



Department of  
**Primary Industries and  
Regional Development**

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**South Coast Offshore Crustacean  
Resource of Western Australia  
Harvest Strategy**

**Version 1.1**

July 2023

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## Version control

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## Important disclaimer

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## Contents

<b>1.0 INTRODUCTION</b> .....	<b>1</b>
<b>1.1 Review Process</b> .....	<b>1</b>
<b>2.0 SCOPE</b> .....	<b>2</b>
<b>2.1 Environmental Context</b> .....	<b>3</b>
2.1.1 West Coast Bioregion .....	4
2.1.2 South Coast Bioregion .....	4
<b>2.2 Target Species</b> .....	<b>5</b>
2.2.1 Crystal crab .....	5
2.2.2 Champagne crab .....	5
2.2.3 Giant crab .....	6
2.2.4 Southern rock lobster .....	7
2.2.5 Western rock lobster .....	7
<b>2.3 Fishing Activities</b> .....	<b>8</b>
2.3.1 Governance .....	8
2.3.2 Commercial Fishing .....	9
2.3.3 Recreational Fishing .....	11
2.3.4 Customary Fishing .....	11
<b>2.4 Catch-Share Allocations</b> .....	<b>11</b>
<b>3.0 HARVEST STRATEGY</b> .....	<b>12</b>
<b>3.1 Long-term Objectives</b> .....	<b>12</b>
3.1.1 Ecological Sustainability .....	12
3.1.2 Economic and Social Benefits .....	13
<b>3.2 Operational Objectives</b> .....	<b>13</b>
<b>3.3 Harvesting and Management Approach</b> .....	<b>13</b>
<b>3.4 Ecological Sustainability</b> .....	<b>14</b>
3.4.1 Performance Indicators and Reference Levels .....	15
3.4.1.1 Target Species .....	15
3.4.1.2 Retained species .....	15
3.4.1.3 Other Ecological Assets .....	16
3.4.2 Application of Harvest Control Rules .....	16
3.4.2.1 Recovering Depleted Stocks .....	17

<b>3.5 Fishery Performance</b> .....	<b>24</b>
3.5.1 Economic and Social Benefits .....	24
3.5.1.1 Commercial Sector Economic and Social Benefits .....	24
3.5.1.2 Recreational Sector Economic and Social Benefits .....	25
<b>3.6 Monitoring and Assessment Procedures</b> .....	<b>25</b>
3.6.1 Information and Monitoring .....	25
3.6.1.1 Commercial Fishing Information .....	25
3.6.1.2 Recreational Fishing Information .....	25
3.6.2 Assessment Procedures .....	26
3.6.2.1 Target Species .....	26
3.6.2.2 Retained Species .....	26
3.6.2.3 Risk Assessments.....	27
<b>4.0 MANAGEMENT MEASURES AND IMPLEMENTATION</b> .....	<b>27</b>
<b>4.1 Management Measures</b> .....	<b>27</b>
<b>4.2 Implementing changes to the Management arrangements</b> .....	<b>28</b>
4.2.1 Consultation.....	29
4.2.1.1 Commercial Sector Consultation.....	29
4.2.1.2 Recreational Sector Consultation.....	29
4.2.1.3 Consultation with Other Groups .....	30
<b>5.0 COMPLIANCE AND ENFORCEMENT</b> .....	<b>30</b>
<b>5.1 Operational Compliance Plans</b> .....	<b>30</b>
<b>5.2 Compliance Strategies</b> .....	<b>31</b>
<b>6.0 REFERENCES</b> .....	<b>32</b>
<b>7.0 APPENDICES</b> .....	<b>37</b>
<b>7.1 Appendix 1 – Target resource categories and assessment method...</b>	<b>37</b>
<b>7.2 Appendix 2 – Generational target species information</b> .....	<b>38</b>
<b>7.3 Appendix 3 – Recovery strategy</b> .....	<b>39</b>
7.3.1 Introduction .....	39
7.3.2 Objective.....	39
7.3.3 Recovery approach .....	40

## List of Acronyms

ARMA	<i>Aquatic Resources Management Act 2016</i>
ASL	Australian Sea Lion
CAES	Catch and Effort Statistics
CDR	Catch and Disposal Record
CL	Carapace Length
DBCA	Department of Biodiversity, Conservation and Attractions
DPIRD	Department of Primary Industries and Regional Development
EBFM	Ecosystem Based Fisheries Management
EEZ	Exclusive Economic Zone
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ERA	Ecological Risk Assessment
ERLMF	Esperance Rock Lobster Managed Fishery
ESD	Ecologically Sustainable Development
ETP	Endangered, Threatened and Protected (species)
FRDC	Fisheries Research and Development Corporation
FRMA	<i>Fish Resources Management Act 1994</i>
FRMR	<i>Fish Resources Management Regulations 1995</i>
HCR	Harvest Control Rule
ITQ	Individually Transferable Quota
MSC	Marine Stewardship Council
MSY	Maximum Sustainable Yield
OCP	Operational Compliance Plan
SCB	South Coast Bioregion
SCCMF	South Coast Crustacean Managed Fishery
SCMP	South Coast Marine Park
SCOC	South Coast Offshore Crustacean
SLED	Sea Lion Exclusion Device
SRL	Southern Rock Lobster
TACC	Total Allowable Commercial Catch
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WCB	West Coast Bioregion
WHARLMF	Windy Harbour-Augusta Managed Fishery
WRL	Western Rock Lobster

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## 1.0 Introduction

Harvest strategies for aquatic resources in Western Australia (WA) that are managed by the Department of Primary Industries and Regional Development (DPIRD, the Department) are formal documents that ensures decision-making processes are consistent with the principles of Ecologically Sustainable Development (ESD; Fletcher 2002) and Ecosystem Based Fisheries Management (EBFM; Fletcher et al. 2012). The objectives of ESD are reflected in the objects of the *Fish Resources Management Act 1994* (FRMA) and the *Aquatic Resources Management Act 2016* (ARMA), which is anticipated replace the FRMA once enacted. At this point, the *Fish Resources Management Regulations 1995* (FRMR) is also anticipated to be replaced by ARMA regulations (Aquatic Resources Management Regulations).

The South Coast Offshore Crustacean (SCOC) Harvest Strategy has been developed in line with the Department's Harvest Strategy Policy for Aquatic Resources (Department of Fisheries 2015) and is consistent with relevant national harvest strategy policies and guidelines (e.g. Sloan et al. 2014; Department of Agriculture and Water Resources 2018a, b). It makes explicit the performance indicators, reference levels, and harvest control rules designed to achieve the specific long- and short-term management objectives for the resource, and the broader goals of ESD and EBFM.

The publication of this harvest strategy is intended to make the decision-making considerations and processes for the management of specified aquatic resources publicly transparent and provide a basis for informed dialogue on management actions with resource users and other stakeholders (Department of Fisheries 2015).

This strategy provides guidance for decision-makers, but do not derogate from or limit the exercise of discretion required for independent decision-making by the Minister for Fisheries, the Director General of DPIRD, or other delegated decision-makers in order to meet the objects of the FRMA or ARMA.

Consistent with the Department's Stakeholder Engagement Guideline (Department of Fisheries 2016), this harvest strategy has been subjected to formal stakeholder consultation with industry members and peak commercial and recreational fishing sector bodies, as well as public consultation processes.

### 1.1 Review Process

The Department's Harvest Strategy Policy recognises that fisheries change over time and that a review period should be built into each harvest strategy to ensure that it remains relevant (Department of Fisheries 2015). This harvest strategy is scheduled to remain in place for a period of five years, after which time it will be fully reviewed. If required, however, it may be subject to review and amended within this five-year period. As the SCOC Harvest Strategy has been drafted at a time when the proposed South Coast Marine Park (SCMP) planning process is still underway, a review may be required before the regular five-year cycle pending the outcomes of the SCMP process.

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## 2.0 Scope

The SCOC Harvest Strategy covers the South Coast Offshore Crustacean Resource of Western Australia (WA) and the fishing activities that directly influence this resource. For the purpose of this harvest strategy, the SCOC Resource covers all WA waters between the South West Cape (34° 24' south latitude) and the WA/South Australian border excluding Princess Royal Harbour (Figure 1). Currently the SCOC Resource comprises five target species; three species of deep-sea crabs: champagne crab (*Hypothalassia acerba*), crystal crab (*Chaceon albus*) and giant crab (*Pseudocarcinus gigas*); and two species of spiny lobsters: southern rock lobster (*Jasus edwardsii*) and western rock lobster (*Panulirus cygnus*).

The SCOC resource is harvested primarily by the commercial South Coast Crustacean Managed Fishery (SCCMF) by uses of potting. Recreational catches are taken by both potting and diving but due to the offshore distribution of the crabs within this resource, the catches of the recreational sector are generally restricted to southern and western rock lobster.

In addition to considering fishing impacts on target and retained species, the SCOC Harvest Strategy also covers impacts on other retained species, bycatch<sup>1</sup>; endangered, threatened and protected (ETP) species; habitats and ecosystems, to ensure any risks to these elements are managed effectively. Note that this harvest strategy currently only considers the impact on these ecological components by commercial fishing activities in the SCCMF fishery, where the majority of targeted fishing for the SCOC Resource occur.

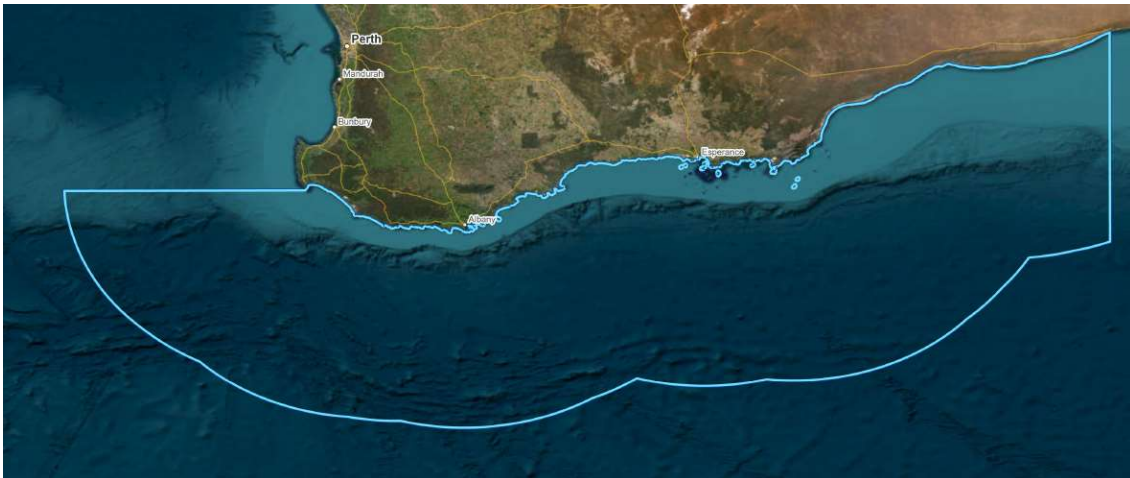


Figure 1. Boundary of the South Coast of Western Australia.

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<sup>1</sup> *Bycatch* is described as the part of the catch which is returned to the sea (usually referred to as non-retained, unwanted or discarded) either because it has no commercial value or because legislative requirements preclude it being retained.

## 2.1 Environmental Context

The SCOC Resource encompasses the coastal, continental shelf and slope aquatic environments out to the Australian Exclusive Economic Zone (EEZ; 200 nm boundary), which includes all WA waters between the South West Cape and the WA/South Australian border (Figure 1 above). Given the extensive area, the aquatic environment stretches from the southern part of the West Coast Bioregion (WCB) and across all of the South Coast Bioregion (SCB) (Figure 2 below).

