

# SOUTH COAST BIOREGION

## ABOUT THE BIOREGION

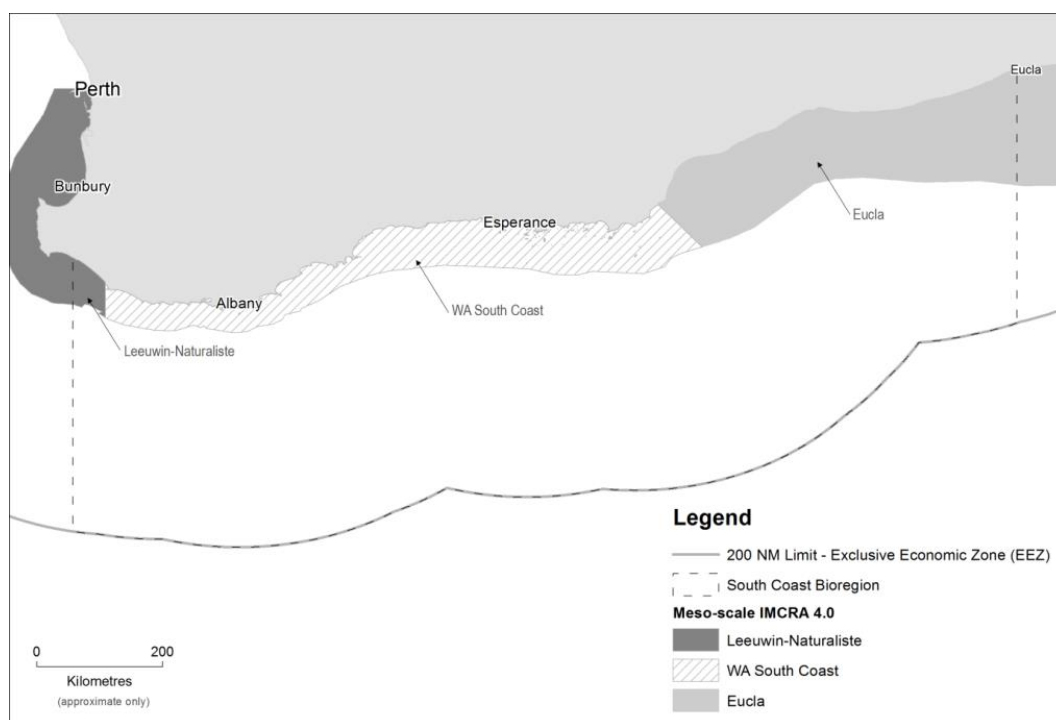
The continental shelf waters of the South Coast Bioregion (South Coast Overview Figure 1) are generally temperate but low in nutrients, due to the seasonal winter presence of the tail of the tropical Leeuwin Current and limited terrestrial run-off. Sea surface temperatures typically range from approximately 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 to 17°C. Summer water temperatures in 2012/13 were at a record high, which may affect the recruitment of some species.

Fish stocks in this region are predominantly temperate, with many species' distributions extending right across southern Australia. Tropical species are occasionally found, which are thought to be brought into the area as larvae as they are unlikely to form local breeding populations.

The South Coast 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, an extensive length (160km) of high limestone cliffs and mixed arid coastline to the South Australian border. There are few large areas of protected water along the South Coast, the exceptions being around Albany and in the Recherche Archipelago off Esperance.

Along the western section of the coastline that receives significant winter rainfall, there are numerous estuaries fed by winter-flowing rivers. Several of these, such as Walpole/Nornalup Inlet and Oyster Harbour, are permanently open, but most are closed by sandbars and open only seasonally after heavy winter rains. The number of rivers and estuaries decreases to the east as the coastline becomes more arid. While these estuaries, influenced by terrestrial run-off, have higher nutrient levels (and some, such as Oyster Harbour and Wilson Inlet, are suffering eutrophication), their outflow to the ocean does not significantly influence the low nutrient status of coastal waters.



**SOUTH COAST OVERVIEW FIGURE 1**

Map showing the South Coast Bioregion and IMCRA (V 4.0) meso-scale regions: South Coast and Eucla.

## SOUTH COAST BIOREGION

The marine habitats of the South Coast are similar to the coastline, having fine, clear sand sea floors interspersed with occasional granite outcrops and limestone shoreline platforms and sub-surface reefs.

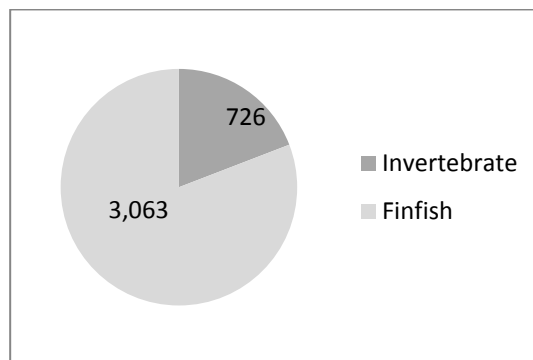
A mixture of seagrass and kelp habitats occurs along the South Coast, with seagrass more abundant in protected waters and some of the more marine estuaries. The kelp habitats are diverse but dominated by the relatively small *Ecklonia radiata*, rather than the larger kelps expected in these latitudes where waters are typically colder and have higher nutrient levels.

The ecosystem boundaries as defined by IMCRA (V 4.0) in the bioregion are depicted in South Coast Overview Figure 1. The potential threats and risks to these ecosystems are often similar. For simplicity risk ratings were allocated by grouping the ecosystems into two broad groups, estuarine or marine. However, if a particular ecosystem is unique and/or is exposed to different or significant threats, risk was allocated to these ecosystems separately.

## SUMMARY OF ACTIVITIES POTENTIALLY IMPACTING THE BIOREGION

### Commercial Fishing

The major commercial fisheries of the South Coast Bioregion are the abalone fishery, the purse seine fishery targeting pilchards and other small pelagics, and the demersal gillnet fishery for sharks and scalefishes. Other smaller commercial fisheries are the long-standing beach seine fishery for Western Australian salmon and herring, a trap fishery targeting southern rock lobsters and deep-water crabs, and the intermittent scallop trawl fishery. There is also a commercial net fishery for finfish operating in a number of South Coast estuaries and commercial fishers also target demersal scalefish offshore with droplines and handlines under general commercial 'wetline' provisions. South Coast commercial fishing vessel operators often hold a number of licences to create a viable year-round fishing operation.

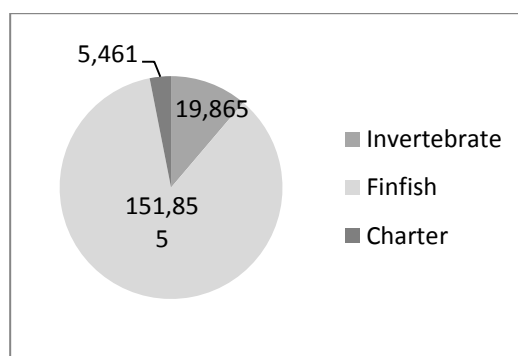


**SOUTH COAST OVERVIEW FIGURE 2**

*Relative contribution of finfish and invertebrates to the total commercial wild fishery catch originating from the South Coast Bioregion. Numbers represent total catch (in tonnes) based on all major assessed fisheries identified in the Overview section of this report (South Coast Overview Table 1).*

### Recreational Fishing

As much of the South Coast is remote or difficult to access, recreational beach and boat fishing tends to be concentrated around the main population and holiday centres. The major target species for beach and rock anglers are salmon, herring, whiting and trevally, while boat anglers target pink snapper, queen snapper, Bight redfish and King George whiting. The third major component of the recreational fishery is dinghy and shoreline fishing off estuaries and rivers, focused in the western half of the bioregion. Here the main angling targets are black bream and whiting (including King George whiting). Recreational netting, primarily targeting mullet, also occurs in these estuaries.



**SOUTH COAST OVERVIEW FIGURE 3**

*The South Coast Bioregion finfish and invertebrate catch numbers as assessed in the integrated survey of boat-based recreational fishing in WA 2013/14, and the charter boat catch numbers for the same period.*

## Aquaculture

The predominant aquaculture activity undertaken on the south coast is the production of mussels and oysters from Oyster Harbour at Albany. This activity is restricted to this area where there are sufficient nutrient levels related to terrestrial run-off to provide the planktonic food necessary to promote growth of filter-feeding bivalves.

Other forms of aquaculture (e.g. sea cage farming) are restricted on the South Coast by the high-energy environment and the very limited availability of protected deep waters typically required by this sector. Most recent development activity in the invertebrate sector has focused on land-based 'raceway' culture of abalone, using pumped sea water. In addition, an offshore abalone farm near Augusta is achieving encouraging early results for abalone grown out using purpose-built concrete structures located on the sea bed (See Aquaculture Regional Research and Development Overview section in this chapter).

## Tourism

Tourism is a regionally-important industry across the South Coast Bioregion, with much of the industry spread across rural areas and away from the major population centres of Albany and Esperance. Tourist infrastructure and development are generally small-scale and focussed on natural and wilderness experiences, thus tourism activities have a relatively low environmental impact, particularly in relation to the extensive length of coastline, which is only accessible via a limited number of four-wheel drive tracks. A significant portion of the bioregion's coastline is encompassed by national parks and nature reserves, particularly to the east of Bremer Bay. Whale watching, including expeditions to the largest known group of killer whales in the Southern Hemisphere at the head of the Bremer Canyon, and other marine wildlife experiences are also popular tourist activities.

## Shipping and Maritime Activity

Significant volumes of bulk commodities such as iron ore, grain, other agricultural products and wood chips are exported from commercial port facilities in Albany and Esperance. Cruise vessels also visit the Ports of Albany and Esperance, providing significant economic input into the local community and surrounding regions during their visits. In addition, many international shipping routes to and from eastern Australia, traverse the South Coast Bioregion without coming to port. Seismic surveying has been conducted in the east

of the bioregion to inform prospective oil and gas exploration in the western Great Australian Bight. At present though, no exploration drilling has been conducted in this area.

