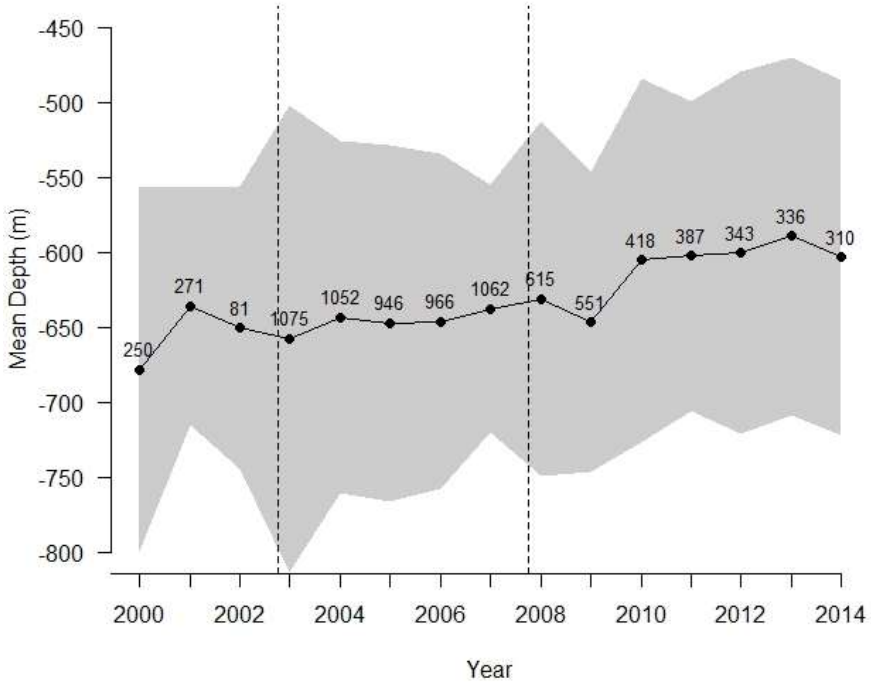

Figure 7.2. Mean depth (± 95 % CI [grey shading]) of fishing effort for crystal crabs. Numbers indicate the number of lines fished. First dotted line represents the introduction of zones to the fishery (2003), where the second signifies the removal of zones and the introduction of quota (2007/08)

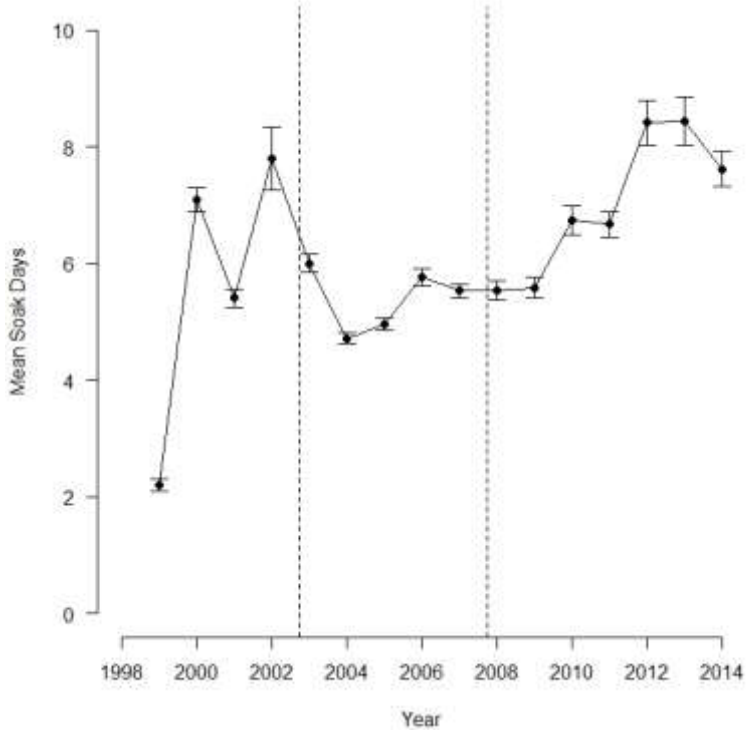

Figure 7.3. The mean soak time (in days, ± SE) by year from the volunteer logbook program. First dotted line represents the introduction of zones to the fishery (2003), where the second signifies the removal of zones and the introduction of quota (2007/08)

7.2 Appropriateness of Assessment

The use of annual catch as part of the assessment is appropriate as this fishery is managed on the basis of a constant catch approach.

This approach is suitable for a long-lived species with low recruitment variability. This approach is expected to be risk-averse since the maximum catch (TAC) is currently set well-below historical levels, which were sustained for seven years prior to the introduction of the unitized quota system.

The use of standardised catch rates in the assessment further takes into account features of crystal crab biology including distribution, catchability and possible depth stratification.

7.3 Assessment Approach

Empirical reference points for stock status used by the fishery are derived from the retained catch and catch rates of various types of crystal crabs. Therefore, the assessment approach is directly related to the reference points.

7.4 Uncertainty in the Assessment

The statutory Catch and Disposal Record (CDR) and catch and effort statistics (CAES) data collected for this fishery provide a high degree of confidence that the annual catch is an accurate representation of what was caught.

For the catch rate assessment, sources of uncertainty in data collection, and several variables are included in the analysis (see Section 8.4). Thus, the catch rate standardisation determines the stock status relative to the reference point in a probabilistic way.

7.5 Evaluation of Assessment

The current assessment approach, focussing on the annual catch of crystal crabs, has been in practice since the introduction of quota in 2008. The use of standardised catch rates of legal-size crystal crabs as a performance measure of stock status has been in place for over a decade, over which time it has continued to be improved. Evidence suggests that stock levels have been maintained over this period and may have been increasing in recent years (see Figure 6.2).

7.6 Peer Review of Assessment

The stock assessment of the crystal crabs is internally reviewed as part of reporting in the annual *Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher & Santoro 2014). The assessment is also reviewed as part of the fisheries export approval process which is administered by DotE (see Section 4.5 for more details on this process).

8. Harvest Strategy

8.1 Framework

The west coast deep sea crustacean resources harvest strategy has evolved over the development of the fishery and has recently been formalised as a Fisheries Management Paper (DoF 2015a). It makes explicit the management objectives, performance indicators, reference levels and harvest control rules for these resources, which are taken into consideration by the Department when preparing advice for the Minister for Fisheries. The harvest strategy has been developed in line with the Department's over-arching Harvest Strategy Policy (DoF 2015b) and relevant national policies / strategies (ESD Steering Committee 1992) and guidelines (e.g. Sloan *et al.* 2014).

The following sections provide an overview of the harvest strategy in place and should be read in conjunction with the *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a).

8.1.1 Design

The west coast deep sea crustacean resources harvest strategy has been designed to be highly risk-averse, commensurate with the very small scale of the fishery, the long-lived biology of the target species, and the corresponding level of information and monitoring. It is responsive to the state of the stock and is designed to achieve management objectives.

Crystal crabs are harvested under a constant catch approach, which involves harvesting a fixed tonnage from the stock each year. Under this approach, the level of catch harvested remains constant and is not affected by normal levels of recruitment variation. This approach is considered suitable for deep sea crustaceans as they are a long-lived, deep-water species with stable recruitment.

In line with this harvesting approach, the WCDSCMF is managed using both input and output controls. Overall effort in the fishery is constrained by a cap on the number of licences / vessels (limited entry) and limits on fishing gear. Spatial closures inshore of the 150 m isobath and in all waters between Point Maud and Tantabiddi further limit the effective fishing effort. Fishery removals are managed via quotas on the amount crystal crabs that can be retained annually by each licence holder. Fishers are not permitted to retain any berried female crabs or crabs under the minimum legal size limits which is set above the size at maturity.

8.1.2 Evaluation

The relative consistency of annual catches in the seven years (2001 – 2007) prior to the introduction of the TAC and ability to catch the full TAC in all years since the introduction (see Figure 6.1), in combination with increasing catch rates since the inception of the fishery (see Figure 6.2), provides strong evidence that the harvest strategy for this fishery has been effective in maintaining the crystal crab stock at or above target levels. Consequently, the harvest strategy is deemed to be meeting its long-term objective with respect to the sustainability of crystal crabs.

8.1.3 Monitoring

The effectiveness of the harvest strategy to maintain the spawning stock biomass and provide good economic returns through the maintenance of high catch rates is monitored annually and reported on in the annual *Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher & Santoro 2014), as well as at Annual Management Meetings (AMMs) attended by Departmental research, policy and compliance staff and industry members.

8.1.4 Review

It is recognised that fisheries change over time and that a review period should be built into the harvest strategy to ensure that it remains relevant. The current harvest strategy will remain in place for five years from 2015 to 2020, after which it will be reviewed. However, given that this is the first formal harvest strategy for this resource, the document may be subject to further review and amendment as appropriate.

8.2 Reference Points

Reference points are used to provide guidance on if the management objectives are being achieved. Four indicators are used to assess the status of crystal crabs (see Table 8.1) with empirical reference points derived from these assessment indicators.

Table 8.1. Harvest strategy performance indicators, reference levels and control rules for the west coast crystal crab (*C. albus*) stock

Performance Indicators	Reference Levels	Control Rules
Primary 1. Annual commercial catch of crystal crab. 2. Standardised commercial catch rate of legally-retainable crystal crab.	**Target:** TAC is achieved (≥ 90 % caught); Catch rate of legally-retainable crabs is ≥ 1.34 and < 2.54 kg / traplift; and Catch rates of sublegal crabs and berried females are ≥ 2.57 and 1.74 crabs / traplift, respectively	No management action required.
	Threshold: TAC is not achieved (< 90 % caught); Catch rate of legally-retainable crabs is ≥ 1.07 and < 1.34 kg / traplift ; or Catch rate of sublegal crabs or berried females is < 2.57 and 1.74 crabs / traplift, respectively	If ≥ 90 % of the TAC is caught and the catch rate of legally-retainable crabs is within or above the target range, but catch rates of either sublegal or berried female crabs are not, a review is triggered to assess causes of variation and appropriate management response initiated.
Secondary 3. Standardised commercial catch rate of sublegal crystal crab.		If < 90 % of the TAC is caught ** or the catch rate of legally-retainable crabs is below the threshold (but above the limit) and catch rates of both sublegal and berried female crabs are above the threshold, the TAC will be reduced by up to 20 %.
4. Standardised commercial catch rate of berried female crystal crab.		If < 90 % of the TAC is caught ** or the catch rate of legally-retainable crabs is below the threshold (but above the limit) and catch rates of either sublegal or berried female crabs is below the threshold, the TAC will be reduced by 20 – 50 %.
	Limit: Standardised commercial catch rate of legally-retainable crabs is <1.07 kg / traplift	The TAC will be reduced by 50 – 100 %.

8.2.1 Annual Commercial Catch of Crystal Crabs

The annual commercial catch of crystal crabs is used to assess if the fishery has achieved the TAC, i.e. ≥ 90 % of the TAC has been caught in any given year. Thus, the target reference levels relate to achieving the TAC, while not achieving the TAC (i.e. < 90 % of the TAC was caught) has been set as the threshold level (Figure 6.1). The current TAC of 140 t has been in place since the fishery became quota managed in 2008. This level is approximately two-thirds of the catch sustained by the fishery before it became quota-managed, and is therefore considered to be set at a highly-precautionary level, with the intent of maintaining the stock at levels above B_{MSY} (see Figure 6.1; Melville-Smith *et al.* 2007). With the current TAC of 140 t, the target range is 126 to 140 t. The threshold level is set as the lower end of the target range at 126 t.

8.2.2 Standardised Catch Rate of Legally-retainable Crystal Crabs

The reference levels associated with the mean annual standardised commercial catch rate of legally-retainable crystal crabs have been identified based on the reference period from 2003 to 2012[10], a period of stable catch rates with no evidence of impaired recruitment. The upper bound of the target range is 2.54 kg / traplift, which is 1.1 times the mean standardised catch rate during this reference period. The lower bound of the target range has been identified as the threshold level, and is 1.34 kg / traplift; this was the lowest 95 % confidence interval (CI) for the standardised catch rate during the reference period (see Figure 6.2). The limit reference point is further defined as the value 20 % below the threshold reference point (i.e. 0.8*Threshold) and is 1.07 kg / traplift.

Note: for standardised catch rates of legally-retainable crystal crabs, an upper target level has also been identified as reference point for the social and economic objective of the fishery (see DoF 2015a for details).

8.2.3 Standardised Catch Rate of Berried Female and Undersize Crystal Crabs

Two secondary performance indicators are also used to assess the fishery's performance in meeting long-term management objectives for crystal crabs. These indicators are the mean annual standardised catch rates of (1) berried female and (2) undersized crystal crabs. Similar to legally-retainable crystal crabs, the reference period for both indicators is from 2003 to 2012. These indicators provide information on spawning stock biomass and recruitment levels of crystal crabs, respectively. Threshold levels of 2.57 and 1.74 crabs / traplift have been identified for undersized and berried female crystal crabs, respectively. These levels are the minimum value of standardised catch rates of during the reference period with 95 % certainty (see Figure 6.3). No limit reference levels have been set for these indicators.

8.2.4 Appropriateness of Reference Points

In line with the Department's Harvest Strategy Policy (DoF 2015b), the use of empirical catch and catch rate-based reference points in the WCDSCMF is appropriate given the size

[10] Prior to the reference period the fishery was in a phase of controlled development (see Section 4.1), and there has never been any indication that the stock was overfished.

and scale of the fishery and is consistent with the monitoring and assessment procedures in place (see Section 8.4 for monitoring programs in place).

8.3 Control Rules and Tools

8.3.1 Design and Application

Well-defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached (see Table 8.1). The design of harvest control rules for crystal crabs is hierarchical with the application of control rules dependent on the level of performance indicators relative to both primary and secondary reference points (Figure 8.1). The primary performance indicators of catch rate of crystal crabs and catch are considered the most important indicators of stock status.

If all primary and secondary performance indicators are at target levels no management action is required. Triggering the threshold levels for either of the primary indicators will result in immediate reduction to the TAC in order to reduce exploitation levels on the stock. Secondary performance indicators provide additional evidence of stock status and help inform the magnitude of the management response required. In the event that target levels for both primary performance measures are met, falling below the threshold levels of one or both of the secondary performance indicators triggers a review to assess the cause of the variation. If either primary performance indicator is below the threshold level, the status of secondary performance indicators will be used to determine whether a minor (0 – 20 %) or major (20 – 50 %) reduction in TAC is required. If the catch rate of legal sized crabs (a primary performance indicator) is below the limit level, it will automatically trigger a major reduction in TAC to reduce exploitation levels on the stock.

In addition to the harvest control rules, a number of additional management measures and instruments of implementation limit exploitation of the crystal crab stock (see Table 15.2). These measures, include condition and size limits for crystal crabs, gear controls and spatial closures, can be amended as necessary to ensure the harvest strategy is achieving its objective. Additional options may also be implemented should they be required.

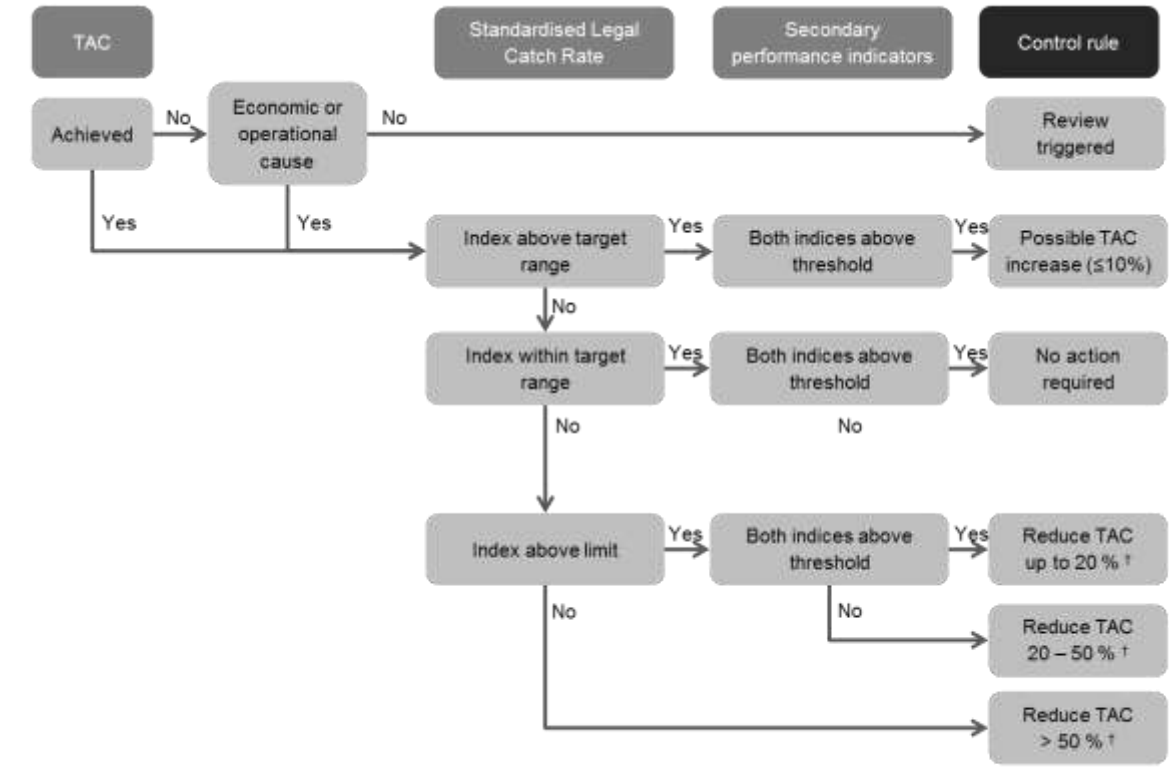

Figure 8.1. Harvest control rule decision tree for the crystal crab stock. Source: *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020*

8.3.2 Accounting for Uncertainty

The design of the harvest control rules take into account a wide range of uncertainties.

Uncertainty in stock status is accounted for by considering four performance indicators that provide information on status of the legally-retainable component of the stock, spawning stock biomass and recruitment, as well as the ability of the fleet to catch the quota. The decision tree process used for applying harvest control rules (see Figure 8.1) involves a weight-of-evidence approach that moves from minor to major management actions after considering the status of several indicators.

In addition to the use of target and limit reference points, threshold reference points and associated harvest control rules further account for uncertainty by triggering pre-emptive management response (e.g. review, minor quota reduction) at the first sign of any evidence that the stock may be at risk.

8.3.3 Evaluation

The overall design of the harvest strategy is highly precautionary and all performance indicators suggest that the stock is at an acceptable level. As a result, threshold and limit levels have yet to be triggered for the fishery. Given that harvest control rules are designed to rapidly reduce exploitation in response to any evidence of stock depletion, it is anticipated that they will be effective.

8.4 Information and Monitoring

8.4.1 Range of Information

A comprehensive range of fishery-dependent data has been collected on crystal crabs throughout the history of the fishery, with some datasets extending back to the commencement of the fishery in the early 2000s. These data include information on; size composition of landings, detailed effort and discarding, as well as environmental conditions (Table 8.2).

Table 8.2. Summary of current research and monitoring activities for the WCDSCMF

Data type	Analyses and purpose	Areas of collection	Frequency of collection	History of collection
Catch and effort statistics (CAES)	Catch rate of legal-sized crystal crabs	Whole fishery	By month	Since 1990
Catch and Disposal Records (CDR)	Catch rate of legal-sized crystal crabs	Whole fishery	By trip	Since 2008
Volunteer logbook	Catch rate of legal, berried female and undersized crystal crabs. Information on fine-scale distribution of effort, e.g. spatial, vertical (depth), temporal	> 90 % of catch	By line (3 – 4 lines per day)	Since 1999
Processor unloads	Grade / size composition of whole catch	Two major processors	By trip	Since 2006
Commercial monitoring surveys	Catch composition and tagging	Predominantly GCB	Approx. four trips per year	Since 2000
Remote monitoring	Catch, discards, size composition, sex and crab condition	Whole fishery	In development	
Environmental Monitoring	Changes in the environment that may impact on catch rates or biology	Locations within the GCB	Hourly	Since March 2012
Targeted research projects	Fisheries biology of deep sea crustaceans, development of volunteer logbooks, depletion study, stock assessment, abundance estimation	Whole fishery	Opportunistically (Three under-taken so far)	2000 – 2014

8.4.2 Monitoring

8.4.2.1 Catch and Effort Statistics

Licensees involved in fishing operations and / or the master of every licenced fishing boat are legally required to submit accurate and complete catch and effort returns on forms approved by the Department. This information has been collected by the Department since 1990 in the form of statutory monthly catch and effort (CAES) logbook returns (see Appendix C). These returns record monthly catch totals (to the nearest kilogram [kg]) for each retained species, monthly effort (total days fished), estimates of daily effort (trap lifts per days, average hours fished per day) and spatial information (by CAES block, 60 x 60 nm).

Commercial catch and effort data are collected and collated by the Department in the CAES database. Data reported by fishers are checked for errors / inconsistencies prior to entry into the database, after extraction from the database and prior to analysis.

CAES data was the main source of catch information for the fishery prior to 2008 that was used in catch rate standardisations. With the move to a quota-managed fishery, Catch Disposal Records (CDRs; see below) were introduced and replaced the use of CAES catch rate standardisations.

8.4.2.2 Catch Disposal Records

Since the introduction of quota, masters of licenced fishing boats and fish processors have also been required by law to submit more-detailed CDRs (see Appendix A). This information is used for monitoring within-season quota levels and has been collected by the Department since 2008.

Masters of licenced fishing boats are required to fill out Part A of a CDR upon completing a trip. This provides a record of the total catch from the trip (to the nearest kg), the place, time and date of the landing, and the species and weight of any crustaceans retained for personal use. A separate CDR must be completed for each retained crustacean species.

Upon receipt of crustaceans by an approved fish processor, the processor must complete Part B of the CDR, which requires the catch to be weighed a second time for compliance purposes (see Section 0). The 'official' catch is that which is recorded by the processors, not the fishers on landing, and it is that data which is currently used in catch rate standardisations.

8.4.2.3 Volunteer Logbook

Volunteer logbooks provide a very valuable data source for the management of the fishery (see Appendix D). Logbooks are used to record effort, location, depth, soak time and catches on a line-by-line basis, providing data on the major factors for which the catch rate is standardised.

Volunteer research logbooks began in 1999 and have generally been filled out by most of the fishers in the fishery. The logbooks have historically been completed by all three vessels actively fishing crystal crabs; however, currently they are only being returned by two boats (representing > 90 % of the total catch).

8.4.2.3.1 Logbook Validation and Adjustments

For ease in completing the logbook form, data can be provided in a several ways. Catch can be recorded as either number of crabs, weight of crabs or number of baskets, while depth can be recorded in either meters or fathoms. Therefore, where necessary, logbooks are adjusted from baskets to kilograms and fathoms to meters before being entered into the SQL database. Conversion to metres is done using the international standard fathom (1.83 m / fathom). Baskets are converted to kilograms by totalling the number of baskets per trip and dividing by the total catch (kg) for that trip. (The weights were provided by either processor unloads [pre-2008] or CDRs from 2008 onwards. This provided a weight-per-basket which was applied to all logbook returns for that trip.)

Discard numbers for both berried and undersize crystal crabs are not always completed (i.e. left blank). This may reflect that none were caught and hence not recorded, or that the numbers were not estimated. To differentiate between these two scenarios, if one of the fields (berried or undersize) is completed, the other is assumed to be zero. Where nothing is recorded for either field, these are assumed to have no estimates and therefore are left as blank entries.

8.4.2.4 Processor Unloads and Grade Monitoring

As part of their licencing requirements, processors are required to submit monthly records of catch, grade and average price to the Department (see Appendix E). Since 2012, processors have also voluntarily released additional data collected on grades of crystal crabs to the Department. This information is valuable to ascertain the size of crabs coming from different locations within the fishery and dates back to 2006. Processors provide the catch (kg) of each grade per fishing trip. Each processor uses a slightly different grading system, with grades for size classes as well as condition. To enable a combined analysis of the size grade data between processors, those processors with finer grade scales are combined into three size classes (Table 8.3).

Table 8.3. Grade sizes and corresponding weights (kg) of crystal crabs from processors

Crab Grade	Weight (kg)
Small	< 0.8
Medium	0.8 – 1.2
Large	> 1.2

Grades that relate to the condition of the crab, such as ‘water’, ‘black’ and dead crabs, are not included in the size category analysis. Water crabs are those crabs that have just undergone a moult, while black crabs are those that have not undergone a moult for a period of time and their shell has blackened (Figure 8.2).

Figure 8.2. Images of a water crab (left) and a black crab (right).

Given the nature of the two fishing / processor businesses, the catch compositions are different, but stable (Figure 8.3). Processor A has a larger component of smaller crabs than Processor B, who is more focused on medium and large crabs. Processor A has, since the introduction of quota in 2008, had a progressive increase in the proportion of medium crabs

at the expense of the smaller size grade. Recently, there has been an increase in larger grades. Both processors have a very small proportion of dead product.

Grade information is not formally in stock assessments, but could be integrated in the future.

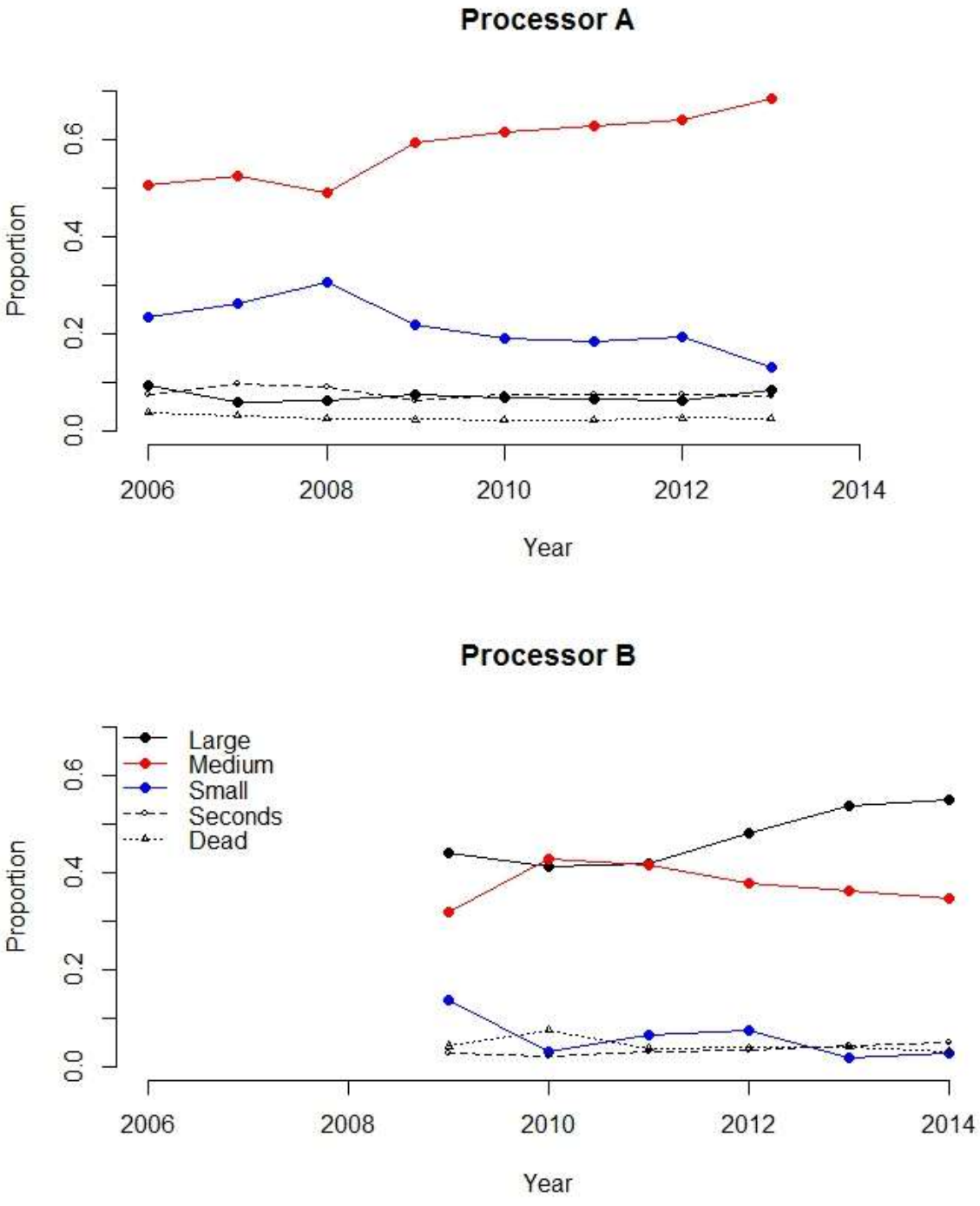

Figure 8.3. Annual proportion of crystal crab size and conditions for the two major crystal crab processors in the WCDSCMF

8.4.2.5 On-board Monitoring

On-board (observer) monitoring of commercial catches by Departmental staff was initiated in 2000. During monitoring trips, members of the Department's Research Division make detailed records of the target catch (retained and discarded) and non-retained catch ('bycatch'), as well as environmental conditions and fishing activities.