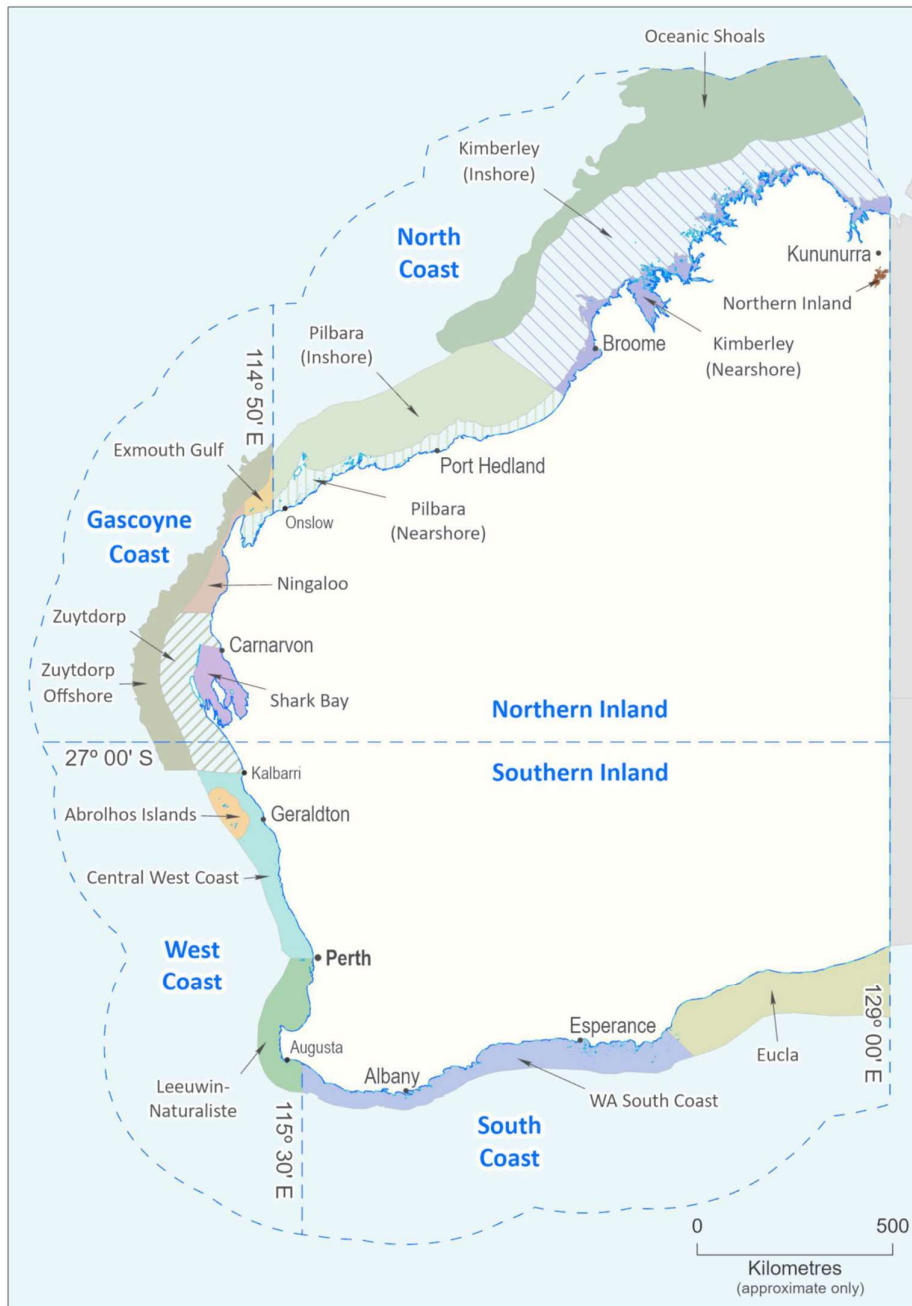


Figure 2. DPIRD Bioregions (blue labels) and Integrated Marine and Coastal Regionalisation of Australia ecosystems.



### **2.1.1 West Coast Bioregion**

The WCB extends from just north of Kalbarri (27.70°S, 114.16°E) to Augusta (34.31°S, 115.16°E) (Figure 2). It is predominantly a temperate oceanic zone, but it is heavily influenced by the Leeuwin Current which transports warm tropical water, and some tropical species, southward along the edge of the continental shelf. Most fish species in the WCB are temperate, in keeping with the coastal water temperatures that range from 18°C to about 24°C. The Leeuwin Current also supports the hard coral reef system at the Houtman Abrolhos Islands (latitude 29°S) and the extended southward distribution of many tropical species along the WCB and even into the SCB.

The Leeuwin Current, which can be up to several hundred kilometres wide along the WCB, flows most strongly in autumn/winter (April to August). The current is variable in strength from year-to-year, flowing at speeds typically around 1 knot, but has been recorded at 3 knots on occasions. The annual variability in current strength is reflected in variations in Fremantle sea level and is related to El Niño Southern Oscillation (ENSO) events in the Pacific Ocean. Weaker counter-currents, such as the cooler Capes Current that flows northward from Cape Leeuwin to as far as Shark Bay, flow along the inner shelf (shoreward of the Leeuwin Current) during summer and influence the distribution of many of the coastal finfish species.

The warm, low-nutrient water of the Leeuwin Current influences the growth and distribution of the temperate seagrasses that form extensive meadows in protected coastal waters of the WCB, generally in depths of < 20 m (but up to 30 m), and act as major nursery areas for many fish species.

The WCB is characterised by exposed sandy beaches and a limestone reef system that creates surface reef lines, often about 5 km off the coast. Further offshore, the continental shelf habitats are typically composed of coarse sand interspersed with low limestone reef associated with old shorelines. Southward of Cape Naturaliste, the coastline changes from limestone to predominantly granite and becomes more exposed to the influences of the Southern Ocean.

### **2.1.2 South Coast Bioregion**

The SCB extends east from Augusta (34.310°S, 115.16°E) to the South Australian border (Figure 2). The continental shelf waters of the SCB are generally temperate but low in nutrients, due to the seasonal winter presence of the tail of the tropical Leeuwin Current and limited terrestrial run-off from an infertile landscape. Sea surface temperatures typically range from approximately 15°C to 21°C, which is warmer than would normally be expected in these latitudes due to the influence of the Leeuwin Current. The effect of the Leeuwin Current, particularly west of Albany, limits winter minimum temperatures (away from terrestrial effects along the beaches) to about 16°C to 17°C. Fish stocks in this region are predominantly temperate, with many species' distributions extending right across southern Australia. Tropical species are occasionally found, mostly brought into the area as larvae by the Leeuwin Current.

The SCB is a high-energy environment, heavily influenced by large swells generated in the Southern Ocean. The coastline from Cape Leeuwin to Israelite Bay is characterised by white sand beaches separated by high granite headlands. East of

Israelite Bay, there are long sandy beaches backed by large sand dunes, until replaced by high limestone cliffs at the South Australian border. There are few large areas of protected water in the SCB, the exceptions being around Albany and in the Recherche Archipelago off Esperance.

The marine habitats of the SCB are similar to the coastline, having fine, clear sand sea floors interspersed with occasional granite outcrops and limestone shoreline platforms and sub-surface reefs. A mixture of seagrass and kelp habitats occurs along the coast, with seagrass more abundant in protected waters and some of the more marine estuaries. The kelp habitats are diverse but dominated by the relatively small *Ecklonia radiata*, rather than the larger kelps expected in these latitudes where waters are typically colder and have higher nutrient levels.

## **2.2 Target Species**

### **2.2.1 Crystal crab**

Crystal crab (*Chaceon albus*) is a large (maximum size > 180 mm carapace width) Geryoniidae crab that is endemic to WA and distributed from North-West Cape to Esperance. It is found from 300 to 1,450 m depths in sand, mud or broken shell habitats. The species was originally thought to be the Pacific congener, *Chaceon bicolor*, until described as a new species (Davie et al. 2007).

Tagging studies indicate crystal crabs are slow-growing and long-lived with a likely maximum age of 25 to 30 years. Studies indicate that maturity in males is attained at 12 years and legal size at 14 years (Melville-Smith et al. 2007). There is little evidence of seasonality in the crystal crab reproductive cycle, and spawning occurs year-round (Smith et al. 2004; Melville-Smith et al. 2007). Size at maturity in males has been estimated at 94.3 mm (Hall et al. 2006) and in females at 90.5 mm (Smith et al. 2004), although this may be an underestimate due to the greater catchability of mature animals.

There is no information on the stock structure of crystal crabs on the west or south coasts of WA. Preliminary information suggests the movement of crystal crabs is limited (< 50 km), although this is currently being re-examined. There is no information on the larval duration of crystal crabs. A relative (*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 short larval duration, which implies limited dispersal during the larval stage. As most of the west coast and south coast catches come from relatively small geographic areas, the population on each coast is considered a single unit for management purposes. A Fisheries Research and Development Corporation (FRDC) funded project is currently underway to assess the genetic stock structure of crystal crabs on both the west and south coasts of WA.

### **2.2.2 Champagne crab**

Champagne crab (*Hypothalassia acerba*) is a large (~140 mm carapace length (CL), 2 kg) decapod crustacean occurring in deep sea waters off the WA coastline, from

approximately Kalbarri on the west coast, to Eucla on the south coast (Smith et al. 2004) at depths of 90 to 310 m.

The age and growth of champagne crab has not been studied, however, like other deep-sea species they are presumed to be relatively long lived and slow growing, with a likely age at maturity of > 10 years. Mean sizes of captured champagne crabs varies between the sexes (larger males) and time of year captured. Peak catch rates occur at depths of 200 m on the west coast of WA, compared to 145 m on the south coast. This difference may be due to temperature between the two regions, with 16.1–17.1 °C being the preferred range for champagne crab (Smith et al. 2004).

Little is known about the movements of champagne crabs. Smith et al. (2004) tagged 1,622 champagne crabs, of which 28 were recaptured, mostly within 50 km of their release. A small number demonstrated most substantial along-shelf movements (~200 km) in both a northwest and southwest direction.

There is limited information on the stock structure of champagne crab. Populations on the west and south coast differ in their reproductive characteristics, suggesting some degree of separation (Smith et al. 2004). A FRDC-funded project is currently underway to assess the genetic stock structure of champagne crabs on both the west and south coasts of WA. Currently, the population on each coast is considered a single unit for management purposes.

### **2.2.3 Giant crab**

The giant crab (*Pseudocarcinus gigas*) is a large (up to 17.6 kg) decapod crustacean of the family Menippidae. It occurs on the continental shelf and shelf break across southern Australia from Perth Canyon, WA, to the central coast of New South Wales, mostly at depths of 120 to 370 m (Gardner 1998; Levings et al. 2001).

Individuals inhabit the steep terrain of the continental shelf, where they move upwards into warmer waters to access the more abundant benthic food resources and move into deeper waters to moult and to spawn. Males are captured from a wider depth range than females, with the majority of individuals captured at depths less than 120 m being male (Levings et al. 2001). Giant crabs have a larval duration of approximate 50 days. Larvae are released at the shelf edge which is an area of high current flow that facilitates larval dispersal (Gardner 1998; Gardner and Quintana 1998; Williams et al. 2009).