## BIOREGIONAL SPECIFIC ECOSYSTEM MANAGEMENT

Within each Bioregion there are a range of management measures that have been implemented to manage the potential impact of activities (See Chapter 3 for an overview). Management measures specific to the South Coast Bioregion include:

### Spatial Closures

Extensive fisheries closures in coastal and offshore waters have been introduced to manage trawling by Australian vessels (South Coast Overview Figure 4). Trawling is currently only permitted in 1% of shelf waters (South Coast Ecosystem Management Table 1).

The inshore marine habitats of the South Coast are relatively unaffected by human activities due to their remoteness, low population density across the bioregion and the extent of coastal management (national parks, nature reserves, etc.). While there are few permanent closures to demersal fishing methods in this region, the geographic footprint of demersal fishing activities is very small with about 98% of the region not affected at all by these methods.

The Walpole–Nornalup Marine Park was declared on the 8th May 2009 and is the first marine protected area on the South Coast. The Department of Fisheries' Marine Ecology Monitoring Section currently undertakes research and monitoring within the Walpole-Nornalup Marine Park, based on the departments identified risks in conjunction with the marine park management plan priorities. This work includes the support and supervision (in collaboration with Murdoch University) of post doctoral studies on the finfish community to assess current trends, movement ecology and development of a long term monitoring program for the finfish community within marine park. Additional access restrictions in the bioregion include closures under s.43 of the Fish Resources Management Act 1994 surrounding the wreck of the 'Perth' (Albany), wreck of the 'Sanko Harvest' (east of Esperance) and Esperance Jetty.

Following completion of the Commonwealth Government's Marine Bioregional Planning process for the South-West marine region (between Kangaroo Island, South Australia and

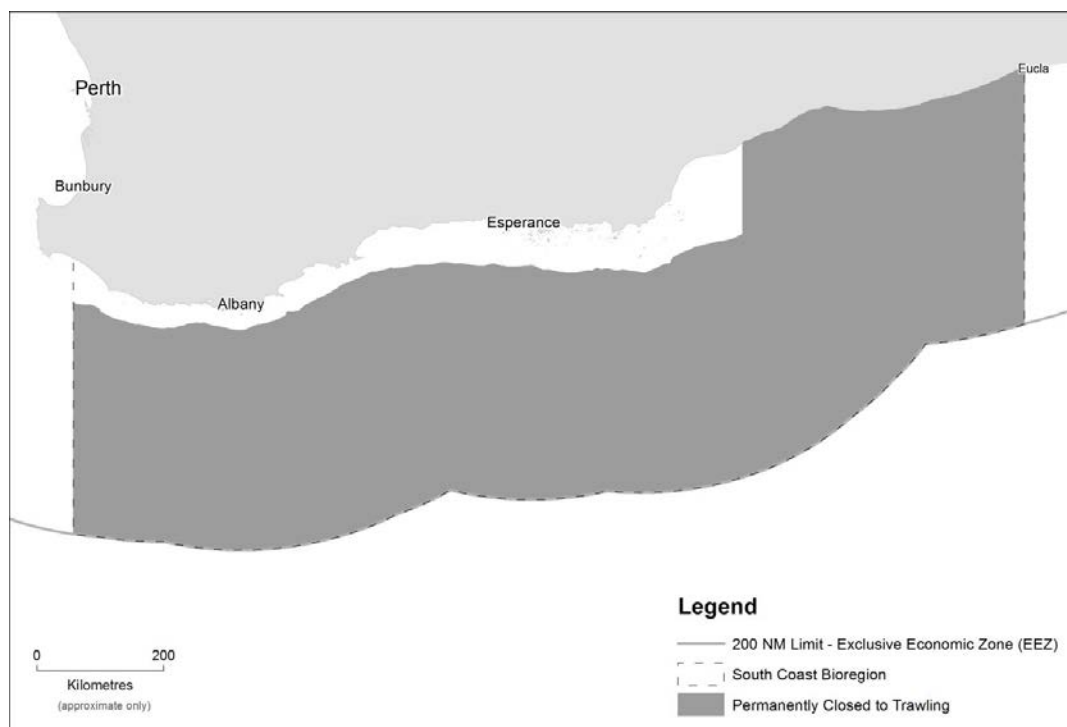
SOUTH COAST BIOREGION

Shark Bay), zoning arrangements for Marine Protected Areas off the South Coast of WA are being developed (South Coast Overview Figure 5).

**SOUTH COAST ECOSYSTEM MANAGEMENT TABLE 1**

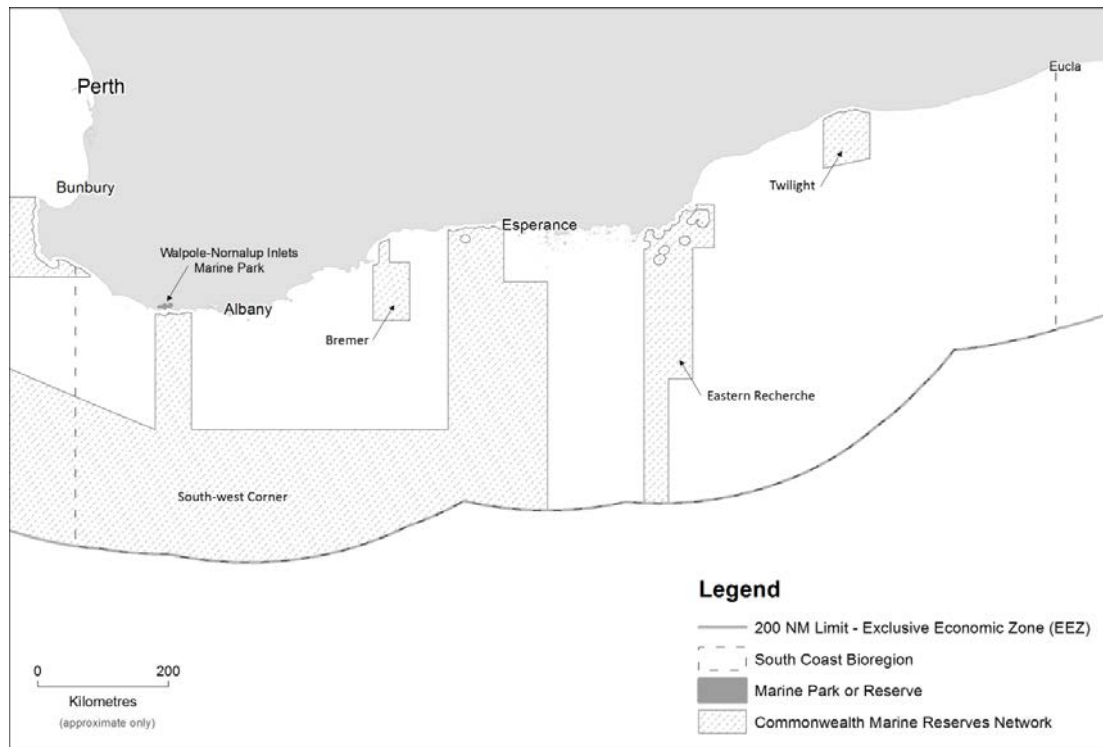
The areas and proportions of the South Coast Bioregion making up State Waters and all continental shelf waters, out to 200 m depth, which meet the IUCN criteria for classification as marine protected areas. This table does not yet include the closures that may be implemented by the Commonwealth as part of their marine planning zones.

IUCN category or equivalent	State Waters only (17,116 km <sup>2</sup> )				All Waters (534,016 km <sup>2</sup> (including State Waters))			
	Fisheries		Existing MPA		Fisheries		Existing MPA	
	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%
I	0	0	0	0	0	0	0	0
II	1	< 1	0	0	1	< 1	0	0
III	0	0	0	0	0	0	0	0
IV	2,400	14	15	< 1	2,400	< 1	15	< 1
V	0	0	0	0	0	0	0	0
VI	14,700	86	0	0	531,600	99	0	0



**SOUTH COAST OVERVIEW FIGURE 4**

Map showing the South Coast Bioregion and areas closed to trawling. The areas permanently closed to trawling are consistent with IUCN marine protected area category IV.