This information provides a secondary data source against which the data from the volunteer logbooks can be validated. Catch monitoring and tagging are conducted on at least four trips each year. Attempts are made to representatively sample each vessel and region that is fished within any given year.

8.4.2.5.1 Catch Monitoring

During on-board monitoring, every second trap is sampled, with carapace length (CL) measured to the nearest millimetre and sex, maturity (or reproductive state), shell state and damage recorded for each crab in the trap. Information is also collected on the species and amount of any discards (e.g. berried females, sublegal crabs) and bycatch. These data are recorded on a digital voice recorder before being transcribed onto the relevant datasheet (see Appendix F).

Monitoring was extensive during the mid-2000s, as this coincided with two FRDC projects (Smith *et al.* 2004, Melville-Smith *et al.* 2007). Since then, monitoring has been more sporadic, due to the lack of available technical staff and budget.

A total of 49 983 crystal crabs have been measured during on-board monitoring trips since 2000 (Table 8.4).

Table 8.4. Number of trap lines and crystal crabs measured as part of the commercial monitoring program by year.

Year	Lines	Crabs	Year	Lines	Crabs
2000	7	1425	2008	12	1187
2001	25	5411	2009	7	318
2002	35	9048	2010	16	1218
2003	68	10370	2011	12	2546
2004	46	2907	2012	17	2602
2005	33	2556	2013	9	1808
2006	31	3002	2014	6	1056
2007	26	4529			

The mean CL remained steady from the early 2000s until 2008, when zone restrictions were lifted. Since 2008, there has been a steady increase in the mean CL of commercially captured crystal crabs (Figure 8.4). The spike in 2009 may be a result of limited sampling during that year (see Table 8.4).

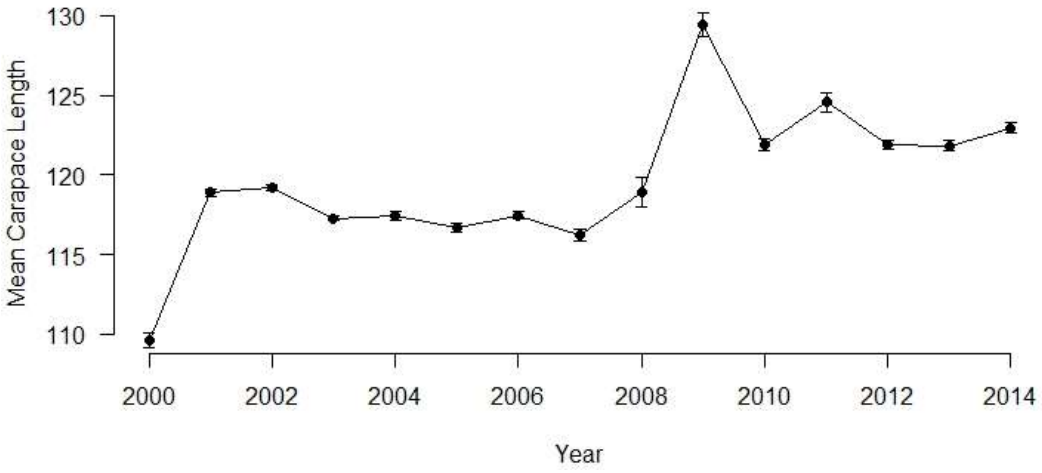

Figure 8.4. Mean (± SE) carapace length (CL) of crystal crabs measured during on-board commercial monitoring since 2000

8.4.2.5.2 Tagging

During catch monitoring, tagging is conducted on undersize or high-graded discarded crystal crabs that have no leg loss. In addition to morphometric and maturity measurements, tag number and release information (location, depth and date/time) are recorded on a digital voice recorder before being transcribed onto the monitoring datasheet (see Appendix F). A special 'crab' t-bar tag is used that prevents the tag moving into the body (Figure 8.5a) as the tag is inserted into the epimeral suture line above the third limb (Figure 8.5b).

Recaptured tagged crystal crabs are recorded both on-board vessels during monitoring or at processor factories. When a tagged crab is recaptured, a range of information is collected including the recapture location, depth and date /time (see Appendix G). When tagged crabs are processed at the factories, recapture information is provided by the skipper from the volunteer logbook records.

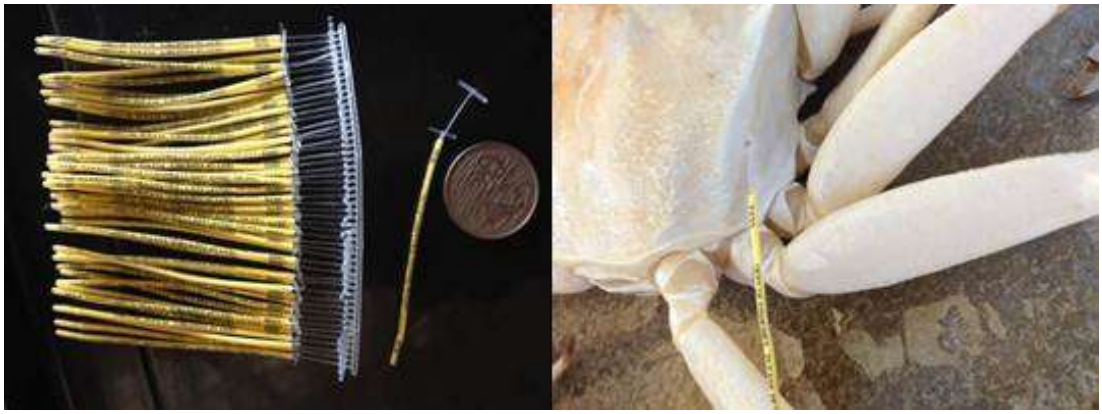

Figure 8.5. Crab t-bar tag showing the two 'T' portion to prevent moving into the body (left); Tagged crystal crab with tag inserted into the epimeral suture line (right).

8.4.2.6 Remote Commercial Monitoring

Two different techniques are currently being trialled that aim to provide additional commercial monitoring data without requiring research staff to be on-board.

8.4.2.6.1 Video Monitoring

Research data for the WCDSCMF is predominately collected from volunteer logbooks and on-board commercial monitoring, both of which have costs and benefits. Commercial monitoring provides comprehensive data, but is costly and conducted infrequently. Volunteer logbooks are effective for retained catch but lack size composition data and only provide an estimate of discards. As the volunteer logbook data is used in the stock assessment and a key part of the harvest strategy, there is an ongoing need to compliment it with robust estimates of size composition data and discard rates.

On-board cameras have been flagged as a tool that provides most of the benefits of an on-board observer at a fraction of the cost. Cameras can provide the added benefit of quantifying bycatch and discards and identifying fine-scale, trap-by-trap catch composition at a spatial and temporal regularity that isn't possible with on-board observers.

The use of video monitoring is in the early stages of development. Initial trials have been conducted with on-board cameras operating while a technical officer simultaneously conducts traditional commercial monitoring. Cameras have been set up to film the table where catch is removed from the trap. This provides a record of the number of crystal crabs caught in the trap, and if they are discarded or retained (Figure 8.6).

Figure 8.6. A sequence of frame grabs from on-board camera showing an undersized crab being discarded from a trap.

8.4.2.6.1.1 Commercial Monitoring vs. Video Monitoring

A pilot study has also been conducted to evaluate the efficacy of video monitoring relative to on-board monitoring and volunteer commercial logbooks. During the pilot study, the actual number of undersize or legal-sized crystal crabs was compared between the commercial monitoring and on-board camera. Discard estimates from the on-board camera were also compared to those recorded by the skipper / crew in the volunteer logbook. Only traps that were sampled on-board were used in the comparison, which resulted in 55 traps examined by both techniques.

The same number of crabs (n = 108) were recorded by both techniques. Estimation of sex from the camera was very accurate, with 97 % legal, 92 % of undersize and 100 % of one-claw crabs identified as the correct sex (Table 8.5). It should be noted that the identification of the condition of the crab and its sex is harder to determine when it is placed directly into a sorting basket as opposed to when it is being discarded straight from the trap (as seen in Figure 8.6). The pilot study indicates that the camera system provides an accurate measure of the sex and condition of the crabs.

Table 8.5. Counts of crabs by sex and condition from commercial monitoring and from the same traps using the on-board camera.

Condition	Sex	Monitoring	Camera
Retainable			
	Female	0	2
	Male	66	64
	Total	66	66
Undersize			
	Female	33	32
	Male	1	2
	Total	34	35
Water crab			
	Female	0	1
One claw			
	Female	4	2
	Male	4	4
	Total	8	6
Unknown		0	1

The volunteer logbooks record catch (usually as number of baskets) and the number of discards, as either berried, small, soft or dead. The number of baskets is then converted to a weight for each line (see Section 8.4.2.3).

A preliminary comparison of the logbook data with the on-board camera has been undertaken for a total of nine lines for the two major vessels in the fishery. A total of 884 discarded crabs were recorded on the camera system. There was a clear difference between the number of discards and the accuracy of the logbook estimation between the two vessels. One vessel ("red") had an average of26.8 discards per line and their estimate was within 4.6 crabs of the actual number of discards. By contrast, the second vessel ("blue") had an average 187.5 discards per line and their estimate was within 107.5 crabs of the actual number of discards (Figure 8.7).

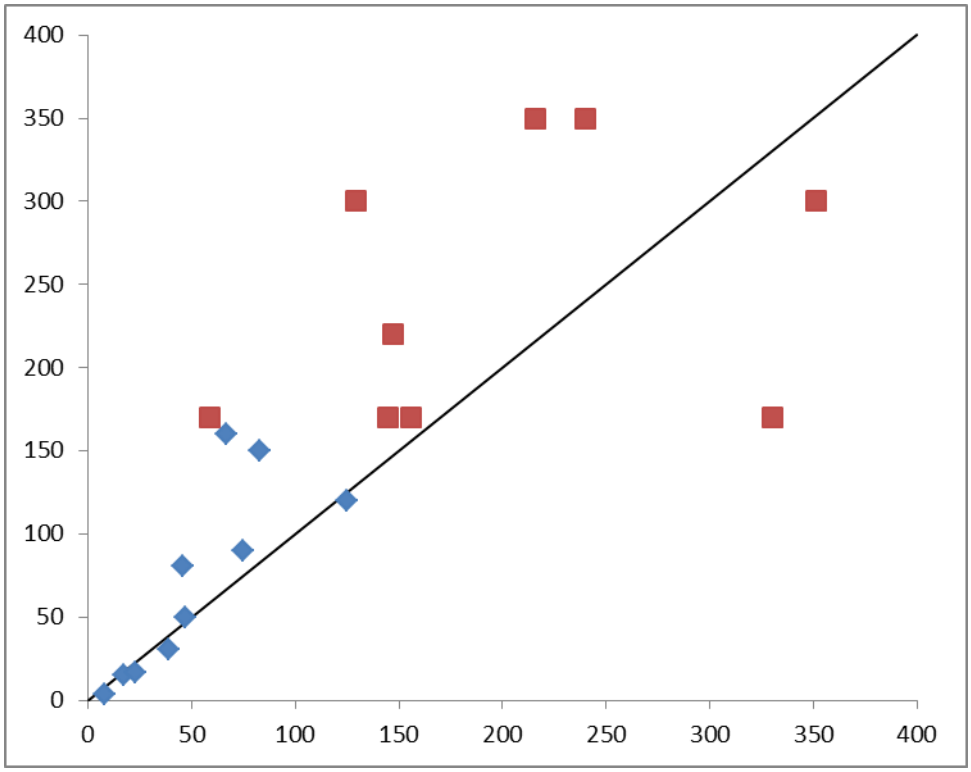

Figure 8.7. Comparison of the number of discards recorded by the camera system and the logbook for lines fished by two vessels denoted by red or blue marks. Line represents the 1:1 relationship where estimated logbook and actual camera discards are the same

8.4.2.6.1.2 Future Development

To date, only one line has been analysed and compared between the on-board camera and commercial on-board monitoring, while nine lines have been compared between the on-board camera with the voluntary logbook. Thus, while the data presented is very preliminary, it does show some promising findings.

Discarded catch recorded as part of on-board commercial monitoring and the camera system showed a high degree of agreement between the two techniques; however, discards estimated by the skipper/crew suggest that the volunteer logbook data may not be an accurate record, particularly in the case of one vessel. Given that these estimates are used in the estimate of the catch rates of berried females and undersize crabs, it is important to further quantify the discrepancies.

The next step is trialling a permanent camera that will record when the winch is in use and have removable storage that can be periodically exchanged for analysis to increase the sample size for comparisons.

8.4.2.7 Industry Catch Sampling

In addition to remote video monitoring trials, a collaborative project is also underway between Curtin University, licence holders, fishers and the Department to develop an industry

based on-board sampling program (Melville-Smith et al 2014) to augment data currently collected by the on-board monitoring program conducted by the Department.

Work with Scielex, an Australian-based firm that develops innovative scientific equipment, has produced electronic Vernier callipers (Figure 8.8). Mobile software has been developed by Curtin University collaborators to retrieve data via Bluetooth from the callipers, this will allow fishers to easily collect and store high-quality sampling data with minimal need for data entry (Figure 8.9).

The project will train fishers in the use of the technology before they undertake a sampling regime (e.g. numbers of traps to sample, when and how the traps will be sampled). The sampling regime is still in negotiation between all parties.

Figure 8.8. Digital Vernier callipers with Bluetooth box for wireless transfer to the iPhone, which is activated when one of the two buttons for male and female is pressed

Figure 8.9. Screen grab of the mobile software which is connected wirelessly to the digital callipers

8.4.2.8 Environmental Monitoring

Due to the inaccessibility of the deep sea habitat, environmental data is limited; however, physical parameters, such as temperature and salinity, are monitored.

A Star Oddi DST logic CTD data logger was deployed in a commercial crab trap in March 2012. The data logger was then placed within a PVC tube with stainless steel ends which enabled it to be affixed to the inside of a crab trap (Figure 8.10). The logger was retrieved, downloaded and re-deployed in September 2012, providing six months of benthic temperature, salinity and pressure at 15-minute intervals. The commercial fisher also recorded the location (latitude and longitude) and depth each time the trap is pulled from the fishing grounds off Shark Bay.

Figure 8.10. Image of the conductivity, temperature and depth logger used to assess the environmental condition.

Temperature was found to decrease with increasing water depth (Figure 8.11). There were no apparent temporal trends in temperature, which is likely due to short duration of the dataset and the varying depths and location of each deployment. Salinity appeared to be unaffected by changes in depth, though there was some variation in salinity for given depths (Figure 8.12).

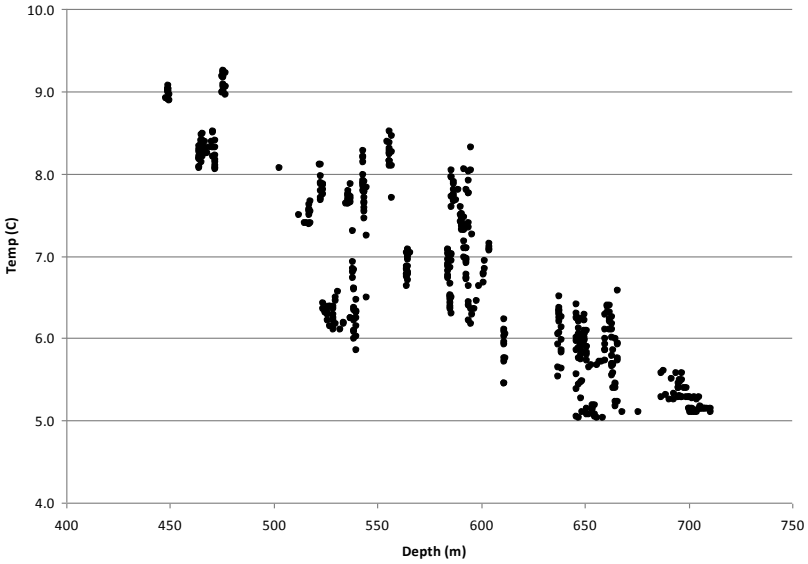

Figure 8.11. Depth (m) and temperature (° C) data for a number of deployments of a logger off Shark Bay

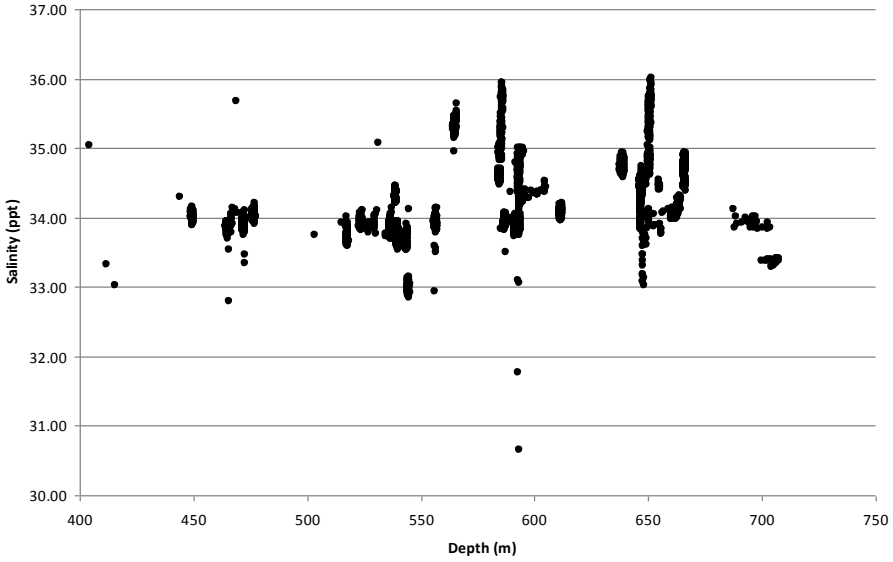

Figure 8.12. Depth (m) and salinity (ppt) data for a number of deployments of a logger off Shark Bay

8.4.2.9 Targeted Research Projects

Three targeted research projects funded by the Fisheries Research and Development Corporation (FRDC) were undertaken between 2000 and 2014 (Melville-Smith *et al.* 2007, Smith *et al.* 2004, Melville-Smith *et al.* 2014). These projects provided baseline information to design the harvest strategy, inform management and improve data collection in the fishery. The projects investigated key aspects the fisheries biology of deep sea crustaceans, particularly crystal crabs and champagne crabs, implemented and trialled innovative monitoring programs and undertook preliminary stock assessments.

MSC Principle 2

MSC Principle 2 (P2) focuses on minimising environmental impact, such that fishing operations should be managed to maintain the structure, productivity, function and diversity of the ecosystem on which it depends (MSC 2013).

9. Retained Species

9.1 Overview

Crystal crabs are the target species in the WCDSCMF and form over 90 % of the total catch. Other retained species in the fishery are giant crabs (*Pseudocarcinus gigas*) and champagne crabs (*Hypothalassia acerba*). Catch history data and composition is provided in Section 3.3. Since the introduction of quota in 2008, neither of these species has comprised more than 5 % of the total catch (Table 9.1).

Giant crabs are distributed between WA and Tasmania and there are seven managed fisheries that capture this endemic species, across the different states. Across the jurisdictions these fisheries are: Tasmania (Giant Crab Fishery), Victoria (Giant Crab Fishery), South Australia (Northern Zone Giant Crab Fishery and Southern Zone Giant Crab Fishery), and Western Australia (Esperance Rock Lobster fishery, South Coast Deep Sea Crab Fishery and West Coast Deep Sea Crab Fishery). Giant crab is considered to be a single biological stock from WA to Tasmania because the species occurs in a continuous distribution across the range. The larval distribution is around 50 days, with larval release occurring along the edge of the continental shelf which is a high current area and will facilitate dispersal. Giant crabs are typically found in depths of 18 to 550 m.

The Status of Key Australian Fish Stocks Reports (Hartmann *et al.* 2014) classified giant crabs to be in a transitional- depleting phase based on declining catches in Tasmania and Victoria. For the purposes of MSC assessment giant crabs maybe considered vulnerable.

Champagne crabs are also an endemic species distributed between Kalbarri and the Eucla in WA at depths of 90 to 310 m. There are currently two managed fisheries that target this species – the WCDSCMF and the SCDSCMF.

Table 9.1. Annual catch composition in the WCDSCMF since 1989

Year	Total Catch (t)	Proportion (%) of Total Catch		
		Crystal Crabs	Champagne Crabs	Giant Crabs
1989	0.2	0.0 %	100.0 %	0.0 %
1990	0	0.0 %	0.0 %	0.0 %
1991	5.1	0.0 %	100.0 %	0.0 %
1992	9.8	0.0 %	100.0 %	0.0 %
1993	7.3	0.0 %	100.0 %	0.0 %
1994	13.3	0.0 %	82.7 %	17.3 %
1995	2.8	0.0 %	100.0 %	0.0 %
1996	2.4	0.0 %	58.3 %	41.7 %
1997	32	2.2 %	96.6 %	1.3 %
1998	52.7	13.5 %	86.5 %	0.0 %
1999	57.3	43.3 %	56.5 %	0.2 %
2000	156.6	91.5 %	7.9 %	0.6 %
2001	212.9	100.0 %	0.0 %	0.0 %
2002	205.4	100.0 %	0.0 %	0.0 %
2003	196.5	99.9 %	0.1 %	0.0 %
2004	226.1	99.9 %	0.1 %	0.0 %
2005	201.8	100.0 %	0.0 %	0.0 %
2006	187.8	98.8 %	1.2 %	0.0 %
2007	227.1	100.0 %	0.0 %	0.0 %
2008	139.1	100.0 %	0.0 %	0.0 %
2009	143.7	96.4 %	3.6 %	0.0 %
2010	145.1	95.6 %	4.3 %	0.1 %
2011	145.2	96.2 %	3.8 %	0.0 %
2012	139.5	99.4 %	0.0 %	0.6 %
2013	139.5	100.0 %	0.0 %	0.0 %
2014	141.3	98.9 %	0.0 %	1.1 %

9.2 Bait

Bait information is currently available for one vessel in the fishery, which accounts for ~ 60 % of the total annual catch. Bait use by other vessels in the WCDSCMF are likely to be similar. Blue mackerel (*Scomber australasicus*) and hoki (*Macruronus novaezelandiae*) are the dominant species used, accounting for 47 % and 43 % of bait used in the fishery over the last five seasons, respectively. Small amounts of orange roughy (~ 1 %; *Hoplostethus atlanticus*), tuna (8 %; Scombridae) and jack mackerel (1 %; *Trachurus declivis*) have also been used in the last five years (2009 – 2013; Table 9.2). The majority of bait is sourced from managed fisheries in New Zealand with an established commercial TAC.

There has been a gradual increase in the amount of bait used in the fishery from 0.46 to 0.78 kg/trap; however, conversion rates remain steady between 0.2 – 0.3 kg of bait for every kilogram of product landed. The increase in bait is likely to have occurred so that there is sufficient bait during the soak times prevalent in recent years.

Table 9.2. Type, source and amount of bait used by one fisher in the WCDSCMF, with associated catch and effort used in the calculation of conversion and usage rates

Year	Bait Type	Bait Source	Total Bait used (kg)	Catch (kg)	Efforts (no. of traplifts)	Conversion Rate	Usage Rate (kg of bait/traplift)
2009	Blue Mackerel	New Zealand	9000				
	Hoki	New Zealand	9000				
2009	**Total**		**18 000**	**81 703**	**38 729**	**0.22**	**0.46**
2010	Blue Mackerel	New Zealand	9225				
	Hoki	New Zealand	8880				
2010	**Total**		**18 105**	**81 024**	**34 148**	**0.22**	**0.53**
2011	Blue Mackerel	New Zealand	9600				
	Hoki	New Zealand	11 780				
	Tuna	Thailand	1020				
	Orange Roughy	New Zealand	1000				
2011	**Total**		**23 400**	**83 686**	**34 633**	**0.28**	**0.68**
2012	Blue Mackerel	New Zealand	10 375				
	Hoki	New Zealand	9640				
	Tuna	Thailand	1020				
	Jack Mac	New Zealand	1000				
2012	**Total**		**22 035**	**83 832**	**32 522**	**0.26**	**0.68**
2013	Blue Mackerel	New Zealand	10,925				
	Hoki	New Zealand	5,760				
	Tuna	Thailand	6,140				
2013	**Total**		**22 825**	**83 930**	**29 084**	**0.27**	**0.78**

9.3 Outcome Status

9.3.1 Retained species

Giant and champagne crabs have a combined annual TAC of 14 t, with the annual catch of each species closely monitored through statutory catch and disposal records (CDRs; see Section 8.4 for an overview of the catch validation process). Small amounts of these species are retained each year, with 1.5 t of giant crabs and no champagne crabs retained in 2014.

Catches of each of these species are monitored and assessed as part of the west coast deep sea crustacean resources harvest strategy (DoF 2015a), with the total annual catch of each species used as a performance measure. Specific reference levels have been set based on catches of each species since the introduction of quota in 2008 through 2012 (Figure 9.1).

In 2014, the annual catch of champagne crabs was within the target range (0 – 6.3 t); however, the annual catch of giant crabs exceeded the threshold level (0.8 t; Figure 9.1). While this level of catch is still well below the permitted TAC, it has triggered a review under the current harvest strategy control rules (see DoF 2015a). The review, which is still in progress, involves an assessment of catch and catch locations with the intention of providing management recommendations to ensure the long term sustainability. Despite the increased

catch of giant crabs in 2014, both species are highly likely to be within biologically-based limits based on the outcomes of the most recent risk assessment (see Section 9.3.3 below).

Across Australia the Giant crab stock is classified as vulnerable (Hartmann *et al.* 2014) due to decreasing catches in Tasmania and Victoria. Management authorities in these states have reduced the TAC progressively over several years with the aim of increasing abundance and catch rates. The WCDSCMF has a marginal contribution to the total catch of giant crabs within Australia. In 2014 the total annual catch in the WCDSCMF was 1.5 t and the total catch across all states was around 35-40 t. The current low catches and highly restricted area where this species can be caught within the WCDSCMF are unlikely to hinder the recovery of this species across the distribution of the stock.

Champagne crabs have not been strongly targeted for the past 15 years, and there have been no catches reported for the last three years. Given the low landings it is highly likely that catches are within biologically based limits and the WCDSCMF has minimal effect on the stocks of this species.

9.3.2 Bait

The impact of the WCDSCMF on the NZ stocks of blue mackerel and hoki are likely to be minimal. Both the blue mackerel and hoki fisheries are managed with input and output controls. The TAC for blue mackerel is 11550 t and 160 000 t for hoki therefore the quantity of bait used in the WCDSCMF is negligible. Recent assessments of these fisheries by NZ Department of Fisheries consider both of these fisheries to currently be within biologically based limits (http://fs.fish.govt.nz/Page.aspx?pk=16&tk=478).

Small quantities of WA herring and pilchards are also used for bait in the WCDSCMF. Pilchards are managed by the Department with a TAC and current catches are within biologically based limits. WA herring stocks are currently in recovery due to poor recruitment and overfishing in recent years (Fletcher and Santoro 2014). In 2014 the Department implemented management measures to assist recovery by reducing the recreational bag limit and closing the South Coast Gillnet fishery. In 2013 around 300 t of herring were caught in the commercial sector of the fishery and it is unlikely the quantities of bait used in the WDCDSMF will hinder stock recovery.