Giant crabs are long-lived and slow growing. Growth parameters indicate a maximum age of ~25 years and maximum size of 460 mm CL. In South Australia females moult during winter (June and July), while males moult in summer (November and December) (McGarvey et al. 2002). Based on tag-recapture data, males were found to grow faster and moult more frequently than females; above 150 mm CL male intermoult duration was around four and half years compared to seven for females. In juvenile males and females (80–120 mm CL), the intermoult duration was three to four years. Radiometric ageing of giant crabs indicated a moult duration of nine years at larger sizes, generally consistent with the finding of slow growth and high longevity inferred from tagging studies (Gardner and Williams 2002).

Although giant crab is thought to comprise a single genetic stock throughout its geographic range, its status is currently assessed nationally at a jurisdictional (state) level.

#### **2.2.4 Southern rock lobster**

The southern rock lobster (SRL, *Jasus edwardsii*) (Hutton 1875), is a decapod crustacean of the family Palinuridae. Southern rock lobsters inhabit a variety of reef habitats in continental shelf waters from 1 – 200 m and are distributed across southern Australia from Coffs Harbour (northern NSW) to Cape Naturaliste (WA), including around Tasmania, with a few records in WA as far north as Dongara. They also occur around New Zealand. SRL comprise a single genetic stock across southern Australia (Ovenden et al. 1992).

SRL attain a maximum age of 20 years and maximum size of 230 mm CL. Growth rates vary substantially between locations due to environmental factors such as depth and population density (McGarvey et al. 1999; Punt et al. 2006). On average this species attains maturity at ~ seven years post settlement. Males have a higher moult frequency and grow about 1.4 times faster than females (Linnane et al. 2011). Fecundity of female SLR ranges from 100,000 to 1,000,000 eggs, depending on the age and size of the individual (Hobday and Ryan 1997). Eggs are attached to the pleopods, where they are carried for 4-6 months.

SRL has an offshore larval phase of up to 24 months, during which time larvae are dispersed and mixed widely by currents resulting in the observed genetic homogeneity of the stock. The Southern Zone of the South Australian Rock Lobster Fishery has the highest level of egg production off southern Australia, and based on biological and hydrodynamic modelling, this area is likely to be a major source of pueruli (Bruce et al. 2007). The net eastward transport of larvae across southern Australia means that SRL off the WA south coast may contribute to recruitment in other regions, however most of the recruitment to the WA south coast probably originates from the Great Australian Bight.

The status of the SRL genetic stock is assessed nationally using an integrated model. The most recent assessment in 2020 indicated that the stock is sustainable (Linnane et al. 2021).

Although regional populations of SRL are genetically similar, differing environmental conditions across southern Australia mean they vary substantially in life history characteristics. As such, WA populations are considered as a spatially discrete units for management purposes.

#### **2.2.5 Western rock lobster**

Western rock lobster (WRL; *Panulirus cygnus*) is a decapod crustacean. WRL is endemic to the waters off WA, with a distribution extending from the North West Cape in the north, to around Albany in the south. It is the dominant lobster throughout its range, with minimal overlap with tropical species (e.g. *P. ornatus*, *P. versicolor*) in the north of its range, and *Jasus edwardsii* in the south.

While WRL can live up to 20 years and weigh up to 5.5 kg, they more typically live for 10-15 years and weigh less than 3 kg. Juvenile WRL predominantly inhabit the inshore shallow reefs (< 40 m) throughout their distribution (Bellchambers et al. 2012, de Lestang et al. 2016).

Growth in both male and female WRL is categorised by rapid juvenile growth, followed by a reduction in growth rate after sexual maturity (de Lestang 2018). In juveniles, growth rates are inversely related to carapace length, rapidly decreasing as carapace length increases (de Lestang 2018). Juvenile growth rates do not differ between sexes (Chittleborough 1975, de Lestang 2018), however, the reduction in growth rates with sexual maturity is more pronounced in females than males, and as a result, adult males have higher growth rates than adult females and therefore attain larger maximum sizes. On average this species attains maturity at ~ six years post settlement.

WRL is considered a single management unit in the WCB and the same genetic stock extends into the SCB (Figure 2). The stock structure of WRL has been examined genetically through allozyme electrophoresis with the conclusion that the western rock lobster is a single panmictic population, with ephemeral genetic patchiness between cohorts (Thompson et al. 1996, Johnson and Wernham 1999).

A recent study examined microsatellite and mitochondrial sequences of WRL from samples collected over a 14-year time span and 960 km of coastline found no loss of genetic variation or significant population structuring (Kennington et al. 2013). This again confirms the previous assertions of a single panmictic population (Thompson et al. 1996, Johnson and Wernham 1999).

## **2.3 Fishing Activities**

### **2.3.1 Governance**

The SCOC Resource is mainly targeted by commercial fishers. Due to the predominantly offshore nature of the resource, there is only a minor take by recreational fishers. These fishing sectors are managed by the Department under the following key legislation:

- *Fish Resources Management Act 1994* (FRMA, anticipated to be replaced by ARMA once enacted)
- *Fish Resources Management Regulations 1995* (FRMR, anticipated to be replaced by the Aquatic Resources Management Regulations once ARMA is enacted)
- *South Coast Crustacean Managed Fishery Management Plan 2015*
- *South Coast Crustacean Managed Fishery Vessel Monitoring Systems Approved Directions*
- *Prohibition on Commercial Fishing (Esperance Jetty) Order 1997*
- *Prohibition on Commercial Fishing (Greens Pool) Order 2018*
- *Prohibition on Commercial Fishing (Ngari Capes Marine Park) Order 2018*; and

- *Prohibition on Fishing for Rock Lobster (Cape Naturaliste to Cape Leeuwin) Order (No. 2) 2005.*

Fishers must also comply with the requirements of:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Marine Safety (Domestic Commercial Vessel) National Law Act 2012*
- *Western Australian Marine Act 1982*
- *Western Australian Biodiversity Conservation Act 2016*
- *Western Australian Conservation and Land Management Act 1984*; and
- Any other legislation governing the use of the marine environment in which fishing activities occur.

### **2.3.2 Commercial Fishing**

Fishing for offshore crustaceans on WA's south coast began in the late 1960s, with the Windy-Harbour Augusta region (subsequently the Windy Harbour-Augusta Managed Fishery [WHARLMF]) being fished by full-time and part-time fishers since the late 1970s. The fishery primarily landed rock lobsters (southern and western), with landings of deep-sea crabs (champagne, giant and small amounts of crystal crab) beginning to appear in the commercial catch landing statistics around the early 1990s.

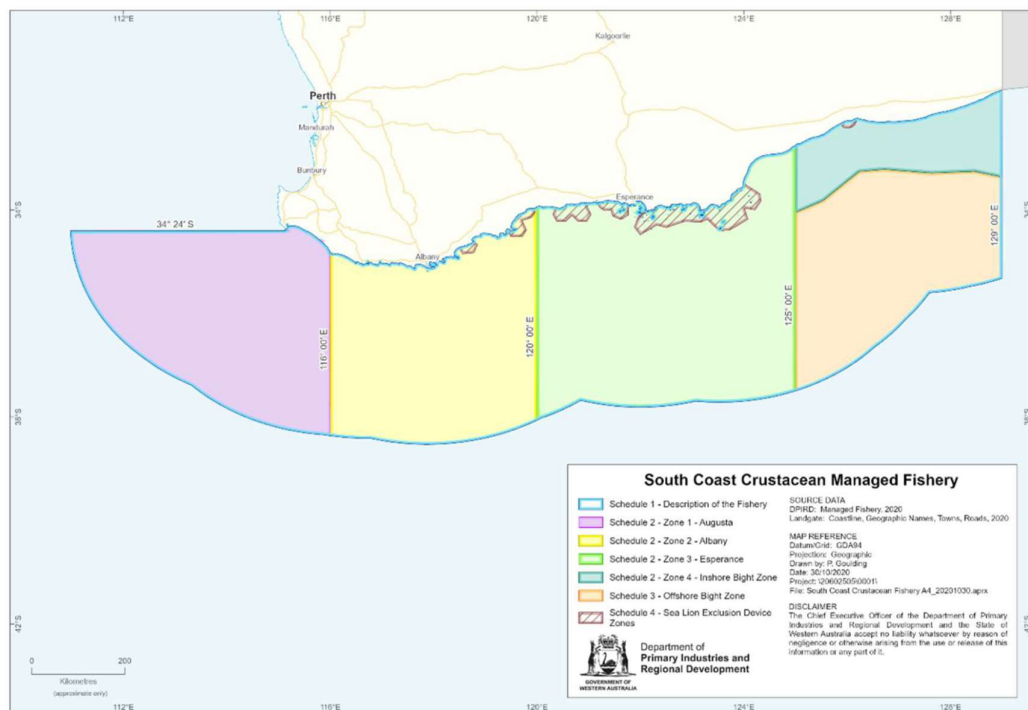
The south coast offshore crustacean fishery came under formal management with the establishment of the WHARLMF and the Esperance Rock Lobster Managed Fishery (ERLMF) in 1987. Access outside these managed fisheries to the resource was through a pot regulation (then Regulation 125 and 126) to take rock lobster and a condition attached to a fishing boat licence (Condition 105) which permitted the take of deep-sea crabs. This regulation and condition permitted access in both the Albany and Bight regions and the retention of deep-sea crabs outside of the (then) lobster season (15 November – 30 June) in the WHARLMF.

The formalisation of management arrangements for the Albany and Bight Regions occurred through their combination with the WHARLMF and ERLMF to form the SCCMF in 2015. An access and allocation process was undertaken in the Albany and Bight Regions to address considerable latent effort in these regions. Additionally, due to a lack of access to the offshore component of the Bight Region, an additional Offshore Bight Zone was established which permitted equal access by any SCCMF licence holder (**Error! Reference source not found.**) to deep-sea crabs only. The fishery was managed by a Total Allowable Effort limited by the number of pots, with a closed season for rock lobsters (both southern and western) between 1 July and 14 November. Deep-sea crabs could be retained year-round, except within Zone 3 (Esperance) where fishing was restricted to the same season as for rock lobster.

The SCCMF is regulated by the *South Coast Crustacean Managed Fishery Management Plan 2015* (Management Plan), the *Fish Resources Management Act 1994*, and *Fish Resources Management Regulations 1995*.

The SCCMF encompasses the waters from South West Cape (34° 24' south latitude) to the WA/South Australian border containing five management zones (**Error!**

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**Figure 3. Boundaries and zones of the SCCMF and Sea Lion Exclusion Device (SLED) areas.**

**Table 1. Species and their initial total allowable commercial catch (TACC) under the ITQ system in each of the four coastal zones of the SSCMF implemented on 1 July 2022.** Note: TACCs may change from season to season, the up-to-date details are included in the Management Plan for the Fishery.

Species	Zone1	Zone 2	Zone 3	Zone 4
Champagne Crab	3,000 kg	5,000 kg	4,000 kg	430 kg
Crystal Crab	910 kg	6,000 kg	4,000 kg	430 kg
Giant Crab	1,505 kg	2,000 kg	2,500 kg	430 kg
Southern Rock Lobster	700 kg	1 000 kg	16,000 kg	14,000 kg
Western Rock Lobster	35,000 kg	6,530 kg	1,050 kg	430 kg

### **2.3.3 Recreational Fishing**

Southern and western rock lobster are the main species of the SCOC Resource accessed by recreational fishers. The recreational catch of western rock lobster in the SCB comprised a small proportion of the state-wide catch for this species between 2018/19 – 2021/22 (0.4 – 2%) (Smallwood et al. 2021, 2022). The numbers of southern rock lobster harvested state-wide are lower than the western rock lobster, and the proportion of the state-wide catch for this species which occurred in the SCB was 5 – 30% between 2018/19 – 2021/22 (DPIRD, unpublished data). The remaining catch of this species occurred in the lower half of the WCB. Recreational catches for both these species of rock lobster within the boundaries of the SCOC Resource are considered to be small compared to the annual catch landed by the commercial fishing sector (Smallwood et al. 2022, 2021). No catches of other offshore crustacean species (i.e. crystal crab, champagne crab or giant crab) have been reported in surveys of boat-based fishing from 2011/12 to 2020/21 (Ryan et al. 2013, 2015, 2017, 2019, 2022).