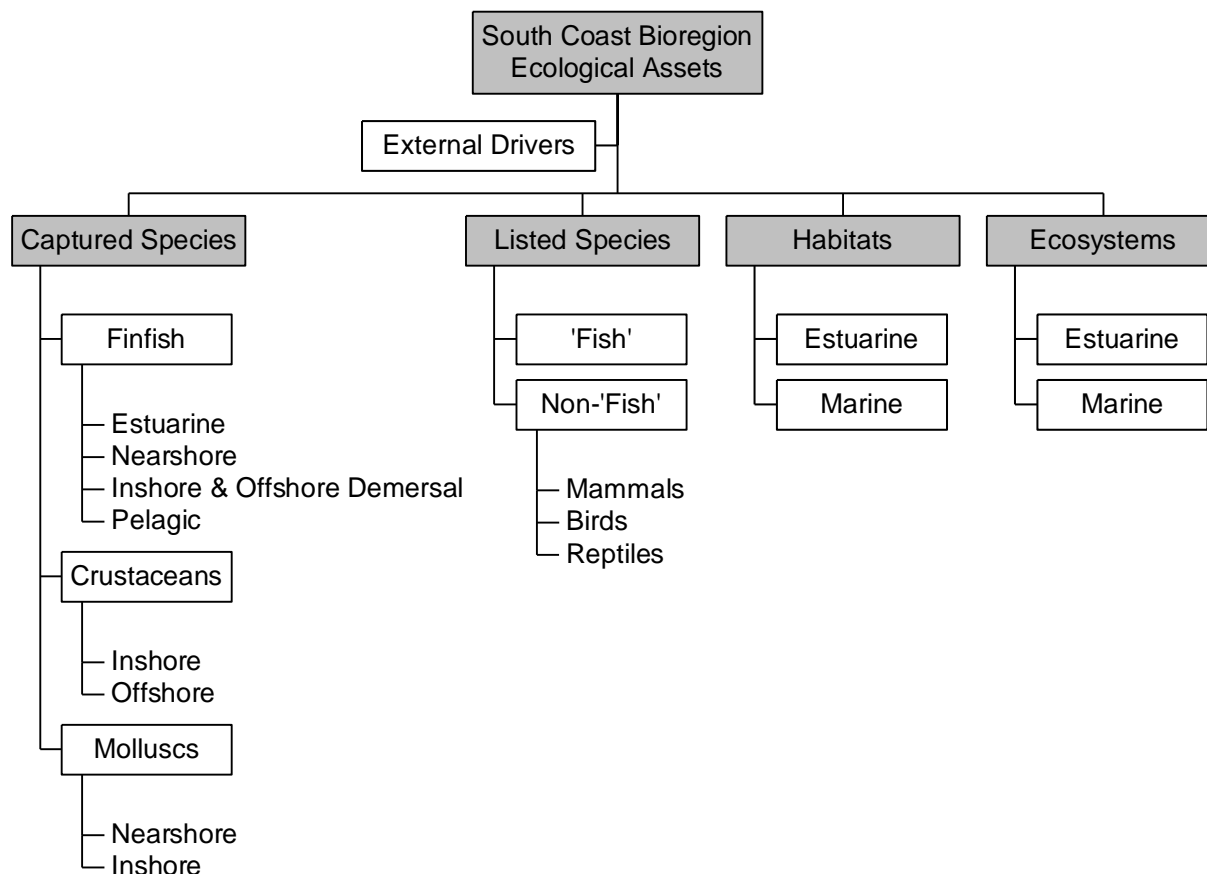
**SOUTH COAST OVERVIEW FIGURE 5**

Map showing the South Coast Bioregion and current and proposed state and Commonwealth marine parks and reserves along the southern WA coast.

## ECOSYSTEM MONITORING AND STATUS

In order to assess the adequacy of management arrangements aimed at ensuring sustainability of the ecological assets within the South Coast Bioregion, the Department must identify and monitor trends in the condition of these resources. This is achieved through application of an Ecosystem Based Fisheries Management (EBFM) framework (Fletcher, *et al.*, 2010<sup>32</sup>) to identify, in a hierarchical manner, the key ecological resources that require ongoing monitoring and assessment. (See *How to Use section for more details*). These key ecological assets identified for the South Coast Bioregion are identified in South Coast Overview Figure 6 and their current risk status reported on in the following sections.

<sup>32</sup> Fletcher WJ, Shaw J, Metcalf SJ, and Gaughan DJ. 2010. An Ecosystem Based Fisheries Management framework: the efficient, regional-level planning tool for management agencies. *Marine Policy* 34, 1226–1238.



**SOUTH COAST ECOSYSTEM MANAGEMENT FIGURE 6**

Component tree showing the ecological assets identified and separately assessed for the South Coast Bioregion.

### External Drivers

External factors that potentially impact marine and estuarine ecosystems at the bioregional-level may not fall within the direct control of Fishery legislation (e.g. climate change). An understanding of these factors, which are typically environmental (storms, ocean currents, rainfall, etc. ) is necessary to properly assess the risks to ecological resources. The main external drivers identified with potential to affect the South Coast Bioregion include climate and introduced pests and diseases.

#### Climate

External Drivers	Current Risk Status
Climate	LOW

This area is unlikely to be impacted by climate change in the near future.

### Introduced Pests and Diseases

External Drivers	Current Risk Status
Introduced Pests	LOW
Introduced Diseases	LOW

The identification of the pest algae *Codium fragile fragile* in Albany highlights the issues that now face many ports in Australia.

### Captured Species

#### Finfish

#### Estuarine

Captured Species	Aquatic zone	Ecological Risk
Finfish	Estuarine	SIGNIFICANT

Stocks of estuarine cobbler are considered inadequate. In addition, there is concern for some estuarine fish stocks mainly due to external (non-fishing) factors (e.g. poor water quality and other environmental factors).

### Nearshore (0-20m depth)

Captured Species	Aquatic zone	Ecological Risk
Finfish	Nearshore	MODERATE

Catches and catch rates of the nearshore indicator species (Australian salmon) have been declining since the mid-late 1990s due to reduced market demand and also environmental factors. Australian herring captures have also been in decline for some years. A study (reported in detail elsewhere in this report) has recently confirmed that this is related to stock issues generated by reductions in recruitment.

### Inshore (20-250m depth) and offshore (>250m depth) demersal

Captured Species	Aquatic zone	Ecological Risk
Finfish	Demersal	MODERATE

An NRM-funded project that concluded in 2016, assessed the risks to inshore demersal indicator species as low (western blue groper) to medium (bight redfish, snapper and blue morwong). Targeted fishing effort in deeper offshore areas is low and intermittent.

### Pelagic

Captured Species	Aquatic zone	Ecological Risk
Finfish	Pelagic	NEGLIGIBLE

While the spawning biomass of sardines has returned to appropriate levels, their catches and those of other pelagic fish have not returned to pre-virus levels due to market factors and changed fish behaviour.

## Invertebrates

### Crustaceans

Captured species	Aquatic zone	Ecological Risk
Crustaceans (Lobsters)	Inshore	MODERATE
Crustaceans (Crabs)	Offshore	MODERATE

The catch levels of lobsters and deep sea crabs remain at relatively low and consistent levels.

### Molluscs

Captured species	Aquatic zone	Ecological Risk
Molluscs (Abalone)	Nearshore	MODERATE
Molluscs (Scallops)	Inshore	NEGLIGIBLE

The stocks of abalone are maintained at appropriate levels. The abundance of scallops varies inter-annually due to recruitment fluctuations and fishing only occurs when stocks are sufficiently abundant.

## Listed species

A variety of endangered, threatened and protected<sup>33</sup> (ETP) species can be found within the South Coast Bioregion, including cetaceans, sealions, elasmobranchs, seahorses and pipefish and sea/shore birds. These species are protected by various international agreements and national and state legislation. Primary pieces of legislation include the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*, the *Western Australian Wildlife Conservation Act 1950*, and the *Fish Resources Management Act 1994*.

### Fish

Listed species	Risk
Fish	NEGLIGIBLE

There are few risks to the listed fish species in this region. This includes the white shark

<sup>33</sup> It must be noted that merely being on the listed species list does not automatically indicate that a species is either threatened or endangered.

(*Carcharodon carcharias*) which is protected under State and Commonwealth legislation throughout this and all bioregions.

### Non-Fish

Listed species	Risk
Mammals	HIGH
Birds and Reptiles	MODERATE

Although captures of Australian sea lions are rare and significantly fewer than they were historically due to substantial reductions in permitted levels of demersal gillnet fishing effort, small numbers have intermittently been reported from demersal and nearshore/estuarine gillnets (see Appendix 3). In addition, concerns about potential captures of juvenile sea lions in South Coast Crustacean Managed Fishery pots, have led to the requirements for Sea Lion Excluder Devices to be fitted to pots when they are fished in proximity to breeding colonies.

Reported captures of shearwaters in purse seine operations have declined in recent years (Appendix 3) due to mitigation measures implemented through a code of conduct. These measures, which apply during a "special mitigation period" (March and April) when entanglement rates historically peaked, include a dawn closure, measures to prevent slack and folds occurring in nets, communication and avoidance protocols and gear modification trials.

### Habitats and Ecosystems

The South Coast Bioregion, extending from just Black Point (east of Augusta) to Israelite Bay (east of Esperance) (South Coast Overview Figure 1).

South Coast Bioregional ecosystems are generally temperate, although the tropical Leeuwin Current maintains temperatures above those normally expected at such latitudes, especially under La Niña conditions. Tropical species can therefore occur across much of the bioregion, although they are unlikely to form breeding populations. Due to the influence of the Leeuwin current and limited freshwater discharge, South Coast Bioregion ecosystems are relatively oligotrophic, although localised upwelling along the outer edge of the continental shelf may be locally-important sources of productivity, e.g. the head of the Bremer Canyon is a recognised biodiversity hotspot in the region.

The key habitats occurring in depths of less than 40 m (where the vast majority of relevant fisheries resources are located and fishing activities are undertaken in this bioregion) include:

- **Rocky shores:** The most conspicuous of the marine habitats in the South Coast Bioregion are the rocky shores. The south coast is exposed to the most extreme wave energy of the entire Australian coastline, due to the narrow continental shelf and lack of protection from offshore reefs and islands. Along this coast, granitic and gneissic slopes exposed to heavy wave action are usually smooth and populated with moderate to large numbers of gastropod molluscs, barnacles and macrophytes showing distinct vertical zonation.
- **Algae:** Macroalgae along the southwestern and southern coasts of Australia are highly diverse, with an estimated 62 % of macroalgal species endemic to the south coast. Algal assemblages are important as a food source, nursery grounds and shelter for a variety of organisms. Macroalgae also contribute to marine nutrient and carbon cycling in the Bioregions.
- **Sand:** The South Coast Bioregion seabed largely composed of soft, unconsolidated sediments. These sediments provide an important habitat for benthic infauna, with sediment structure an important influence on the distribution, abundance and community of these species .
- **Seagrasses:** The diversity of seagrasses in temperate south-western Australia is the highest for any temperate region in the world and reflects the broad distribution of seagrasses in estuaries, coastal embayments and nearshore sheltered environments through to exposed coastal nearshore and offshore areas that are battered by ocean swells. Seagrasses perform the following important ecosystem functions: primary production, nutrient cycling, stabilising sediments and habitat provision.
- **Sponges:** In southwestern Australia, sponges are found in areas where algae are less dominant, which includes areas deeper than 30 m and caves.

The IMCRA ecosystem boundaries are illustrated in South Coast Overview Figure 1. The risk status for



ecosystems and habitat is simplified into two broad categories: estuarine and marine.

### Habitats

Habitats	Aquatic zone/category	Current Risk Status
South Coast	Estuarine	MODERATE
South Coast	Marine	NEGLIGIBLE

The footprint and intensity of demersal fishing methods (i.e. trawling, gillnetting, potting, droplining and longlining) on benthic habitats is extremely low (<1%) relative to the geographic scale of the bioregion. Trawling and demersal gillnetting also take place away from potentially sensitive hard-substrate habitats due to target species' distributions and to avoid damage to fishing gear. Some estuaries (e.g. Wilson and Hardy Inlets) are in poor condition due to reduced rainfall and other environmental factors.