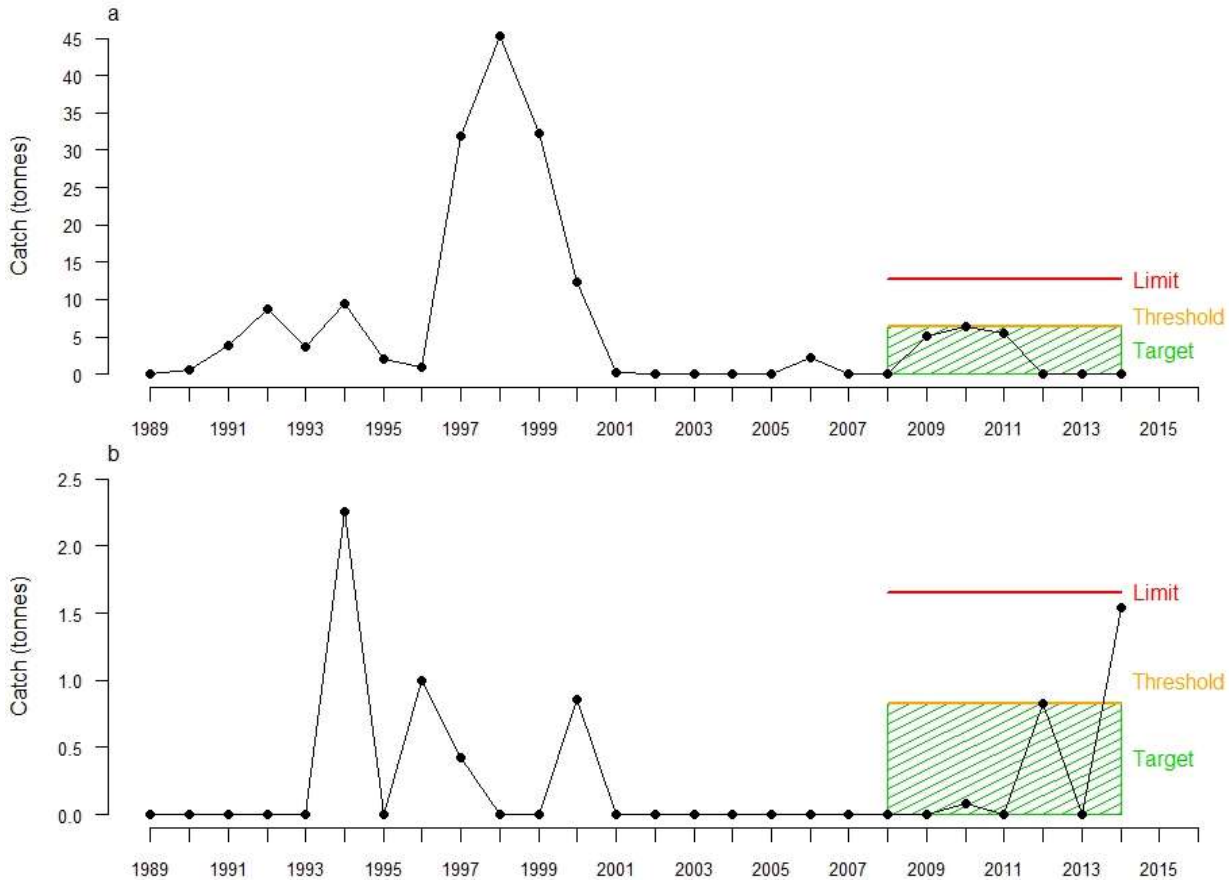

Figure 9.1. Annual catch (tonnes) of champagne crabs (a) and giant crabs (b) in the WCDSCMF since 1989 and their respective reference points.

9.3.3 Risk Assessment Outcomes

9.3.3.1 Giant crab

ERA Risk Rating (2002): Impact on breeding stock: C0 L4, Negligible

PSA Assessment (2014): Medium

The giant crab (*P. gigas*) is distributed along the southern continental shelf of Australia, from the Perth canyon in southwest WA to central New South Wales (Kailola *et al.* 1993). Giant crabs are found at depths of 18 to 400 m, which is shallower than where the main fishing effort for crystal crabs is focused (i.e. 500 – 800 m; How and Nardi 2014). Giant crabs predominantly inhabit the steep terrain of the continental shelf, where they move upwards into shallower, warmer waters to access the more abundant benthic food resources and into deeper depths to moult and spawn. The results of allozyme electrophoresis indicated that there is a genetic homogeneity across the whole species range (Levings *et al.* 2001). This species is both long-lived and slow growing, requiring cooler, temperate waters (7 – 11° C) to survive.

There is a minimum size limit in place for giant crabs under the FRMR of 140 mm CW, along with the protection of all berried female crabs. Thus, any undersize or berried female crabs captured in the crab traps are returned to the water within five minutes of the trap being landed. Only small quantities of giant crabs have been landed on the southwest coast of WA

as part of the WCDSCMF, with less than two tonnes retained annually since the fishery began (see Figure 9.1). In the past three seasons, there has been more targeting of giant crabs off the State's southwest Capes region, resulting in catches of 0.8 and 1.5 t in 2012 and 2014, respectively.

The PSA risk assessment outcome for giant crabs was medium. This score is highly conservative as the assessment only considers giant crabs within the WCDSCMF, which have a restricted population due to the warm waters of the Leeuwin Current limiting the northern distribution. Giant crabs are distributed across the southern Australia from WA to NSW (Currie and Ward 2009).

9.3.3.2 Champagne crab

ERA Risk Rating (2002): Impact on breeding stock: C2 L3, Low

PSA (2014): Low

The champagne crab (*H. acerba)* is endemic to WA and occurs from Kalbarri to Eucla. These crabs are caught between 30 and 550 m water depths on sand or rocky substrate (Yearsley *et al.* 1999). Historically, champagne crabs were the primary target species of the WCDSCMF, with substantial catches landed in 200 – 400 m depths. However, catches of champagne crabs have declined significantly due to a decrease in effort targeting this species, resulting from commercial quantities of the more valuable crystal crabs being discovered in deeper waters. Lack of demand and declining prices are also responsible for the decline in champagne crab targeting and catches.

There is a minimum size limit in place for champagne crabs under the FRMR of 90 mm CW, along with the protection of all berried female crabs. Thus, any undersize or berried female crabs captured in the crab traps are returned to the water within five minutes of the trap being landed.

Catches of champagne crabs in the WCDSCMF are small relative to the extent of their range and are currently considered to be at sustainable levels

9.4 Management Strategy

There is a strategy in place to manage fishery impacts on retained non-target species. This strategy utilises a number of management measures under the *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012*, including:

- Limited entry;
- Minimum size limits for champagne and giant crabs;
- An annual (combined) catch limit (TAC) for champagne and giant crabs;
- Total protection of undersize and berried female crabs;
- Spatial closure within the 150 m depth contour;
- Gear restrictions;

- Statutory reporting requirements and
- Compliance policing.

These management measures work together to reduce the impact of the fishery on retained species stocks by limiting overall fishing effort and annual catches of the only two retained deep sea crustaceans, champagne and giant crabs.

Each MFL holder has a combined usual entitlement for champagne and giant crabs of 100 Class B Units[11] or 2000 kg (2 t), with a combined total of 14 t of quota available for the entire fishery. Since moving to a quota-managed fishery in 2008, this annual combined TAC for giant and champagne crabs has not been exceeded. In fact, combined catch levels are generally less than half of this annual limit, ranging from 0 to 6.4 t since 2008.

The *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a) also includes acceptable catch levels for both champagne and giant crabs. Should the catch of either species exceed the threshold level (i.e. > 6.3 t of champagne crabs or > 0.8 t of giant crabs) a review of the causes for the change in catch will be undertaken. If sustainability is considered to be at risk, changes to the management arrangements will be undertaken. Should catches exceed the limit level (i.e. > 12.6 t of champagne crabs or > 1.6 t of giant crabs), management strategies to further protect the stocks will be implemented.

9.5 Information and Monitoring

Catches are reported in monthly catch and effort (CAES) returns, and daily CDRs. There is high confidence that the reported catches of giant and champagne crabs are accurate, with Departmental research staff validating CAES returns and compliance monitoring of the CDRs for quota-management purposes (see Section 8.4).Occasional observer coverage also provides information on the catch of non-target retained species.

[11] Each Class B Unit is worth 20 kg

10. Bycatch

10.1 Outcome Status

The WCDSCMF has extremely low levels of bycatch. Data from on-board monitoring by Departmental research staff (observers) and remote on-board surveillance cameras indicated fifteen incidences of bycatch (e.g. discarded catch other than totally-protected crabs) in almost 4 700 traplifts that were observed between 2010 and 2014 (Table 10.1). The few species that were caught included other deep sea crab species, sea urchin, octopus, deep sea sharks and one unidentified finfish.

Table 10.1. Observed bycatch species recorded during on-board monitoring (scientific observer and video) between 2010 and 2014. Data are standardised to catch rate per traplift.

Common Name	Taxonomic Name	2010	2011	2012	2013		2014		Total	Catch Rate (no./1000 traplifts)
		Monitoring	Monitoring	Monitoring	Video	Monitoring	Video	Monitoring		
Antlered crab	*Dagnaudus* sp	0	0	4	0	0	0	0	**4**	0.85
Sea urchin	Echinoidea (Class)	0	0	1	0	0	0	0	**1**	0.21
Red spider crab	*Lithodes rachelae*	1	0	1	0	0	0	0	**2**	0.43
Octopus	*Octopus sp*	0	0	2	0	0	0	0	**2**	0.43
Shark		0	0	2	0	0	0	0	**2**	0.43
Furry spider crab	*Paralomis sp*	0	0	2	0	0	0	0	**2**	0.43
Hermit crab	Paguroidea	0	0	0	0	1	0	0	**1**	0.21
Fish (unknown)		0	0	0	0	1	0	0	**1**	0.21
# Traps Sampled		210	646	1093	1651		164	348	**4694**	

The level of catch of each species is considered to be insignificant compared to each species' distribution and population size. All bycatch is returned to the water, and most bycatch species are required to be returned within five minutes of being brought on board a fishing vessel. Crabs, echinoderms and molluscs are expected to survive this process, although the survival of finfish is less likely. However, the l number of finfish captured would likely have a negligible impact on the breeding stocks of these species.

Traps are also designed to reduce bycatch through the use of mandatory escape gaps. The loss of commercial traps and the potential for ghost fishing is low for WCDSCMF, as the traps are set in longlines and are clipped together. Bottom currents are minimal at the depths fished, and the chances of losing one, or a whole line, of traps is very low.

The level of bycatch is monitored and assessed as part of the *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a), with risk assessment outcomes used to measure fishery performance (see below).

10.1.1 Risk Assessment Outcomes

10.1.1.1 Deep Sea Sharks

ERA Risk Rating (2002): Assessment not undertaken

PSA (2014): Medium

Deep sea sharks were not identified as issue of ecological concern in the initial assessment undertaken under the provisions of the EPBC Act 1999; but were included in the 2014 PSA due to their occurrence in on-board monitoring data. The 2014 PSA assessment found the impacts to deep sea sharks to be a medium risk, which was mainly attributed to their biological characteristics of low productivity rather than their susceptibility to fishing activities.

Deep sea sharks are very occasionally either caught in traps or entangled in the longlines attached to the traps (see Table 10.1 above). The impacts of the WCDSCMF on deep sea sharks is considered be within acceptable limits due to the low number of; captured individuals, fishing effort and longlines associated with traps (< 25 for the total fishery). In addition, fishing activities are concentrated in a few discrete areas along the Gascoyne and West coasts, resulting in extensive areas of refuge from fishing activities for these widely-distributed species.

Deep sea shark bycatch was also identified as an ongoing consideration in the MSC pre-assessment, with records of bycatch as a high priority. The use of remote videos on-board vessels provides greater coverage of deep sea shark captures and assists with species identification.

10.1.1.2 Finfish

ERA Risk Rating (2002): Impact on breeding stock: C0 L4, Negligible

PSA (2014): Low

Finfish are rarely captured in traps, although a variety of species have been observed during on-board monitoring. Species vary and are not always identifiable although a number of specimens have been sent to the WA Museum for formal identification.

10.1.1.3 Western Rock Lobster

ERA Risk Rating (2002): Impact on breeding stock: C0 L2, Negligible

PSA (2014): Low

The western rock lobster (*Panulirus cygnus*) has a range from NW Cape to Albany in WA.

A small number of lobsters have been captured when operating at shallower depths (150 – 200 m); however, the majority of fishing effort in the WCDSCMF fishery is focused in water > 600 m in depth. Western rock lobsters are therefore unlikely to be captured because these depths are well outside the normal distribution of this species.

Fishers in the WCDSCMF are not permitted to retain any captured rock lobster, with all individuals returned to the water alive within five minutes of landing.

10.1.1.4 Sea Lice

ERA Risk Rating (2002): Impact on breeding stock: C0 L4, Negligible

PSA (2014): Low

Sea lice (*Bathynomous* spp.) are small isopod crustaceans that have been captured in traps in small numbers, generally from locations where crystal crabs are not abundant.

Traps have mandatory escapes gaps and generally few lice are captured. Those that are brought to the surface are quickly returned to the sea and are considered to have high survival rates.

10.1.1.5 Spider Crabs (and other deep sea crabs)

ERA Risk Rating (2002): Impact on breeding stock: C0 L4, Negligible

PSA (2014): Low

Several other species of deep sea crabs are captured in the traps in small numbers, such as spider crabs and other unidentified crabs. None of these crabs are retained, due to low meat content and market values.

Tagging experiments with crystal crabs have indicated low mortality of released crabs, and it is likely that the same low mortality rates would apply to other deep sea crab species.

10.1.1.6 Molluscs

ERA Risk Rating (2002): Impact on breeding stock: C0 L3, Negligible

PSA (2014): Low

On rare occasions, some mollusc species are brought to the surface in the trap. Quantities are insignificant, and any captured molluscs are immediately returned to the water, with a high likelihood of survival. Species vary and are not always identifiable, and a number of specimens have been sent to the WA Museum for formal identification.

10.1.1.7 Octopus

ERA Risk Rating (2002): Impact on breeding stock: C0 L4, Negligible

PSA (2014): Low

Octopuses are rarely caught in the WCDSCMF, probably because of their low abundance and ability to escape from the traps. The insignificant number captured is likely to have a negligible impact on the breeding stocks of these species.

10.2 Management Strategy

There is a strategy in place to manage fishery impacts on bycatch species. This strategy utilises a number of management measures under the *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012*, including:

- Limited entry;
- Species restrictions;
- Gear restrictions;
- Spatial closures within the 150 m depth contour; and
- Compliance policing.

These management measures work together to reduce the impact of the fishery on bycatch species stocks by limiting overall fishing effort and providing incentives for fishers to reduce the capture of unwanted species, as they are not permitted to retain a number of species, such as rock lobster, sharks and finfish. There are also restrictions on the retention of scampi and white-tailed bugs east of 128° E.

The *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a) also includes acceptable risk levels for all bycatch species. Should the risk to any species exceed the threshold level, a review of the causes for the increased risk will be undertaken. If sustainability is considered to be at risk, changes to the management arrangements will be undertaken. Should the assessed risk level exceed the limit reference level (i.e. a severe risk), management strategies to further protect the species' population will be implemented.

10.3 Information and Monitoring

Fishers are encouraged to report all bycatch in voluntary logbooks, with additional bycatch information collected during periodic on-board monitoring trips undertaken by Departmental staff. Additional bycatch information has also been obtained through the use of a remote on-board camera deployed on two commercial crab vessels (which account for over 90 % of the landed catch).

11. ETP Species

11.1 Overview

Endangered, threatened and protected (ETP) species in WA are protected by various international agreements and national and state legislation. International agreements include:

- *Convention on the Conservation of Migratory Species of Wild Animals 1979* (Bonn Convention);
- The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES);
- The *Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment 1974* (JAMBA)[2];
- The *Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment 1986* (CAMBA)[2];
- The *Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds 2007* (ROKAMBA)[2]; and
- Any other international agreement, or instrument made under other international agreements approved by the Environment Minister.

Primary pieces of national and Western Australian legislation include the Commonwealth EPBC Act, the *Western Australian Wildlife Conservation Act 1950* (WC Act) and the FRMA.

Various whale species are likely to be encountered throughout the waters of the WCDSCMF. Blue and sperm whales are often observed well offshore, and migrating humpback whales can be seen approximately 10 – 20 km from the shoreline (Shaw 2000). Dolphins and dugongs are abundant in more coastal areas but are likely to migrate onto the shelf at times and may be important tertiary and primary consumers (respectively) in this area (Brewer *et al.* 2007). Loggerhead, green, leatherback and hawksbill turtles can also be encountered in coastal areas, along with various sea snakes, including the critically endangered short-nosed sea snake, *A. apraefrontalis.* Whale sharks and manta rays are abundant in the Ningaloo region, although their occurrence offshore is not well documented (Brewer *et al.* 2007). The totally-protected shark species, grey nurse sharks and white sharks, also occur in these waters.

11.2 Outcome Status

The traps and ropes used in deep sea crab longlines have minimal capacity to interact with ETP species. The main possible interaction would be entanglement in ropes/lines; however, with approximately 1000 traps in the fishery and an average of 120 traps per longline, there is estimated to be fewer than 25 vertical rope lines deployed at any given time. Furthermore, these lines are generally spaced far apart to allow the 120 traps between them.

There have been 63 records of baleen whales being entangled in commercial fishing gear between 1982 – 2010 (Groom and Coughran 2012), with the majority of entanglements in western rock lobster fishing gear which is set in waters shallower than 150 m. There has been one record of a humpback whale becoming entangled with fishing gear associated with the WCDSCMF (in 2014) since the commencement of the fishery in 1989. This individual was disentangled and was released unharmed. The migratory paths of humpback whales along the Western Australian Cost is typically within the 200 m isobath (Jenner *et al.* 2001), which is typically outside of where the WCDSCMF operates. The use of heavy ropes and the low number of lines in the water, spaced long distances apart, is considered to reduce the risk of entanglement of whales, dolphins, manta rays and turtles.

The fishing activities and impacts of the WCDSCMF have been assessed by the Commonwealth government under the provisions of the EPBC Act 1999 (Part 13 and 13A) and have been found to meet the *Guidelines for the Ecologically Sustainable Management of Fisheries* (see Section 4.5 for more information on this process).

The number of interactions with ETPs are monitored and assessed annually as part of the *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a), with the number of annual interactions and risk assessment outcomes used to measure fishery performance (see below).

11.2.1 Risk Assessment Outcomes

11.2.1.1 Whales and Dolphins

ERA Risk Rating (2002): Impact on breeding stock: C0- L1, Negligible

PSA (2014): Medium

The main impact of deep sea crab fishing on whale and dolphin species will be from indirect interactions, such as boat strikes and/or entanglement with longline ropes. Given few vertical lines (< 25) are in the water at any given time and location of fishing activities in deep, offshore waters, the likelihood of entanglements is very low. The likelihood of vessel strike is also very low, given the fishery consists of only two full-time and one part-time vessel.

The 2002 ERA concluded that this fishery was a negligible risk to whale and dolphin populations on the west coast because of the extremely low potential for interactions. More recently, the PSA rated the risk to humpback whales (as the most-vulnerable whale species for this fishery) as medium. This score is primarily based on the life history characteristics of this species (long-lived, low productivity) rather than from impacts from the WCDSCMF.

11.2.1.2 Leatherback Turtles

ERA Risk Rating (2003): Impact on breeding stock: C0 L1, Negligible

PSA (2014): Low

The leatherback turtle (*Dermochelys coriacea)* is a scarce but regular, non-nesting feeding migrant visitor to WA waters and is the only turtle that is found outside of coastal waters. The

main risk of interactions between fishing operations and turtles in the WCDSCMF is from boat strikes and entanglement in ropes and lines, not from capture in traps. However, given the low number of longlines in the water and fishing boats operating at any given time, the likelihood of an interaction is very low.

There have been no reports of boat strikes or entanglements of turtles in this fishery.

11.3 Management Strategy

There is a strategy in place to manage fishery impacts on ETPs that is designed to achieve national and international requirements for protection of these species. This strategy uses a number of management measures under the *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012* and operational activities, including:

- Limited entry;
- Gear restrictions;
- Fishing methods (use of longlines); and
- Spatial closures within the 150 m depth contour.

These management measures work together to reduce the impact of the fishery on ETPs populations by limiting overall fishing effort and minimising the likelihood of an interaction through reducing the number of lines in the water at any given time and fishing in offshore areas where the majority of ETPs are not found.

The *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a) also includes acceptable interaction and risk levels for all ETPs. Should the number of interactions or risk to any species exceed the threshold level (i.e. more than three interactions with any particular species in a year or fishing impacts considered a high risk to species populations), a review of the causes will be undertaken. If sustainability is considered to be at risk, changes to the management arrangements will be undertaken. Should the assessed risk level exceed the limit reference level (i.e. a severe risk), management strategies to further protect the species' population will be implemented.

11.4 Information and Monitoring

Fishers are required to report all interactions with ETPs on monthly CAES returns. Additional information on ETP interactions is also provided through observer monitoring activities.

The Department of Parks and Wildlife (DPaW) are responsible for attending to stranding and entanglements of ETPs. If an ETP species is entangled in fishing gear DPaW notify the Department that the event has taken place. At the conclusion of every year DPaW forwards a summary of ETP interactions with fishing gear to the Department.

12. Habitats

The coastal and oceanic waters off WA are characterised by low nutrients, in comparison to the west coasts of other continents such as South Africa and South America (Waite *et al.* 2007). Productivity, especially in the deeper waters, is low and associated ecosystems are not likely to be highly complex.

Broad scale mapping indicates that deep water habitats off the GCB, where the majority of fishing in the WCDSCMF occurs, are relatively featureless (Brewer *et al.* 2007). Benthic environments are fairly uniform due to the lack of geomorphological heterogeneity and hard substrates for sessile benthic invertebrates and are dominated by fine particulate matter deposited from the water column and fine shelf sediments. Communities of infauna and epifauna are likely to be sparse (Brewer *et al.* 2007). Sediments at depths greater than 300 m are likely to be mostly mud, with macrobenthic fauna decreasing with increasing depth (Levings *et al.* 2001).

12.1 Outcome Status

The WCDSCMF is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. The impact of traps on benthic habitats depends on many factors such as the size, weight and material of the trap; hauling speed, ocean conditions, depth of haul and substrate where the trap is set (Fuller *et al.* 2008). In general, sand and mud bottom habitats are less affected by traps than sensitive bottom habitats, i.e. corals and sponges (Barnette *et al.* 2001). Studies on the effects of crab and lobster traps on deepwater benthic fauna have identified that flexible species, such as sea pens, tended to bend in response to wave pressure before the traps made contact. After contact, smothering and even uprooting, they re-established themselves when in contact with muddy substrate (Eno *et al.* 2001). It is also thought that because of their flexibility, sea whips and soft corals are also less vulnerable to the effects fishing gear (Troffe *et al.* 2005, Kenchington *et al.* 2010). Hard corals are likely to be more vulnerable to impacts from traps (Lewis *et al.* 2010), however as the fishery is restricted to areas deeper than 150 m it is unlikely that hard coral communities exist in the fishing areas.

Within the WCDSCMF, sponges and solitary corals are occasionally brought to the surface after being entangled in the traps, although this is rare. If biota are brought to the surface, it is immediately returned to the water.

Fishing impacts on benthic habitats are monitored and assessed annually as part of the *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a), with the extent of the area fished and risk assessment outcomes used to measure fishery performance (see below).

12.1.1 Risk Assessment Outcomes

12.1.1.1 Benthic Biota - Mud

ERA Risk Rating (2002): Impact on breeding stock: C0 L2, Negligible

The WCDSCMF operates in 150 m to 1200 m water depths. The main habitat at these depths is mud (Levings *et al.* 2001). Soft sediment dwelling biota is infrequently brought to the surface with the traps and are immediately returned to the water when found. Due to the low abundance of benthic biota and low probability of encounters with traps, the fishery is considered to be a low risk to benthic mud habitats.

12.1.1.2 Sponges/Corals

ERA Risk Rating (2002): Impact on breeding stock: C0 L2, Negligible

Sponges and small solitary corals are infrequently brought to the surface with traps. The impacts to these sessile invertebrates are thought to be minimal due to the infrequency that they are brought to the surface and minimal footprint of the traps to the benthic substrate. Any individuals brought to the surface are immediately returned to ocean.

12.2 Management Strategy

There is a strategy in place to manage fishery impacts on benthic habitats. This strategy utilises a number of management measures under the *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012*, including:

- Limited entry;
- Species restrictions;
- Gear restrictions; and
- Spatial closures within the 150 m depth contour.

These management measures work together to reduce the impact of the fishery on benthic habitats by limiting overall fishing effort, minimising benthic impacts through the methods and gear used and providing refuge from fishing activities within the 150 m depth contour. Traps are mainly set over muddy bottom habitats, which are likely to have a low density of sessile invertebrates. Benthic biota is occasionally brought to the surface and is returned to the water immediately upon removal.

The *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a) also includes reference levels for benthic habitats. Performance indicators for habitat impacts are the extent of the area fished annually (number of 10°'x 10°' blocks) and annual fishing effort, measured in number of traplifts. Target levels of ≤ 125 blocks and $\leq 169\,000$ traplifts/year have been identified, based on the highest levels recorded during the reference period (2003 – 2012). Should the area fished or fishing effort exceed the threshold level (i.e. > 125 blocks or > 169 000 traplifts), a review is triggered to investigate the reasons, with changes to management arrangements implemented if sustainability is considered to be at risk. The limit reference levels have been set as 10 % above the target levels (i.e. > 138 blocks or > 186 000 traplifts). If the limit reference level is breached, management strategies to further protect benthic habitats will be initiated.

12.3 Information and Monitoring

The location (longitude and latitude) of fishing activities is reported in voluntary daily logbooks and statutory CDRs and is used to monitor fishing location. Sponge and coral entanglements are also reported in daily logbooks.

Commercial monitoring by observers and remote video surveillance also provides information potential entanglements and habitats where fishing is occurring.

Logbooks can provide information about the amount of corals and/or sponges that are encountered in the traps. This is currently being augmented by the placement of remote videos on board commercial fishing vessels. These videos will provide footage of any benthic species which have become entangled in the traps. Trained observers review the footage and record bycatch and entanglements.

13. Ecosystem

13.1 Outcome Status

Total annual landings of the three retained species of deep sea crabs (combined total of 141.3 t in 2014) represent a very small biomass. Deep sea crabs are not known to concentrate on a particular prey species and are not a preferred prey for higher trophic levels. As such, the current levels of removal of deep sea crabs in the fishery are highly unlikely to have any major impacts on trophic relationships.

The level of catch of each crab species and the potential risk of fishing activities on ecological processes are monitored and assessed as part of the *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a), with risk assessment outcomes used to measure fishery performance (see below).

13.1.1 Risk Assessment Outcomes

13.1.1.1 Impact on trophic levels

ERA Risk Rating (2002): Impact on trophic levels: C0 L3, Negligible

The fishing activities of the WCDSCMF are considered to be a negligible risk to trophic interactions in the deep sea ecosystem. Deep sea crabs are considered to be both scavengers and opportunistic predators, and their exploitation is therefore unlikely to have a significant effect on species in higher trophic levels. In terms of the effect that their removal might have on the lower trophic levels, the minimum sizes are such that only a small portion of the standing stock is harvested, with sufficient levels of crabs remaining to maintain trophic structure.

The amount of finfish and invertebrate bycatch is small and is unlikely to impact marine food webs or community structure.

13.2 Management Strategy

There is a strategy in place to manage fishery impacts on retained non-target species. This strategy utilises a number of management measures under the *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012*, including:

- Limited entry;
- Minimum size limits for champagne and giant crabs;
- An annual (combined) catch limit (TAC) for champagne and giant crabs;
- Total protection of undersize and berried female crabs;
- Spatial closure within the 150 m depth contour;
- Gear restrictions;
- Statutory reporting requirements; and
- Compliance policing.

The main strategy to ensure there is minimal impact on the broader ecosystem is the maintenance of significant stock/biomass levels of the target species, crystal crabs. In most cases, this serves to minimise the potential for any trophic interactions as this species accounts for > 95 % of the total annual catch in the fishery. Since the implementation of a TAC, catches of crystal crabs have remained at or just below the 140 t limit. Other strategies, such as limited entry, minimum size limits, spatial closures, biological restrictions and gear restrictions further minimise the potential for impacts through the protection of other retained, bycatch, and ETP species, as well as benthic habitats.

The *West Coast Deep Sea Crustacean Resources Harvest Strategy 2015 – 2020* (DoF 2015a) also includes acceptable risk levels for ecosystem processes. Should the risk to the ecosystem exceed the threshold level (i.e. a high risk), a review will be undertaken, with management action implemented if sustainability is considered to be at risk. Should the risk to the ecosystem (or more than one component of the ecosystem) exceed the limit reference level (i.e. a severe risk), management strategies to further protect the ecosystem will be implemented.

13.3 Information and Monitoring

Community composition and productivity for the North West Shelf ecosystem have been described by Brewer *et al.* (2007).

Appropriate levels of information are available for each component (e.g. retained/bycatch species, ETP species and habitats), which has allowed for a sensible assessment of the level of risk to be determined. This information includes data collected from both fishery-independent monitoring and fishery-dependent reporting (see Section 8.4).

MSC Principle 3

MSC Principle 3 relates to the effective management of the fishery under assessment. Within this context, the fishery must demonstrate that it meets all local, national and international laws and must have a management system in place to respond to changing circumstances and maintain sustainability.