Rules for managing the recreational fishery are primarily contained within the FRMR. A recreational rock lobster licence is required to fish for any species of rock lobster in WA. The recreational catch is managed through a combination of bag, boat, size and possession limits as well as protection for berried (egg-carrying) crustaceans, gear specifications and gear limits. It is prohibited to sell recreationally caught rock lobsters and crabs, including barter or exchange for other goods and services.

### **2.3.4 Customary Fishing**

Customary fishing is defined as fishing by an Aboriginal person for personal, domestic, ceremonial, educational or non-commercial communal needs. Customary fishing respects customary law and tradition, which includes fishing only where the person has a connection or permission from traditional owners of that area. Customary fishers are not required to hold a recreational fishing licence, however fishing rules that protect fish stocks and marine habitat still apply. These rules are the subject of review to ensure they best reflect the rights and responsibilities of traditional owners to access and look after aquatic resources, at the same time as addressing the statutory responsibilities of government to manage aquatic resources for future generations.

There is no quantitative information available on the customary catch of SCOC Resource, as the resource is generally limited to deep oceanic waters, customary fishing impacts on this resource are thought to be limited to rock lobsters in inshore areas.

## **2.4 Catch-Share Allocations**

The SCOC Resource has historically been fished mainly by the commercial sector, without an explicit catch share allocation with recreational fishing sector.



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## 3.0 Harvest Strategy

The procedures used within all harvest strategies involve two interrelated decision-making processes. The first constitutes the formal review of targeted stocks and other ecological assets against defined reference levels to determine performance against management objectives relating to ecological sustainability (Section 3.4). The second process involves a fishery-level review at least every three years that determines whether the current catch/effort by each of the relevant fisheries/sectors is consistent with the levels expected when ecological objectives are met (Section 3.5).

This harvest strategy is structured to describe, hierarchically:

- 1) the high-level, long-term objectives of management (Section 3.1);
- 2) the short-term, operational objectives (Section 3.2); and
- 3) how these translate into the management approach for this resource (Section 3.3).

This is followed by a more detailed description of:

- 4) the processes for assessing ecological sustainability (Section 3.4);
- 5) the processes for assessing fishery performance (Section 3.5); and
- 6) the specific monitoring and assessment procedures used to ascertain if objectives are being met (Section 3.6).

### 3.1 Long-term Objectives

In addition to ensuring the biological sustainability of all captured aquatic resources, this harvest strategy includes broader ecological objectives for each ecosystem component, as well as a high-level social and economic objective for the fisheries/sectors targeting this resource. It is important to note that the social and economic objectives are applied within the context of ESD and are considered once the ecological objectives have been met (Department of Fisheries 2015, see Section 3.5 for more information).

#### 3.1.1 *Ecological Sustainability*

- 1) To maintain spawning stock biomass of each target species<sup>2</sup> at a level where the main factor affecting recruitment is the environment;
- 2) To maintain spawning stock biomass of each retained species<sup>3</sup> at a level where the main factor affecting recruitment is the environment;

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<sup>2</sup> Within this harvest strategy, 'target species' are defined as regularly targeted offshore crustacean species in quota zones of the fishery where data is sufficient to conduct a biomass based assessment.

<sup>3</sup> Within this harvest strategy, 'retained species' are defined as intermittently caught offshore crustacean species in quota zones where data is limited and biomass-based assessments are not possible.

- 3) To maintain stock biomass of each other retained species<sup>4</sup> (non-target species) at a level where the main factor affecting recruitment is the environment;
- 4) To ensure fishing impacts do not result in serious or irreversible harm<sup>5</sup> to bycatch species' populations;
- 5) To ensure fishing impacts do not result in serious or irreversible harm to ETP species' populations;
- 6) To ensure fishing impacts do not result in serious or irreversible harm to habitat structure and function; and
- 7) To ensure the effects of fishing do not result in an unacceptable risk of serious or irreversible harm to ecological processes.

### **3.1.2 Economic and Social Benefits**

The social and economic benefits outlined below are to be considered within the constraints of ecological sustainability and while having regard for other fishing sectors.

- 1) To provide a flexible management and operational framework to ensure commercial fisheries can maximise their livelihood (economic and social);
- 2) To maintain and provide the opportunity to maximise the economic and social contribution of commercial fishing flow to regional and metropolitan WA; and
- 3) To maintain or improve cultural, recreational and lifestyle benefits for recreational fishing participants.

## **3.2 Operational Objectives**

Long-term management objectives are typically operationalised as short-term (e.g. annual or periodic) objectives through one or more performance indicators that can be measured and assessed against pre-defined reference levels so as to ascertain actual performance. Within the context of the long-term ecological objectives provided above, operational objectives aim to maintain each resource above the threshold level close to the target level, or rebuild the resource if it has fallen below the threshold or the limit levels.

## **3.3 Harvesting and Management Approach**

The SCCMF is managed primarily through output controls in the form of TACCs, set periodically ( $\leq$  every three years) for each offshore crustacean species in the relevant quota management areas of the fishery (see Figure 3 and Table 1) and allocated to licence holders as ITQs. The TACCs are set based on the state of the resource relative to species-and zone-specific reference levels (see below for more detail).

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<sup>4</sup> Within this harvest strategy, 'other retained species' are defined as offshore crustacean species caught in the Offshore Bight Zone and any other species kept from any area of the fishery.

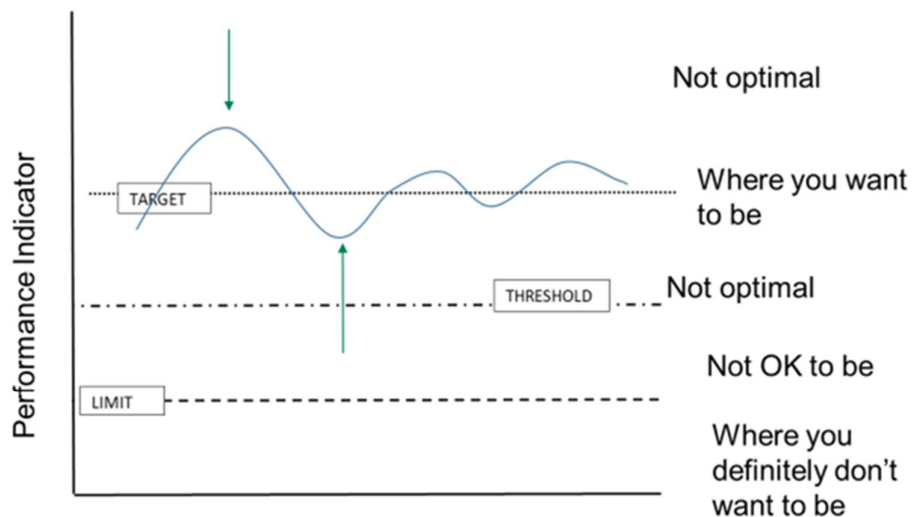
<sup>5</sup> Serious or irreversible harm relates to a change caused by the fishery that fundamentally alters the capacity of the component to maintain its function or to recover from the impact.

The recreational fishery is limited mainly to western and southern rock lobsters and is managed under a mix of input and output controls, including bag limits, boat limits, size limits, protection for breeding females, possession limits, gear restrictions, temporal and spatial closures. Recreational fishers targeting these species are required to hold a rock lobster recreational fishing licence.

### 3.4 Ecological Sustainability and Socio-Economic Benefits

A formal, resource-level review process is undertaken by the Department to assess the status of relevant target stocks and performance in relation to each ecological objective plus the economic and social benefit objectives. Suitable indicators have been selected to determine the status of the resource, and other ecological assets, against defined reference levels established to separate acceptable from unacceptable performance (Section 3.4.1). Where relevant, these levels include the following, defined and illustrated within Figure 4:

- A target level (i.e. where you want the indicator to be);
- A threshold level (i.e. where you review your position); and
- A limit level (i.e. where you do not want the indicator to be).



**Figure 4. Relationship between performance indicators, limits, thresholds and targets.**

Harvest Control Rules (HCRs) define the management actions that relate to the status of each indicator compared to the reference levels (Section 3.4.2). A summary of the management objectives, performance indicators, reference levels and HCRs are provided in Table.

### 3.4.1 Performance Indicators and Reference Levels

#### 3.4.1.1 Target Species

Target species are regularly targeted offshore crustacean species where there is sufficient data to conduct biomass modelling (Appendix 1). Each target species (by quota zone) will be assessed based on estimates of legal biomass ( $B$ ) relative to the unfished level ( $B_0$ ) (Table). The estimates of  $B/B_0$  are periodically compared to reference levels as outlined in the Department's Harvest Strategy Policy (Department of Fisheries 2015). Recognising the naturally fluctuating stock levels of offshore crustacean species, this harvest strategy aims to maintain the stock at a level above that at which Maximum Sustainable Yield (MSY) can be achieved, i.e.  $B > B_{MSY}$  (Table). Any stock size above this level is therefore consistent with meeting the objectives for biological sustainability and also satisfies stock status requirements under the Marine Stewardship Council (MSC) standard for sustainable fishing. Due to the inherent uncertainty around estimates of  $B_{MSY}$  and the selection of suitable proxy reference points (e.g. Punt et al. 2014), this is applied as a threshold reference level (i.e. below which exploitation will be reduced) rather than as a target level, to ensure management is more precautionary.

Since the information required to accurately determine  $B_{MSY}$  for resources in the SCCMF is unavailable, proxy reference levels, based on those from similar species in other jurisdictions (e.g. Alaskan king crab and Tanner fisheries), have been applied. Biomass reference levels of 35% ( $B_{35}$ ) and 20% ( $B_{20}$ ) of unfished levels have been chosen as threshold and limit reference points, respectively (Punt et al. 2012; Heller-Shipley et al. 2021). A target reference level has been based on  $1.2 * B_{MSY}$  ( $1.2 * B_{35}$ ) and is 42% of unfished biomass ( $B_{42}$ ) (Kompas and Grafton 2011). The resultant target and limit reference levels (42% and 20%, respectively) are also very similar to default proxies suggested by the MSC (0.4, 0.2, respectively; Marine Stewardship Council, 2018). The aim of these decision rules is to ensure the stock is maintained near the target level to maximise landings whilst ensuring that the stock remains sustainable.

The exception to this is Western Rock Lobster in Zones 1 and 2 of the SSCMF. Since recruitment to these resources is sourced (almost) entirely from the West Coast Rock Lobster Managed Fishery, the setting of TACCs will be based on the sustainability of this source biomass, and not on localised levels. As such other localised factors will be considered in setting of TACCs, such as historic catch ranges and smoothing of catches to maintain consistent, economically viable, catch rates.

#### 3.4.1.2 Retained species

Retained species are intermittently targeted offshore crustacean species where data is limited and biomass modelling is not possible (Appendix 1). For a resource that has only a short time series of targeted effort or is only caught in small amounts and no contrast exists between catch and catch rates, a "Data Appropriate" assessment will be conducted.

Under this process, decision rules based on the attainment of TACC, catch rate trends and the outputs from a data limited assessment technique such as CatchMSY, will be

used as the performance indicators in a weight of evidence approach. Over time it is expected that the number of resources being assessed under “Data Appropriate” will move to “Data Sufficient”.