### Ecosystems

Ecosystems	Aquatic zone/category	Current Risk Status
South Coast	Estuarine	MODERATE (non fishing)
South Coast	Marine	LOW

An assessment by Hall and Wise (2011)<sup>34</sup> of finfish community structure using commercial fishery data for the past 30 years, concluded that trends mean trophic level, mean length and a Fishery-In-Balance indicator had stabilised in the South Coast Bioregion and that there were, thus, no concerning trends in available ecosystem-based indices.

The most likely cause of any changes to community structure in estuarine regions is changing rainfall levels and changes in tidal exchange due to opening and closing of sand-bars at river mouths.

<sup>34</sup> Hall NG, and Wise BS. 2011. Development of an ecosystem approach to the monitoring and management of Western Australian fisheries. FRDC Report – Project 2005/063. *Fisheries Research Report*, No. 215. Department of Fisheries, Western Australia. 112pp.

# SOUTH COAST CRUSTACEAN RESOURCE STATUS REPORT 2016

J. How and G. Baudains



## OVERVIEW

The South Coast Crustacean Fishery (SCCF) is a multi-species, effort-controlled pot based fishery, with catches of southern rock lobster (*Jasus edwardsii*) and western rock lobster (*Panulirus*

*cygnus*) as well as deep-sea crab species namely, giant crab (*Pseudocarcinus gigas*), crystal crab (*Chaceon albus*) and champagne crab (*Hypothalassia acerba*).

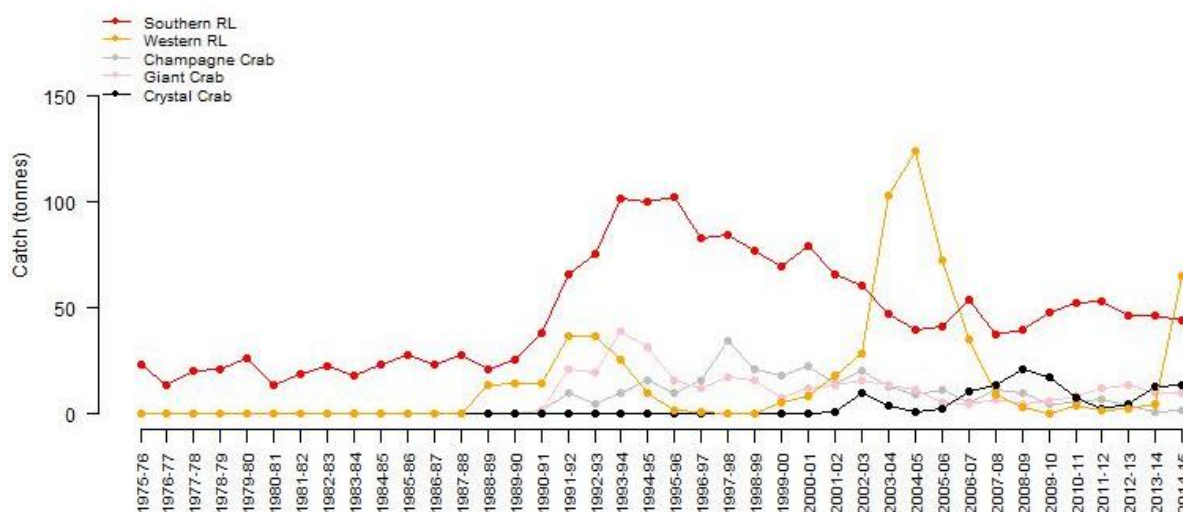
## SUMMARY FEATURES 2016

Fishery Performance	Commercial	Recreational	
<b>Total Catch 2015</b>	135 t	< 5 t	
<b>Fishing Level</b>	Acceptable	Acceptable	
Stock/Resource Performance	Stock Status	Assessment Indicators	
	Sustainable - Adequate	Annual: Catch and Catch Rates	
EBFM Performance			
Asset	Level	Asset	Level
<b>Bycatch</b>	Low Risk	<b>Listed Species</b>	Moderate Risk
<b>Habitat</b>	Low Risk	<b>Ecosystem</b>	Low Risk
<b>Social</b>	Moderate Amenity Moderate Risk	<b>Economic</b>	GVP Level 3 -\$7.6 million Moderate Risk
<b>Governance</b>	Stable	<b>External Drivers</b>	Moderate Risk

## CATCH AND LANDINGS

The total landings of crustacean from this offshore resource in 2014-15 accessed by the South Coast Crustacean Fishery (SCCF) was 135 t, with 109.1 t

of rock lobster (southern and western combined) and 26.2 t of deep sea crabs retained (South Coast Crustacean Figure 1).



SOUTH COAST CRUSTACEAN FIGURE 1. Total landings in the South Coast Crustacean Fishery by species.

## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

### *Zone 1 – Augusta / Windy Harbour (Western rock lobster-Adequate)*

The assessment for this zone is determined using western rock lobster as the indicator species. Western rock lobster (*Panulirus cygnus*) can live for over 20 years and weigh of up to 5.5 kg, more typically they live for 10 to 15 years and weigh less than 3 kg. They are considered as a single genetic stock throughout its geographic range (Thompson *et al.* 1996, Johnson 1999, Kennington *et al.* 2013). For more details on the western rock lobster resource see de Lestang *et al.* (2016).

Commercial catch rates in this zone have improved markedly and are approaching historic high levels (South Coast Crustacean Figure 2a). It is likely that the current level of overall stock depletion in this region is minimal. The western rock lobster stock in this area represents the southern edge of the distribution of the stock. Evidence suggests that the source of recruitment for western rock lobsters in the SCCF is the West Coast Rock Lobster Managed Fishery (WCRLF). The WCRLF is MSC certified and has spawning biomass estimated as near record **high** levels.

### *Zone 2 – Albany (Crystal Crab-Adequate)*

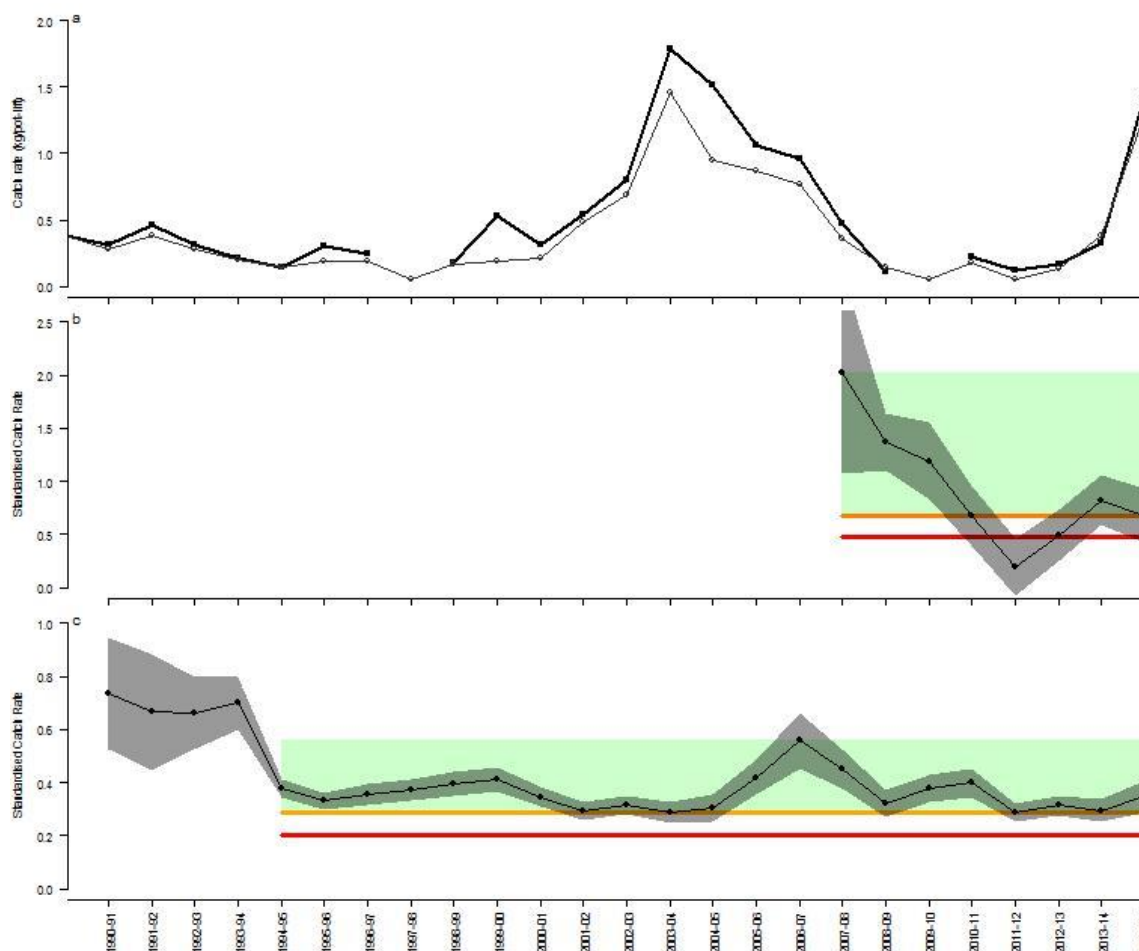
Crystal crab (*Chaceon albus*), which is found on the west and south coasts of Western Australia is the indicator species within this zone. It is a deep water species typically caught between 500 – 800 m. (For more details see How *et al.* 2015).

Landings of crystal crabs have increased in the 2014/15 season by about 1 t to 13.9 tonnes (South Coast Crustacean Figure 1). The standardised commercial catch rate declined slightly from the 2013/14 season and is now just above threshold levels. This slight decline occurred after a progressive increase the standardised catch rate from a record low in 2011/12 (South Coast Crustacean Figure 2b). It is likely that the stock biomass is above its proposed threshold level and is therefore **adequate**.