14. Governance and Policy

This section captures the broad, high-level context of the fishery management system within which the WCDSCMF is found. It includes:

- The legal and / or customary framework that overarches the fishery, including relevant international treaties, national environmental legislation, national cooperative management arrangements, jurisdictional arrangements between the state of WA and the Commonwealth government and the system of governance in WA, including relevant fisheries legislation;
- Consultation processes and policies, as well as an articulation of the roles and responsibilities of people and organisations within the overarching fishery management system;
- The long-term fishery management objectives; and
- A description of the incentives in place to encourage sustainable fishing within the WCDSCMF.

14.1 Legal Framework

The management system for the WCDSCMF exists within an appropriate legal framework, which ensures that it (1) is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; (2) observes the legal rights created explicitly or established by custom on people dependent on fishing for food or livelihood; and (3) incorporates an appropriate dispute resolution framework.

14.1.1 Jurisdictional Arrangements

The Australian Constitution bestows certain specific powers on the Australian Government, with all other powers residing with the individual state / territory governments. The Constitution provides that the Australian Government may make laws with respect to trade and commerce with other countries and among the states / territories, while states / territories, on the other hand, have sovereign powers in matters affecting their rural industries, land tenure, land use and water supply. There are formalised cooperative management arrangements for developing and implementing Australian national policies and strategies in State jurisdictions.

14.1.1.1 Western Australian Fisheries Authorities

There are three different statutory entities responsible for the control and management of fisheries within Australian waters off the coast of WA (1) the Commonwealth Australian

Fisheries Management Authority (AFMA); (2) the WA State Fisheries Joint Authority and (3) the WA Department of Fisheries (the Department).

The WA Government operates under the Westminster system, with the responsible Minster making executive management decisions. For fisheries in WA, the relevant executive decision maker is the Minister for Fisheries. The Minister for Fisheries has legislative power to turn knowledge and advice he is provided with into action, while the administration of these management arrangements is the responsibility of the Chief Executive Officer (CEO) of the Department, and the Department more generally.

The Minister / Department is responsible for the sustainable development and management of the State's aquatic resources, fisheries and aquaculture in accordance with its governing legislation. The Department is governed by the *Public Sector Management Act 1994* and is required to provide an *Annual Report*[12] to Parliament, which includes an overview and profile of the Agency and an assessment of the extent to which the Department has achieved its goal of conserving and sustainably developing the State's aquatic resources and the relationship between the service delivered and the cost of resources used in its delivery.

In accordance with the *Offshore Constitutional Settlement 1995* (OCS), the Department's fisheries management responsibilities extend seaward beyond the three nautical mile limit of the State to the 200 nautical mile limit of the Australian Fishing Zone (AFZ). Additionally, the OCS sets out that the State will manage all trawling on the landward side of the 200 m isobath in the waters adjacent to WA and the Commonwealth will manage all deep-water trawling (seaward of the 200 m isobath). The OCS also provides for some fisheries in both State waters and the AFZ to be managed either jointly by the Commonwealth and State or solely by the Commonwealth (Brayford and Lyon 1995).

Fisheries undertaken in waters adjacent to WA that are managed by the Commonwealth (AFMA) in accordance with Commonwealth legislation include a number of commercial fisheries (e.g. the Northern Prawn Fishery) and all recreational fishing in the waters of any Commonwealth marine park. Fisheries under joint Commonwealth-State jurisdiction are managed under the WA Fisheries Joint Authority (a body comprising State and Commonwealth ministers) in accordance with State legislation.

Except where specifically noted, fisheries involving the following species are managed by the WA Department of Fisheries in accordance with State law:

- All bony fish and sharks (except to the extent they are managed under a Joint Authority or by the Commonwealth);
- All aquatic invertebrates;
- All marine algae; and
- All seagrasses.

[12] The most recent annual report is available on the Department's website at: http://www.fish.wa.gov.au/About-Us/Publications/Pages/Annual-Report.aspx

The Department provides management, licensing (where applicable), research and compliance and education services for commercial fisheries, recreational fisheries, customary fishing, pearling and aquaculture in all State waters (including marine parks) and the fish processing and charter boat industries. The Department's operations are guided by a *Strategic Plan 2009 – 2018* (currently in Phase 3 [2013 – 2015]), which sets out explicit long-term objectives in four main areas: sustainability, community outcomes, partnerships and agency management. The *Strategic Plan 2009 – 2018* also sets out the strategies and key deliverables and Divisions of the Department that are responsible for delivery and is reviewed on a regular basis.

The Department is structured around three key service delivery areas:

- **Aquatic Management:** provides management, policy development, licensing and legislation related to the State's commercial and recreational fisheries, pearling, aquaculture, fish processing, the charter boat industry, customary fishing and protection of aquatic ecosystems;
- **Compliance and Education:** provides state-wide fisheries compliance and community education, in accordance with the provisions of relevant legislation; and
- **Research and Monitoring:** provides timely, quality scientific knowledge and advice to support the conservation and sustainable use of the State's fish resources and aquatic systems.

The Department also provides a marine safety service on behalf of the Department of Transport.

Further information on the Department's structure, management, research, compliance and other activities is available in the *Annual Report*[13] and the annual *Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries*[14].

14.1.2 Relevant Legislation

The governance system in place for all commercial fisheries in WA state waters, including the WCDSCMF, is subject to a number of treaties, policies and pieces of legislation.

Every commercial fishery in Australia is subject to international agreements and conventions to which the Australian government is a signatory, such as:

- The *United National Convention on the Law of the Sea* (UNCLOS);
- The *Convention on Biological Diversity* (CBD);
- The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES);
- The *FAO Code of Conduct for Responsible Fisheries*;

[13] http://www.fish.wa.gov.au/About-Us/Publications/Pages/Annual-Report.aspx
[14] http://www.fish.wa.gov.au/About-Us/Publications/Pages/State-of-the-Fisheries-report.aspx

- The *United Nations Fish Stocks Agreement* for straddling and / or highly-migratory fish stocks; and
- Commitments as a member state of the *International Union for the Conservation of Nature* (IUCN).

The Commonwealth Department of the Environment (DotE) is responsible for acting on international obligations on a national level, by enacting policy and / or legislation to implement strategies to address those obligations. As such, all commercial fisheries in Australia are subject to national environmental legislation under the *Environment Protection and Biodiversity Conservation Act 1999* (the EBPC Act), which is administered by the DotE. The EPBC Act provides a legal framework for the protection and management of nationally- and internationally-important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as 'matters of national environmental significance'.

Within WA, the Department assists the Minister in the administration of the following State acts and regulations[15]:

- *Fish Resources Management Act 1994* (FRMA);
- *Fish Resources Management Regulations 1995* (FRMR);
- *Pearling Act 1990*;
- *Pearling (General) Regulations 1991*;
- *Fisheries Adjustment Schemes Act 1987*;
- *Fishing and Related Industries Compensation (Marine Reserves) Act 1997*; and
- *Fishing Industry Promotion Training and Management Levy Act 1994*.

The FRMA is the primary instrument for fisheries management in WA, and it adheres to arrangements established under relevant Australian laws with reference to international agreement, including the use of the precautionary principle. The FRMA provides for the creation of subsidiary legislation, in the form of Regulations (i.e. FRMR), Orders, Management Plans, Ministerial Policy Guidelines and Policy Statements.

The FRMA deals with broad principles and the provision of head powers and high-level overarching matters, while the FRMR and other subsidiary legislation deal with the details needed to put these matters into practice. Parts 5 and 6 of the FRMA set out the general regulation of fisheries through the use of orders and regulations and the specific management of fisheries via the declaration or creation / amendment of fisheries management plans.

Fishery management plans in WA set out the operational rules that control managed commercial fishing activities. Specifically, a fishery's management plan provides the power (pursuant to section 58 of the FRMA) to issue and restrict the number of authorisations and

[15] Up-to-date versions of the legislation governing the Department and the Fisheries acts and regulations can be accessed via the Departmental website: http://www.fish.wa.gov.au/About-Us/Legislation/Pages/default.aspx.

regulate other conditions and grounds related to fishing. There is also the power to set the capacity of a fishery under a management plan (under section 59).

Under the FRMA, there is a division of power between the Minster for Fisheries and the statutory office of the Department's Chief Executive Officer (CEO). In broad terms, it is the Minister for Fisheries who establishes legal and policy framework for fisheries management (under Parts 5 and 6 of the FRMA) in line with consultation processes, while the Department's CEO (and staff) carries out the day-to-day administration of these frameworks.

In 2010, the (then) Minster for Fisheries directed the Department to investigate and scope the requirements for a new WA Act of Parliament to ensure the sustainable development and conservation of the state's aquatic resources into the future. This review recognised the need for the establishment of a clear statutory basis for commercial and recreational fishing access rights as a component in improving the overall robustness of sustainable fisheries management and improving security of resource access for all fisheries sectors. A proposed *Aquatic Resources Management Bill* (ARMB) has been drafted to replace the FRMA and will be introduced to Parliament during 2015. Importantly, the ARMB's proposed framework includes a primary emphasis on biological sustainability; clear and transparent guidelines for decision-making; and provisions for a rights-based management approach for all fishing sectors. An overview of the proposed new ARMB and the objectives of sustainable fisheries and aquatic management policy and how they relate to national and international fisheries law and policy are provided in Department of Fisheries (2010).

In addition to the legislative framework, the Department has set out its fisheries and aquatic resource objectives in the *WA Government's Fisheries Policy Statement* (DoF 2012a). This policy provides high-level guidance on the Government's preferred approaches to key resource management challenges, including resource management, resource access and allocation, marine planning and governance and consultative structures. The Government has also recognised that more detailed policies are needed for a number of other key areas:

- *Harvest Strategy Policy and Operational Guidelines for the Aquatic Resources of Western Australia* (DoF 2015a) — this policy sets out the main requirements of an effective harvest strategy in WA, i.e. operational objectives, performance indicators, reference levels and harvest control rules. This policy is consistent with the *National Harvest Strategy Guidelines* (Sloan *et al.* 2014); however, in addition to the management of target species stocks, it includes unacceptable risks to other ecological resources and sectoral allocation.
- *Aquatic Biodiversity Policy* — The Department is currently drafting an overarching policy that describes the Department's role, responsibilities and jurisdiction in the management of the State's aquatic biodiversity. The policy focuses on five key asset areas (retained fish species; non-retained fish species; endangered, threatened and protected species; fish habitats and ecosystem processes) and seven key threats imposed upon these asset areas (habitat loss, invasive pests, unsustainable harvest, external drivers, lack of information, governance and cumulative impacts).

14.1.3 Management Framework

14.1.3.1 Ecologically Sustainable Development

In accordance with international treaties and initiatives, the Australian Government is committed to implementing the principles of Ecologically-Sustainable Development (ESD). ESD is a dynamic concept that seeks to integrate short- and long-term economic, social and environmental effects into the decision-making processes of government and industry. As per the *National Strategy for Ecologically Sustainable Development* (CoA 1992), ESD is defined as *"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased"*. ESD is accepted as the foundation for natural resource management in Australia and is a major component of all fisheries legislation, at both Commonwealth and State levels.

The EPBC Act requires the Australian Government to assess the environmental performance of fisheries and promote ecologically-sustainable fisheries management (in line with the principles of ESD). For State-managed fisheries, an independent assessment[16] of a fishery in accordance with the EPBC Act is required for export approval (this is undertaken by the DotE through the Commonwealth Minister for the Environment). In order to meet these requirements, a comprehensive ESD reporting system has been developed for all Australian fisheries (Fletcher *et al.* 2002).

In any assessment using an ESD framework (e.g. export approval), all relevant environmental issues, social and economic outcomes and governance issues are addressed. In WA, these assessments are completed using a risk-based framework to examine the impacts of an individual fishery on retained species, bycatch (including protected species) and habitats, as well as any potential indirect impacts on the broader ecosystem. These assessments are independently-reviewed by the federal environmental agency against the *Guidelines for the Sustainable Management of Fisheries – V2* (*Guidelines*; CoA 2007), with their ongoing performance reported annually in the *Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher and Santoro 2014).

14.1.3.2 Ecosystem Based Fisheries Management

The Department has implemented Ecosystem Based Fisheries Management (EBFM) as the primary strategy to achieve the goal of ESD for fisheries in WA. EBFM deals with the aggregate management of all fisheries-related activities within an ecosystem or bioregion and takes into account the impacts of fishing on retained species, discarded bycatch species, protected species, habitats and the broader ecosystem — regarded as 'ecological assets' — and the social and economic impacts of aquatic resource use.

The EBFM framework used in WA was developed in 2010 in partnership with the Western Australian Marine Science Institution (WAMSI) and the Fisheries Research and Development Corporation (FRDC). The framework provides the operating policy / basis for

[16] Further information on fishery assessments against the EPBC Act is provided on the DotE website at: http://www.environment.gov.au/marine/fisheries

implementing sustainable fisheries and ecosystem management in WA and is based on the global standard for risk assessment and risk management (AS/NZS ISO 31000). The framework provides a step-by-step process (see Fletcher *et al.* 2010; Fletcher 2012) to establish priorities, allowing the Department to focus on managing resources most at risk and of the most value to the community. It also complements Integrated Fisheries Management (IFM), which allocates a percentage of the catch to each fishing sector, helping to ensure fair access and minimise conflicts.

Within the EBFM framework, WA has been divided into six aquatic bioregions, with a high-level set of ecological resources / assets that are to be managed under the FRMA identified for each bioregion[17]. The risks associated with each individual ecological asset are examined separately using formal qualitative risk assessment (consequence x likelihood) or more-simple problem assessment processes (as detailed in Fletcher 2005; Fletcher *et al.* 2011). All risk scoring considers both the current level of activities and management controls already in place.

The risk levels are then used as a key input in the Department's Risk Register, which combined with the assessment of the economic and social values and risk associated with these assets, is an integral part of the annual planning cycle (Figure 14.1) for assigning Departmental activity priorities (e.g. management, research, compliance, education, etc.).

The Department's Risk Register feeds into guidance documents for long-term Departmental activities, which are documented in Fish Plan and a five-year research plan (Figure 14.1). Fish Plan is the guiding document to assist the Department in achieving its desired agency-level outcomes, which are measured by the Department's key performance indicators and published in the Department's *Annual Report*[18] to Parliament. Fish Plan provides a planned, structured approach to the management of fishery resources, including review of the management arrangements for fish stocks, assessment and monitoring of these stocks and compliance planning. Thus, Fish Plan includes two planning schedules; the first describes the key outcomes to be delivered at a resource / fishery level during the next five years (and potentially into the next five-year cycle). Within this schedule, fish resources considered to be at 'higher' risk are likely to receive higher priority than those where the risk is lower. The second schedule provides a description of the other key functions undertaken by the Department related to management of fishery resources. Many of these functions have an annual cycle, such as licensee and stakeholder liaison and fee setting; others are addressed on an 'as needed' basis, such as marine park planning.

More information on the Department's research plan is provided in Section 15.4.

[17] More information on the EBFM framework in WA is provided in the *Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher and Santoro 2013).
[18] http://www.fish.wa.gov.au/About-Us/Publications/Pages/Annual-Report.aspx

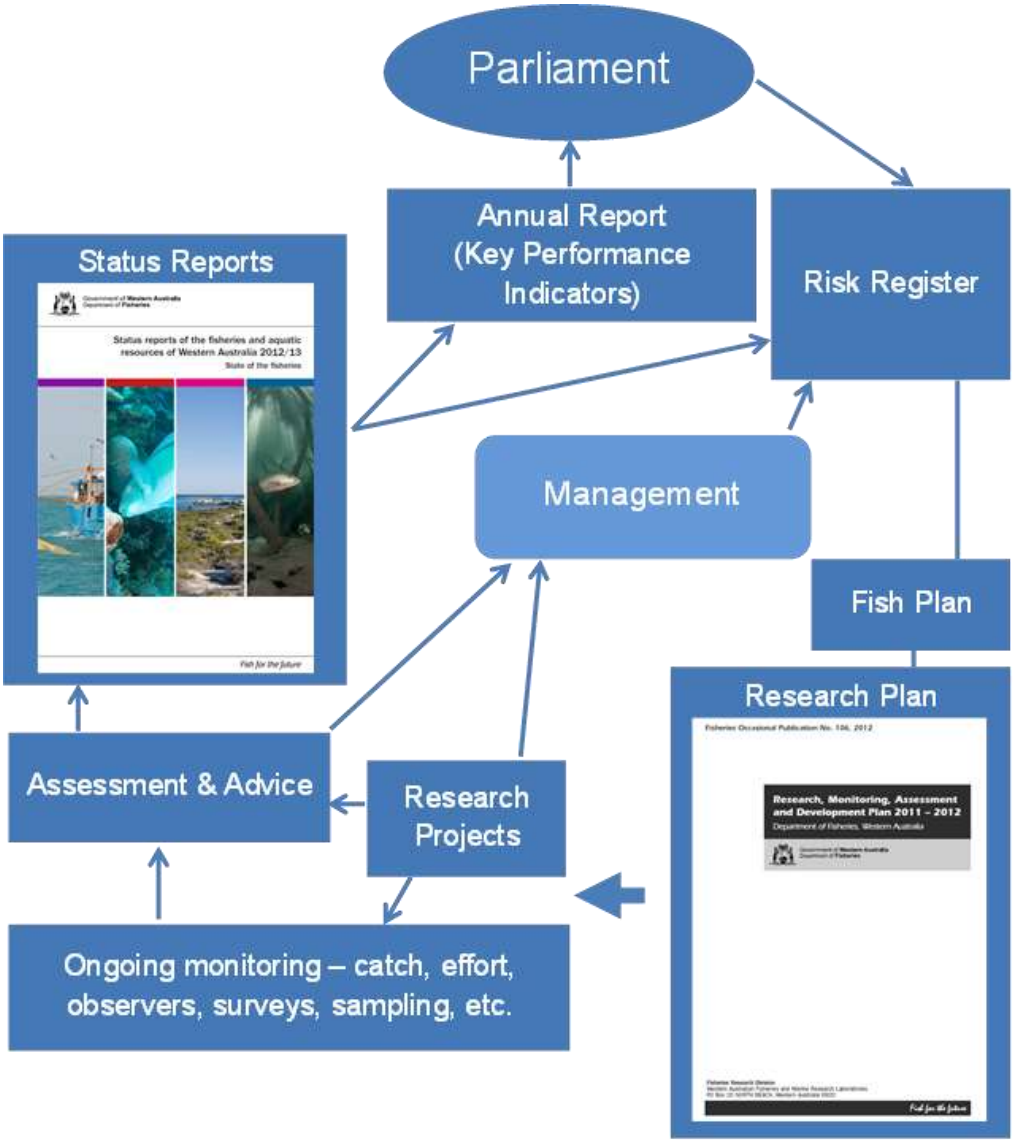

Figure 14.1. Outline of risk-based planning cycle used by the Department to determine annual priorities and activities.

14.1.3.3 Catch Allocation

Historically, WA's fish resources have been shared on an implicit basis, with no explicit setting of catch shares within an overall total allowable catch (TAC) or corresponding total allowable effort (TAE). In more recent years, the Department has begun implementing an Integrated Fisheries Management (IFM) approach, where the aggregate effects of all fishing sectors are taken into account. This involves the use of a framework in which decisions on optimum resource use (i.e. allocation and re-allocation of fish resources) are determined and implemented within a total sustainable catch for each fishery or resource.

The IFM initiative will generate explicit allocations and / or re-allocations to specific sectors using a formal and structured allocation process facilitated by an independent body – the Integrated Fisheries Advisory Allocation Committee (IFAAC). This process has already been completed for western rock lobster and metropolitan abalone fisheries and is nearly completed for the West Coast Demersal Scalefish Fishery. The Department's aim is to have

formal share allocations determined in at least 25 % of the State's resources by 2015 and the majority under formal share allocations within the next 10 years.

The IFM framework, including the need for explicit catch shares to strengthen access rights, will be further strengthened with the introduction of the proposed ARMB. In essence, the IFM approach involves:

- Setting a total allowable harvest level of each resource that allows for an ecologically-sustainable level of fishing;
- Allocation of explicit proportional catch shares for use by commercial, recreational and customary sectors;
- Continual monitoring of each sector's catch;
- Managing each sector within its allocated catch share; and
- Developing mechanisms to enable the reallocation of catch shares between sectors.

14.1.4 Fishery-Specific Framework

The WCDSCMF operates under the following legislation[19] (within the international, national and state frameworks described above):

- FRMA (will be replaced by ARMB once enacted);
- FRMR;
- FRMA Part 6 — *West Coast Deep Sea Crustacean Managed Fishery Management Plan 2012*; and
- FRMA Section 7 Exemptions.

Fishers must also comply with the requirements of:

- The Commonwealth EPBC Act;
- *Western Australian Marine Act 1982*; and
- Western Australian *Wildlife Conservation Act 1950*.

Detailed information on the management measures in place under this legislation is provided in Section 0.

14.1.5 Resourcing the Management Process

From July 2010, all managed commercial fisheries were subject to a new funding model that replaced a cost-recovery system. The new funding model aimed at improving flexibility for resourcing priority management needs and providing equity in how much licensees pay in access fees and greater certainty of funding and access rights. This involves all managed

[19] The collection of orders and regulations pertaining to the fishery are available online at: http://www.fish.wa.gov.au/About-Us/Legislation/Western_Australian_Fisheries_Legislation/Pages/default.aspx

commercial fisheries in WA paying an access fee equivalent to 5.75 % of the gross value of production (GVP) of the respective fishery.

The costs of managing the WCDSCMF, including conducting relevant research, are met from a variety of sources. In particular, significant contributions come each financial year from the State Government Consolidated Revenue and the Fisheries Research and Development Corporation (FRDC).

14.1.6 Resolution of Disputes

All changes to or new fisheries legislation, including subsidiary legislation, are potentially subject to review through the disallowance process of State Parliament. All subsidiary legislation is also reviewed by the Joint Standing Committee on Delegated Legislation, who may seek further advice on the reasons for the legislation and potentially move to disallow. In this way, there is Parliamentary and public scrutiny of all fisheries legislation.

Disputes in the fishery are informally dealt with through the ongoing processes of communication and consultation between the fishery's management and research staff and industry (see Section 14.2 for more information); however, there are also well-established formal dispute mechanisms for administrative and legal appeals of decisions taken in respect to fisheries (as prescribed in Part 14 of the FRMA).

Most decisions made by the Chief Executive Officer (CEO) [20] of the Department and disputes regarding the implementation and administration of fisheries legislation can be taken to the WA State Administrative Tribunal[21] (SAT) for review or the WA (and Commonwealth) Court System[22]. The decisions of the SAT and Courts are binding on the Department, and all SAT decisions must be carried out by the Department (under section 29(5) of the *State Administrative Tribunal Act 2004)*. These mechanisms have been used and tested across several fisheries, including the WCDSCMF (see Section 15.3.6).

14.1.7 Respect for Rights

14.1.7.1 Native Title Rights

Statutory aboriginal native title rights are managed under the Commonwealth *Native Title Act 1993* (NT Act). The Native Title Tribunal facilitates the negotiation of indigenous land use agreements following a claim[23] or determination[24] and is required to keep registers of approved native title claims and determinations.

A key aspect of the legislation is that proposed developments or activities (including fisheries where a registered claim or determination extends into State waters) that may affect native title are classed as 'future acts'. In 1999, the Department obtained a 'Report for Fisheries

[20] When exercising his powers pursuant to the FRMA, the Director General of the Department is referred to as the 'Chief Executive Officer'
[21] http://www.sat.justice.wa.gov.au/
[22] http://www.courts.dotag.wa.gov.au/
[23] A registered native title claim is an application where a decision about native title is yet to be made.
[24] A determination of native title is a decision that native title does or does not exist in a particular area of land and/or waters (the determination area).

Western Australia' in respect to the interaction between fisheries / pearling legislation and the NT Act. The report advised that:

1. The very wide scope of what can be done under a fishery management plan means that fisheries / pearling do have the potential to affect native title. As a result, a new management plan would be considered a 'future act' for the purpose of the NT Act.
2. Because a new management plan would be covered by the section 24 HA of the NT Act, it can be validly made without the need for any specific native title notification or comment procedure.
3. While specific notification is not required, it would, however, be prudent for comment to be sought from any native title parties likely to be affected by the new management plan under the provisions of the FRMA section 64(2).
4. The granting of licences and permits under management plans will not be 'future acts' in their own right, and they can therefore be granted without the need for any native title procedure or notification requirement.

In accordance with point 3 above, the Department provides any native title party or parties with an opportunity to comment on the development of a proposed fishery.

A 2013 Australian High Court decision related to the application of State fisheries law to native title holders fishing for abalone in their local area in South Australia concluded that the State fisheries legislation did not extinguish native title rights to fish and that the defence under section 211 of the NT Act was applicable[25]. It is therefore unlikely that fisheries legislation in WA has the effect of extinguishing native title rights to fish and that the defence provided by section 211 of the NT Act will apply to most cases where the right to fish is being exercised by an Aboriginal person for a traditional, non-commercial purpose.

There are a number of native title determinations that include marine waters that overlap the boundaries of the WCDSCMF (Figure 14.2), with additional applications in place along the west coast of WA[26]; however, as these determinations / applications do not extend beyond the 150 m isobath, the fishing activities of the WCDSCMF are not considered to directly impact native title rights.

[25] http://www.hcourt.gov.au/assets/publications/judgment-summaries/2013/hca47-2013-11-06.pdf

[26] More information on Native Title determinations and applications is available on the Native Title Tribunal website at http://www.nntt.gov.au/

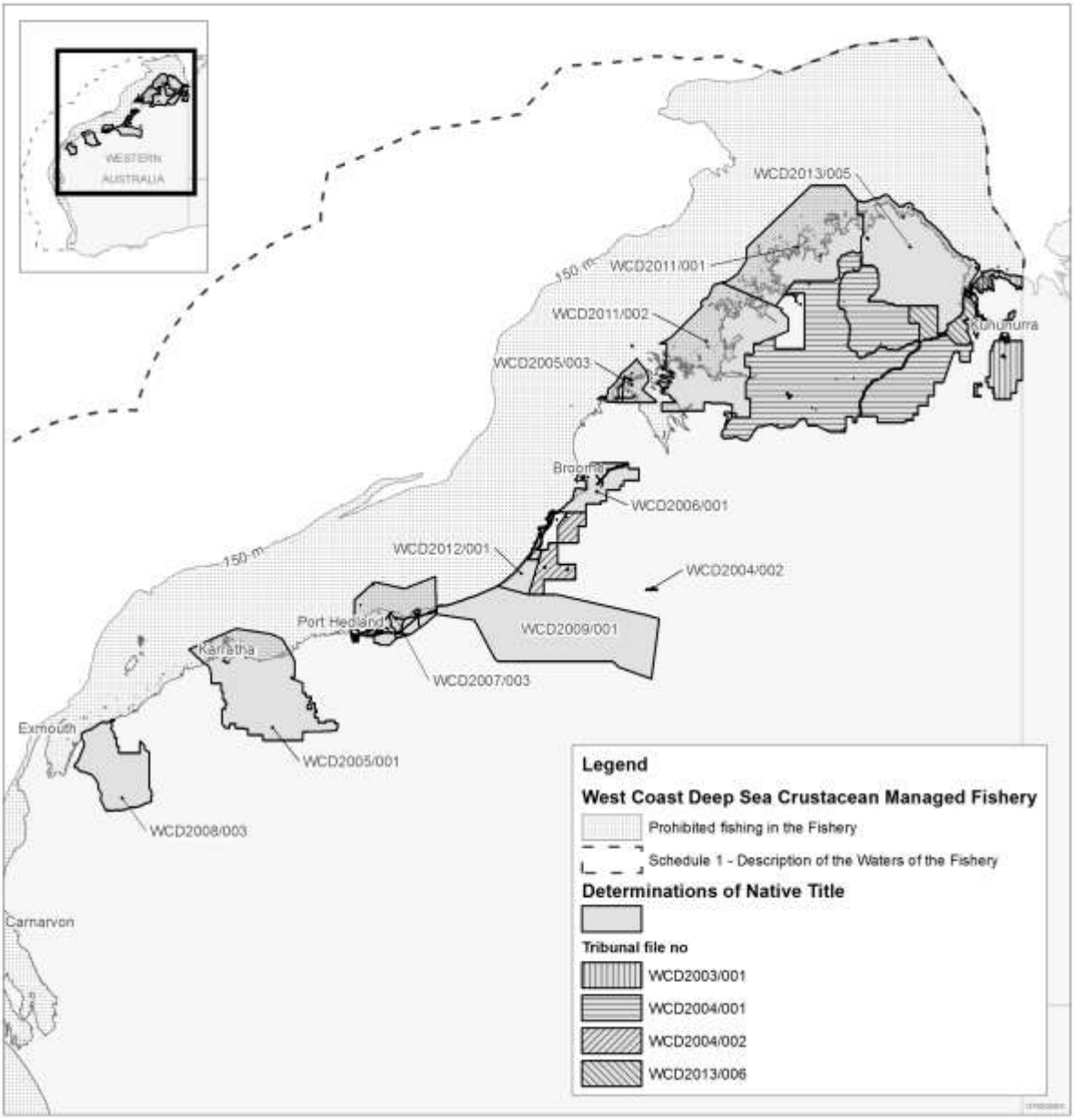

Figure 14.2. Native Title determinations that include marine waters that overlap the boundaries of the WCDSCMF

14.1.7.1.1 Customary Fishing in WA

The WA Government and the Department are committed to working with the customary fishing sector to recognise customary rights. Section 6 of the FRMA acknowledges the rights of Aboriginal persons fishing for a customary fishing purpose —

"Aboriginal persons, application of the Act to

An Aboriginal person is not required to hold a recreational fishing licence to the extent that the person takes fish from any waters in accordance with continuing Aboriginal tradition if the fish are taken for the purposes of the person or his or her family and not for a commercial purpose"

The FRMA defines customary fishing as *"fishing by an Aboriginal person that —*

(a) Is in accordance with the Aboriginal customary law and tradition of the area being fished; and

(b) Is for the purpose of satisfying personal, domestic, ceremonial, education or non-commercial communal needs"

The FRMA also provides the power to make regulations to manage customary fishing in WA. The Department released a *Customary Fishing Policy* position statement in 2009 (DoF 2009), which states that "*customary fishing applies, within a sustainable fisheries management framework, to persons:*

- *of Aboriginal descent;*
- *fishing in accordance with the traditional law or custom of the area being fished; and*
- *fishing for the purpose of satisfying personal, domestic, ceremonial, education or non-commercial communal needs*."