#### 3.4.1.3 *Other Ecological Assets*

Other ecological assets incorporated in this harvest strategy include other retained species, bycatch, ETP species, habitats and ecosystem processes that may be affected by commercial and recreational fishing activities in the SCOC Resource (Table). For all ecological components, reference levels have been set to differentiate acceptable fishery impacts from unacceptable fishery impacts according to the risk levels defined in Fletcher (2015).

### **3.4.2 Application of Harvest Control Rules**

For each ecological performance indicator and reference level, an accompanying HCR directs the management needed to meet sustainability objectives (Table). These HCRs are designed to maintain the resource near to the target level or rebuild it where it has fallen below the threshold (undesirable) or the limit (unacceptable) levels.

Where an indicator remains close to the target level (i.e. within a suitable tolerance level), generally no actions will be required.

When an indicator has moved outside of the tolerance range of the target level, minor adjustments (up or down) to the TACC can be made from the start of the next fishing season to return the stock towards the target by the next assessment.

Where an indicator has fallen, or based on the trend is likely to soon fall below the threshold reference level, the HCR requires the initiation of a review of all available information to determine an appropriate management response. The extent of management action taken is determined by the extent to which a performance indicator has or is likely to breach the reference point, increasing in line with an increasing risk to the resource. This review process also includes consideration of other relevant information as well as future research and monitoring needed to ensure the indicator returns to the target level, as well as the compliance response needed to ensure management changes are adequately enforced.

If the threshold for a target species has been or is likely to be breached in any of the relevant quota management areas, a review will be initiated within three months, to determine the level of reduction required and develop a management response. Appropriate action will be taken to reduce the commercial catch by setting the TACC for the relevant target species and zone at a level to enable recovery to above the threshold, based on projections, preferably by the next assessment but at most within one generation or a maximum of 10 years (whichever comes first) of the breach (refer to Table 2 and Appendix 2) from the start of the next fishing season (1 July).

If the limit has been or is likely to be breached by a target species in any zone, a review will be initiated within a month, to determine the level of reduction required and develop an appropriate recovery strategy (Appendix 3). This will involve actions to reduce the commercial catch by setting the TACC for the relevant target species and zone at

levels to enable recovery to at least above the threshold, based on projections, within two generations or a maximum of 20 years (whichever comes first).

For the recreational sector, implementing the HCR based on a specific reduction in current estimated catch levels may not be appropriate except where if the stock is in a recovery strategy and the recreational catch is considered material to this recovery.

A catch reduction for this sector will instead typically be applied indirectly through an equivalent reduction in the current bag/boat limit and/or the length of the fishing season expected to achieve the required response. Where data are available to suggest the current bag/boat limit is often not achieved by fishers, the review may determine that a stronger management response is necessary to achieve the desired catch reduction. For species where a large proportion of catches are released, temporal closures are more likely to achieve a reduction in recreational fishing pressure than a reduction in bag/boat limits.

For more information on the management tools available to achieve the catch reductions specified by the HCR, and the legal instrument under which the management measure occurs, see Section 4.1.

#### 3.4.2.1 *Recovering Depleted Stocks*

A resource that has fallen below the acceptable level, and for which suitable recovery strategy management adjustments have already been implemented to reduce catch and/or effort (as outlined in the HCRs), is considered to be in a recovery phase (Department of Fisheries 2015).

Where the environmental conditions have led, or contributed significantly, to the resource being at an unacceptable level, the recovery strategy should consider how this may affect the speed and extent of recovery.

Due to biological differences between the five target species, the recovery strategy will need to consider the appropriate measures on a case-by-case basis. Recovery or precautionary principles are to be applied in the quota setting arrangements for the start of the next fishing season following the exceedance.

Before the stock is considered rebuilt, a review will be undertaken to ensure the harvest strategy and management arrangements remain appropriate to maintain the stock above the threshold levels in the future.

**Table 2. Harvest strategy performance indicators, reference levels and control rules for the SCOC Resource, and other ecological assets that may be impacted from fishing activities while targeting this resource.**

Component	Management objectives	Resource / Asset	Performance Indicators	Reference levels	Control rules
Target species	To maintain the spawning stock biomass of each primary target species at a level where the main factor affecting recruitment is the environment.	Target species <sup>6</sup> by quota zone of the fishery where biomass modelling is available.	Periodic (at least every three years) stock assessment estimates of biomass relative to the unfished level ( $B_0$ ) for each resource.	<b>Target<sup>7</sup>:</b> $B_{42}$	Continue management aimed at achieving ecological, economic, and social objectives.  If the performance indicator is projected to trend away from the target level, adjust the TACC for the resource to move performance indicator to target level.
				<b>Threshold:</b> $B_{35}$	If the threshold level is breached, reduce the TACC to a level where the resource recovers to above the threshold level within one generation from the time of the breach.
				<b>Limit:</b> $B_{20}$	If the limit level is breached, reduce the TACC to a level where the resource recovers to above the limit level within one generation from the time of the breach.

<sup>6</sup> Target species are defined as regularly targeted offshore crustacean species in quota zones of the fishery (data sufficient). Further information on the species which fall within this category is provided at Appendix 1.

<sup>7</sup> Except Zones 1 and 2 Western Rock Lobster, for which the weight-of-evidence from the West Coast species assessments are used to inform a unique target, based on sustainable catches in line with historical catches considering the sink stock nature of the resource into the South Coast.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference levels	Control rules
<b>Retained species</b>	To maintain the spawning stock biomass of each retained species at a level where the main factor affecting recruitment is the environment.	Retained species <sup>8</sup> by quota zone of the fishery where biomass modelling is not possible.	Periodic (at least every three years) assessments of: <ul style="list-style-type: none"> <li>• Catch rate trend;</li> <li>• % TACC caught; and</li> <li>• Data applicable assessment technique.</li> </ul>	<b>Target:</b> Stable or increasing catch rate trend; and > 90% TACC achieved.	Continue management aimed at achieving ecological, economic, and social objectives.  Consider TACC increase, if TACC for the resource is achieved and the catch rate trend is increasing or stable.
				<b>Threshold:</b> Catch rate trend declining or data applicable assessment indicates overfishing.	If the threshold level is breached, review the reasons for this variation within three months and consider decreasing TACC by up to 50%.
				<b>Limit:</b> Catch rate trend declining and data applicable assessment indicates overfishing.	If the limit level is breached, initiate an immediate management response to reduce the risk and decrease TACC by up to 100%.

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<sup>8</sup> Retained species are defined as intermittently caught offshore crustacean species in quota zones (data limited). Further information on the species which fall within this category is provided at Appendix 1.



Component	Management objectives	Resource / Asset	Performance Indicators	Reference levels	Control rules
<b>Other retained species</b>	To maintain spawning stock biomass of each other retained (non-target) species at a level where the main factor affecting recruitment is the environment.	All other retained species <sup>9</sup> .	Periodic risk assessments incorporating: <ul style="list-style-type: none"> <li>• current management arrangements;</li> <li>• available data on fishing effort and catch (relative to MSY or historical levels);</li> <li>• species information; and</li> <li>• other available research.</li> </ul>	<b>Target:</b> Fishing impacts are expected to generate an acceptable risk level to other retained species, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic, and social objectives.
				<b>Threshold:</b> A potentially material change to risk levels is identified; or Fishing impacts are considered to generate an undesirable level of risk to other retained species, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.
				<b>Limit:</b> Fishing impacts are considered to generate an unacceptable level of risk to other retained species, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.

<sup>9</sup> Within this harvest strategy, 'other retained species' are defined as offshore crustacean species caught in the Offshore Bight Zone and any other species kept from any area of the fishery.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference levels	Control rules
<b>Bycatch (non-ETP) species</b>	To ensure fishing activities do not result in serious or irreversible harm to bycatch species' populations.	All (non-ETP) bycatch species.	Periodic risk assessments incorporating: <ul style="list-style-type: none"> <li>• current management arrangements;</li> <li>• catch levels;</li> <li>• species information; and</li> <li>• other available research.</li> </ul>	<b>Target:</b> Fishing impacts are expected to generate an acceptable risk level to all bycatch species' populations, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic and social objectives.
				<b>Thresholds:</b> A potentially material change to risk levels is identified; and/or Fishing impacts are considered to generate an undesirable level of risk to any bycatch species' populations, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.
				<b>Limit:</b> Fishing impacts are considered to generate an unacceptable level of risk to any bycatch species' populations, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.
<b>Endangered, threatened and protected (ETP) species</b>	To ensure fishing activities do not result in serious or irreversible harm to ETP species' populations.	All ETP species.	Periodic risk assessments incorporating: <ul style="list-style-type: none"> <li>• current management arrangements;</li> </ul>	<b>Target:</b> Fishing impacts are considered to generate an acceptable level of risk to all ETP species populations, i.e. medium risk or lower.	Maintain current management arrangements aimed at achieving ecological, economic and social objectives.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference levels	Control rules
			<ul style="list-style-type: none"> <li>number of reported ETP species interactions;</li> <li>species information; and</li> <li>other available research.</li> </ul>	<p><b>Thresholds:</b> A potentially material change to risk levels is identified; and/or Fishing impacts are considered to generate an undesirable level of risk to any ETP species' populations, i.e. high risk.</p>	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.
				<p><b>Limit:</b> Fishing impacts are considered to generate an unacceptable level of risk to any ETP species' populations, i.e. severe risk.</p>	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.
<b>Habitats</b>	To ensure fishing activities do not result in serious or irreversible harm to habitat structure and function.	Benthic habitats	<p>Periodic risk assessments incorporating:</p> <ul style="list-style-type: none"> <li>current management arrangements;</li> <li>catch levels;</li> <li>extent of fishing area; and other available research.</li> </ul>	<p><b>Target:</b> Fishing impacts are considered to generate an acceptable level of risk to any benthic habitats, i.e. medium risk or lower.</p>	Maintain current management arrangements aimed at achieving ecological, economic and social objectives.
				<p><b>Thresholds:</b> A potentially material change to risk levels is identified; and/or Fishing impacts are considered to generate an undesirable level of risk to benthic habitats, i.e. high risk.</p>	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference levels	Control rules
				<b>Limit:</b> Fishing impacts are considered to generate an unacceptable level of risk to benthic habitats, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.
<b>Ecosystem</b>	To ensure fishing activities do not result in an unacceptable risk of serious irreversible harm to ecological processes.	Trophic interactions Community structure	Periodic risk assessments incorporating: <ul style="list-style-type: none"> <li>• current management arrangements;</li> <li>• catch levels;</li> <li>• extent of fishing activities;</li> <li>• ecosystem information; and</li> <li>• other available research.</li> </ul>	<b>Target:</b> Fishing impacts are considered to generate and acceptable level of risk to ecological processes within the ecosystem, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic and social objectives.
				<b>Thresholds:</b> A potentially material change to the risk levels is identified; and/or Fishing impact is considered to generate an undesirable level of risk to any ecological processes within the ecosystem, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.
				<b>Limit:</b> Fishing impacts are considered to generate an unacceptable level of risk to any ecological processes within the ecosystem, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.

### **3.5 Fishery Performance**

Defining periodic tolerance levels for fisheries provides a formal and efficient basis to evaluate the effectiveness of current management arrangements in delivering the levels of catch and/or effort specified by the HCRs and, where relevant, any sectoral allocation decisions (Fletcher et al. 2016). In line with the principles of ESD, this fishery-level review process can also consider the performance against any objectives relating to the economic and social amenity benefits of fishing.

Where possible, and in due consideration of ecological sustainability, fisheries management arrangements can be adjusted or reformed to help meet these economic and/or social objectives.