### *Zone 3 – Esperance and Zone 4 – Bight (Southern Rock Lobster-Adequate)*

The assessment for these zones are determined using southern rock lobster as the indicator species. Southern rock lobster (*Jasus edwardsii*) is considered to be a single genetic stock across the southern waters of Australia where it is caught (Ovenden *et al.* 1992). This is a major commercial species for a number of southern Australian states with a national stock assessment showing the overall status of the stock being sustainable (Linnane *et al.* 2014) and the relative catches of southern rock lobster from WA are minimal. For more details see Linnane *et al.* (2014).

Catches of southern rock lobsters in the SCCF have declined slightly in recent seasons, with catch landings outside of the target catch range of 50-80 tonnes (Figure 1). Standardised commercial catch rates have improved slightly from the previous season and remain within the proposed target range for this species (South Coast Crustacean Figure 2c). It is likely that the current level of overall stock depletion is **acceptable** (i.e. overall a low-medium sustainability risk) and the SCCF stock biomass is above its threshold level and is therefore **adequate**.



**SOUTH COAST CRUSTACEAN FIGURE 2.** Annual catch rate (grey line open circles), targeted catch rate (heavy line solid circles) and standardised catch rate (line and open circles with grey 95CI) for a) western rock lobster, b) crystal crab and c) southern rock lobster. Target region (green), threshold (orange) and limit (red) reference points are presented when applicable.

## BYCATCH AND PROTECTED SPECIES INTERACTIONS

**Bycatch:** The gear used in this fishery generates minimal bycatch and the design of the pots is such that their potential to 'ghost fish' if lost is negligible.

**Protected Species:** The SCCF operates in areas adjacent to Australian Sea Lions (ASL) colonies. Pots fished in areas potentially frequented by juvenile ASL are required to be fitted with a sea lion exclusion device (SLED). These devices are designed to stop the entrance and accidental drowning of ASL. An exemption was granted in the 2015/16 season to assess the impact of SLEDs on catch composition and catch rate in Zone 3. Consultation is currently underway between Zone 3 fishers and the Department of Fisheries to establish suitable mitigation measures to reduce

potential ASL interactions and minimising any impact on fisher catches.

In the 2014-15 season there was one whale entanglement reported by the SCCF. This whale was fitted with a makeshift tracking buoy, however recovery attempts yielded only the buoy which had come adrift of the entangled whale, therefore its status is unknown.

Turtles can also get caught in the float rigs of lobster pots. In 2015 no turtles were reported to have been entangled in lobster fishing gear.

## HABITAT AND ECOSYSTEM INTERACTIONS

**Habitat:** Potting is considered to have a low impact on the habitat over which the fishery operates.

**Ecosystem:** The effects of the removal of lobster and deep sea crabs has been assessed for the

West Coast Deep Sea Crustacean Fishery and Western Rock Lobster Managed Fishery on the state's west coast. Both of these fisheries have been assessed as having negligible food chain effects by the removal of crabs and lobsters respectively. Therefore, at current catch levels, it is unlikely that removal of lobster and crabs on the south coast are likely to result in food chain effects.

## SOCIAL AND ECONOMIC OUTCOMES

### *Social*

This fishery is based on mobile vessels that employ a skipper and two or three crew. The product is landed live at ports between the South Australian / West Australian border and Augusta, generating some additional economic activity and benefits. There is a small recreational fishery for rock lobsters on the south coast of Western Australia.

### *Economic*

The beach value of the fishery was about \$7.6 million in 2014/15 with the majority of the catch sold live to Asian markets both locally and internationally. This is a substantial increase in the value of the fishery compared to 2013-14 due to the considerable increase in landings of western rock lobster from Zone 1 of the SCCF.

## GOVERNANCE SYSTEM

### *Annual Catch Tolerances*

Southern Rock Lobster – 50-80 t

Current fishing level – **Acceptable**

Under the SCCF Management Plan, the Fishery is managed through limited entry, input controls (including limiting the number of pots that can be used), size limits and seasonal closures. Through the establishment of the SCCF, the large amount of latent effort which existed in Zones 2 and 4 was dramatically reduced.

### *Harvest Strategy (Under Development)*

A preliminary harvest strategy was developed as part of the Marine Stewardship Council (MSC) pre-assessment for this fishery. This continues to be refined, and will be formally presented to industry in upcoming seasons to ratify.

### *Compliance*

Enforcement effort is either opportunistic or targeted. Practices include on-land and at-sea

inspection of vessels, gear, authorisations and catch.

### *Consultation*

Consultation occurs between the department and the commercial sector either through Annual Management Meetings convened by WAFIC. Consultation with RecFishWest and other interested stakeholders is conducted through specific meetings and the Department's Website.

### *Management Initiatives (Stable)*

Management initiatives will primarily focus on refinement of management arrangement pertaining to SLED zones and ASL mitigation measures. Research priorities will be the increased participation in voluntary logbooks to provide greater spatial and temporal resolution of catch and effort data.

## EXTERNAL DRIVERS (*Moderate Risk*)

Given a large export market, fluctuation in the Australian dollar can have impacts on the economic performance of the fishery. The southern and western rock lobsters are near the edge of their distributional range and hence could be influenced by environmental conditions.

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## SOUTH COAST GREENLIP/BROWNLIP ABALONE RESOURCE STATUS REPORT 2016

L. Strain, F. Fabris and S. Walters



### OVERVIEW

The Greenlip/Brownlip Abalone Fishery is a dive fishery that operates in the shallow coastal waters off the south-west and south coasts of WA. The fishery targets two large species of abalone: greenlip abalone (*Haliotis laevis*) and brownlip abalone (*H. conicopora*), both of which can grow to approximately 20 cm shell length. The commercial Greenlip/Brownlip Abalone Fishery is managed primarily through Total Allowable Commercial Catches (TACCs) for each species in

three management areas, which are allocated annually as Individually Transferable Quotas (ITQs).

Recreational fishing only occurs in the Southern Zone with management arrangements that include a specific abalone recreational fishing licence, size limits, daily bag and possession limits, and temporal closures. Further details on the fishery can be sourced from Hart *et al.* (2017).

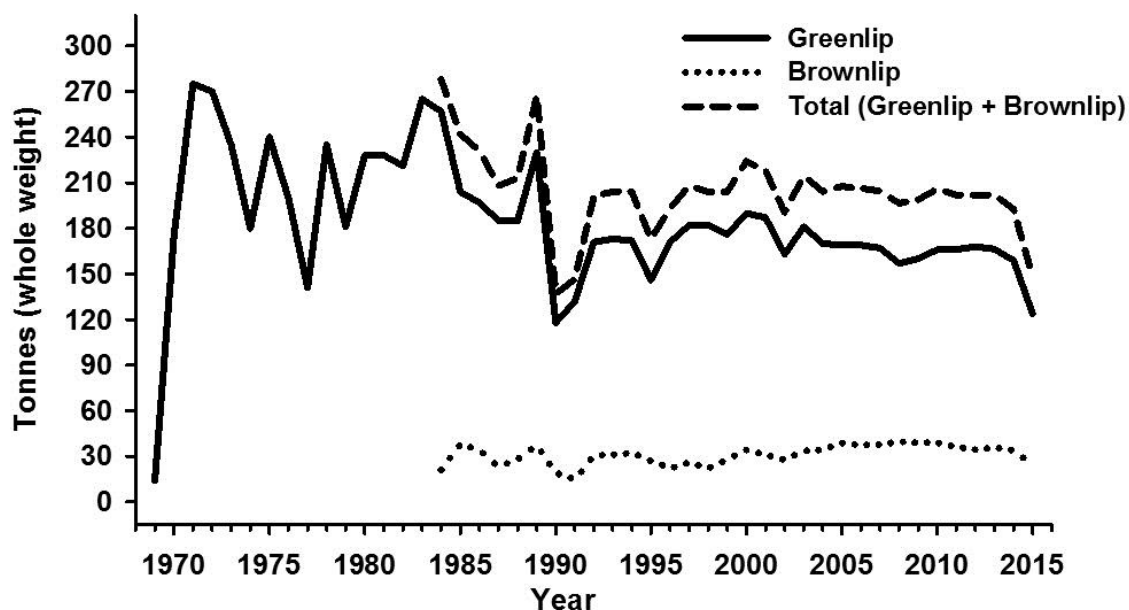
### SUMMARY FEATURES 2016

<b>Fishery Performance</b>	<b>Commercial</b>	<b>Recreational</b>	
<b>Total Catch 2015</b>	152 t	8 t	
<b>Fishing Level</b>	Not Acceptable	Acceptable	
<b>Stock/Resource Performance</b>	<b>Stock Status</b>	<b>Assessment Indicators</b>	
<b>Greenlip abalone</b>	Sustainable - Adequate	Annual: Catch, Catch Rates, Sizes, Surveys	
<b>Brownlip abalone</b>	Sustainable - Adequate	Annual: Catch, Catch Rates, Sizes, Integrated Model	
<b>EBFM Performance</b>			
<b>Asset</b>	<b>Level</b>	<b>Asset</b>	<b>Level</b>
<b>Bycatch</b>	Negligible Risk	<b>Listed Species</b>	Negligible Risk
<b>Habitat</b>	Negligible Risk	<b>Ecosystem</b>	Negligible Risk
<b>Social</b>	Low Amenity	<b>Economic</b>	GVP - \$6.6 million
	Low Risk		Moderate Risk
<b>Governance</b>	TACC Adjustments	<b>External Drivers</b>	Moderate - High Risk
	MSC full assessment underway		

### CATCH AND LANDINGS

In 2015 the total commercial greenlip/brownlip abalone catch was 152 t whole weight (greenlip 127 t and brownlip 25 t), which was 89% of the combined TACC (170 t whole weight; Greenlip/Brownlip Abalone Figure 1). The lower catch in 2015 was due to reductions in TACC (greenlip 20 t and brownlip 11 t) and a voluntary

commercial reduction of 17 t greenlip abalone from the TACC set in Management Area 3. The combined recreational catch of both species estimated at 8 t, which was derived from a 2007 telephone diary survey, is still considered sufficiently accurate.