Under the proposed ARMB, a quantity of each specified aquatic resource will be reserved for conservation and reproductive purposes, with a sustainable allowable harvest level set for use by the fishing sectors. The quantity 'reserved' includes an allowance for customary fishing and public benefit purposes, such as scientific research. Thus, a specific share does not have to be allocated to the customary sector, as that share is set aside prior to setting an allowable harvest level for the resource. In this way, customary fishing can continue in accordance with existing customary fishing arrangements. IFM also recognises the rights of customary fishers of Aboriginal descent who are fishing for cultural needs.

To date, the only survey designed to document the indigenous catch was the National Recreational and Indigenous Fishing Survey conducted in 2000/01 (Henry and Lyle 2003). Based on survey results, the majority of indigenous catch is from inland and coastal waterways. Given there is no evidence of indigenous (or recreational) fishing for deep sea crabs in WA, there is no requirement to implement IFM to manage the catch share of crabs between sectors; however, the customary framework still applies.

14.2 Consultation, Roles and Responsibilities

The management system of the WCDSCMF has effective consultation processes that are open to any interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties.

14.2.1 Roles and Responsibilities

One of the first steps in the consultation process is identifying the key and other interested stakeholders relevant to a fishery. The number and type of stakeholders vary depending on the type of fishery, target species, the area of operation and whether or not the fishery contains a significant recreational or customary fishing component. For the WCDSCMF, this

includes the Department (and relevant personnel), peak commercial and recreational sector bodies, and the deep sea crab fishing industry licensees and other interested parties, where relevant.

14.2.1.1 Department of Fisheries

The roles and responsibilities of the State of WA in fisheries management are explicitly outlined in the *Western Australian Government Fisheries Policy Statement (March 2012)* and the OCS arrangements, particularly in relation to the management of fisheries outside the three nautical mile state-waters boundary. Departmental planning and prioritisation is done in conjunction with the CEOs of the peak bodies for the commercial (Western Australian Fishing Industry Council [WAFIC]) and recreational sectors (Recfishwest [RFW]) in WA.

With respect to the WCDSCMF, key Departmental personnel to whom the responsibilities of ensuring management, research and compliance outcomes (including proper prioritisation of departmental funding) include:

- South West Bioregions Program Manager (Aquatic Management Division);
- South West Bioregions Principal Management Officers (Aquatic Management Division);
- South West Bioregions Fishery Management Officer (Regional Services Division)
- Supervising Scientist — Invertebrates (Research Division);
- Research Scientist — Invertebrates (Research Division); and
- Midwest Region Compliance Manager (Regional Services Division).

The Minister / Department is responsible for advising licensees and WAFIC of Ministerial / Departmental decisions that are the subject of a consultation process. Responsibilities of the Department in formal consultation arrangements with WAFIC are that the Department —

- Provides annual funding to WAFIC equivalent to 0.5 % of WA commercial fishing gross value of product (based on a three-year average), plus a pro-rata amount equivalent to 10 % of water access fees paid by aquaculture and pearling operators. Payments to WAFIC are made by six-monthly instalments each year;
- Works with WAFIC in a manner consistent with WAFIC's role as the peak body representing commercial fishing interests in WA;
- Engages with WAFIC, sector bodies and commercial fishing interests according to WAFIC's Operational Principles (see Table 14.1 below).

The Department is also responsible for ensuring the recreational fishing sector, through RFW, is formally consulted on proposed changes to recreational fisheries management and is advised of Ministerial / Departmental decisions that are the subject of a consultation process. The Department is responsible for providing RFW with a proportion of the income generated

from annual recreational fishing licence fees to undertake its role as the peak body representing recreational fishing interests in WA.

14.2.1.2 Peak Sector Bodies

The WA Government formally recognises WAFIC and RFW as the key sources of coordinated industry advice for the commercial and recreational sectors, respectively.

14.2.1.2.1 Western Australian Fishing Industry Council

WAFIC[27] is the peak industry body representing professional fishing, pearling and aquaculture enterprises, as well as processors and exporters, in WA. It is an incorporated association that was created by industry more than 40 years ago to work in partnership with Government to set the directions for the management of commercial fisheries in WA. WAFIC aims to secure a sustainable industry that is confident of:

- Resource sustainability and security of access to a fair share of the resource;
- Cost-effective fisheries management;
- That its business can be operated in a safe, environmentally-responsible and profitable way; and
- That investment in industry research and development is valued and promoted.

WAFIC's responsibilities include coordinating Government funding for industry representation and taking on a leadership role for matters that involve or impact on or across a number of fisheries or are of an industry-wide or generic nature. WAFIC also represents those commercial fishing sectors that do not have capability for self-representation.

WAFIC's responsibilities can be summarised as:

- Providing effective professional representation of commercial fishing interests and the commercial fishing sector to Government, industry, other relevant organisations and the community. This includes engaging, facilitating and consulting, as necessary in order to meet this responsibility;
- Providing representation of commercial fishing interests on fisheries management and Ministerial committees, as required;
- Documenting priority issues for commercial fishing interests (by 30 March) each year to the Department;
- Providing feedback to the Department on proposed deliverables and budget priorities for expenditure of the Fisheries Research and Development account;
- Engaging with RFW and other appropriate parties with a view to identifying joint priorities and solutions to issues of shared concern;
- Engaging in promotion, education and awareness of key sustainability messages consistent with best practice fisheries management and objects of the FRMA; and

[27] More information about WAFIC is available on their website: www.wafic.org.au/

- Conducting agreed activities that are consistent with the FRMA as it relates to the provision of assistance to, or promotion of, the fishing industry (i.e. s238(5)(1) of the FRMA).

WAFIC's Operational Principles (Table 14.1) outline consultation responsibilities of the organisation in dealing with policy issues that could affect, as a whole, the commercial fishing, aquaculture, and pearling industries; issues which primarily affect one sector, but could have broader industry implications; and issues that affect only one specific industry group.

Table 14.1. WAFIC's Operational Principles for consultation

Principle	Responsible Body	Example
On generic policy issues that could affect, as a whole, the commercial fishing, aquaculture, and pearling industries	WAFIC	Bioregional marine planning; safety, education and training; research and development policy and biosecurity
On policy issues that currently primarily affect one sector but which could have implications for the broader industry	WAFIC will nominate the relevant sector body, and WAFIC and that body will jointly represent industry.	WAFIC would represent industry on marina and port access issues, which may primarily initially impact on the fishing industry in regard to certain locations but have precedents for the rest of the industry for other locations, and on animal welfare.
On issues which affect only one specific industry group.	The relevant sector association would represent itself, but WAFIC would be kept informed and may have a statutory consultation role.	Regulation of gear design or compliance (WAFIC and specific industry associations)

14.2.1.2.2 Recfishwest

Similar roles and responsibilities exist with Recfishwest[28] as the peak body for the recreational sector. Recfishwest has the responsibility to provide representation of recreational fishing interests in WA, and their key deliverables include:

- Provide recreational fishing representation, consultation and engagement;
- Provide peak body advice;
- Promote key sustainability messages; and,
- Project management.

RFW receives 15 % of the revenue raised from recreational fishing licence fees to provide the above deliverables.

A recent example of extensive consultation processes undertaken by Recfishwest was in relation to the proposed reform of state-wide recreational fishing rules in 2012 as outlined in

[28] More information about Recfishwest is available on their website: www.recfishwest.org.au/

Fisheries Management Paper 252[29]. Consultation included visiting regional locations such as Albany, Broome, Carnarvon, Denham, Derby, Esperance, Exmouth and Karratha, as well as holding information sessions at several metropolitan locations. Recfishwest conducted an online survey and produced a "Have your say" document as methods to receive comments. Recfishwest received a total of 996 submissions, 850 of which were from the online survey.

In early 2014, Recfishwest again surveyed recreational fishers about how changes to fishing rules implemented in February 2013 have affected their recreational fishing experiences. Recfishwest received 943 responses to this survey from a range of regions that closely resembles the distribution of Recreational Fishing from Boat Licence (RFBL) holders throughout the state.

Using the results of this survey and the comments provided, Recfishwest concluded that the majority of the rules implemented in 2013 has had a positive effect on fishing experiences, and that 90 % of fishers have found it beneficial to have a single consolidated guide book covering the whole of WA. These results support the Department's strategy to pursue a simplification of the recreational fishing rules. Recfishwest has provided summaries of the survey results to the Department.

14.2.1.3 Licensees / Sector Associations

The licence holders in the fisheries have a responsibility to make themselves aware of the fisheries legislation that relates to their activities, as it changes from time to time. In order to fulfil this responsibility, the Department assists licence holders by explicitly reminding them in writing of where they can access the latest legislation. This information can be found on every licence (e.g. MFLs, CFLs and FBLs).

14.2.1.4 Other interests

The deep sea crustacean resources targeted by the WCDSCMF are not taken in large numbers by recreational or customary fishers; however, other interested stakeholders are recognised on the basis that the fishery:

- Has the potential to interact on socially high-profile species, such as whales;
- Has the potential to interact with other marine users in the offshore environment, including research, oil and gas development and Commonwealth-managed commercial fishing activities; and
- Provides a seafood product to retailers and consumers both locally and overseas.

Based on these characteristics, other stakeholders relevant to the WCDSCMF include:

- Conservation sector representatives (e.g. World Wildlife Fund and Conservation Council of WA);
- Organisations / institutions undertaking research relevant to the deep-sea environment off WA (e.g. oil and gas sector) and any protected species (e.g. WA Department of Parks and Wildlife);

[29] http://www.fish.wa.gov.au/Documents/management_papers/fmp252.pdf

- Companies exploring the area for other commercial investment opportunities;
- AFMA;
- Investors, banking representatives, boat brokers, etc.;
- Retailers and consumers; and
- The wider community.

14.2.2 Consultation Processes

The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge, and the system demonstrates consideration of information and explains how it is used or not used.

The WA Government's commitment to consultation with stakeholders is set out in the *WA Government's Fisheries Policy Statement*. The broad consultation framework (Figure 14.3) was developed following the outcome of a 2009 review of consultation arrangements between the fishing sector and Government, which resulted in:

- Recognition of WAFIC as the peak body representing the commercial fishing sector (including pearling and aquaculture) and RFW as the peak body representing the recreational fishing sector, with funding provided by Government to each peak body to support these roles;
- Capacity for these peak bodies to perform consultation functions on behalf of the Minister. In this regard, the Department has entered into a Service Level Agreement (SLA) with WAFIC for the provision of specified consultation services with the commercial sector;
- The replacement of Management Advisory Committees (MACs) with two key sources of advice: (1) the Department, as the key source of Government advice on fisheries management, and (2) WAFIC and RFW, as the key sources of coordinated industry advice for the commercial and recreational sectors, respectively;
- Establishment of an Aquatic Advisory Committee (AAC) to provide independent advice to the Minister or the Department on high-level strategic matters;
- The establishment by the Minister (or Department) of tasked working groups to provide advice on specific fisheries or operational matters. Tasked working groups differ to MACs in that they are expertise-based and operate on the basis of a written referral on a specific matter. Tasked working groups have been established to provide advice on matters such as water access (lease) fees, strengthening of access rights in the fisheries legislation, development of a Government fisheries policy statement and determining catch shares among sectors.

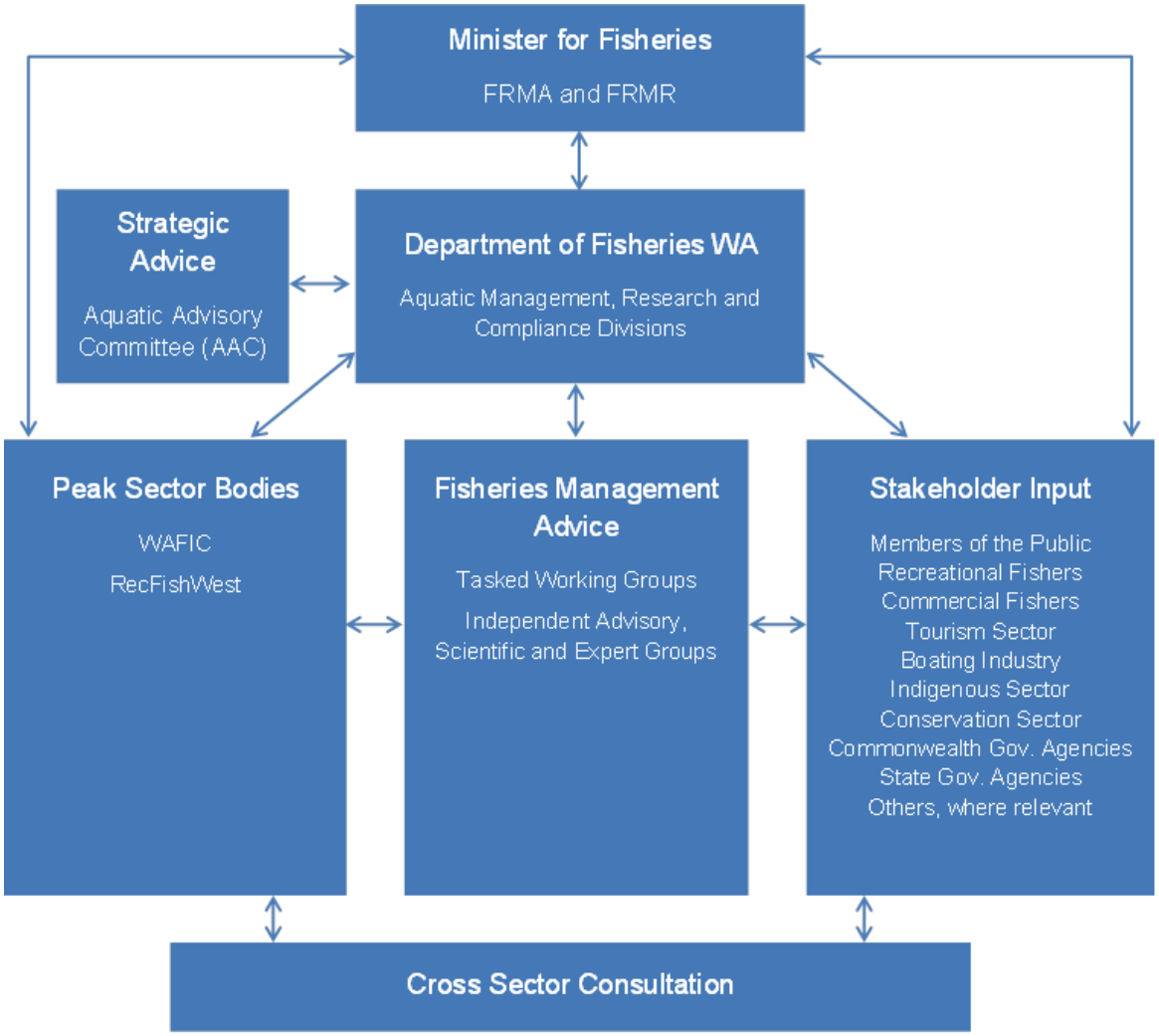

Figure 14.3. Broad fisheries management consultation framework in WA

14.2.2.1 Statutory Consultation

Given the commercial aspects of fishing access rights and the potential for amendments to management arrangements to adversely affect these interests, it is fundamental that the interest holders are consulted, have the opportunity to respond to any proposed amendments by the Minister / Department and have these responses genuinely considered by the Minister prior to the final decision.

Most management changes and fishing arrangements in the WCDSCMF are facilitated through amendments to the fishery's management plan and by notices determined by the Department's Director General (DG; also referred to as the CEO under the FRMA); however, other arrangements can be implemented via section 43 orders, licence conditions and (section 7) exemptions, as required. The Minster is the final decision-maker in determining or amending legislation. The Department generally undertakes consultation work on the Minister's behalf; however, the statutory consultation function is presently conducted by WAFIC on behalf of the Department under an SLA.

Amendments to a fishery management plan cannot be undertaken without addressing statutory consultation requirements pursuant to section 65 of the FRMA[30], with each fishery management plan explicitly identifying the key stakeholders for the fishery that the Minster must consult with prior to making an amendment. In the case of the WCDSCMF, this includes all licence holders of the Fishery.

For the implementation of other statutory fishing management tools, such as section 43 orders or section 7 exemptions, statutory provisions are silent as to procedural consultation requirements; nevertheless, the Minister must have regard for common law principles to afford natural justice to the licence holder. The Department has a series of formal decision-making delegations for licensing decisions and exemptions from legislation. Most Departmental decisions (excluding Ministerial decisions) are subject to review by the State Administrative Tribunal.

14.2.2.2 Obtaining Information

The Department / Minster may seek advice from a number of sources, including external expert advice and internal management advice, when considering policy or management changes. Collaborative research projects that provide expert advice on data and other information are often sought and this advice underpin management changes (e.g. Melville-Smith *et al.* 2007).

The Department / Minister may also seek and provide advice directly through the peak sector bodies (WAFIC and RFW) and / or other sector associations. For example, WAFIC and RFW have direct input into the annual planning and priority-setting process used to determine management, compliance, research and other priorities for the Department.

14.2.2.2.1 Strategic Advice

An Aquatic Advisory Committee (AAC) provides independent advice to the Minster / Department on high-level strategic matters. This committee consists of members who have strong backgrounds in governance and policy.

14.2.2.2.2 Fisheries Management Advice

Fisheries management advice may be provided by tasked working groups and / or independent advisory, scientific and expert groups. Tasked working groups and panels can be established by the DG or the Minister to provide independent, expert advice relating to a range of fisheries management matters. Working groups are highly flexible and work to specific terms of reference within a particular timeframe. They are usually provided with a specified task, such as addressing resource access (e.g. closures and compensation) and allocation (e.g. IFM) or reviewing research, management or Government policy.

[30] Note that section 65(4) of the FRMA provides for the Minister to amend a management plan without consultation if, in the Minister's opinion, the amendment is required urgently or is of a minor nature (but must provide advice following the amendment of the plan). This might include the need for amendments for emergency sustainability reasons.

14.2.2.2.3 Stakeholder Input

The Department / Minister is responsible for advising licensees and WAFIC of management decisions that are the subject of a consultation process. In carrying out the consultation functions on matters referred to the organisation by the Minister or the Department, WAFIC must:

- Distribute proposed changes to management arrangements that include the Minister's / Department's reasoning for the proposal(s) and the information on which the proposal(s) is based to all licence holders in the relevant fishery;
- Describe the method by which licence holders may provide their views; this may be by way of inviting written responses, or it may involve additional processes, such as the establishment of appropriate forums in which licence holders can discuss and deliberate on the merits of proposed changes prior to putting forward individual views as well as collective views, where appropriate;
- Ensure that licence holders have a reasonable period in which to consider their position and respond; and
- Ensure the decision maker is fully aware of the views being put forward, in order to ensure the decision maker gives proper and genuine consideration to the views being put forward.

The Department has a general practice of holding regular (often annual) management meetings with fishery licensees to discuss research, management, compliance and other specific issues affecting the fishery (e.g. marine park planning). These management meetings underpin the decision-making process at the fishery-specific level. These meetings are generally coordinated by WAFIC (under the SLA), with the location, timing and priority of the annual management meeting determined by the WAFIC Industry Consultation Unit (ICU) in liaison with relevant Departmental resource managers. The meeting can occur at any time of year but is usually held either before the start of a licencing year or at the end of a fishing year, in accordance with the schedule agreed upon by WAFIC and the Department.

The meetings are attended by Departmental personnel, WAFIC and licence holders, but can also be open to other stakeholder groups, e.g. RFW, processors, universities, other Government departments, the conservation sector and the general public, following appropriate consultation with industry.

The annual management meetings are widely recognised by the commercial licence holders as a mechanism for receiving the most up-to-date scientific advice on the status of the fishery, facilitating information exchange between stakeholders and decision-makers and for discussing new and ongoing management issues. The invaluable information licensees provide to the Department at these forums is considered when making research, management and compliance decisions.

14.2.3 Participation

The consultation processes undertaken by the Department ensures that stakeholders and the broader community have an increased awareness of and access to relevant information regarding fisheries management decisions. The Department encourages input from stakeholders and the broader community in the management process and facilitates their involvement by making all relevant information available and providing for discussion and the exchange of ideas.

WAFIC and RFW are also responsible for seeking advice from their sector members during consultation periods and providing consolidated advice to the Department. Both organisations provide a monthly newsletter to subscribers, keeping them up-to-date with new initiatives, research results and issues. News and other relevant information is also publically-available on their WAFIC and RFW websites (www.wafic.org.au and www.recfishwest.org.au, respectively).

Before making a decision around aquatic resource policy, the Minister must demonstrate that he/she has asked for, and taken into account, interested and affected parties' submissions on policy proposals. The release of Fisheries Management Papers (FMPs; discussion papers) for public comment are the most common way the Department undertakes wider consultation with the public and other interested stakeholders and invites stakeholder engagement on fisheries management proposals. Published FMPs detail the recommended management approach arising out of the expert review process and seeks public comment on those recommendations. The Minster is required to take these comments into account before a decision is made in respect to future management.

The Department encourages stakeholder comment in regard to any proposed management recommendations and publicises the release of new FMPs. The Department uses a variety of processes to ensure coverage and engagement with stakeholders and the wider community during the consultation period, including:

- direct consultation in writing;
- press releases;
- newspaper, radio and television interviews;
- dissemination of information via the Department's website; and
- Invitations for stakeholders to sit on tasked working groups or participate in scientific reviews / workshops, formal risk assessment processes and management reviews.

For example, prior to the gazettal the *WCDSCMF Management Plan 2012*, FMP No. 259 (DoF 2012b) was released and made available via the Department's website for public comment. The paper included a presentation of the intended changes to the previous *West Coast Deep Sea Crustacean (Interim) Management Plan 2007* and provided details for providing comments prior to gazettal.

At the end of the public consultation period (i.e. Oct 26 2012 for the *Draft WCDSCMF Management Plan*), the Department collated and provided advice to the Minister regarding the written comments received on the Draft Plan (with the Minister amending the Draft Plan where he considered it appropriate to do so). The new Management Plan was then approved by the Minister and published in the Government Gazette in November 2012.

Once the new Management Plan was gazetted, existing permit holders were advised in writing of the process to apply for a WCDSCMF Licence (MFL). Licences were then granted in accordance with the new Plan, which came into effect on 1 January 2013.

The Department is currently reviewing its consultation processes to provide greater opportunity for stakeholder involvement. This may include public forums, targeted consultation with key interest groups, or a regional approach, depending on the fishery or issues under consideration.

14.3 Long-Term Objectives

The fisheries management legislation and policy in WA has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria and incorporate the precautionary approach. These objectives are explicit in fisheries legislation and are required by management policy. The Department's *Strategic Plan 2009 – 2018* (currently in Phase 3 [2013 – 2015]) sets out clear and explicit long-term biological, ecological, social and economic objectives, which include

- Sustainability: To ensure WA's fisheries and aquatic resources are sustainable and to provide services based on risk to ensure fish for the future and support the maintenance of healthy aquatic ecosystems;
- Community Outcomes: to achieve an optimum balance between economic development and social amenity in accordance with a framework to achieve sustainability;
- Partnerships: to promote effective strategic alliances and community stewardship; and
- Agency Management: deliver services on behalf of Government in accordance with the Department's statutory requirements to achieve effective and efficient use of resources to support the delivery of our strategy.

The broad scope of enabling legislation for aquatic resources in WA ensures that it:

- Manages all factors associated with fishing (incorporating ESD and EBFM);
- Provides a clear basis for management of a whole biological resource (as opposed to just one sector);
- Gives effect to IFM by
    - Creating head powers that can establish management strategies with clear biological outcomes for all sectors, as required;
    - Establishing formal harvest allocations where these have been made; or

    - Describes the basis of informal allocations where these operate.
- Clearly distinguishes between managed aquatic resources and fisheries with biological targets and socially-regulated fisheries.

Sections 3 and 4a of the FRMA set out the overarching long-term sustainability strategy for fisheries and the aquatic environment in WA. As set out in section 3, the objects of the FMRA are to:

"(a) to develop and manage fisheries and aquaculture in a sustainable way and (b) to share and conserve the State's fish and other aquatic resources and their habitats for the benefit of present and future generations."

The FRMA outlines the following means to achieve these objectives, including:

- *"Conserving fish and protecting their environment;*
- *Ensuring that the impact of fishing and aquaculture on aquatic fauna and their habitats is ecologically-sustainable and that the use of all aquatic resources is carried out in a sustainable manner;*
- *Enabling the management of fishing, aquaculture, tourism that is reliant on fishing, aquatic eco-tourism and associated non-extractive activities that are reliant of fish and the aquatic environment;*
- *Fostering the sustainable development of commercial and recreational fishing and aquaculture, including the establishment and management of aquaculture facilities for community or commercial purposes;*
- *Achieving the optimum economic, social and other benefits from the use of the fish resources;*
- *Enabling the allocation of fish resources between users of those resources, their reallocation between users from time to time and the management of users in relation to their respective allocations;*
- *Providing for the control of foreign interests in fishing, aquaculture and associated industries; and*
- *Enabling the management of fish habitat protection areas and the Abrolhos Islands reserve."*

Additionally, section 4a of the FRMA outlines the use of the precautionary principle in fisheries management:

"*In the performance or exercise of a function or power under this Act, lack of full scientific certainty must not be used as a reason for postponing cost-effective measure to ensure the sustainability of fish stocks or the aquatic environment.*"

The proposed ARMB more-explicitly incorporates broader ESD and biodiversity conservation goals, with objects to:

"(a) ensure the ecological sustainability of the State's aquatic resources and aquatic ecosystems for the benefit of present and future generations; and (b) to ensure that the State's aquatic resources are managed, developed and used having regard to the economic, social and other benefits that the aquatic resources may provide."

In order to effectively deal with community expectations for aquatic resource management, these legislative objectives have been translated into clearly-defined operational arrangements and procedures for each resource / fishery in the form of a fishery- or resource-specific harvest strategy. The harvest strategy is used to implement adaptive and precautionary approaches to fisheries management and includes the identification of harvesting approaches, the establishment of precautionary reference points and harvest decision and control rules that describe how fishing exploitation should be adjusted as a function of changes in spawning potential or stock size (DoF 2015b).

The *WCDSCMF Harvest Strategy* (DoF 2015a) includes fishery-specific objectives that align with those prescribed under the FRMA (and proposed ARMB), as well as clear and specifically-articulated performance levels and the associated management actions designed to achieve these objectives (see Section 8 for more details on the *WCDSCMF Harvest Strategy*).

14.4 Incentives for Sustainable Fishing

WA fisheries legislation, including that governing the WCDSCMF, has policies and principles that provide social and economic incentives to fishers to fish sustainably and encourage a sense of stewardship towards the resource. These incentives include policies that attempt to provide stability and / or security for fishers by:

- Providing strategic or statutory management planning to give certainty about rules and goals of management; for example, the Department has a general practice of holding annual management meetings with licensees to discuss fishery research, management, compliance and other fishery-specific issues as they arise. These meetings are attended by Departmental officers, WAFIC and licence holders and are recognised by licence holders as a mechanism for receiving the most up-to-date scientific advice on the status of the fishery, facilitating information exchange and discussing new and ongoing management issues.
- Providing for the clarification of roles, rights and responsibilities of the various stakeholders; for example, WAFIC is recognised by the WA Government as the key source of coordinated industry advice for the commercial fishing sector. WAFIC's responsibilities include coordinating Government funding for industry representation and taking a leadership role for matters that involve or impact on a number of fisheries or are of an industry-wide or generic nature.
- Providing for a participatory approach to management, research and other relevant processes. The WCDSCMF has well-defined management processes, which are enshrined in legislation / policy and practice; for example, the *WCDSCMF Harvest*

Strategy was developed following internal workshops and correspondence with the licensees.