#### **3.5.1 Economic and Social Benefits**

Initial economic and social objectives have been developed in consultation with stakeholders.

Specific performance indicators and reference levels have been developed for some of the economic and social operational objectives to evaluate their benefits (see below). If the performance indicator for an economic and social operational objective is at or above the Target level, then the action is to maintain management aimed at achieving ecological, economic and social objectives.

If the performance indicator for an economic and social operational objective is below this level, then the action is to consult with the relevant stakeholders to investigate potential causes. If possible, initiate commercial and/or recreational initiatives aimed at moving the performance indicator back to the target level and/or review whether fisheries management arrangements impose constraints, for reasons other than ecological sustainability, that limit the ability to achieve that economic or social objective.

It is important to note that management actions relating to these objectives are to be applied within the constraints of meeting objectives for ecological sustainability and while having regards to the objectives of other sectors.

##### **3.5.1.1 Commercial Sector Economic and Social Benefits**

The economic and social benefit operational objectives for the commercial SCCMF are to:

- 1) Provide sustainable long-term consistent catches to support maximum economic returns; and
- 2) Maintain or provide opportunity to maximise the flow of commercial fishing related economic and social (including supplying consumers with quality pot caught offshore crustaceans) benefits to the broader WA community including regional and metropolitan areas.

The performance indicator to evaluate whether commercial fishers in the SCCMF have been able to maximise their economic efficiency is the proportion of TACC attained annually. The target reference level ( $Efficiency_{Target}$ ) has been set at 75% of the entitlement being used each fishing season.

No performance indicators or reference levels currently exist to evaluate flow of commercial fishing related economic benefit to the broader WA community. This objective could be measured using socio-economic surveys in the future.

#### 3.5.1.2 *Recreational Sector Economic and Social Benefits*

The economic and social benefit objectives for the South Coast Offshore Crustacean Resource is to:

- 1) To maintain or improve cultural, recreational and lifestyle benefits for recreational fishing participants; and
- 2) Maintain or provide the opportunity to maximise the flow of recreational fishing tourism related economic benefit to the broader community.

No performance indicator for or reference levels currently exist to evaluate the cultural and recreational experiences. In the future, this objective could be measured by level of participation of recreational rock lobster fishers in the South Coast of WA and/or the catch rate.

### **3.6 Monitoring and Assessment Procedures**

#### **3.6.1 Information and Monitoring**

##### 3.6.1.1 *Commercial Fishing Information*

There is a statutory obligation for commercial fish fishers to report catch information. Since 2022/23, when the SCCMF was transitioned to quota, catch and disposal reporting (CDR) information is through a daily CDR book with 10 x 10 nautical mile statistical reporting blocks. Information recorded includes species catches (weight and numbers), effort, statistical reporting block, fishing, landing and weighing location. In addition, commercial fishers must also report any interactions with ETP species as part of the statutory reporting.

Before that time, from 2019/20 fishers were required to complete trip returns and prior to that the statutory return for SCCMF fishers was through monthly catch and effort (CAES) returns. The information from these statutory returns provides the basis for calculating the standardised catch and biomass modelling for target and retained species, which inform the broader weight-of-evidence assessments of stocks. All returns are checked by Departmental staff, and any possible erroneous entries or gaps are verified directly with the skippers or relevant licensees.

##### 3.6.1.2 *Recreational Fishing Information*

Since 2011, boat-based recreational surveys have been undertaken every two to three years to collect information on private (non-charter), boat-based recreational fishing throughout WA (Ryan et al. 2022). The survey uses the Recreational Fishing from Boat Licence as a sampling frame for off-site phone diary surveys and these data are completed by on-site boat ramp surveys and remote camera monitoring. This survey is designed to provide information on participation, fishing effort and catch for key species caught by boat-based recreational fishers at broad spatial and temporal scales (e.g. state-wide, bioregion, zone).

In addition, annual phone-recall surveys have been completed since 2018/19 using the rock lobster licence as a sampling frame (Smallwood et al. 2022). This survey is designed to provide information on participation, fishing effort and catch primarily for the western rock lobster, but catch data are also obtained for other rock lobster species (e.g. southern rock lobster). These data are reported at state-wide and, where robust data are available, regional scales.

Recreational catches of the SCOC Resource are small and participation is low compared to catches from the west coast of WA, which makes the collection of these data challenging.

Interactions between recreational fishers and/or their gear with ETP species are generally reported to the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) via the Wildcare Helpline.

### **3.6.2 Assessment Procedures**

The different methods used by the Department to assess the status of aquatic resources in WA have been categorised into five broad levels. These range from relatively simple analyses of annual catch levels and catch rates, through to the application of more sophisticated models, for estimating biomass and fishing mortality. Irrespective of the types of assessment methodologies used, all stock assessments undertaken by the Department take a risk-based, weight of evidence approach that considers all of the available information (Fletcher 2015).

#### **3.6.2.1 Target Species**

The status of all target species (section 2.2) of the SCOC Resource is assessed periodically (at least every three years) using a “Data-Specific” set of decision rules. A resource is considered a “Target Species” if sufficient catch and targeted effort is available and contrast exists between catch and catch rates (Appendix 1). Each data sufficient target species (by quota zone) will be assessed based on estimates of legal biomass ( $B$ ) relative to the unfished level ( $B_0$ ) (Table).

#### **3.6.2.2 Retained Species**

The status of all retained species (section 2.2) of the SCOC Resource is assessed periodically (at least every three years). For a resource that has only a short time series of targeted effort or is only caught in small amounts and no contrast exists between catch and catch rates, a “Data Appropriate” assessment will be conducted (Appendix 1). Under this process, a data limited assessment technique such as Catch-MSY (Martell and Froese 2013) or SSDL (Purwanto et al. 2020) will first be applied to catch data. Based on the results of this analysis, how the catch rates are trending and whether the TACC was achieved (> 90%), the TACC for that resource may be adjusted. The aim of these decision rules is to ensure that the stock is maintained above a level that could cause recruitment impairment, whilst also maximising landings.

### 3.6.2.3 Risk Assessments

The Department uses a risk-based EBFM framework to assess the impacts of fishing on all parts of the marine environment, including the sustainability risks of other retained species, bycatch, ETP species, habitats and the ecosystem. This framework has led the development of the periodic risk assessment process, which is used to prioritise research, data collection, monitoring needs and management actions to ensure that fishing activities are managed both sustainably and efficiently.

Most recently in April and December 2022, two separate ecological risk assessments for the Western Rock Lobster Resource (Stoklosa 2022) and the Offshore Crustacean Resource (How et al. 2023) (including southern rock lobster, champagne crab, crystal crab and giant crab) in WA were undertaken to consider the ecosystem impacts of the fishing activities targeting the resource, assessed both individually and cumulatively. Except for pre-existing scores for some target species stocks with high risks (based on 2021 stock assessments), most of the components related to this harvest strategy were evaluated as medium or below, which do not require any specific management action. To address the target species which were identified as high risk, management action was implemented by transitioning the SCCMF from input-controls to output-controls under an ITQ system in July 2022.

Risk assessments will continue to be undertaken periodically (approximately every 5 years) to reassess any current or new issues that may arise from fishing activities targeting the resource. However, a new risk assessment can also be triggered if there are significant changes identified in fishery operations or management activities or controls that are likely to result in a change to previously assessed risk levels.

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## 4.0 Management Measures and Implementation

### 4.1 Management Measures

There are a number of management measures in place for the fisheries that target the resource (Table ). These measures can be amended as needed to ensure management objectives are achieved, however, they do not preclude the consideration of other options.

**Table 3. Management measures and instrument of implementation for fisheries targeting the SCOC Resource.**

Measure	Description	Instrument
Limited Entry	A limited number of Managed Fishery Licences (37) are permitted to operate in the SCCMF.	SCCMF Management Plan
Output-controls	In Zones 1, 2, 3 and 4 of the SCCMF TACC limits are in place for all five offshore crustacean species.	SCCMF Management Plan



Measure	Description	Instrument
Effort restrictions	In the SCCMF a maximum number of pots in each zone and on each Managed Fishery Licence applies.	SCCMF Management Plan FRMA (Section 7 Exemptions)
	Recreational rock lobster fishers must not use more than two pots per licenced person.	FRMR
Gear Restrictions	Commercial fishers must comply with restrictions pot configuration; including maximum size, entrance to pot and escape gaps.	SCCMF Management Plan FRMR
	Recreational rock lobster fishers must comply with gear specifications when using pots; alternatively catching lobsters by hand, hand-held snare or a blunt crook is permitted.	FRMR
Sea lion exclusion devices (SLED)	SLED zones are in place for commercial fishers around all known sea lion colonies, in these areas sea lion exclusion devices must be used to reduce the risk of drownings.	SCCMF Management Plan
Spatial Closures	Parts of the South Coast of WA includes marine protected areas and with some areas closed to commercial and recreational fishing.	EPBC Act FRMA (Section 43 Orders)
Temporal Closures	A night fishing ban is in place for recreational fishers, under which setting pots or diving for rock lobster is not permitted at certain times.	FRMR
Recreational Licences	Recreational fishers must hold a current recreational fishing for rock lobster licence.	FRMR
Size Limits	Species-specific size limits apply to offshore crustacean species.	FRMR
Recreational Bag and Boat Limits	Recreational boat and bag limits are in place for rock lobsters, and bag limits apply when fishing for crabs.	FRMR
Possession limits	A maximum number of southern and western rock lobsters combined permitted in a person's possession applies under the recreational fishing requirements.	FRMR
Reporting	Licensed commercial fishers are required to report all retained species catches, effort, ETP species interactions and fishing location in statutory logbooks.	FRMR
Monitoring	Commercial operators are required to make nominations pre- and post-fishing.	SCCMF Management Plan

## 4.2 Implementing changes to the Management arrangements

Decision making processes can be triggered following the identification of new or potential issues as part of a 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.

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

- Periodic decision-making processes that may result in measures to meet the short-term fishery objectives (driven by the HCRs); 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 as required to discuss the issue and determine appropriate management action.

#### **4.2.1 Consultation**

Management changes are generally given effect through amendments to legislation, such as the commercial fishery management plan, regulations and orders. These changes generally require consultation with all affected parties and the approval of the Minister for Fisheries and/or the Department's Director General (or appropriate delegates). In making decisions relevant to fisheries, the Minister for Fisheries may choose to receive advice from any source, but has indicated that:

- 1) The Department is the primary source of management advice; and
- 2) The peak bodies of the Western Australian Fishing Industry Council (WAFIC) and Recfishwest are the primary source of advice and representation from the commercial and recreational sectors, respectively.

The peak bodies are funded by Government under Service Level Agreements to undertake their representation / advisory and consultation roles.

##### **4.2.1.1 Commercial Sector Consultation**

Under its funding agreement with the Department, WAFIC is required to undertake statutory consultation functions related to fisheries management and the facilitation of management meetings for licensed fisheries such as the SCCMF.

Consultation with licence holders is required before changes to the SCCMF Management Plan are made in accordance with Section 65 of the FRMA and Clause 5 of the SCCMF Management Plan.

Management meetings between the Department, WAFIC and licence holders in the SCCMF are generally held annually and are important forums to consult on the management of the fishery. During these meetings, Departmental (science, management and compliance) staff, licence holders and WAFIC discuss current and future management issues that may have arisen during the previous fishing season and any proposed changes to the management plan. Follow-up meetings may be held as required.

##### **4.2.1.2 Recreational Sector Consultation**

Under the funding agreement with Recfishwest, the Department is required to consult with Recfishwest as the recognised peak body for recreational fishing in WA.

Recfishwest is required to engage and consult with recreational fishers as necessary in order to meet its obligations.