**GREENLIP/BROWNLIP ABALONE FIGURE 1.** Commercial greenlip and brownlip abalone catch (t, whole weight) by season as recorded against the nearest calendar years.

## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

### *Greenlip abalone (Sustainable-Adequate)*

Greenlip abalone are distributed from south-west WA across southern Australia to Victoria and northern Tasmania. A recent genomic study suggests the existence of one single greenlip abalone population along the WA coast but with five adaptive populations (Sandoval-Castillo *et al.* 2015). The fishery has a legal minimum length of 14 cm, which allows 2–5 years of spawning to occur before recruitment to the fishery.

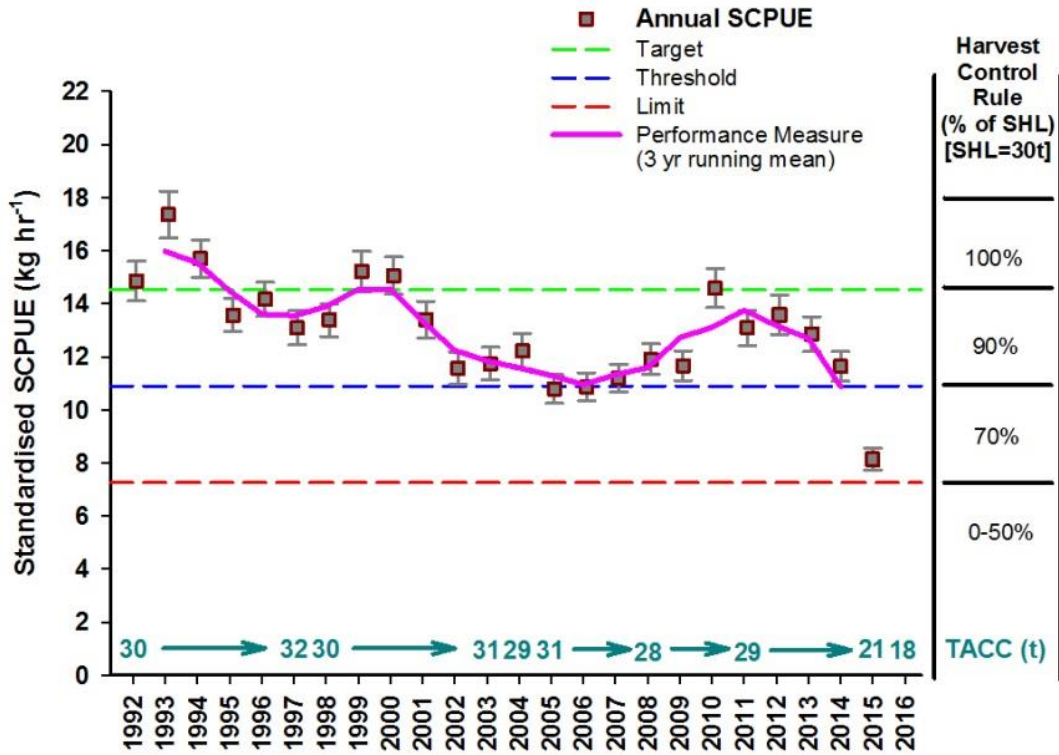
To determine the TACCs for each management area, the stock status is assessed by the primary indicator of standardised catch per unit effort (SCPUE) which uses commercial catch and effort statistics, and other indicators such as fisheries-

independent sampling. In Management Area 2 (Esperance) there has been a declining trend in SCPUE since 2010-11, with a marked decline in 2015 and the SCPUE is now below the threshold but above the limit reference level (Greenlip/Brownlip Abalone Figure 2a). In Management Area 3 (Albany), since 2013 the SCPUE has declined to below the threshold but remains above the limit reference level (Greenlip/Brownlip Abalone Figure 2b). Analysis of raw catch rate, average meat weight per individual and length-frequency trends also support evidence of a declining trend (Hart *et al.* 2017). Fishery-independent surveys show evidence of a recent decline in juvenile (4 – 8 cm), recruit (14.5+ cm) and total densities but are not outside of historical ranges (Hart *et al.* 2017). Stock status of greenlip abalone is considered **adequate**.



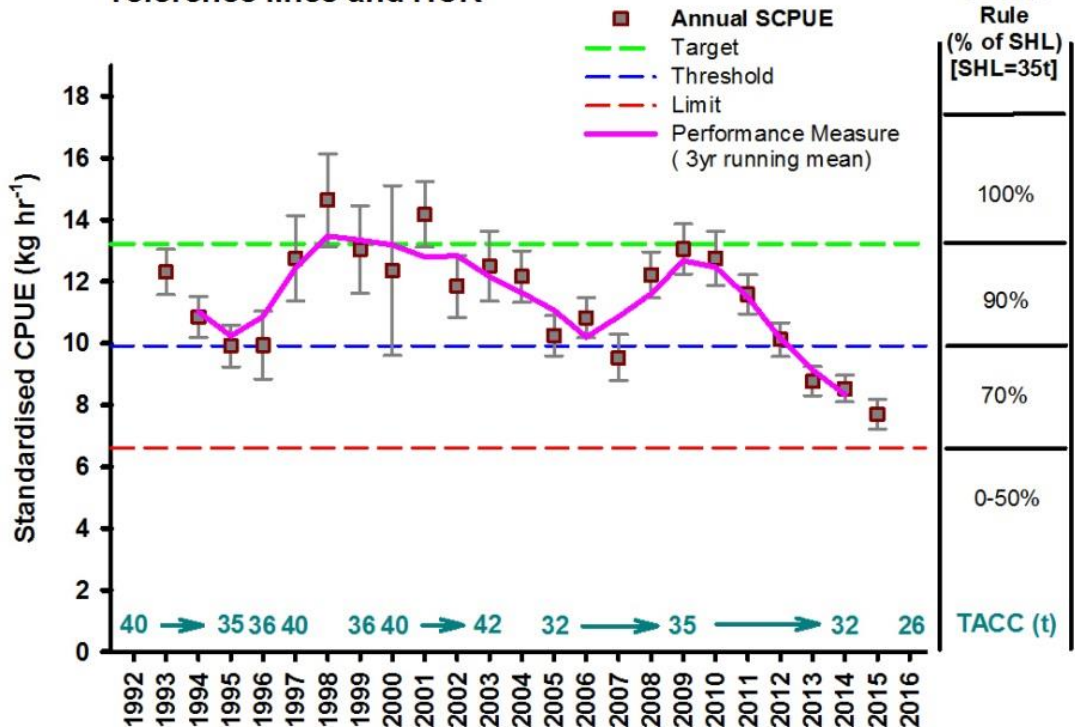
a)

**Area 2 Greenlip SCPUE - with reference lines and HCR**



b)

**Area 3 Greenlip SCPUE- with reference lines and HCR**



**GREENLIP/BROWNLIP ABALONE FIGURE 2.** The standardised CPUE (kg.hr<sup>-1</sup>) for greenlip abalone with the performance indicator (3 year running mean), reference levels (target, threshold and limit), harvest control rule and TACCs (t, meat weight) in Management Area 2 (a) and Area 3 (b).

**Brownlip abalone (Sustainable-Adequate)**

Brownlip abalone are limited to WA and distributed from the south-west to the WA/SA border. There is evidence to suggest brownlip abalone are genetically similar to, and can even be considered conspecific with blacklip abalone (*Haliotis rubra*) (Brown and Murray 1992), which are distributed east from WA/SA border to northern NSW and Tasmania. Estimates of biological characteristics can be found in Strain *et al.* (2017), and given the fishery has a legal minimum length of 14 cm it allows 2–3 years of spawning to occur before recruitment to the fishery.

The stock status is assessed using commercial catch and effort statistics, and an integrated model. Trends in the stock indicator (SCPUE) were used for the assessment of the 2016 TACC for each management area. In Management Area 2 (Esperance) the SCPUE for brownlip abalone was relatively stable above the target reference level between 1999 and 2012, however in 2013 and 2014 it declined markedly but has stabilised in 2015 at the threshold reference level.

In Management Area 3 (Albany) the SCPUE for brownlip abalone fluctuated greatly during 1999 to 2010 (above the target), before remaining relatively stable from 2011 to 2015 above the threshold reference level. The integrated length-based model was fitted to commercial catch and catch rate data, length composition data and modelled growth of brownlip abalone from Management Areas 2 and 3 combined (Strain *et al.* 2017). The integrated model estimated the ratio of spawning biomass to unfished levels in 2015 as above the target reference level. Consequently the stock status of brownlip abalone is considered to be **adequate**.

**BYCATCH AND PROTECTED SPECIES INTERACTIONS (Negligible Risk)**

Divers have the ability to target abalone of choice (species, sizes and quality of abalone) and do not inadvertently harvest bycatch in their normal fishing activities. The only potential listed species interaction is with the white shark (*Carcharodon carcharias*), which has been known to attack divers. Most divers now use diving cages and/or electronic shark deterrent devices for their personal protection, and are recording their encounters with white sharks.

**HABITAT AND ECOSYSTEM INTERACTIONS (Negligible Risk)**

The fishing activity makes minimal contact with the habitat, which typically consists of hard rock surfaces in a high wave-energy environment. As abalone are drift algae feeders, their removal is unlikely to result in any change to the algal growth cover in fished areas, and hence it is considered unlikely that the fishery has any significant effect on the food chain in the region.

**SOCIAL AND ECONOMIC OUTCOMES Social (Low Risk)**

There are 20 vessels operating in the Commercial Greenlip/Brownlip Abalone Fishery, employing approximately 45 divers and deckhands. The dispersed nature of the Greenlip/Brownlip Abalone Fishery means that small coastal towns from Busselton to the WA/SA border receive income from the activity of divers. Recreational diving for greenlip and brownlip abalone is a small but active sector, with dive shops and vessel manufacturers benefiting from this activity. The recreational fishery provides a major social benefit to those community members that appreciate abalone as a delicacy. There were 16,965 licenses issued that would have allowed fishers to participate in the recreational abalone fishery, although most of these would have targeted the Roe's abalone fishery in the Perth metropolitan area.