- Providing rights of exclusion (limited entry); the number of MFLs in the Fishery is limited to seven. These 'access rights' engender a sense of ownership of the resource and a commitment to long-term sustainability to protect their investment; and
- Providing industry the opportunity to optimise economic returns generated by the resource within a sustainable fishery framework.

There is high acceptance by the commercial fishing sector that well-managed and sustainable fisheries result in positive social and economic outcomes for the individual fishers, the sector as a whole and the broader community. This acceptance drives sustainable and compliant fishing behaviour by providing positive social and economic incentives, including:

- An opportunity to support regional communities through the provision of employment and demand for services and supplies;
- The operation of commercially-viable fisheries that result in both profit and lifestyle benefits;
- A general understanding by the WA community that the commercial fishing industry acts with integrity and respect.

Compliance, research and management staff work together to monitor compliance with sustainable fishing arrangements, and the Department actively considers and reviews management policy and procedures to ensure they are not contributing to unsustainable fishing practices and will adjust the fishing arrangements if necessary.

15. Fishery-Specific Management System

This section focuses on the management system directly applied to the WCDSCMF and includes:

- Fishery-specific management objectives;
- The decision-making process used in the Fishery;
- The compliance and enforcement system and its implementation;
- Research planning and monitoring for the WCDSCMF; and
- An evaluation of the performance of the management system in meeting the fishery's objectives.

15.1 Harvest Strategy

To assist stakeholders (e.g. peak bodies), advisory committees, tasked working groups, etc. in developing management advice for the Minster, the current harvest strategy and control-rule framework for the WCDSCMF was developed in 2014. In line with the Department's *Harvest Strategy Policy*, the *WCDSCMF Harvest Strategy* includes:

- The long- and short-term fishery-specific management objectives;
- A description of the performance indicators used to measure performance against these objectives;
- Reference levels (target, threshold and limit) for each performance indicator; and
- Associated harvest control rules, which articulate pre-defined, specific management actions designed to maintain each resource at target levels and achieve the management objectives for the fishery.

The *WCDSCMF Harvest Strategy* also includes a summary of the monitoring and assessment procedures for the collection and analysis of data to determine stock status and fishery performance, as well as a description of the management measures that have been adopted for the fishery and how the specific operations of the fishery may be adjusted in response to performance against each of the reference levels.

Consultation and decision-making processes, together with compliance measures are also included to ensure stakeholders are provided with a fully-transparent description of the key processes that are used to manage the fishery.

15.2 Fishery-Specific Objectives

The WCDSMF has clear, specific long- and short-term objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2. These objectives are outlined in the *WCDSCMF Harvest Strategy*, which is approved by industry and publically-available on the Department's website.

The fishery-specific management system contains a range of strategies (as described throughout the MSC Principle 1 and Principle 2 sections of this document) to meet these objectives, with sufficient monitoring in place to assess the extent to which each objective is being met.

15.2.1 Long- and Short-Term Objectives

The long-term ecological objectives for the WCDSCMF focus on maintaining spawning stock biomass of retained species and ensuring the fishery does not result in serious or irreversible harm to any ecosystem components.

The short-term operational (annual) objectives are to maintain each component / resource above the threshold reference level (as indicated in the *WCDSCMF Harvest Strategy*) or rebuild the resource if it has fallen below the threshold or the limit levels. Complete lists of the long- and short-term objectives for the WCDSCMF are provided in .

Table 15.1.

Table 15.1. Long- and short-term ecological objectives in place for each component of the WCDSCMF. The performance indicators and reference levels used to assess the extent in which the fishery has met these objectives is provided in the *WCDSCMF Harvest Strategy*.

Component	Long-term Objective	Operational Objectives (Target Reference Levels)
Target species: Crystal crabs	To maintain spawning stock biomass of crystal crab (*C. albus*) at a level where the main factor affecting recruitment is the environment	• ≥ 90 % of the TAC is caught annually; • Catch rate of legally retainable crystal crabs is within the target range (and above the threshold); and • Catch rate of undersized crystal crabs and berried female crabs is above the threshold level
Other retained deep sea crustaceans	To maintain spawning stock biomass of each retained species at a level where the main factor affecting recruitment is the environment.	• The catch of champagne crabs is ≤ 6.3 t; and • The catch of giant crabs is ≤ 0.8 t.
Bycatch (non-ETP species)	To ensure fishery impacts do not result in serious or irreversible harm to bycatch species populations	• Fishery impacts expected to generate an acceptable risk level (i.e. moderate risk or lower) to bycatch species populations.
ETP species	To ensure fishery impacts do not result in serious or irreversible harm to endangered, threatened and protected (ETP) species populations	• Less than three interactions with any particular ETP species in a year; and • Fishing impacts expected to generate an acceptable risk level, e.g. moderate risk or lower.
Habitats	To ensure the effects of fishing do not result in serious or irreversible harm to habitat structure and function	• The area fished is ≤ 125 blocks and • Annual fishing effort is ≤ 169 000 traplifts
Ecosystem Processes	To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes	• Fishing impacts on ecological processes are at an acceptable risk level, e.g. moderate risk or lower; and • Fishing impacts on each ecological resource / asset is at an acceptable risk level, e.g. moderate risk or lower.

As discussed above, one of the long-term objectives of the FRMA is to achieve the optimum economic and social and other benefits from the use of fish resources for both direct stakeholders (e.g. the commercial fishing industry, recreational fishers, customary fishers, conservation sector) and indirect stakeholders (e.g. the tourism sector, fishing tackle suppliers, restaurants and retail sector, consumers and the wider WA community). In line with the principles of ESD, the WCDSCMF also has the following long-term social and economic objective in place:

- To provide flexible opportunities to ensure fishers can maintain or enhance their livelihood, within the constraints of ecological sustainability.

The performance indicator for this objective looks at whether fisheries management arrangements impose constraints, for reasons other than ecological sustainability, on access to livelihood opportunities. The main way this is achieved is by providing fishers the opportunity to increase the TAC by up to 10 % annually, subject to targets for ecological objectives being met or exceeded.

It is important to note that management actions relating to social and economic objectives are applied within the constraints of ecological sustainability and that fisheries managers cannot always address the causes of constraints on access to fishing activities, as these may be due to environmental or other factors.

15.3 Decision-Making Processes

There are established decision-making processes in the WCDSCMF that result in measures and strategies to achieve the objectives listed above in Section 15.2.1. These processes are understood by all stakeholders and underpinned by explicit and transparent consultation.

Decision-making processes can also be triggered following the identification of new or potential issues as part of an ecological risk assessment (generally reviewed every 3 – 5 years), results of research, management or compliance projects or investigations, monitoring or assessment outcomes (including those assessed as part of the Harvest Strategy) and / or expert workshops and peer review of aspects of research and management.

Once an issue has been identified, mitigation measures are developed and implemented in consultation with industry. Alternatively, if appropriate, additional research may be undertaken, with research results used to inform management action.

There are two main processes for making decisions about the implementation of management measures and strategies in the WCDSCMF:

- Annual decision-making processes that may result in measures to meet the short-term fishery objectives (driven by the control rules contained in the *WCDSCMF Harvest Strategy*); and

- Longer-term decision-making processes that result in new measures and / or strategies to achieve the long-term fishery objectives (i.e. changes to the management system).

However, if there is an urgent issue, stakeholder meetings may be called to discuss the issue and determine appropriate management action, as needed.

15.3.1 Annual Processes

The *WCDSCMF Harvest Strategy* guides management responses in the event that a short-term objective is not met (i.e. the performance indicator is not maintained above the threshold reference level following an annual assessment).

In the case that a performance indicator is below the threshold level but above the limit level, the harvest control rules require that research and management staff undertake a review of the reasons for this variation. This review includes an investigation of any changes that may have taken place in the fishery (e.g. targeting, methods, gear, seasonality, etc.), environmental factors, such as variations in weather or water temperature, or other external factors, such as changes in any market forces that influence fishing effort (e.g. fuel prices, demand, etc.). This review is often undertaken in conjunction with the licence holders, as they provide many of the details needed during the review process (e.g. changes in effort).

The outcomes from the previous season's assessment against the defined reference levels (including any additional reviews undertaken as described above) are provided to industry by the Department at the Annual Management Meeting. It is at this stage that any issues arising from the annual evaluation of the fishery's performance are discussed. Where sustainability is considered to be at risk, changes to the management arrangements are discussed with the licensees, with appropriate changes implemented for the following fishing season.

15.3.2 Long-term Processes

There is also an established decision-making process in place to ensure the long-term management objectives are met. This process is triggered primarily as a result of analysing longer-term patterns or trends in the annual fishery performance. Variations in the operating environment caused by other factors (e.g. environmental conditions, market forces, fishing behaviour, conflicts with other user groups, marine planning, etc.) can also trigger an investigation and discussion that may lead to more-permanent changes (i.e. lasting more than one season) in the management system.

Longer-term changes are often implemented in legislation. The decision-making process that results in changing legislation involves a high level of consultation with industry and other stakeholders that may be affected by the change. In developing management options, consultation is undertaken with affected parties and relevant experts through a number of mechanisms, including:

- Directly in writing;
- At licensee meetings;
- At internal workshops, e.g. harvest strategy development, compliance risk assessments;
- Through the establishment of a tasked working group; and / or

- As part of external / expert workshops (e.g. an ecological risk assessments).

These forums are used to work through options for addressing emerging issues and provide the opportunity for decision-makers to consider all interested stakeholder advice. Comments provided during this process also allow managers to take into account the broader implications of management options.

Following this consultation process, any new proposed management measures or strategies that require changes to legislation or publication are provided to the statutory decision maker (usually the DG or the Minister) by the relevant Departmental aquatic management staff.

For example, at the 2014 Annual Management Meeting, licensees requested that the Department review the existing TAC for crystal crabs, with the view of increasing the TAC by 10 % (as per the Harvest Strategy control rules related to achieving the economic objective for the fishery). Following the formal request by licensees, the Department's research division is currently working to provide advice to the managers regarding the sustainability of the increase. Once this advice is received, and if favourable, a formal consultation process will be undertaken to amend the management plan to reflect the new TAC of 154 t crystal crabs annually. This process generally takes from three to six months to complete, with the additional quota likely to be introduced mid-2015.

15.3.3 Responsiveness of Processes

The governance system in place allows for a timely response in instances where management changes need to be applied to alleviate unacceptable risks to stocks. The timing of provision of scientific advice on the status of stocks is concomitant with the risk levels for particular species, thus it varies between different fisheries; however, once advice is received, there is a prompt process to review this advice for scientific rigour and develop management actions.

Section 43 of the FRMA also provides the power for immediate action by allowing the Minister for Fisheries to prohibit fishing activities (i.e. close an area to fishing) or prohibit a specific fishing activity (i.e. trap fishing) should information come to hand that purports to an unacceptable risk. Should immediate action be required, section 65(4) of the FRMA provides for the Minister to amend a management plan without consultation if, in the Minister's opinion, the amendment is required urgently or is of a minor nature (but must provide advice following the amendment of the plan).

15.3.4 Use of Precautionary Approach

The EBFM process used by the Department provides the operating basis for implementing sustainable fisheries and ecosystem management by identifying ecological assets in a hierarchical manner and identifying the risks associated with them. Thus, the levels of knowledge needed for each of the issues only need to be appropriate to the risk and the level of precaution adopted by management.

Where reliable stock information is lacking, the reference levels set in the fishery have been set at precautionary levels. For example, the reference levels for bycatch species have been set to reflect the outcomes of periodic (every 3 – 5 years) risk assessments. The target

reference level is that fishery impacts generate an acceptable risk level (e.g. moderate risk or lower [as per Fletcher *et al.* 2005]); however, should substantial changes to fishery operations or management be introduced (e.g. an increased TAC), a review of the risk levels is undertaken to determine any changes in the risk to bycatch species as a result of these changes. Where fishing impacts are considered to be at an unacceptable risk level (e.g. high risk or above), appropriate management strategies will be implemented to reduce the risk back to an acceptable level.

The control rules in place under the *WCDSCMF Harvest Strategy* also incorporate a precautionary approach to the decision-making process by requiring a review of the fishing activities and management arrangements when a threshold reference level is met (i.e. prior to reaching the limit level). The use of a threshold level provides for an inherent 'warning system', with any potential issues recognised, investigated and potentially addressed while in their early stages. The frequency of evaluation (annually) and review allows for management action to alleviate adverse impacts before a limit level is reached and long-term sustainability may be compromised.

15.3.5 Accountability and Transparency

The Department is required to provide evidence of consultation and the results of the decision-making processes. This evidence is usually provided in the form of formal Departmental publications and is made available on the Department's website[31]. The implementation of any new statutory arrangements must also be formally communicated to the licence holders in writing.

The Department regularly reports to key stakeholders on annual fishery performance, including information on fishery outcomes, management actions and relevant findings and recommendations from research, monitoring, evaluation and review activities. This information is primarily provided to licence holders at the annual management meetings. Additionally, comprehensive information on each of the State-managed fishery's performance, management system and actions, research, monitoring, and other activities are compiled regularly and published in a number of publically-available documents, including:

- The *Annual Status Reports of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher and Santoro 2014);
- The Department's *Annual Report* to Parliament;
- The *Research, Monitoring, Assessment and Development Plan 2011 – 2012* (RMAD Plan; DoF 2012c; currently being updated); and
- Fisheries Management Papers (FMP), Fisheries Research Reports (FRR), Fisheries Occasional Papers (FOP) and peer-reviewed scientific journal articles. For example, recent publications relevant to the WCDSCMF include:
    - FRDC Final Report on Project No. 2011/254: "*Establishing industry catch sampling for WA's crystal crab fishery*" (Melville-Smith *et al.* 2014);

[31] All post-2010 publications available at: http://www.fish.wa.gov.au/About-Us/Publications/Pages/default.aspx

- FMP No. 259: "*West Coast Deep Sea Crustacean Managed Fishery Draft Management Plan 2012*" (DoF 2012b);
- FRR No. 165: "*Biological and Fisheries Data for Managing Deep Sea Crabs in Western Australia"* (Melville-Smith *et al.* 2007);

All of the fishery-specific management information, including the FRMA, FRMR, the *WCDSCMF Management Plan* and the *WCDSCMF Harvest Strategy*, is also publically available on the State Law Publisher and the Department's websites.

15.3.6 Approach to Disputes

The WCDSCMF decision-making process proactively avoids legal disputes through the inclusion of and consultation with stakeholders when making changes to key management matters. This allows for all impacts of proposed management actions to be considered and for the resolution of conflicts through negotiation and compromise. Additionally, the close collaboration and regular communication between the Department and licence holders in the WCDSCMF has resulted in a mutual and in-depth understanding of industry operations and the fishery management system.

Should a dispute arise, there are well-established mechanisms for administrative and legal appeals of decisions, as prescribed under part 14 of the FRMA (see Section 14.1.6). These mechanisms have been used and tested across several fisheries; for example, within the WCDSCMF, the SAT has been used to assess a variation of permit under the WCDSCMF (Interim) Management Plan. The case notes for this case (2005WASAT31) are available from the SAT website: http://decisions.justice.wa.gov.au/SAT/SATdcsn.nsf/PDFJudgments-WebVw/2005WASAT0031/$FILE/2005WASAT0031.pdf.

15.4 Compliance and Enforcement

In order to optimally utilise compliance resources, enforcement effort is designed to maximise the potential for fishers to voluntarily comply with fishery rules, while at the same time provide a reasonable threat of detection, successful prosecution and significant penalties for those who do not comply. This is achieved through a range of strategies, including effective monitoring and surveillance, appropriately trained staff, suitable deterrents in the forms of fines and administrative penalties and targeted education campaigns.

The Department's Regional Services Division (RSD) delivers the Department's compliance and education services, with the support of the Communications and Education Branch. There is approximately 170 RSD staff across the State, spread throughout regional and district offices. Regional operational areas are supported by the Regional Services Branch's Perth-based Central Support Services and Strategic Policy sections.

Key compliance programs in place throughout the State include:

- Recreational fishing;
- Commercial fishing;
- Biosecurity;
- Pearling and Aquaculture;

- Marine parks (State and Commonwealth);
- Fish Habitat Protection Areas (FHPAs);
- Marine Safety; and
- Organised, unlicensed fisheries crime.

The WCDSCMF is considered as part of the West Coast Bioregion (WCB) for compliance purposes, and compliance and community education services can be delivered by Fisheries and Marine Officers (FMOs), Community Education Officers and associated management and administrative support staff based at the Busselton, Bunbury, Mandurah, Rockingham, Fremantle, Hillarys, Lancelin, Jurien, Dongara and Geraldton offices, state-wide mobile patrol units and officers aboard the large, ocean-going patrol vessels PV Houtman and Walcott.

During 2012/13, the WCB FMOs delivered a total of 24 428 hours of compliance and community education services in the field (Fletcher and Santoro, 2014). A continuing emphasis was placed on employing risk- and intelligence-based approaches to compliance planning and prioritisation. The West Coast Rock Lobster Managed Fishery (WCRLMF) is the largest commercial fishery in the state, and within the WCB, and therefore much of the compliance focus is on this fishery. In addition to the WCRLMF, FMOs focused activity on ensuring high levels of compliance in other commercial fisheries that operate in this region.

Most Fisheries Officers are permanently located in the main population centres with access to appropriate platforms to allow them to undertake patrols up and down the entire WA coastline. A small number of Officers are also specifically employed to undertake mobile patrols to conduct 'surprise' inspections, an activity that is particularly important in smaller towns where fishers can quite easily learn the movement patterns of local Officers (Green and McKinley 2009).

FMOs undertake regular land, air and sea patrols using a compliance delivery model supported by a risk assessment process and associated operational planning framework. Services provided by the land-based officers include processing inspections, landing and gear inspections, licensing checks, wholesale / retail checks and sea-based patrols utilising vessels ranging in size from five to 12 metres. They also provide support to seagoing personnel and provide a wide variety of educational and extension services through formal and informal media to commercial fishers, fishing related operations (wholesale / retail / processors), other resource management agencies and community members (Fletcher and Santoro, 2014).

The Department also delivers at-sea marine safety compliance services on behalf of the Department of Transport (DoT) in the Metropolitan Region extending from Mandurah to Lancelin (excluding the Swan and Canning Rivers). Outside of this area, marine safety is unfunded, and inspections are carried out in combination with fisheries compliance inspections. Marine park education and compliance functions are also undertaken in the Ngari Capes Marine Park (South West), Shoalwater and Marmion Marine Parks (Metropolitan) and Jurien Bay Marine Park (Midwest). These functions are primarily related to the integrity of management arrangements for the different zoning within the marine parks (Fletcher and Santoro 2014).

15.4.1 Monitoring, Control and Surveillance Systems

Monitoring, control and surveillance (MCS) mechanisms ensure a fishery's management measures are enforced and complied with. The MCS system for the fishery is administered by the Department's RSD through an Operational Compliance Plan for the minor fisheries of the WCB.

15.4.1.1 Implementation

15.4.1.1.1 Compliance Risk Assessments

The Department conducts compliance risk assessments every 1 – 2 years in major fisheries or those perceived to be at high risk and every 3 – 5 years in minor fisheries (e.g. the WCDSCMF). The risk assessment process is normally undertaken by Departmental management staff, field-based FMOs and researchers, but where appropriate may also involve commercial and recreational fishers, fish processors and representatives from other interested stakeholder groups. The risk assessment process feeds into an Operational Compliance Plan[32] (OCP; where required), which provides the formal framework for the delivery of specific compliance services that remove or mitigate those identified risks.

The compliance risk assessment process identifies modes of offending, compliance countermeasures and risks and relies on a weight-of-evidence approach, considering information available from specialist units, trends and issues identified by local staff and Departmental priorities set by the Aquatic Management Division through Fish Plan. The risk assessment process can be triggered by the introduction of new supporting legislation[33] in a fishery / resource or the identification of any new major issues that would require RSD managers to assess their compliance program including (but not limited to):

- A sectoral complaint;
- Ministerial or Parliamentary enquiry;
- Management framework issues;
- Public complaint or sustained media interest;
- Market changes;
- Intelligence; or an
- Upward trend in non-compliance.

There are broadly three levels of compliance risk assessment and associated planning and monitoring undertaken by the RSD. The WCDSCMF undergoes Level 1 compliance risk assessment, planning and monitoring, with a local annual review and update of compliance assessment and associated compliance strategies, manuals and procedures. This is usually undertaken by the relevant Compliance Manager, in consultation with the Regional Manager, Regional Fisheries and Management Officer, and Supervising Fisheries and Marine Officers,

[32] By their nature, finished OCPs contain sensitive information and are only made available to authorised compliance personnel.

[33] Supporting legislation refers to legislation that would allow non-compliance with the management framework to be detected and prosecuted with a reason chance of securing a conviction.

with a focus on a preparing annual work programs and taking into account minor or local changes affecting the fishery.

Within the Midwest region of the WCB, separate risk assessments and OCPs are developed for (1) the West Coast Rock Lobster Managed Fishery and (2) all other commercial fisheries combined. The WCDSCMF is included in the 'Commercial, Other' risk assessments and OCP, which covers all commercial managed fishery activities conducted within the lands and waters of the Midwest region between the Zuytdorp Cliffs to Wedge Island (i.e. where the majority of the commercial fishing activities of the WCDSCMF take place).

The most recent combined risk assessment undertaken for these fisheries in the Midwest region was conducted in June 2012.

15.4.1.1.2 Operational Compliance Plan

An OCP provides a formal process for staff to carry out defined compliance activities in order to monitor, inspect and regulate the compliance risks to each specific high-risk activity in a fishery/region, and in turn confirm they are at an acceptable and manageable level. Each OCP is reviewed following a compliance risk assessment. In addition, by regularly reviewing the OCPs for all fisheries in a particular location, rational and accountable decisions can be made about deploying compliance resources and ensuring that resources are available to mitigate risks to an acceptable level.

Following a formal review of a fishery's OCP and associated compliance strategies, compliance activities are prioritized in accordance with risk, budget and resourcing considerations. Annual planning meetings are held for OCPs, with regular specific planning of day-to-day targeted and non-targeted patrols linked to the OCP based on resources and competing priorities.

15.4.1.1.3 Resourcing Compliance Operations

RSD staff co-ordinate the allocation and prioritisation of existing resources across all programs in the region based on risk assessments and related OCPs for each program. Compliance planning meetings are held regularly to ensure staffing requirements are adequate for scheduled compliance activities.

Available compliance resources are allocated based on the risk assessment outcomes and the contacts and compliance statistics which are captured, reported on and reviewed at the end of each year. The allocated resources and compliance strategies (i.e. monitoring, surveillance and education activities) are outlined in the OCP, which specifies planned hours and staff allocated to key compliance tasks and duties. This planning and delivery process allows for more-targeted, effective and relevant compliance service in terms of both cost and activities.

There is also flexibility within the region to allocate additional resources to respond to changes, such as the need for a planned tactical operation in response to new intelligence. This may be achieved by redirecting existing resources or seeking additional resources from other areas or units. Similarly, changing priorities and resourcing on a local level can involve

reducing planned delivery of compliance services to ensure resources are directed to where they are most needed.

15.4.1.1.3.1 Key Compliance Personnel in the West Coast Bioregion

The Regional Office of the Department relevant to the WCDSCMF is located at Geraldton, and staff located at this office provide the primary on-ground compliance and education delivery for the fishery. Key compliance and enforcement personnel located in the region and their responsibilities include:

1. Compliance Manager
    - Overall responsibility for OCPs and compliance strategies, including their development, review and ensuring outcomes are delivered;
    - Responsible for providing sufficient and appropriate resources to achieve compliance outcomes;
    - Ensuring FMO safety is considered at all times and the Region's occupational health and safety requirements are met;
    - Monitoring the progress of the OCPs and strategies during their execution;
    - Consulting with all key stakeholders when reviewing the OCPs and strategies; and
    - Compiling reporting outcomes.
2. Supervising Fisheries and Marine Officers
    - Field responsibility for OCPs and strategies, including reporting any deficiencies and reporting the outcomes as they are delivered or achieved;
    - Supervision of staff performance;
    - Ensuring officer safety is considered at all times and the district's occupational health and safety requirements are met;
    - Provide briefings and de-briefings as required;
    - Ensuring all equipment required to execute the OCPs and strategies is serviced, operational and available;
    - Liaising with staff from other agencies operating in a joint servicing arrangement; and
    - Reporting outcomes.
3. Fisheries and Marine Officers (FMOs):
    - Day-to-day responsibility for the execution of the OCPs and strategies in their interaction with users of the Fishery;
    - Ensuring FMO safety is considered at all times and individual occupational health and safety requirements are met;

- Reporting any deficiencies and outcomes in a timely and accurate manner;
- Complying with the *Standard Operating Procedures*, *Prosecution Guidelines*[34], the Department's *Code of Conduct* and promoting the vision and mission statement of the Department and its joint-servicing partners; and
- Carrying out prosecution actions within agreed timelines.

FMOs are formally appointed pursuant to the FRMA, which clearly sets out their powers to enforce fisheries legislation, enter and search premises, obtain information and inspect catches. FMOs are highly trained; they must have a thorough knowledge of the legislation they are responsible for enforcing and follow a strict protocol for undertaking their duties in accordance with FRMA and in recording information relating to the number and type of contacts, offences detected and sanctions applied.

In addition to regional compliance staff, there are a number of units within the Department that support the delivery of compliance outcomes, including:

1. Patrol Boat Business Unit
    - Provides large oceangoing patrol vessels for State-wide offshore compliance operations and education activities.
2. Vessel Monitoring System[35] Unit
    - Operates the Department's vessel monitoring system (VMS) to help manage the State's commercial fisheries.
3. Serious Offences Unit
    - Undertakes covert operations and deals with connections to organised crime;
    - Conducts major investigations and initiates proactive intelligence-driven operations;
    - Targets any serious and organised criminal activity within the fishing sector;
    - Provides specialist investigative training; and
    - Provides technical assistance in relation to covert surveillance.
4. Fisheries Intelligence Unit
    - Responsible for providing intelligence reports to support strategic, operational and tactical needs of compliance programs; and
    - Collects and analyses compliance data.
5. Compliance Statistics Unit
    - Develop monitoring and sampling programmes to support compliance delivery;
    - Collects and analyses compliance data to identify trends; and
    - Provides compliance statistics to help target enforcement activities.
6. Prosecutions Unit

[34] The *Prosecution Guidelines* is a confidential guide used by FMOs that provide a tiered framework for dealing with fishery offences, thus it is not a publically-available document.
[35] Note VMS in not used for WCDSMCF vessels

- Manage the electronic system used to issue infringement notices or commence prosecution processes when offences are detected; and
- Custodians of information relating to detected offences which can be used for official reporting purposes.

7. Strategic Policy Section of the Regional Services Branch
    - Develops and implements strategic compliance policy and standards;
    - Provides compliance risk assessments for fisheries;
    - Provides review and implementation of fisheries management and compliance legislation;
    - Oversees collection and analysis of compliance data;
    - Oversees compliance research projects;
    - Develops occupational health and safety standards for FMOs; and
    - Provides recruitment and training of new and existing FMOs.

15.4.1.2 Formal MCS Systems

Compliance staff utilise a number of formal monitoring and surveillance activities and control mechanisms in the WCDSCMF.

15.4.1.2.1 Monitoring Activities

The primary monitoring activity in the WCDSCMF relates to the reporting and validation of crystal, champagne and giant crab catches for quota-monitoring purposes.

The licensee and / or the master of every licenced fishing boat in the WCDSCMF is required (under regulation 64 of the FRMR) to submit accurate and complete catch and effort returns on forms approved by the Department. Historically, catch has been reported in monthly catch and effort (CAES) returns; however, with the move to a quota-managed fishery in 2008, a more-detailed catch disposal records (CDR) form was introduced for compliance purposes.

Under the management plan, the master of an authorised boat must accurately determine:

a) The number of containers that contain crustaceans or other permitted retained species[36]; and

b) The total gross weight of both the container and the crustaceans / other species being held in the container.

Once the catch has been landed ashore, the master of the boat must then sign and specify in a CDR (in triplicate) accurate details of —

- The place, time and date of the landing of the crustaceans / other species;
- The name, licence number and business address of the approved processor to whom the crustaceans / other species have been or are to be consigned;

[36] Defined as 'bycatch' in the 2012 management plan

- The species and weight of any crustaceans / other species which is being retained for personal use;
- The name and business address of the person who is to transport the crustaceans / other species;
- The number of containers in which the crustaceans / other species is consigned;
- The determination of the net weight of each species of crustacean and each other species;
- The name of the master of the authorised boat and details of the licence under the authority of which the crustaceans / other species were taken; and
- The total individual amount of crystal crab, champagne crab and giant crab taken under the authority of the licence during the period for which is has been granted.