#### 4.2.1.3 *Consultation with Other Groups*

Consultation on SCOC Resource management with customary fishers and non-fisher stakeholders, including Government agencies, conservation sector Non-Government Organisations and other affected/interested parties, is undertaken in accordance with the Department's Stakeholder Engagement Guideline (Department of Fisheries 2016). The Department's approach to stakeholder engagement is based on a framework designed to assist with selecting the appropriate level of engagement for different stakeholder groups and includes collaborating with and involving key stakeholders, seeking input from interested parties through a public consultation process and keeping all parties fully informed through the provision of balanced, objective and accurate information. Key fishery-specific documents such as harvest strategies, recovery plans and bycatch action plans are subjected to both formal key stakeholder consultation and public consultation processes.

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## **5.0 Compliance and Enforcement**

As the key regulatory agency, the Department's compliance role is to achieve sustainability, economic and social objectives by addressing:

- our ability and capacity to influence compliance with the rules; and
- the effectiveness, capacity and credibility of the compliance program.

Western Australian Fisheries Compliance Strategy (the Strategy; DPIRD 2018) was published in 2018. The purpose of the Strategy is to provide an understanding of the principles underlying the Department's compliance role and how its compliance services are delivered to the WA community. The Strategy aligns with, and complements, Department's Compliance Framework and Risk Assessment Policy which informs the risk-based model, compliance planning and the governance structure applied to fisheries compliance services.

The Department's compliance model is based on the Australian Fisheries National Compliance Strategy 2022-2026 (the National Strategy). Department's compliance program is aligned to support the three key compliance strategies recommended by the National Strategy:

- maximising voluntary compliance;
- effective deterrence; and
- organisational capability and capacity.

### **5.1 Operational Compliance Plans**

Management arrangements for the SCOC Resource are enforced under Operational Compliance Plans (OCPs) that are informed and underpinned by a compliance risk assessment, which is reviewed every two years. These OCPs have the following objectives:

- to provide clear and unambiguous direction and guidance to Fisheries and Marine Officers for the yearly delivery of compliance in the fishery;
- to protect the fisheries' environmental values, while providing fair and sustainable access to the fishery's commercial and social values; and
- to encourage voluntary compliance through education, awareness and consultation activities.

## **5.2 Compliance Strategies**

Compliance strategies and activities that are used in the fisheries targeting the SCOC Resource include:

- land patrols;
- on-water patrols;
- road-side checkpoints;
- catch, licence, gear and vessel inspections;
- wholesale and retail inspections;
- monitoring of fishing through fishing nominations; and
- covert surveillance of persons of interest under approved operations.

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## 6.0 References

- Bellchambers, L., Mantel, P., Chandrapavan, A., Pember, M. and Evans, S. (2012). Western Rock Lobster Ecology – The State of Knowledge Marine Stewardship Council Principle 2: Maintenance of Ecosystem. Fisheries Research Report No. 236. Department of Fisheries, Western Australia. 128p.
- Bruce BD, Griffin DA, Bradford RW. 2007. Larval transport and recruitment processes of southern rock lobster. Hobart, CSIRO Marine and Atmospheric Research.
- Chittleborough, R.G., 1975. Environmental factors affecting growth and survival of juvenile western rock lobsters *Panulirus longipes* (Milne-Edwards). Marine and Freshwater Research, 26(2), pp.177–196.
- Davie PJF, Ng PKL, Dawson EW. 2007. A new species of deep-sea crab of the genus *Chaceon* Manning & Holthuis, 1989 (Crustacea: Decapoda: Brachyura: Geryonidae) from Western Australia. Zootaxa 62:51–62.
- Department of Agriculture and Water Resources (2018a). Commonwealth Fisheries Harvest Strategy Policy. Canberra, June. CC BY 4.0.
- Department of Agriculture and Water Resources (2018b). Guidelines for the Implementation of the Commonwealth Fisheries Harvest Strategy Policy. Canberra, June. CC BY 4.0.
- de Lestang S, Caputi N, How J. 2016. Resource Assessment Report: Western Rock Lobster Resource of Western Australia. Page Western Australian Marine Stewardship Council Report Series No. 9. [http://www.fish.wa.gov.au/Documents/wamsc\\_reports/wamsc\\_report\\_no\\_9.pdf](http://www.fish.wa.gov.au/Documents/wamsc_reports/wamsc_report_no_9.pdf)
- de Lestang S. 2018. Could warming oceans and increased lobster biomass rates be affecting growth rates in Australia's largest lobster fishery? Bull Mar Sci. 94:1055–1075. <https://doi.org/10.5343/bms.2017.1100>
- Department of Fisheries (2015). Harvest Strategy Policy and Operational Guidelines for the Aquatic Resources of Western Australia. Fisheries Management Paper No. 271. Department of Fisheries, Western Australia.
- Department of Fisheries (2016). Guideline for stakeholder engagement on aquatic resource management-related processes. Fisheries Occasional Publication No. 131. Department of Fisheries, Western Australia.
- Department of Primary Industries and Regional Development (DPIRD) (2018). Fisheries compliance strategy. DPIRD, Western Australia.
- Fletcher, W.J. (2002). Policy for the implementation of ecologically sustainable development for fisheries and aquaculture within Western Australia. Fisheries Management Paper No. 157. Department of Fisheries, WA.
- Fletcher, W.J. (2015). Review and refinement of an existing qualitative risk assessment method for application within an ecosystem-based management framework. *ICES Journal of Marine Research* 72:1043–1056.

- Fletcher, W. J., Gaughan, D. J., Metcalf, S. J., & Shaw, J. (2012). Using a regional level, risk based framework to cost effectively implement Ecosystem Based Fisheries Management (EBFM). In: Global progress on Ecosystem-Based Fisheries Management, Kruse, G.H. et al. (eds.), pp. 129–146, Alaska Sea Grant College Program, Fairbanks, Alaska.
- Fletcher, W.J., Wise, B.S., Joll, L.M., Hall, N.G., Fisher, E.A., Harry, A.V., Fairclough, D.V., Gaughan, D.J., Travaille, K., Molony, B.W. and Kangas, M. (2016). Refinements to harvest strategies to enable effective implementation of Ecosystem Based Fisheries Management for the multi-sector, multi-species fisheries of Western Australia. *Fisheries Research* 183:594–608.
- Gardner C. 1998. The first record of larvae of the giant crab *Pseudocarcinus gigas* in the plankton. Papers and Proceedings of the Royal Society of Tasmania 132:47–48. [https://www.fish.gov.au/Archived-Reports/2012/reports/Documents/Gardner\\_1998.pdf](https://www.fish.gov.au/Archived-Reports/2012/reports/Documents/Gardner_1998.pdf)
- Gardner C, Quintana R. 1998. Larval development of the Australian giant crab *Pseudocarcinus gigas* (Lamarck, 1818) (Decapoda: Oziidae) reared in the laboratory. *Journal of Plankton Research* 20:1169–1188. <https://doi.org/10.1093/plankt/20.6.1169>
- Gardner C, Williams H. 2002. Maturation of the male giant crab, *Pseudocarcinus gigas*, and the potential for sperm limitation in the Tasmanian fishery. *Marine and Freshwater Research*. 53:661–7. <https://doi.org/10.1071/MF01097>
- Hall, N. G., Smith, K. D., de Lestang, S., and Potter, I. C. (2006). Does the largest chela of the males of three crab species undergo an allometric change that can be used to determine morphometric maturity? *ICES journal of marine science: journal du conseil*, 63:140–150. Oxford Academic.
- Heller-Shipley, M.A., Stockhausen, W.T., Daly, B.J., Punt, A.E. and Goodman, S.E., 2021. Should harvest control rules for male-only fisheries include reproductive buffers? A Bering Sea Tanner crab (*Chionoecetes bairdi*) case study. *Fisheries Research*, 243, p.106049.
- Hobday DK, Ryan TJ. 1997. Contrasting sizes at sexual maturity of southern rock lobsters (*Jasus edwardsii*) in the two Victorian fishing zones: implications for total egg production and management. *Marine and Freshwater Research*.48:1009–14. <https://doi.org/10.1071/MF97143>
- How J., Smith K.A., Donnelly H., Wiberg L. and Oliver R. (2023). Ecological Risk Assessment for the Western Australian Offshore Crustacean Resource. Fisheries Research Report No. 332. Department of Primary Industries and Regional Development, Western Australia. 104 pp.
- Johnson, M.S. and Wernham, J., 1999. Temporal variation of recruits as a basis of ephemeral genetic heterogeneity in the western rock lobster *Panulirus cygnus*. *Marine Biology*, 135, pp.133-139.
- Kennington, W.J., Cadee, S.A., Berry, O., Groth, D.M., Johnson, M.S. and Melville-Smith, R., 2013. Maintenance of genetic variation and panmixia in the

commercially exploited western rock lobster (*Panulirus cygnus*). Conservation Genetics, 14, pp.115–124.

- Levings A, Mitchell BD, McGarvey R, Mathews J, Laurenson L, Austin C, Heeron T, Murphy N, Miller A, Rowsell M. 2001. Fisheries biology of the giant crab *Pseudocarcinus gigas*. Project 93:220. Final report to the Fisheries Research and Development Corporation, Australia. <https://www.frdc.com.au/sites/default/files/products/1997-132-DLD.pdf>
- Linnane A, Hobday D, Frusher S, Gardner C. 2011. Growth rates of juvenile southern rock lobster (*Jasus edwardsii*) estimated through a diver-based tag–recapture program. Marine and Freshwater Research 63:110–118. <https://doi.org/10.1071/MF11121>
- Linnane A, McGarvey R, Gardner C, Hartmann K, de Lestang S. 2021. Southern Rock Lobster 2020. In: T Piddocke, C Ashby, K Hartmann, A Hesp, P Hone, J Klemke, S Mayfield, A Roelofs, T Saunders, J Stewart, B Wise, J Woodhams (eds). 2021. Status of Australian Fish Stocks 2020. Fisheries Research and Development Corporation, Canberra. <https://fish.gov.au/report/294-Southern-Rock-Lobster-2020>
- Marine Stewardship Council (2018). MSC Fisheries Standard v2.01. Marine Stewardship Council, United Kingdom.
- Martell, S. and Froese, R., (2013). A simple method for estimating MSY from catch and resilience. Fish and Fisheries, 14(4), pp.504–514.
- McGarvey R, Ferguson GJ, Prescott JH. 1999. Spatial variation in mean growth rates at size of southern rock lobster, *Jasus edwardsii*, in South Australian waters. Marine and Freshwater Research. 50:333–42. <https://doi.org/10.1071/MF97172>
- McGarvey R, Levings AH, Matthews JM. 2002. Moulting growth of the Australian giant crab, *Pseudocarcinus gigas*. Marine and Freshwater Research. 53:869–81. <https://doi.org/10.1071/MF00074>
- Melville-Smith R, Norton SMG, Thomson AW. 2007. Biological and fisheries data for managing deep sea crabs in Western Australia. Final FRDC report – project 2001/055. Fisheries Research Report 165. Department of Fisheries, Western Australia.
- Ovenden JR, Brasher DJ, White RW. 1992. Mitochondrial DNA analyses of the red rock lobster *Jasus edwardsii* supports an apparent absence of population subdivision throughout Australasia. Marine Biology 112:319–26. <https://doi.org/10.1007/BF00702478>
- Punt AE, Hobday D, Gerhard J, Troynikov VS. 2006. Modelling growth of rock lobsters, *Jasus edwardsii*, off Victoria, Australia using models that allow for individual variation in growth parameters. Fisheries Research 82:119–30. <https://doi.org/10.1016/j.fishres.2006.08.003>
- Punt, A.E., Siddeek, M.S.M., Garber-Yonts, B., Dalton, M., Rugolo, L., Stram, D., Turnock, B.J. and Zheng, J., (2012). Evaluating the impact of buffers to account