**Economic (Moderate Risk)**

Estimated annual value (to fishers) for 2015 was \$6.6 million, based on the estimated average price received by commercial fishers of \$107/kg meat weight (\$40/kg whole weight) for greenlip abalone and \$84/kg meat weight (\$34/kg whole weight) for brownlip abalone. Greenlip abalone prices in 2015 were similar to prices in 2014 (\$101/kg meat weight) but are still lower compared to 10 years ago (e.g. \$127/kg meat weight in 2005).

**GOVERNANCE SYSTEM****Annual Catch Tolerance Levels (Commercial - Not Acceptable; Recreational - Acceptable)**

**Commercial:** 170 t (TACC) (3,440 – 5,270 fishing hours)

**Recreational:** Not formal

Commercial effort (5,293 hours) exceeded tolerance range due to lower abundance. TACC reduced in 2016 for both management areas in response to the lower abundance.

Current recreational catch levels are not considered to pose any stock issues.

### ***Harvest Strategy (Formal)***

The harvest strategy (DoF 2017) uses SCPUE as a proxy for biomass as the key performance indicator, which are assessed against specified reference levels for each management area. A recent review (2015) of the harvest control rule and reference levels indicated that a more conservative approach was required, and management action has subsequently been implemented. The TACCs (whole weight) have been set for the 2016/17 season using the harvest strategy (DoF 2017), for greenlip abalone they are 3 t in Area 1, 48 t in Area 2 and 68 t in Area 3, while for brownlip abalone they are 150 kg in Area 1, 12.5 t in Area 2 and 12.5 t in Area 3.

### ***Compliance***

The Department conducts regular inspections of commercial catch at both the point of landing and processing facilities to ensure the commercial industry is adhering to governing legislation. The recreational fishery has a level of enforcement appropriate to the distribution of recreational fishing effort.

### ***Consultation***

The Department undertakes consultation directly with the Abalone Industry Association of Western Australia (AIAWA) and licensees on operational issues. Industry Annual Management Meetings are convened by the West Australian Fishing Industry Council (WAFIC), who are also responsible for statutory management plan consultation under a Service Level Agreement with the Department. Recreational consultation processes are facilitated by Recfishwest under a Service Level Agreement, although the Department undertakes direct consultation with the community on specific issues.

### ***Management Initiatives (MSC Assessment)***

Consultation also took place with industry on relatively minor operational changes to the *Abalone Management Plan 1992* and these matters are currently being progressed. The commercial greenlip/brownlip abalone fishery is currently undergoing full MSC assessment (<https://www.msc.org/track-a-fishery/fisheries-in-the-program/in-assessment/Indian-ocean/Western-Australia-abalone-fishery/Western-Australia-abalone-fishery>).

### ***EXTERNAL DRIVERS (Moderate-High Risk)***

In the last few years there have been a number of changes which impact on fishery governance, and particularly on catch rates. Lease divers and using 2 divers per fishing day are more common, and industry size limits have been varied substantially above the legal minimum lengths. A major impact on fishery governance is expected over the next few years with commercial fishers in Area 3 considering a different industry management model. The value of the abalone fishery is still at historical low levels; however this may change with recent decreases in the relative value of the Australian dollar. In addition, environmental effects such as weather conditions, and the effect of technology changes, continue to have significant impacts on diver efficiency. The effect of above-average water temperatures on the abalone stocks since 2011 needs to be investigated further.

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## SOUTH COAST NEARSHORE AND ESTUARINE FINFISH RESOURCE STATUS REPORT 2016

K. Smith and G. Baudains



### OVERVIEW

In the South Coast Bioregion (SCB), nearshore and estuarine finfish are targeted by beach-based fishers and boat-based fishers operating in shallow water. The main recreational method is line fishing. The main commercial methods are haul, beach seine and gill netting. The main commercial fisheries targeting nearshore and/or estuarine finfish in the SCB are the South Coast Estuarine Managed Fishery (SCEMF) and the South Coast Salmon Managed Fishery (SCSMF). Thirteen estuaries in the SCB are open to commercial fishing.

Fishery landings of nearshore finfish are currently mainly western Australian salmon (*Arripis truttaceus*), southern school whiting (*Sillago bassensis*), Australian herring (*Arripis georgianus*), King George whiting (*Sillaginodes punctata*), silver trevally (*Pseudocaranx georgianus*) and southern garfish (*Hyporhamphus melanochir*). Landings of estuarine finfish are mainly sea mullet (*Mugil cephalus*), estuary cobbler (*Cnidoglanis macrocephalus*) and black bream (*Acanthopagrus butcheri*).

### SUMMARY FEATURES 2016

<b>Fishery Performance</b>	<b>Commercial</b>	<b>Recreational</b>	
<b>Total Catch 2015</b>	317 t	23 t (Boat-based only)	
<b>Fishing Level</b>	Acceptable	Acceptable	
<b>Stock/Resource Performance</b>	<b>Stock Status</b>	<b>Assessment Indicators</b>	
<b>Nearshore</b>	Sustainable - Adequate	Annual: Catch, Catch Rate; Periodic: Fishing Mortality, SPR	
<b>Estuarine</b>	Inadequate	Annual: Catch, Catch Rate; Periodic: Fishing Mortality, SPR	
<b>EBFM Performance</b>			
<b>Asset</b>	<b>Level</b>	<b>Asset</b>	<b>Level</b>
<b>Bycatch</b>	Low Risk	<b>Listed Species</b>	Negligible Risk
<b>Habitat</b>	Negligible Risk	<b>Ecosystem</b>	Low Risk (from fishing)
<b>Social</b>	High Amenity Moderate Risk	<b>Economic</b>	GVP Level 2 - (\$1-5 million) Moderate Risk
<b>Governance</b>	Recovery plan for Wilson Inlet cobbler under development	<b>External Drivers</b>	High Risk (Environment)

### CATCH AND LANDINGS

In 2015, the total commercial catch of nearshore and estuarine finfish in the SCB was 317 t, comprising 143 t from ocean waters and 174 t from estuaries (South Coast Nearshore and Estuarine Finfish Table 1). The commercial catch was taken by two fisheries: South Coast Estuarine Managed Fishery and the South Coast Salmon Managed Fishery. The boat-based recreational catch (top 10 species only) of nearshore and estuarine finfish in the SCB was estimated to be 23

t in the most recent survey in 2013/14 (Ryan *et al.* 2015). No recent estimate of shore-based catch is available.

**SOUTH COAST NEARSHORE AND ESTUARINE FINFISH TABLE 1.** Total catches of finfish by commercial fisheries in nearshore and estuarine waters in South Coast Bioregion in previous five years.

Species	Scientific name	2011	2012	2013	2014	2015
Western Australian salmon	<i>Arripis truttaceus</i>	165.2	75.0	139.4	303.4	119.3
Estuary cobbler	<i>Cnidoglanis macrocephalus</i>	65.5	53.1	67.2	56.9	52.7
Black bream	<i>Acanthopagrus butcheri</i>	43.9	42.7	42.1	31.2	29.1
Sea mullet	<i>Mugil cephalus</i>	29.8	30.6	33.9	27.9	17.6
Australian herring	<i>Arripis georgianus</i>	110.7	134.4	250.6	103.9	23.5
King George whiting	<i>Sillaginodes punctata</i>	8.0	9.9	11.5	13.3	21.5
Leatherjackets	Monacanthidae	7.5	11.1	11.2	11.7	8.7
Southern garfish	<i>Hyporamphus melanochir</i>	11.1	5.4	14.0	6.7	6.8
Tarwhine	<i>Rhabdosargus sarba</i>	6.7	3.9	4.6	6.0	7.4
Yelloweye mullet	<i>Aldrichetta forsteri</i>	3.9	4.9	3.4	5.2	4.2
Flatheads	Platycephalidae	4.3	3.1	4.9	3.0	5.2
Other finfish		14.2	15.4	15.2	18.8	21.1
<b>Total</b>		<b>470.8</b>	<b>389.6</b>	<b>597.9</b>	<b>588.0</b>	<b>317.1</b>

## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

The status of each stock listed below is assessed using a weight-of-evidence approach that considers all available information about the stock.

### *Western Australian salmon (Sustainable-Adequate)*

Western Australian salmon comprise a single breeding stock that ranges across southern Australia from Western Australia (WA) (typically Kalbarri) to Bass Strait with adult fish in other states migrating to WA prior to spawning (Smallwood *et al.* 2013). The species is caught by commercial and recreational fisheries in WA and South Australia, with minor quantities also taken in Victoria and Tasmania (Stewart *et al.* 2014).

Commercial catches have been at historically low levels since 2011 as a result of weak market demand and low wholesale prices (landings in WA are mainly sold as bait). The 2015 commercial catch was 157 t, 76 % taken by the SCSMF with the remainder taken on the west coast by the South West Coast Salmon Managed Fishery (SWCSMF). Estimated boat-based recreational catches in 2013/14 were 6.8 t ( $\pm 1.6$  t) in 2011/12 and 3.4 t ( $\pm 0.6$  t) but the shore-based sector is believed to take most of the recreational catch of this species.

A level 3 assessment of Western Australian salmon, based on biological data collected in WA during 2012-2015 indicated current fishing mortality (F) was very low and estimates of SPR

suggest the current spawning biomass is relatively high (>60% of the virgin (unfished) level). On the basis of this evidence, the western Australian salmon breeding stock is classified as **adequate**.