An original copy of the CDR must be attached to the catch at the place of landing prior to consignment[37]. A separate CDR must be completed for each species. The triplicate copies of each completed CDR must be provided to an office of the Department (within 48 hours of landing).

All crustaceans / other species caught in the WCDSCMF must be taken to an approved fish processor (as determined by the CEO and listed in the *Notice of Approved Processors*[38]). As per the management plan, a processor who has received any crustacean or other species catch taken from the WCDSCMF must immediately accurately determine the total weight of each species. Once the processor has determined the weight of each species, they must also submit a written record of that weight to the Department (within 24 hours).

As fishers are permitted to operate along the entire west coast of WA, the master of the vessel and fish processors generally provide their records to the nearest local Departmental offices (e.g. Denham, Carnarvon or Fremantle). Both electronic and hard copies of the records are provided to the relevant RSD staff at the Geraldton office.

The weights provided in the CDR copies and those provided by the processors are compared for each consignment; should a discrepancy between the weight received for any species and the weight specified on the accompanying CDR occur, the Department's staff is required to notify a Fisheries Officer immediately. Note, however, that this does not apply if the discrepancy in weight determined by the processor for a species is less than 10 % of the weight specified on the CDR for that species.

It is the total amount of crystal, champagne or giant crabs that have been reported by the approved processor in relation to a licence, together with any amount reported as retained for personal use, that is used by the Department to determine the total weight of fish taken under the authority of a licence for quota monitoring purposes.

[37] Each occasion in which crustaceans / other species are transported from the place of landing is considered a separate consignment, with a separate CDR completed for each consignment.

[38] http://www.slp.wa.gov.au/statutes/subsiduary.nsf/0/32F183B72CC2BF3148257D2500038794/$file/29.07.14.+approved+processor+notice.pdf

Although licence holders generally maintain catch records for monitoring their quota use, a request to the Department about how much personal quota remains during a season can be made by submitting an *Application for the Release of Information*[39] (Form E-1) to the Department's Geraldton office. The details and process to be followed in making this request are described in full on the E-1 form.

15.4.1.2.2 Control Mechanisms

Fisheries legislation forms the main component of the control system for commercial fisheries in WA. A description of the control measures in place in the WCDSCMF are provided in Table 15.2.

Table 15.2. Description of the control measures and instruments of implementation in the WCDSCMF

Measure	Description	Instrument
Limited entry	A limited number (7) of Managed Fishery Licences are permitted to operate in the WCDSCMF.	WCDSCMF Management Plan
Fishery Capacity	The maximum quantity of crystal, champagne and giant crabs that can be removed from the fishery annually is limited by their TAC.	WCDSCMF Management Plan
Allocation of Units	Class A units entitle fishers to retain an amount (kg) of crystal crabs; Class B units entitle fishers to retain an amount (20 kg) of champagne and / or giant crabs.	WCDSCMF Management Plan
Spatial closures	Fishers are not permitted to fish landward of the 150 m isobath.	WCDSCMF Management Plan
Gear controls	Fishers are only permitted to use fish traps with an internal volume less than 0.257 ^{3} and two escape gaps	WCDSCMF Management Plan
Minimum size limits	The legal minimum size limits in place for crystal, champagne and giant crabs is greater than the size at maturity for both males and females.	FRMR
Protection of berried females	Female crabs that are actively breeding ('berried') are required to be returned to the sea.	FRMR
Species restrictions	Fishers are not permitted to retain rock lobster or finfish throughout the entire fishery area or scampi or white tailed bug east of 126° 58' E	WCDSCMF Management Plan
Reporting	All fishers are required to provide CAES returns to the Department's research branch.	FRMR
	All fishers are required to provide CDR forms to the Department within 48 hours of landing catch.	WCDSCMF Management Plan
Specification of Port Areas and Approved Fish Processors	All catches must be unloaded at approved port areas.	WCDSCMF Management Plan
	All catches must be sold or transferred to an approved fish processor.	WCDSCMF Management Plan / Notice of Approved Processors

[39] http://www.fish.wa.gov.au/Documents/commercial_fishing/e-1_application.pdf

15.4.1.2.3 Surveillance Activities

FMOs deliver compliance activities directed at commercial fisheries in the Midwest region via:

- Wholesale retail inspections targeting records and catch;
- Boat inspections to detect bycatch and off-quota product;
- Attending industry meetings;
- Intel-driven investigations;
- Land patrols, including opportunistic inspections of catch, licenses and bycatch;
- Sea patrols;
- Processor inspections; and
- Road-side check points (in collaboration with the WA Police) for protected fish species (e.g. undersize or berried females).

Surveillance activities, including licences and gear check, in the WCDSCMF are undertaken by FMOs during in-port inspections.

FMOs follow a variety of established Standard Operating Procedures (SOPs) when undertaking patrol and inspection work. This procedure ensures that inspections are carried out safely, efficiently, correctly and with due regard to relevant policies. SOPs also ensure consistency in the delivery of compliance services and the ability to quickly familiarise new staff to the specifics of important compliance elements in a fishery.

Compliance activities undertaken during patrols are recorded and reported by FMOs using a daily patrol contact (DPC) form (Appendix H). The purpose of these forms is to record and classify contacts and time spent in the field for each FMO. These forms provide managers with information about:

- The number of field contacts made, which provides a context for the number of offences detected and reported. This includes random contacts and offences from random inspections;
- The number of targeted[40] contacts made, which provides information on the effectiveness of the intelligence gathering capacity at identifying 'targets';
- The number of face-to-face contacts outside of a compliance context (referred to as 'A/L/E' contacts) made, which provides information on the educative effort of FMOs in a fishery; and
- Other routine information that can be used to help managers report on where and which fisheries FMOs have undertaken patrols. This information is also used in patrol planning and risk assessments and ensures accountability of the compliance program.

[40] A targeted contact is one that is initiated because available information indicates that an offence may have been committed or may be more likely to have been committed.

A ‘contact’ occurs when an FMO has a chance of detecting illegal activity being undertaken by a fisher and includes personal contact (face-to-face), covert activities (e.g. deliberate, intensive surveillance) and unattended gear checks (e.g. traps; contact statistics available in Table 15.3).

Table 15.3. Contact details for the WCDSCMF for 2010 – 2014

Vessel	Year				
	2010	2011	2012	2013	2014
Vessel 1					1
Vessel 2		1			
Vessel 3	1		1	1	
Grand Total	**1**	**1**	**1**	**1**	**1**

The DPC form also includes a section to record details of individual commercial vessel inspections / checks. These inspections may involve:

- Inspection of all fishing gear;
- Inspection of all authorizations; and
- Inspection of freezers and fish on board the boat.

The Department has also implemented an initiative called Fishwatch[41], whereby the community can report instances of suspected illegal fishing. The Fishwatch phone line provides a confidential quick and easy way to report any suspicious activity to Departmental compliance staff.

15.4.2 Applying Sanctions

The WCDSCMF management system provides a number of incentives to fish both lawfully and sustainably (see Section 14.4). These incentives, combined with explicit penalties and comprehensive MCS systems, provide a robust framework for ensuring that licensed commercial fishers comply with the management arrangements.

There is an explicit and statutory sanction framework that is applied should a person contravene legislation relevant to the WCDSCMF. Sanctions to deal with non-compliance are listed in the FRMA and FRMR and can be severe. These sanctions consist of:

- Significant monetary penalties;
- Licence cancellations or suspensions;
- A reduction in trap number of over use (over-potting); and
- Confiscation of gear and catch.

[41] http://www.fish.wa.gov.au/About-Us/Contact-Us/Pages/Fish-watch.aspx

Breaches in fishery rules may occur for a variety of reasons, and FMOs undertake every opportunity to provide education, awareness and advice to fishers; however, all offences detected in the fishery are considered to be of significant concern and are addressed by FMOs via the prosecution process outlined in the Department's *Prosecution Guidelines* and rules set out in the FRMA and FRMR. When an FMO detects a breach of the FRMA, the officer determines if the matter is prosecutable (according to the Department's *Prosecution Guidelines*) and where it is, a prosecution brief is prepared by the FMO and submitted to their supervisor. Based on the *Prosecution Guidelines*, there are four tiers of enforcement measures applied by FMOs when an offence is detected in the fishery including:

- Infringement warnings: These are written warnings issued for minor fisher offences. They do not incur a fine, but are a written record of a minor offence that may be referred to by Fishery Officers in the future. A certain number of infringement warnings for similar offences in a designated period may result in an infringement notice;
- Infringement notices: These are written notifications to pay a monetary penalty for an observed offence. Fishers issued infringement notices may choose to defend the matter in court; however, most fishers choose to pay the fine. The Department may initiate a prosecution brief for habitual offenders;
- Letters of warning: A letter of warning (LOW) is a formal record of a commercial offence where a prosecution may be unduly harsh under the circumstances. A LOW may be issued where an offence may have been committed but detected outside of the 45-day period where an infringement can be issued. There may not be a public interest in prosecution, but this still formally records the detected offence. A LOW formally advises the offender of their actions and seeks future 'voluntary' compliance.; and
- Prosecutions: These are offences of serious nature (prescribed in the FRMA) that immediately proceed to formal, legal prosecution. Such matters often incur hefty fines or can even result in incarceration, and matters brought before the court are often vigorously defended (especially by commercial fishers).

FMOs have the autonomy to issue an infringement warning after detecting some 'minor' offences that have resulted from a lack of understanding of the rules or an error of judgment, while infringement notices are used to apply a modified penalty and are usually used in cases where the offence does not warrant prosecution action that is likely to end up in court. Modified penalties are prescribed in Schedule 12 of the FRMR and can only be applied to particular sections of the FRMA (including contravening a provision of a Management Plan) and the FRMR[42]. A copy of the infringement notice is provided in Schedule 14 of the FRMR. If there is a dispute over an infringement notice, the offender can request the matter be heard in court.

[42] http://www.slp.wa.gov.au/legislation/statutes.nsf/main_mrtitle_1458_homepage.html

More serious offences against the legislation will require the Department to seek to prosecute. The Department's Prosecution Advisory Panel (PAP) reviews recommendations made by the RSD in respect to alleged offending against the FRMA (or Pearling Act) and considers whether such decisions are in the 'public interest'. This process ensures fairness, consistency and equity in the prosecution decision-making process. The PAP consists of three panel members (representing legal and executive services and the compliance and aquatic management branches) who meet on a monthly basis or as necessary. The PAP operates on a majority basis, with the prosecution process continuing where the majority of the PAP agrees with the recommendation to prosecute. If the majority of the PAP disagrees with the recommendation to prosecute, the matter is referred to the Chief Executive Officer (CEO) of the Department, who will then make a determination on the matter. Should prosecution action be undertaken, the outcomes are generally released to the public via media releases and recorded on the Department's website[43].

Penalties for illegal activity in WA fisheries are commensurate with the value of the illegal fish involved and the type of illegal activity. This can result in large monetary penalties for certain types of activities, with large penalties considered necessary in order to create a deterrent effect for high-value species, such as western rock lobster or abalone. Additional penalty provisions that apply should there be a prosecution are provided in the FRMA under sections 222 (mandatory additional penalties based on value of fish), 223 (court ordered cancellations or suspensions of authorisations), 225 (prohibition on offender activities) and 218 (forfeiture of catch, gear, etc.).

A successful prosecution for a serious offence in a commercial fishery may result in a 'black mark' against the fisher or the commercial licence (as per section 224 of the FRMA). If an authorisation holder or a person action on behalf of the holder accumulates three black marks within a 10-year period, the authorisation is suspended for one year. Additionally, under section 143, the CEO has the administrative power to cancel, suspend or not renew an authorisation in certain circumstances, which can be used even if cancellations through the court are unsuccessful. These powers have been used to deal with serious offending in other fisheries.

All fisheries offences in WA are recorded in a dedicated Departmental offences system, which also manages the workflow associated with infringements and prosecutions. In order to link this information with patrol data, FMOs include information about the fishery, DPC area, type of patrol and whether the offence resulted from a targeted inspection in all offence paperwork.

15.4.2.1 Sanctions in the WCDSCMF

There have been few offences detected in the WCDSCMF in the last ten years (Table 15.4). Note the data provided here indicate offences that resulted in an outcome in-line with the enforcement measures described above.

[43] Example of media release: http://www.fish.wa.gov.au/About-Us/Media-releases/Pages/Court-fines-hit-hard-for-out-of-season-lobster-fishing.aspx

Table 15.4. Summary of detected offences in the WCDSCMF from 2009 – 2014

Year	Infringement Warnings	Infringement Notices	Letters of Warning	Prosecution Briefs
2009				3
2010				
2011	1	1		
2012				1
2013				
2014				

15.4.3 Level of Compliance

In evaluating compliance in a specific fishery, the Department uses a weight-of-evidence approach, which considers:

- Ongoing evidence of a sustainable fishery, i.e. whether ecological objectives continue to be met;
- Assessment of the risk posed by the fishery to target species and ecosystem components under the current management regime;
- Annual outputs arising from formal MCS systems —
    - Number of offences and successful prosecutions (dependent on whether compliance is undertaken in a random or targeted manner);
- Number of reports of illegal activity logged by Fishwatch and from intelligence gathered by FMOs;
- General level of industry support / buy-in around fishing rules; and
- Level of compliance education and communications during key stakeholder engagement (at least annually).

Using this weight-of-evidence approach, there is a high degree of confidence that fishers in the WCDSCMF comply with the management system in place, including providing information of importance to the effective management of the fishery based on the following:

- There is ongoing evidence that the fishery is operating sustainably, as the performance indicators for each component (i.e. target species, retained non-target species, bycatch, ETP species, habitat and ecosystem processes) of the fishery have generally been maintained above threshold reference levels.
- In the most recent risk assessment (using a PSA in 2014) for the WCDSCMF, the highest risk indicated to any component was ‘medium’ (i.e. the maximum acceptable level of impact). Where this was the case (i.e. deep sea sharks), appropriate management actions have been implemented to mitigate this risk. The *Status Report of the Fisheries and Aquatic Resources of Western Australia* report on the evaluation of performance of the fishery annually.

- There have been few offences recorded (based on formal compliance systems) in the WCDSCMF within the last five years (see Table 15.4);
- Apart from statutory requirements around submitting catch returns, the licensees also actively participate in providing extra information for the effective management of the fishery, particularly through the provision of industry boats for Department surveys and the collection of additional data via industry surveys, which are delivered under a Service Level Agreement (SLA) with the Department.

15.5 Research Plan

The WCDSCMF has a research plan in place that addresses the information needs for management. The current research plan for the WCDSCMF is detailed in the Department's RMAD Plan (DoF 2012c; DoF in press).

The RMAD Plan provides a mechanism to identify and track any major gaps in knowledge, resources and expertise, which assists in capacity planning, future funding applications and planning in a broader context. The RMAD Plan is developed by scientists, managers and stakeholders who are involved across stock status (MSC Principle 1); ecology (MSC Principle 2); and governance, policy, compliance (MSC Principle 3).

The Departments' RMAD Plan forms part of the planning cycle for determining research, monitoring and assessment needs for a fishery / asset and specifically outlines the historical, current and proposed activities that support the collection and analysis of data to assist the Department to meet the objectives of the FRMA over a five year period (currently 2011/12-2015/16, with 2015/16-2020/21 plan in press). The RMAD Plan specifically outlines the activities that are currently planned or have already been identified that directly contribute to the effective management of the aquatic resources of WA. Consequently, it includes research, monitoring and assessment activities being done by other agencies that have been identified as being directly relevant to the fishery / sector / asset or issue. The focus of monitoring, assessment or research activities currently being undertaken within each of the sectors documented in the RMAD Plan have been the result of deliberations and discussions by internal Departmental committees and, for some sectors, with direct input from relevant industry / sector bodies (e.g. industry / advisory groups). There are four main ways that issues that require the development of further monitoring and research projects are identified (Figure 15.1):

- Existing monitoring that identifies issues that arise in the fishery (e.g. not achieving operational objectives; these can also be issues identified by stakeholders or researchers);
- Results of other research, management or compliance projects or investigations;
- Expert workshops (including risk assessments) and peer-reviews of aspects of research and management; and
- Industry liaison.

Once an issue or risk has been identified, an expert group or workshop may be established to review the available information and make recommendations regarding what research should be undertaken, and in many instances, help develop an appropriate research framework. The management actions in Fish Plan and the Research Strategic Plan inform the fishery-specific research plan to ensure that there is a coherent and strategic approach to research.

Given the diverse levels of risk and differing relative community values associated with each of the various assets, there are large differences in the level of research, monitoring and assessment activities planned among the different fisheries and ecosystems. These differences also reflect different levels of ongoing information required to enable each of the current management processes to operate effectively and generate acceptable, cost effective outcomes.

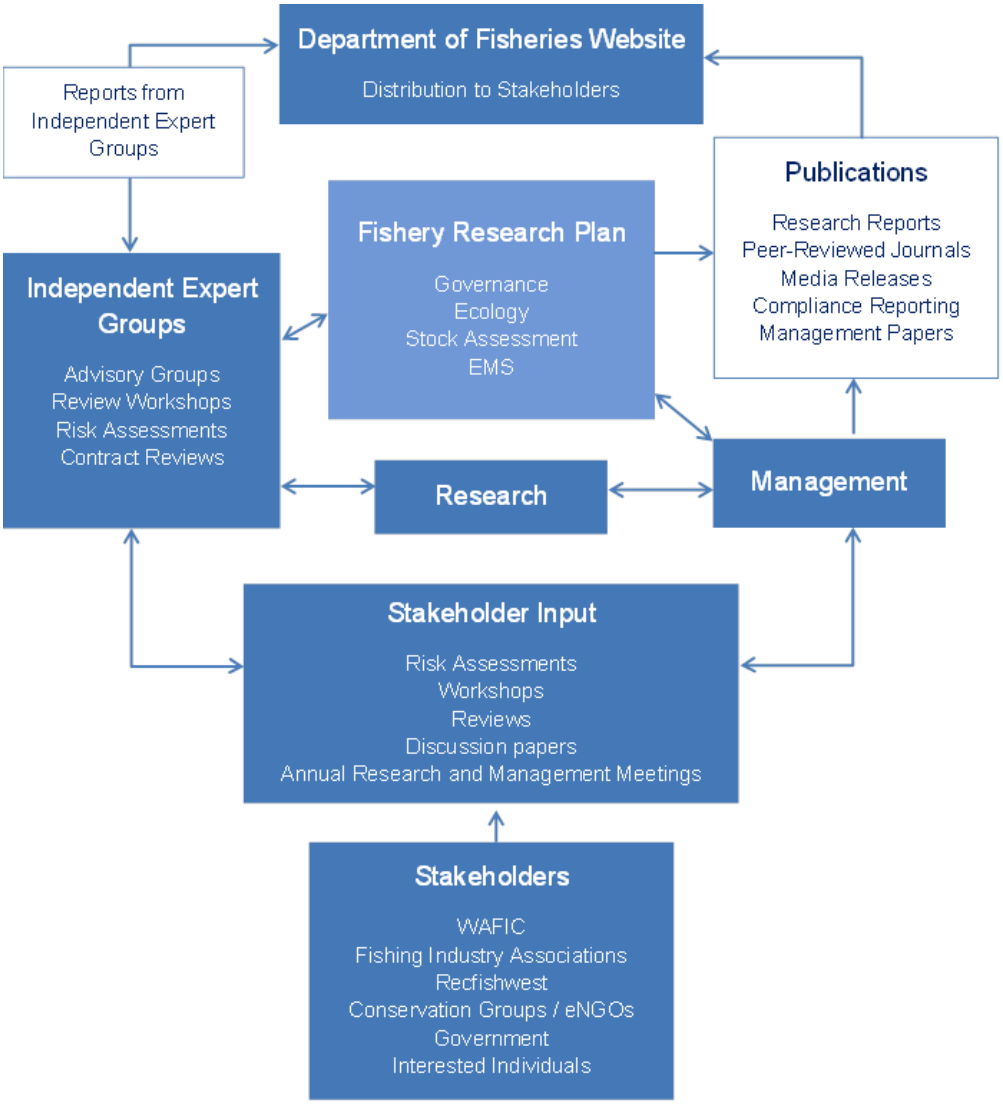

Figure 15.1. Overview of the fishery-specific research plan development process undertaken by the Department of Fisheries WA

The WCDSCMF is considered to be a moderate risk to west coast crustacean stocks, with the majority of research focused on crystal, champagne and giant crabs. As outlined in the

WCDSCMF Research Plan (pp. 60 – 62 of the 2012 RMAD Plan) biological information has been collected through a number of FRDC-funded projects, which have resulted in publications on crystal crabs (Melville-Smith *et al.* 2007), champagne crabs (Smith *et al.* 2004) and giant crabs (Levings *et al.* 2001). Ongoing research and monitoring is currently undertaken through fishers' monthly (CAES) returns data, which is used to inform annual stock assessments for these species. The Fishery is scheduled to undergo a science review during the 2015/16 financial year to reassess the validity of the current stock assessments.

There is no ongoing research identified as part of the WCDSCMF Research Plan for bycatch, ETP species and benthic habitats, as the fishery is considered to be a low risk to these components. Additionally, no other fishery impacts had been identified at the time of publication that warranted further research.

The status and progress of activities required under the WCDSCMF research plan are closely monitored by Departmental research staff to ensure that actions are being undertaken within the designated timeframes. Any issues around milestones, monitoring, reporting, resourcing, etc., relevant to the Plan are discussed with Departmental management staff as they arise. Additionally, the Research Division's Supervising Scientists meet fortnightly to raise any issues, which may include concerns around the timing of delivery of research programs / information. This group develops actions to address slippages, and any significant issues can be included as standing items. The Supervising Scientists group also manages the peer-review process of all fisheries (with external reviewers).

The results arising from projects outlined in the WCDSCMF research plan are made publicly available in a timely manner on the Department's website[44] in the form of FMPs, FRRs and FOPs. The outcomes of monitoring and research undertaken in accordance with the RMAD Plan are also reported in the annual *Status Report of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher & Santoro 2014), which is reviewed by the relevant Supervising Scientist, Executive Director of Research, Director of Aquatic Management and the Deputy Director General. This hierarchy of review ensures not only that each fishery is well covered but also that any impending issues (e.g. early signs of recruitment failure) are identified.

The annual review process, in combination with the periodic external reviews and industry liaison through AMMs permit ongoing identification or re-evaluation of risks in the fishery. In turn this contributes to the identification of any additional data needs or new projects, which leads into an annual update of the Department's RMAD Plan.

15.6 Monitoring and Management Performance Evaluation

There is a system in place for monitoring and evaluating the performance of the WCDSCMF management system against its objectives. An annual review of the fishery's performance is undertaken by Departmental research, management and compliance staff, with outcomes used to assess the extent to which the fishery's management system has met both the long- and short-term objectives of the fishery.

[44] http://www.fish.wa.gov.au/About-Us/Publications/Pages/default.aspx

Performance against the short-term (annual) objectives is measured using the performance indicators, reference levels and management control rules that are explicitly identified in the *WCDSCMF Harvest Strategy*. Where the fishery has failed to meet the short-term objective (i.e. is at or below the threshold reference level for a particular component), a review of the fishery operations, including the management system is triggered. In the case that the review indicates that the management system is not achieving the desired objective, appropriate management action will be undertaken to reduce fishing impacts to an acceptable level through the mechanisms discussed in Section 15.3.

The annual fishery performance outcomes are provided to licence holders at the annual management meeting. The Department is also required to report to Parliament on the stock assessment outcomes for all target species, with this information provided in the Department's *Annual Report.* The fishery performance outcomes for target and retained non-target species, bycatch, ETP species, habitats and ecosystems are also made publically-available in the annual *Status Report of the Fisheries and Aquatic Resources of Western Australia: the state of the fisheries* (e.g. Fletcher & Santoro 2014).

15.6.1 Review of the Management System

Current actions across the management, assessment and monitoring, research and compliance areas for the WCDSCMF for the period of 2011/12 – 2015/16 have been developed in consultation with key stakeholders and are set out in Fish Plan; however, an internal review of the management system can occur at any time should patterns emerge from annual monitoring and evaluation undertaken as part of the harvest strategy. Such reviews may identify management or compliance projects or may indicate the need for major changes to the management system. Any such major changes are reviewed with stakeholders and implemented through the consultation and decision-making frameworks described in Section 14.2).

15.6.1.1 Internal Review

15.6.1.1.1 Review of Fishery Risk Levels

Risk assessments are undertaken periodically (every 3 – 5 years) to reassess any current or new issues that may arise in the fishery; however, a risk assessment can also be triggered if there are significant changes identified in fishery operations or management activities or controls.

Each new risk assessment will inform a major review of the management system, including Fish Plan, the WCDSCMF Research Plan and compliance requirements. This review also takes into account the level of resourcing across the management, research and compliance divisions for the WCDSCMF, which can be modified if the level of risk indicates a change is required.

15.6.1.1.2 Review of Management Strategies

The *WCDSCMF Harvest Strategy* was subject to extensive internal review (within the Department's management and research divisions) in 2014, as part of the preparation for

MSC full assessment. While the next formal review of the *Harvest Strategy* is scheduled to occur in 2020, the appropriateness of the current performance indicators, reference levels and control rules may be further refined and updated in the interim (in consultation with the licence holders) as additional information becomes available (e.g. new research results, updated risk assessments, expert advice, etc.).

15.6.1.2 External Review

15.6.1.2.1 Export Approval under the EBPC Act

The WCDSCMF's management system has been the subject of periodic external review as part of the process undertaken to achieve accreditation by the Commonwealth DoE against the *Guidelines for the Sustainable Management of Fisheries – V2* (the *Guidelines*; CoA 2007).

The WCDSCMF has been assessed under the EPBC Act for the purposes of the protected species provisions (Part 13 of the Act) and the wildlife trade provisions (Part 13A of the Act; see Section 4.5). The latest accreditation in 2013 resulted in an amendment of the list of exempt native specimens (from export controls), which is in place until May 2018.

The most recent assessment (2013) took into account measures that have been developed by the Department in response to conditions and recommendations made in the 2010 assessment of the fishery, with five recommendations provided as part of this assessment:

1. Operations of the fishery will be carried out in accordance with the *WCDSMF Management Plan 2012* in force under the FRMA;
2. The Department to advise the DoE of any intended material change to the fishery's legislated management regime and management arrangements that could affect the assessment against which EPBC Act decisions are based;
3. The Department is to produce and present reports to the DoE annually (as per Annex B of the *Guidelines*);
4. The Department is to finalise performance indicators for the fishery and implement the proposed performance measures;
5. That an Ecological Risk Assessment (ERA) be undertaken for the fishery, either through the MSC accreditation process or by the Department. The ERA should include:
    - A review of the risk levels and updating or developing new objectives, performance measures, management responses and information requirements as appropriate; and
    - Consideration of target species, byproduct, bycatch (including protected species) and impacts on the marine environment.

15.6.1.2.2 Status of Key Australian Fish Stocks

The *Status of Key Australian Fish Stocks Reports* (published in 2012 and 2014)[45] assesses the biological sustainability of the key wild-caught fish stocks against a nationally agreed framework. The reporting framework used was developed collaboratively by fisheries scientists from around Australia and uses standardised terminology and reference points for stock status classifications. Fisheries management also considers other aspects of ESD, such as the effects of fishing on the marine environment, economic performance and governance. Although these issues are not considered in the stock status classification, the reports provide comments on the effects of fishing on the marine environment and environmental effects on the stocks.

A Fish Stock Report for giant crabs, *P. gigas*, was included in both the 2012 and 2014 Reports. This species is retained as a 'byproduct' species in the WCDSCMF, although the majority of the commercial catch occurs along the south coast of WA as part of the SCCF and in South Australian, Victorian and Tasmanian waters. In 2014, the stock status of this species in Australia was classified as 'Transitional-depleting'; however, this classification was based only on the Tasmanian and Victorian parts of the stock, as the majority of the biological stock (in terms of biomass and catch) occurs in these areas (Hartmaan *et al.* 2014).

15.6.1.2.3 MSC Pre-assessment

The WCDSCMF has also undergone a confidential pre-assessment against the MSC Principles and Criteria for Sustainable Fisheries as part of the WA MSC program. The WCDSCMF was included for pre-assessment as part of the Gascoyne Coast Bioregion, which was undertaken by Food Certification International Ltd (FCI). During the pre-assessment process, the FCI assessment team met with a wide range of stakeholders, used the dataset of fisheries statistical information provided and referred to a number of relevant articles and publications. The FCI assessment team took a precautionary approach to scoring, with borderline issues scored down; however, in general, the pre-assessment is considered to give an accurate picture of the *relative position* of the assessed fisheries in relation to the MSC principles and criteria.