- for scientific uncertainty when setting TACs: application to red king crab in Bristol Bay, Alaska. *ICES Journal of Marine Science*, 69(4), pp.624–634.
- Punt, A.E., A'mar, T., Bond, N.A., Butterworth, D.S., de Moor, C.L., De Oliveira, J.A., Haltuch, M.A., Hollowed, A.B. and Szuwalski, C., 2014. Fisheries management under climate and environmental uncertainty: control rules and performance simulation. *ICES Journal of Marine Science*, 71(8), pp.2208–2220.
- Purwanto, P.D., USAID, S., Mardiani, S.R. and USAID, S., 2020. Training-workshop on Dat Limited Stock Assessment Modelling using Stock Synthesis and Application in Fisheries Management.
- Ryan, K.L., Wise, B.S., Hall, N.G., Pollock, K.H., Sulin, E.H. and Gaughan, D.J. (2013). An integrated system to survey boat-based recreational fishing in Western Australia 2011/12. Fisheries Research Report No. 249. Department of Fisheries, WA.
- Ryan, K.L., Hall, N.G., Lai, E.K., Smallwood, C.B., Taylor, S.M. and Wise, B.S. (2015). Statewide survey of boat-based recreational fishing in Western Australia 2013/14. Fisheries Research Report No. 268. Department of Fisheries, WA.
- Ryan, K.L., Hall, N.G., Lai, E.K., Smallwood, C.B., Taylor, S.M., Wise, B.S. (2017). Statewide survey of boat-based recreational fishing in Western Australia 2015/16. Fisheries Research Report No. 287, DPIRD, WA.
- Ryan, K.L., Hall, N.G., Lai, E.K., Smallwood, C.B., Tate, A., Taylor, S.M., Wise, B.S. (2019). Statewide survey of boat-based recreational fishing in Western Australia 2017/18. Fisheries Research Report No. 297, DPIRD, WA.
- Ryan, K. L., Lai, E. K. M., & Smallwood, C. B. (2022). Boat-based recreational fishing in Western Australia 2020/21. Fisheries Research Report No. 327, DPIRD, WA.
- Sloan, S.R., Smith, A.D.M., Gardner, C., Crosthwaite, K., Triantafillos, L., Jeffries, B. and Kimber, N. (2014). National Guidelines to Develop Fishery Harvest Strategies. FRDC Report – Project 2010/061. Primary Industries and Regions, South Australia, Adelaide, March.
- Smallwood, C. B., Ryan, K. L., Tate, A. C., & Desfosses, C. J. (2021). Recreational fishing for Western Rock Lobster: estimates of participation, effort and catch from 2018/19 – 2020/21. Fisheries Research Report No. 313, DPIRD, WA.
- Smallwood, C. B., Ryan, K. L., Tate, A. C., & Rudd, L. J. (2022). Recreational fishing for Western Rock Lobster: estimates of participation, effort and catch in 2021/22. Fisheries Research Report No. 325, DPIRD, WA.
- Smith, K. D., Hall, N. G., de Lestang, S., and Potter, I. C. (2004). Potential bias in estimates of the size of maturity of crabs derived from trap samples. *ICES journal of marine science: journal du conseil*, 61:906–912. Oxford Academic.
- Stoklosa, R. 2022. Ecosystem Based Fishery Management—Ecological Risk Assessment of the Western Rock Lobster Resource. Fisheries Occasional Paper No. 142. Prepared for the Department of Primary Industries and Regional Development, Western Australia. E-Systems, Hobart.



Thompson, A.P., Hanley, J.R. and Johnson, M.S., 1996. Genetic structure of the western rock lobster, *Panulirus cygnus*, with the benefit of hindsight. Marine and freshwater research, 47(7), pp.889–896.

Williams A, Gardner C, Althaus F, Barker B, Mills D. 2009. Understanding the shelf-break habitat for sustainable management of fisheries with spatial overlap. Page Final report to the Fisheries Research and Development Corporation: project no. 2004/066.  
[http://frdc.com.au/research/Documents/Final\\_reports/2004-066-DLD.pdf](http://frdc.com.au/research/Documents/Final_reports/2004-066-DLD.pdf).

## 7.0 Appendices

### 7.1 Appendix 1 – Key resource categories and assessment methods

The two categories of SCOC Resources by quota zone are outlined below, current at the time of publication. The method of assessment may change as more information becomes available and the highest level of assessment based on the information available will be undertaken in the stock assessment at fishery level.

Category	Asset and assessment method
<p><b>Target species –</b> Data (rich) sufficient offshore crustacean species by quota zone where biomass modelling is possible.</p>	<p>Zone 1</p> <ul style="list-style-type: none"> <li>• Western rock lobster – Integrated population model*</li> </ul> <p>Zone 2</p> <ul style="list-style-type: none"> <li>• Crystal crab – Biomass dynamic model</li> <li>• Western rock lobster – Integrated population model*</li> </ul> <p>Zone 3</p> <ul style="list-style-type: none"> <li>• Southern rock lobster – Linked depletion model</li> </ul> <p>Zone 4</p> <ul style="list-style-type: none"> <li>• Southern rock lobster – Linked depletion model</li> </ul> <p>* Based on stock assessment of West Coast, due to the sink nature of the stocks Western Rock Lobster in the South Coast.</p>
<p><b>Retained species –</b> Data limited offshore crustacean species by quota zone where assessments will be based on data applicable assessments or catch assessments (depending on the level of information available).</p>	<p>Zone 1</p> <ul style="list-style-type: none"> <li>• Champagne crab – Catch assessment</li> <li>• Crystal crab – Catch assessment</li> <li>• Giant crab – Catch assessment</li> <li>• Southern rock lobster – Catch assessment</li> </ul> <p>Zone 2</p> <ul style="list-style-type: none"> <li>• Champagne crab – Data applicable assessment</li> <li>• Giant crab – Data applicable assessment</li> <li>• Southern rock lobster – Data applicable assessment</li> </ul> <p>Zone 3</p> <ul style="list-style-type: none"> <li>• Champagne crab – Catch assessment</li> <li>• Crystal crab – Catch assessment</li> <li>• Giant crab – Data applicable assessment</li> <li>• Western rock lobster – Catch assessment</li> </ul> <p>Zone 4</p> <ul style="list-style-type: none"> <li>• Crystal crab – Catch assessment</li> <li>• Champagne crab – Catch assessment</li> <li>• Giant crab – Catch assessment</li> <li>• Western rock lobster – Catch assessment</li> </ul>

## 7.2 Appendix 2 – Generational target species information

A summary of generational information for each offshore crustacean species or in case of limited details about the age at maturity, a proxy in for the purpose of recovery timeframes. A generation period is considered that of an animal whose parents spawned in the wild, regardless of parental lineage. For long lived species a maximum one generation of 10 years apply to recovery period apply when below the threshold, and for two generations a maximum recovery time of 20 years apply to recovery from below the limit in line with best practice fisheries management standards.

<b>Species</b>	<b>One generation</b>
Champagne crab	Proxy 10 years
Crystal crab	Proxy 10 years
Giant crab	Proxy 10 years
Southern rock lobster	7 years
Western rock lobster	6 years

## 7.3 Appendix 3 – Recovery strategy

### 7.3.1 Introduction

This Recovery Strategy has been developed in line with the Western Australian (WA) Harvest Strategy Policy (Fisheries Management Paper No. 271) and establishes performance levels that represent an appropriate rate of recovery for target stocks of the SCOC Resource.

The status of the target species is assessed for each quota zone of the SCCMF (resource level) at least every three years and the adoption of a recovery strategy would be triggered if the relevant performance indicator falls below the limit reference level for any of the target species.

### 7.3.2 Objective

The key management objective of this recovery strategy is to:

- Protect the residual biomass of the target species to allow the stock to recover to above the threshold level within two generations or a maximum of 20 years (whichever comes first), from the time of the breach to limit.

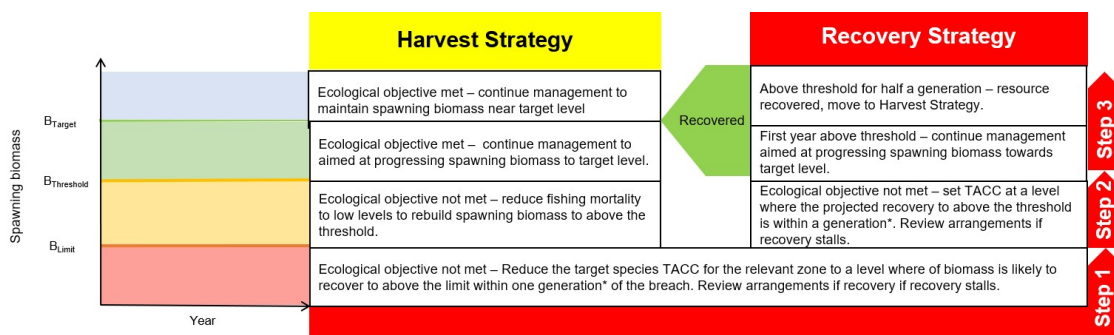
To achieve this objective three key steps have been identified:

**Step 1:** Initial recovery of stock of the relevant target species and rebuild to above the Limit reference level within one generation.

**Step 2:** Rebuild the stock of the relevant target species to above the Threshold reference level within one generation.

**Step 3:** Ensure recovery by maintaining relevant target species above the Threshold. The target species is considered recovered after being above the threshold for at least half a generation.

Once above the threshold, management should continue in accordance with the harvest strategy control rules to progress the performance indicator towards the target reference level, to ensure the ecological objective for these species are met.



\*one generation or a maximum of 10 years (whichever comes first).

Two key strategies have been developed to support this recovery plan:

1. Reduce the TACC for the relevant target species to a level where the planned recovery is aligned with the recovery rates in the objective.
2. Consider implementation of closures for relevant target species in appropriate areas to maximise the protection of stocks and aid with recovery.

### **7.3.3 Recovery approach**

For target species, management arrangements of the fishery are designed to maintain the spawning stock biomass at a level where the main factor affecting recruitment is the environment. To maintain ecological sustainability the limit reference level has been set at  $B_{20}$ , considered the point of recruitment impairment. Should a target species resource fall below the limit reference level, this recovery strategy will be triggered to enable the resource to recover to a level above the limit reference level within one generation of the initial exceedance.

A generational period is considered that of an animal whose parents spawned in the wild, regardless of parental lineage. A generation is dependent on the biology of the species and in cases where information is limited or unknown a proxy generational period has been set based on consideration of available research combined with a precautionary approach as a proxy in line with best practice and MSC standards, species details are included at Appendix 2.

Recovery projections will be included in the weight-of-evidence assessments for each resource and are based on average estimated recruitment from the previous ten-year period. To aid in the recovery, the TACC for the relevant resource/s should be reduced at the start of the next fishing season to a level where the biomass is projected to recover to above the limit reference level within one generation.

During a recovery phase monitoring of the health of the resource stock/s will be included in the weight-of-evidence assessment. During the recovery phase, assessments will be undertaken at more regular intervals to monitor health relevant stocks, where below the limit on an annual basis and bi-annually when progressed to above limit, but below threshold. In the case of years of poor recruitment (possibly because of changes in the climate), further reductions to the TACC for the relevant resource should be taken if necessary to meet recovery expectations to above limit levels within a generation from the time of the initial breach. When the resource recovers to above the limit reference level, the guidance under the general harvest strategy rules apply.