The outcomes from the pre-assessment indicated the WCDSCMF was likely to pass at full assessment based on the information available at the time of pre-assessment. The information received on potential fishery issues as part of the pre-assessment have been used to improve the fishery's management system, primarily through updating and amending the existing *WCDSCMF Harvest Strategy*, which has been undertaken primarily by the Department, in consultation with industry.

[45] http://www.fish.gov.au/Pages/SAFS_Report.aspx

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17. Appendices

Appendix A: Catch Disposal Record

CATCH AND DISPOSAL RECORD

PART A (to be completed by nominated operator)

MFL No.:		Authorised Boat Name:		LFB No.:	
Landing Details:	Port:		Time:	Date:	
Details of Persons to whom crabs are to be consigned:			Name:		
Address:					
Fish Processing Licence No. (if applicable):					
Details of Persons retaining any crabs not consigned:			Name:		
Address where crabs are to be taken:					
Details of crabs being retained for personal use:		Species:		Weight:	
Consignment Details:	Name of employer of person transporting crabs:				
Total number of containers in which crabs are contained:					

Net weight of crabs
(a new CDR must be completed for each species caught)

Net weight (kg) landed:		Species:	

I certify that:
(a) The information contained herein is true and correct; and
(b) The crabs described herein were taken for sale in accordance with the *West Coast Deep Sea Crustacean Fishery (Interim) Management Plan 2007*.

Signature of Master:		Name of Master (print):	

CONSIGNMENT RECIEVED

PART B (to be completed by fish processor in BLOCK LETTERS)

Date:		Time:	am/pm	No. of containers:	

Net weight of crabs received

Weight received (kg):		Species:	

Person authorised to receive consignment I certify that the information is complete and accurate		Consignment weighed	
Print Name	Signature	Date:	Time:

Fish Processing Licence No.:	
Stamp of approved receiver	This copy to be retained by nominated operator and must be provided to a Fisheries Officer on demand.

ORIGINAL (white) - This copy must forwarded within 48 hours to Deep sea crab quota monitoring Metropolitan Regional Office, Department of Fisheries, PO Box 496, Fremantle WA 6160.
DUPLICATE (pink) - This copy to accompany consignment to approved receiver and must be forwarded within 24 hours of completion to Deep Sea Crab Quota Monitoring Metropolitan Regional Office, Department of Fisheries, PO Box 496, Fremantle WA 6160
TRIPLICATE (yellow) - This copy to be retained by nominated operator and must be provided to a Fisheries Officer on Demand.

Appendix B: 2014 Internal PSA Risk Assessment Outcomes

Introduction

The West Coast Deep Sea Crustacean Managed Fishery (WCDSCMF) has a number of procedures in place to assess and mitigate the potential impacts of the fishery on target, non-target retained, bycatch and ETPs. These include ecological risk assessments (ERA), spatial closures, limited entry, restrictions on size and reproductive females, gear restrictions and compulsory reporting. All these processes are described in detail in the MSC Report for the WCDSCMF.

In addition to these processes, a Productivity Susceptibility Analysis (PSA) was conducted for all target, retained non-targeted and bycatch species within the WCDSCMF. The PSA approach is based on the assumption that the risk to a species depends on two characteristics: (1) the extent of the impact due to the fishing activity, which will be determined by the susceptibility to the fishing activities (Susceptibility) and (2) the productivity of the species (Productivity), which will determine the capacity of the stock to recover if the population is depleted.

Productivity analysis is determined by the species life history traits, i.e. growth and maturity characteristics, trophic level and fecundity (Table 1). While susceptibility is calculated using the overlap of the fishing area compared with the species range (geographical spread and depth/habitat overlap) the probability of capture if the fishing gear is encountered (e.g. species size v mesh size) and the likelihood of post capture survival (Table 2). There are seven productivity categories and four susceptibility categories. The scores for productivity are combined with susceptibility scores to produce a risk score. PSA scores are divided into low risk (i.e. < 60), medium risk (i.e. 60 – 80) and high risk (i.e. > 80).

Table 1. MSC PSA productivity attributres and scores.

Productivity determinant	Low productivity (high risk score =3)	Medium productivity (medium risk score =2)	High productivity (low risk score =1)
Average age at maturity	15 years	5-15 years	5 years
Average maximum age	25 years	10-25 years	10 years
Fecundity	<100 eggs per year	100-20 000 eggs per year	>20 000 eggs per year
Average maximum size	>300cm	100-300cm	<100cm
Average maximum size at maturity	>200cm	40-200cm	<40cm
Reproductive strategy	Live bearer	Demersal egg layer	Broadcast spawner
Trophic level	>3.25	2.75-3.25	<2.75

Table 2. MSC PSA susceptibility attributes and scores.

Susceptibility determinant	Low susceptibility (Low risk =1)	Medium susceptibility (Medium risk =2)	High susceptibility (High risk =3)
Areal overlap (Overlap of the fishing effort with a species distribution of the stock)	<10% overlap	10-30% overlap	>30% overlap
Vertical overlap (Position of the stock/species within the water column relative to the fishing gear)	Low overlap with fishing gear	Medium overlap with fishing gear	High overlap with fishing gear
Selectivity			
Selectivity for set gillnets – The potential of gear to capture or retain the species	Length at maturity < mesh size or >5m in length	Length at maturity is 1-2 times mesh size or 4-5m in length	Length at maturity >2 times mesh size 4m in length
Selectivity for hooks – Defined by typical weights of the species caught relative to the breaking strain of the snood, the gaffing method used in the fishery and by the diet of the potential species (Scores for hook susceptibility may be assigned using the categories to the right. If there are conflicting answers e.g. low on point 1 but medium on point 2, the higher risk score shall be used.)	a. Does not eat bait (e.g. diet specialist) filter feeder (e.g. basking shark) small mouth (e.g. sea horse) Most robust scoring attribute b. Species with capacity to break line when hooked (e.g. large toothed whales and sharks) c. selectivity unknown to be low from selectivity analysis/experiment (e.g. <33% of fish encountering gear are selected)	a. Large species, with adults rarely caught, but juveniles captured. b. Species with capacity to break snood when being landed. c. selectivity known to be medium from selectivity analysis/experiment (e.g. 33-66% of fish encountering gear are selected)	a. Bait used in the fishery is selected for this type of species and is a known diet preference (e.g. squid bait used for swordfish) or important in wild diet. b. Species unable to break snood when being landed c. selectivity known to be high from selectivity analysis/experiment (e.g. >66% of fish encountering gear are selected)
Selectivity for traps/pots – (Scores for trap susceptibility may be assigned using the categories to the right. If there are conflicting answers e.g. low on point 1 but medium on point 2 the higher risk score shall be used.)	a. Cannot physically enter the trap (e.g. too big for openings, sessile species wrong shape etc.) b. Can enter and easily escape from the trap and no incentive to enter the trap (does not eat bait, trap is not attractive as habitat etc.)	a. Can enter and easily escape from the trap but is attracted to the trap (e.g. does eat the bait, or trap is attractive as habitat) b. Can enter but cannot easily escape from the trap and no incentive to enter the trap (does not eat bait, trap is not attractive as habitat etc.) c. Species occasionally found in trap	a. Can enter but cannot easily escape from the trap and is attracted to either the bait or the habitat provided by the trap. b. Species regularly found in trap
Post capture mortality	Evidence of post capture release and survival	Released alive	Retained species or majority dead when released

The PSA is based on target, non-target retained, bycatch and ETPs. There is very little bycatch in the WCDSCMF, a list of bycatch recorded by on-board observers and video between 2010 and 2014 is provided in Table 3. The PSA assessment was based on this list of bycatch species, and also species which have previously been assessed under the EPBC Act 1999.

Information used to generate the productivity scores was based on Fishbase, (www.fishbase.org), the Department of Environment's Species Profile database (sprat) (http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl) and published peer reviewed literature. Where productivity attributes for a particular species were not available values for a similar species (in the same family) were used. If no productivity scores were available a precautionary approach was used and species were assigned the most conservative score. In some cases, where species identifications were uncertain similar species were grouped together. In these cases, the most conservative score was applied across the group i.e. deep sea sharks.

A summary of the information used to justify the productivity and selectivity scores is provided in Table 4. The results from the PSA with the individual scores for each attribute and a total PSA score and risk rating is provided in Table 5.

Results

The PSA risk rating for most of the target, retained and bycatch species was low (Table 5). Three species / categories were assessed as medium risk; giant crabs (*Pseudocarcinus gigas)*, deep sea sharks and the humpback whale (*Megaptera novaeangliae*). No species were identified as high risk. Whilst some species were identified as medium risk, these ratings were considered overly conservative and the more likely rating is low, justification is provided below.

Giant crabs

Giant crabs scored a medium risk rating, which was mainly due to higher susceptibility scores. Giant crabs are restricted in distribution, along the south coast of Australian, and the very southern end of the WCDSCMF.

There are several management procedures in place which whilst not taken into consideration in the PSA and are likely to reduce the risk rating to low, these include:

- Escape gaps for undersized crabs
- Release of berried females (high survival post release)
- Restricted license holders (7 in total)
- TAC of 14t annually for giant and champagne crabs combined
- Compulsory catch returns

In the decade prior to 2012 giant crab landings were low or zero. Landings increased in 2012 and in 2014 have breached threshold levels triggering a review under the current harvest strategy. If catches are deemed unsustainable management interventions will be implemented.

Deep Sea Sharks

The medium risk rating for deep sea sharks was mainly attributed to low productivity scores, related to late age of maturity, maximum age and bearing live young. The susceptibility of deep sea sharks is relatively low with sharks having a wide distribution and low probability of entanglement or entrapment in traps.

Bycatch monitoring on-board vessels from observers and on-board cameras has identified only two deep sea shark captures between 2010 and 2014. In total 4694 traplifts were observed and the rate of capture was calculated at 0.43 per 1000 traplifts.

Due to the low probability of deep sea shark encounters, and high probability that if captured in traps they are returned to the ocean alive, the risk rating for these species is likely to be low.

Humpback whales

Humpback whales were identified as medium risk in the PSA. The medium score is related more to low productivity rather than susceptibility to fishing gear.

There has been one record of a humpback whale becoming entangled with fishing gear associated with the WCDSCF since the commencement of the fishery in 1990. This one individual was disentangled and was released unharmed. The use of heavy ropes, and the minimal number of ropes (i.e. <25 throughout the whole fishery), spaced long distances apart reduces the risk of entanglement of whales. Furthermore the migratory paths of humpback whales along the Western Australian Coast is typically within the 200 m bathymetry (Jenner *et al.* 2001), which is typically a depth not targeted by the WCDSCMF.

The risk of whale entanglement in ropes is higher in the western rock lobster industry which typically operates in <150 m of water. Whale entanglements in the western rock lobster fishery are the subject of two Fisheries Research and Development Corporation (FRDC) research projects, one examining whale migration patterns and the other exploring gear modifications to mitigate potential entanglements.

Table 3. List of observed bycatch from on-board monitoring (observer and video) between 2010 and 2014. Data are standardised to catch rate per traplift.

Common Name	Taxonomic Name	2010	2011	2012	2013		2014		Total	Catch Rate (/1000 traplift)
		Monitoring	Monitoring	Monitoring	Video	Monitoring	Video	Monitoring		
Squat lobster	*Dagnaudus* sp	0	0	4	0		0	0	4	0.85
Sea urchin	Echinoidea (Class)	0	0	1	0		0	0	1	0.21
Red spider crab	*Lithodes rachelae*	1	0	1	0		0	0	2	0.43
Octopus	*Octopus sp*	0	0	2	0		0	0	2	0.43
Shark		0	0	2	0		0	0	2	0.43
Furry spider crab	*Paralomis sp*	0	0	2	0		0	0	2	0.43
Hermit crab	Paguroidea	0	0	0	0		0	0	1	0.21
Fish (unknown)		0	0	0	0		0	0	1	0.21
# traps sampled		210	646	1093	1651		164	348	4694	

Table 4. Productivity and Susceptibility attributes and associated explanations of species (or groups) included in PSA

Species/Group	Productivity							Susceptibility				Comments
	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy (BS - broadcast spawner DEL - demersal egg layer LB - live bearer)	Trophic level	Availability (Areal overlap)	Encounterability (Vertical overlap)	Selectivity	Post-capture mortality	
Retained species												
Crystal (snow) crab (*Chaceon albus*)	12 M/F	At least 25-30y	192 000	12-13 cm F 15-16 cm M	9.05 cm F 9. 43 cm M	BS		<10%	High	Med	Ret	*Source:* Melville Smith *et al.* 2007
Champagne (spiny) crab *(Hypothalassia acerba*)	-	-	356 210	11.5-12 cm. F 13.0-13.5 M	6.97 cm F 6.81 cm M	BS		<10%	High	Med	Ret	*Source:* Smith, *et al.* 2004 Hall *et al.* 2006
Giant crab (*Pseudocarcinus gigas)*	-	-	830 000 – 2500000 (size dep)	West Aus 17-18 cm F 19-20 cm S&E coast 18-19 cmF 22-23 cm M	West Aus 11.2 cm F 12.7 cm M Sth and E Coast 12.2-13.0 cm F 12.6-14.2 cm M	BS		<10%	High	Med	Ret	*Source:* Gardner and Williams 2002 Gardner 1997 Levings *et al.* 2001

Species/Group	Productivity							Susceptibility				Comments
	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy (BS - broadcast spawner DEL - demersal egg layer LB - live bearer)	Trophic level	Availability (Areal overlap)	Encounterability (Vertical overlap)	Selectivity	Post-capture mortality	
Bycatch species												
Deep Sea shark (Overall assessment)	> 15 y	>25 y	< 100 eggs	100-300 cm	40-200 cm	LB	4.3 0.3	<10%	Low	Med	High	EPBC Listing: None IUCN Listing: Vulnerable CITES Listing: None *Source:* Last and Stevens 2009 www.fishbase.org. www.iucnredlist.org *Notes:* Based on *Squalus species particularly S.megalops*
Western Rock lobster (*Panulirus cygnus*)	4.9-5.6 yrs 6-7 yrs cold waters	15 years	200, 000 to 1,200,000 dep on size	20 cm	Variable with location 65.0 to 87.5 females	BS		< 10%	Low	High	Low	*Source:* Bellchambers *et al.* 2012 Phillips *et al.* 1980
Other deep sea crab species	5-15 years	> 15 y	> 20,000 per y	100-300 cm	40-200 cm	BS		<10%	High	High	Low	Based on information collected for *Chaecon albus*, *Hypothalassia acerba* and *Pseudocarcinus gigas*
Hermit crab	< 5 y	< 10	100-20,000 per y	< 100 cm	< 40 cm	?		<10%	High	Med	Low	Super family Paguroidea. Over 1100 species. *Source:* www.marinespecies.org
Octopus *(Octopus tetricus*)	0.5 yr	1-2 yr	125,000-700,000	-	100-50 g M 1000-2000 g F	DEL		<10%	High	Med	Low	*Source:* Joll 1983 Wadley and Dunning 1998
Sea lice (*Bathynomus giganteus*)			100-20,000 per yer	36 cm	21 cm M 18-19 cm F	BS?		<10%	High	Med	Low	Scavengers or Parasites *Source:* Briones-Fuorza'n and Lozano-Alvarex 1991
Solitary corals	< 5 y	?	100-20,000 per y	< 100 cm	< 40 cm	BS		<10%	High	Low	Low	79 genera *Source:* www.marinespecies.org http://coral.aims.gov.au/info/factsheets.jsp

Species/Group	Productivity							Susceptibility				Comments
	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy (BS - broadcast spawner DEL - demersal egg layer LB - live bearer)	Trophic level	Availability (Areal overlap)	Encounterability (Vertical overlap)	Selectivity	Post-capture mortality	
Echinoderms	< 5 y	?	>20,000 per year	< 100cm	< 40 cm	BS		<10%	High	Med	Low	Phylum Echinodermata with over 7000 species Source: *Source:* www.marinespecies.org
Brittle star	< 5 y	< 10	100-20,000 per year	< 100 cm	< 40 cm	BS		<10%	High	Med	Low	Class Ophiuroidea with over 2000 species Source: *Source:* www.marinespecies.org
Molluscs	< 5 y	?	100-20,000 per year	<100 cm	< 40 cm	DEL		<10%	High	Med	Low	Phylum Mollusca over 85000 species Source: *Source:* www.marinespecies.org
Deep Sea fish	-	-	8,000	8.3 cm	6 cm	BS	3.4 0.45	<10%	Low	Med	High	*Source:* Hulley *et al.* 1998 www.fishbase.org. *Notes:* Myctophidae account for 65% of all deep sea biomass. Based on *Myctophum nitidulum*

Species/Group	Productivity							Susceptibility				Comments
	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy (BS - broadcast spawner DEL - demersal egg layer LB - live bearer)	Trophic level	Availability (Areal overlap)	Encounterability (Vertical overlap)	Selectivity	Post-capture mortality	
ETP species – Direct capture												
Humpback whale (*Megaptera novaeangliae*)	4-8 years	48 years	1 calf every 2-3 years	16 m		LB		<10%	Low	Low	Low	EPBC Listing: Vulnerable, Cetacean, Listed migratory - Bonn IUCN Red List: Least Concern CITES: Appendix I *Source:* www.iucnredlist.org www.environment.gov.au/sprat www.checklist.cites.org Jenner *et al.* 2001 *Notes:* Populations are recovering from whaling at a rate of around 10% per year Whale migratory route is outside of 200m isobath
Leatherback turtles *(Dermochelys coriacea)*	13-14 although could be 20 years	30 years	60-120 eggs 4-5 times per season, nesting every 2-3 years	At least 1.6 m - F	-	Terrestrial nests		<10%	Low	Low	Low	EPBC Listing: Endangered, Listed Marine, Listed Migratory - Bonn IUCN Listing: Vulnerable CITES: Appendix I *Source:* www.iucnredlist.org www.environment.gov.au/sprat www.checklist.cites.org

Table 5. PSA scores for target, non-target retained, bycatch and ETPs, with the overall risk rating and MSC scoring guidepost

Category	Scientific name	Common name	Gear type	Productivity Scores [1-3]							Total Productivity (average)	Susceptibility Scores [1-3]				Total (multiplicative)	PSA Scores			MSC scoring guidepost
				Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level (fishbase)		Availability	Encounterability	Selectivity	Post-capture mortality		PSA Score	MSC Score	Risk category name	
Target	*Chaecon albus*	Crystal (snow) crab	Trap	2	3	1	1	1	1	2	1.57	1	3	2	3	1.43	2.12	92.9	Low	>80
Retained	*Hypothalassia acerba*	Champagne (spiny) crab	Trap	2	3	1	1	1	1	2	1.57	1	3	2	3	1.43	2.12	92.9	Low	>80
Retained	*Pseudocarcinus gigas*	Giant crab	Trap	2	3	1	1	1	1	2	1.57	3	3	2	3	2.33	2.81	74.6	Med	60-80
Bycatch	*Squalus megalops*	Deep Sea shark	Trap	3	3	3	2	2	3	3	2.71	1	1	2	2	1.08	2.92	70.5	Med	60-80
Bycatch	*Panulirus cygnus*	Western rock lobster	Trap	2	2	1	1	1	1	2	1.43	1	3	2	1	1.13	1.82	97.4	Low	>80
Bycatch	Other deep sea crabs	Other deep sea crabs	Trap	2	3	1	1	1	1	2	1.57	1	3	2	1	1.13	1.93	96.0	Low	>80
Bycatch	Hermit crab	Hermit crab	Trap	1	1	2	1	1	1	1	1.14	1	3	2	1	1.13	1.60	99.3	Low	>80
Bycatch	*Octopus tetricus.*	Octopus	Trap	1	1	1	1	1	2	3	1.43	1	3	2	1	1.13	1.82	97.4	Low	>80
Bycatch	*Sea lice*	Sea lice	Trap	1	1	2	1	1	1	1	1.14	1	3	2	1	1.13	1.60	99.3	Low	>80
Bycatch	*Solitary corals*	Solitary corals	Trap	1	1	2	1	1	1	1	1.14	1	3	1	1	1.05	1.55	99.5	Low	>80
Bycatch	*Echinoderms*	Echinoderms	Trap	1	1	1	1	1	1	1	1.00	1	3	2	1	1.13	1.51	99.7	Low	>80
Bycatch	*Brittle star*	Brittle star	Trap	1	1	2	1	1	1	1	1.14	1	3	2	1	1.13	1.60	99.3	Low	>80
Bycatch	*Molluscs*	Molluscs (Gastropods)	Trap	1	1	2	1	1	2	1	1.29	1	3	2	1	1.13	1.71	98.5	Low	>80
Bycatch	*Myctophum nitidulum*	Deep Sea fish	Trap	2	2	2	1	1	1	3	1.71	1	1	2	3	1.13	2.05	94.1	Low	>80
ETP	*Megaptera novaeangliae*	Humpback whale	Trap	1	3	3	3	3	3	3	2.71	1	1	1	1	1.00	2.89	71.5	Med	60-80
ETP	*Dermochelys coriacea*	Leatherback turtle	Trap	3	3	3	2	2	2	2	2.43	1	1	1	1	1.00	2.63	80.5	Low	>80

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Appendix C: Catch and Effort Return

Original (white) – post to Department of Fisheries Duplicate (yellow) – retain for your records 8011566

Office Use

Trap and line: catch and effort return

Fish Resources Management Regulations 1995 Regulation 64

Year	Month	Boat registration LFB	Boat name
Fishing Boat Licence FBL		Managed fishery licence(s) MFL	
Anchorage		Master's CFL No.	Master's name
Months you propose not to fish		Phone no.	Address
No. days fished	Crew number (inc master)	Fuel purchased (litres)	I certify that the information on this form is correct. (Master, authorisation holder or agent) / Date signed

Fishery e.g. NDS, (one fishery per column)					Fishery e.g. WL, EXEM			
If applicable Zone fished (one zone per column)					If applicable Zone fished			
Trap and line methods e.g. LL (one method per column)					Other methods e.g. HN			
Block number (one block per column)					Block number			
Days fished					Days fished			
Hours fished per day					Hours fished per day			
Pots/traps pulled per day					Pots/traps pulled per day			
Hooks per day					Hooks per day			
Shots/pulls per day					Shots/pulls per day			
					Net length (m) per shot			
					Mesh size range (mm)			

Species (include all retained catch)	Condition codes	kg	kg	kg	kg	Species (include all retained catch)	Condition codes	kg	kg

Dealer/processor	Crew names
Have you had an interaction with a protected species? Yes ☐ No ☐ If yes, was animal released Alive ☐ Dead ☐	Species, location and other comments

Notification of months when no fishing occurred is required on this form. A signed facsimile of this form may be submitted

Appendix D: Volunteer Logbook Form

Deep Sea Crustacean Log Sheet

98001

BOAT NO.	BOAT NAME	SKIPPER	POT TYPE eg. Amateur rock lobster, Steel Beehive, Fathoms plus	BAIT USED	TARGET SPECIES CODES				
					CRYSTAL (SNOW) CRAB (SnC)	CHAMPAGNE (SPINY) CRAB (SpC)	GIANT (KING) CRAB (GC)	SOUTHERN ROCK LOBSTER (SRL)	WESTERN ROCK LOBSTER (WRL)

DATE (DAY GEAR IS RETRIEVED)	LINE NUMBER	TARGET SPECIES	No. POTS (IN LINE)	FISHING LOCATION Please record the START and END details – for each pot line fished; or the START details only – for each group of individual pots used in the same depth.						SOAK TIME (Days)	CATCH 1 (Species Name)					CATCH 2** (Species Name)			REMARKS
				START			END				CATCH	DISCARDED (numbers)				CATCH	DISCARDED (numbers)		
				LATITUDE	LONGITUDE	DEPTH Specify Metres or Fathoms	LATITUDE	LONGITUDE	DEPTH Specify Metres or Fathoms		Specify Kilograms Baskets* Numbers*	Berried	Small	Soft	Dead	Specify Kilograms Baskets* Numbers*	Berried	Small	

NOTE: * IF CATCH IS GIVEN IN BASKETS OR NUMBERS PLEASE PROVIDE AN ESTIMATE OF THE AVERAGE WEIGHT PER BASKET OR ANIMAL; ** CATCH 2 CAN BE USED TO RECORD A SECOND COMMERCIAL SPECIES.

Bycatch Type and approximate number of all non-commercial animals caught in pots; note any interactions (death/entanglement) of fishing gear with marine mammals, turtles or birds for the period recorded above

NOTE: TEAR OUT AND RETURN THE ORIGINAL COPY (THE WHITE SHEET) AND KEEP THE DUPLICATE (THE YELLOW SHEET) IN THE BOOK FOR YOUR PERSONAL USE.

Appendix E: Fish Processor Return

PROCESSOR MONTHLY RETURN FPR 7000005

FISH RESOURCES MANAGEMENT REGULATIONS 1995 Reg 64

For the return of fish other than rock lobsters, prawns or scallops

PLEASE COMPLETE IN BLOCK LETTERS

Office Use Only	Year	Month	Processor Licence Number	Name and Address (of processing establishment)	
	Authorised Person (Printed)			Authorised Signature	Date Signed

Species	Cond./Grade (see codes)	Received Weight (Kg)	Average Price Paid ($Kg)

If you record a monthly total of catch received, please record the total weight here:

If there is no production for a month please submit a 'Nil' return.

Appendix F: On-board Commercial Monitoring Datasheet

DEPARTMENT OF FISHERIES
DEEPSEA CRAB CATCH MONITORING DATASHEET

LFB Number		MEASURER	
DATE		SOAK TIME (DAYS)	
START TIME		LINE NUMBER	
START LATITUDE (DEG/MIN		CRABS MEASURED	
START LONGITUDE (DEG/MI			
START DEPTH (FM) or (M)			PAGE OF

	Pot NO"	SEX (M / F)	MAT MARKS (Y / N)	CRPC LNGTH (mm)	SHELL STATE (1-3)	BERRIED STATE (1-4)	LIMBS MISSING (R1-5, L1-5)	SOFT MOULT (Y)	dead	COMMENTS
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
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Please return this sheet to: Deepsea Crab Research, Western Australian Marine Research Laboratories, P.O. Box 20 North Beach, WA 6920. Ph (08) 9246 8444

Appendix G: Tag Return Datasheet

DEPARTMENT OF FISHERIES WA - DEEP SEA CRAB RESEARCH
TAG RECAPTURE DATASHEET

SAMPLING GROUP (CIRCLE): FISHERIES / INDUSTRY

LFB _____ BOAT NAME _____ SKIPPER _____ CRAB SP _____

	DATE	TAG NO.	RECAPTURE LOCATION LATITUDE	RECAPTURE LOCATION LONGITUDE	DEPTH (m)	SEX (M or F)	MAT MARKS (Y or N)	SHELL STATE (1 - 3)	TAG PUNCTURE HOLE (OLD/NEW)	CRPC LNGTH (mm)	EGG STAGE (Y, 1 - 4)	LIMBS MISSING (R1-5,L1-5)	SOFT (Y)	DISPOSAL (R=Kept, R=Released)	RELEASE LOCATION LATITUDE	RELEASE LOCATION LONGITUDE	DEPTH (m)	COMMENT
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

Return to: Deep sea crab research, Western Australian Fisheries and Marine Research Laboratories, P.O. Box 20 North Beach, WA 6920. Ph (08) 9203 0111

Appendix H: FMO Daily Patrol Contacts

Government of Western Australia
Department of Fisheries

FMO Daily Patrol Contacts

District: ____________ Page ____ of ____

Date: ___ / ___ / ___   Patrol Start: ___:___ Patrol Finish: ___:___

Reporting Officer: ____________   Other FMOs: ____________
(Please print full names)
Other FMOs: Non FMOs:

Major Projects (specify)	
%	%

CF Field Compliance				
RF	MCF	AQ	MS	MPA
%	%	%	%	%

ACTIVITY	AREA	ARRIVE TIME	DEPART TIME	SZ/PA Compliant?	Insp Time	Rego/LFB	Fishery Code(s)	Contact Type	# of Contacts / POB	MSI Full Check	Bag Limit?	BL Sp. / Offences / MS Speed MS non-compliant items (ST RE LJ AL BB FL FX RD PF EP) Comments
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	
		:	:	☐	:			T P C G A		Y N	Y	

L – Land based (other than W, R, P)   S – At sea on commercial Vessel   P – Processor
V – Aboard Fisheries WA small vessel   Z – Walcott, Houtman or Hamelin   R – Roadside checkpoint
O – At Sea on other Agency vessel   W – Wholesale/Retail   A – Aerial | D - Diving

Return to: Compliance Statistics Unit - PO Box 20, North Beach, WA 6920
modified 23-Jan-15