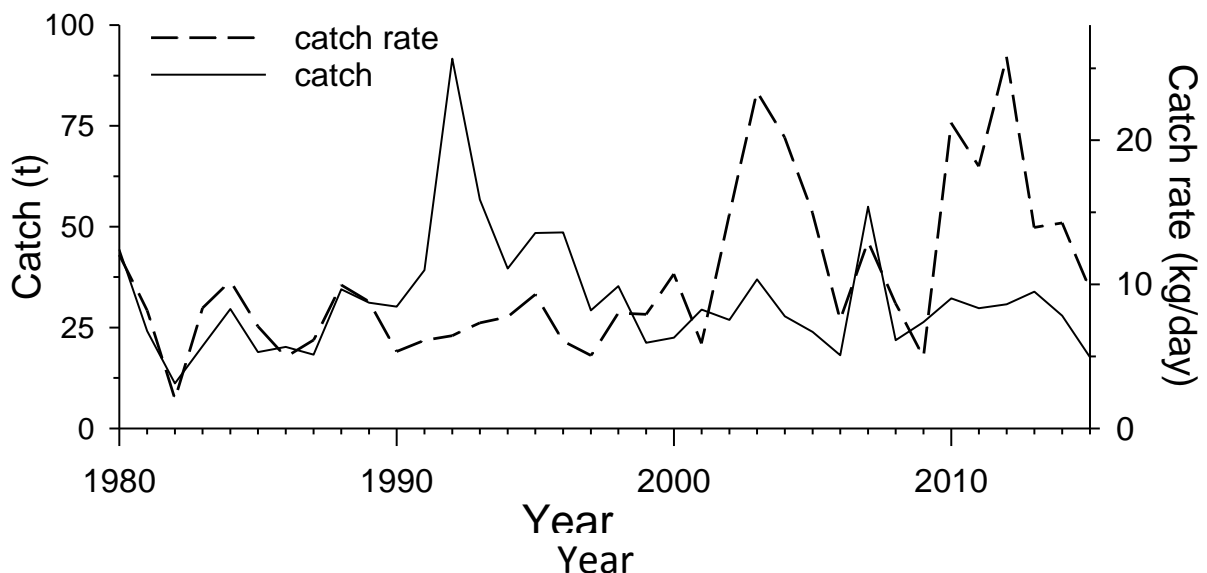
### *Australian herring (Sustainable-Recovering)*

(see West Coast Nearshore and Estuarine Finfish Resource Status Report)

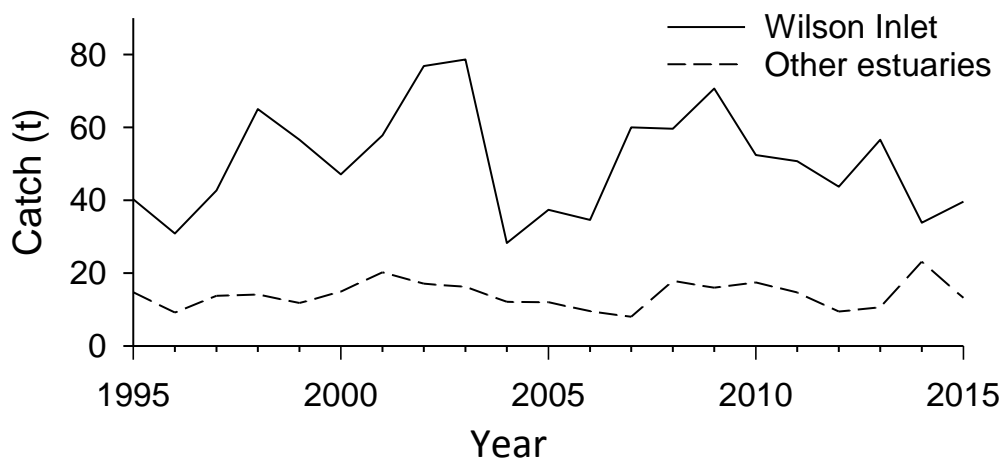
### *Sea mullet (Sustainable-Adequate)*

Sea mullet within each WA Bioregion are currently regarded as discrete stocks. In the SCB, the majority (>90% p.a.) of commercial landings are taken by the SCEFM, mainly in Wilson Inlet and Oyster Harbour although significant quantities are taken in other estuaries in some years. Since the 1970s, total commercial landings in the SCB have been relatively stable, mostly remaining between 20 and 50 t per year (range 11 - 92 t) (South Coast Nearshore and Estuarine Figure 1). The total SCB commercial catch in 2015 was 18 t. Recreational catch is estimated to be **negligible**.

The commercial catch rate trend in Oyster Harbour suggests an increase in SCB stock level since 2000, coinciding with a period of pronounced ocean warming around south-western Australia (South Coast Nearshore and Estuarine Figure 2). On the basis of this evidence, the SCB sea mullet stock is classified as **adequate**.



**SOUTH COAST NEARSHORE AND ESTUARINE FIGURE 1.** *Sea mullet* i) total commercial catch in the South Coast Bioregion, and ii) annual standardised commercial catch rate in Oyster Harbour, 1980 to 2015.



**SOUTH COAST NEARSHORE AND ESTUARINE FIGURE 2.** *Total annual commercial catches of estuary cobbler* in i) Wilson Inlet and ii) other South Coast Bioregion estuaries, 1995 to 2015.

### **Estuarine cobbler (Inadequate - Wilson Inlet)**

In WA, cobbler occurs in marine and estuarine waters but is mainly caught by commercial fishers in estuaries. Landings by recreational fishers are believed to be **negligible**. Each estuary hosts a discrete stock of cobbler, which is genetically distinct to other estuarine populations and also distinct to populations in adjacent ocean waters.

Since 2000, 95% of commercial landings of cobbler have been caught in estuaries of the SCB, with the remainder in the WCB. From 2000 to 2015, the total SCB catch ranged from 40 to 98 t (South Coast Nearshore and Estuarine Figure 2). Over this period, 78% of SCB commercial landings were

taken in Wilson Inlet, with the remainder in Irwin Inlet (10%), Oyster Harbour (8%) and several other estuaries. The catch was 53 t in 2015, including 40 t from Wilson Inlet.

A level 3 assessment of the Wilson Inlet stock, based on biological data collected during 2010-2014, indicates SPR is currently below the limit reference level of 20%. Annual fishery-independent surveys since 2007 indicate that juvenile recruitment and adult abundance has been declining. The commercial catch and catch rate in this estuary have both followed downward trends since 2009/10, although each was still within the historical range in 2015. On the basis of

this evidence, the Wilson Inlet stock is classified as **inadequate**.

In Irwin Inlet, commercial catches have gradually increased over the last two decades and the catch rate has been relatively high since 2000, suggesting an increase in stock level. In Oyster Harbour, catch has remained stable, but the catch rate has declined slightly since 2000, suggesting a slight decrease in stock level. The catch and catch rate trends are within historical levels, implying that stock levels are **acceptable** in these estuaries. However, it must be noted that the recent Level 3 assessment in Wilson Inlet indicates that catch/catch rate trends may not provide sufficient information to assess stock status for this species. On the basis of the available evidence, these other stocks are classified as **adequate**.

### **King George whiting (Sustainable-Adequate)**

(see West Coast Nearshore and Estuarine Finfish Resource Status Report)

### **Black bream (Sustainable-Adequate)**

Most estuaries and coastal lagoons in south-western WA host a discrete population of black bream which is a true estuarine species. The vast majority (>95% each year) of WA commercial landings occur in the SCB which in 2015 was 29 t coming from Beaufort Inlet (51% of landings), Wilson Inlet (20%), Oyster Harbour (12%), Dempster Inlet (6%), Oldfield Estuary (5%) and five other estuaries. Historically, Stokes Inlet has contributed the greatest proportion of black bream commercial landings of any single South Coast estuary. The 2015 catch (<1 t) in Stokes Inlet was the lowest since the 1970s.

Estimated boat-based recreational catches of black bream in the SCB were 7.1 t ( $\pm 1.9$  t) in 2011/12 and 1.8 t ( $\pm 0.5$  t) in 2013/14 (Ryan *et al.* 2015). The current shore-based recreational catch is unknown, but is believed to be substantially larger than the boat-based catch of this species. A 2002/03 survey of shore- and boat-based fishing in 17 SCB estuaries estimated the total recreational catch was approximately 23 t, including 15 t from Walpole Nornalup Inlet (Smallwood and Sumner 2007). The current stock status in Walpole-Nornalup Inlet cannot be assessed due to lack of recent data.

The increase in annual catch rate in each key commercially-fished estuary suggested a common environmental factor possibly driving strong recruitment by black bream in SCB estuaries in the mid-1990s, leading to higher stock levels.

Environmental factors including rainfall, river flow, temperature, salinity, oxygen and nutrient loads determine the condition and productivity of the estuary, which affects growth and reproductive success in bream. With the exception of Stokes Inlet, the 2015 catch rate in each estuary remains relatively high, suggesting the stock level is still high compared to historic levels. The Stokes Inlet catch rate is low but remains within the historical range. On the basis of this evidence, the black bream stocks in these four estuaries are classified as **adequate**.

### **BYCATCH AND PROTECTED SPECIES INTERACTIONS**

**Bycatch:** The small-scale commercial fisheries in nearshore and estuarine waters mainly use gill, seine and haul nets that are deployed in a targeted manner. Few non-target species are taken. Mesh size regulations ensure that target species caught by these methods are within an appropriate size range. Minimal discarding occurs because virtually all fish taken can be retained and marketed. Recreational fishers mainly use line-based methods in nearshore and estuarine waters. This method can result in the capture and release of a significant number of non-target species and undersized fish. The risks associated with post-release mortality vary considerably among species. In general, fish in nearshore and estuarine waters are captured from shallow depths and suffer less barotrauma-related injuries than deep water species and so bycatch species are at **low risk**.

**Protected Species:** It is compulsory for commercial fishers to report all interactions with protected listed marine species. New Zealand fur seals and Australian sea lions are occasionally surrounded by beach seine nets used in the South Coast nearshore and estuarine fisheries, but are released immediately by the fishers. This is possible because seine netting is a labour-intensive operation and the fishing team will immediately notice a seal in the net. Fishers are able to release a seal from their seine net without injury to the animal. There have been no reports of incidental mortalities of seals in these fisheries and it is



believed that the present level of interaction (direct and indirect) is not a significant threat to the populations of fur seals and sea lions. An assessment of the impact of interactions is performed on an annual basis and, if required, appropriate management plans will be devised to mitigate these interactions. The current risk is considered to be **negligible**.

Birds such as pelicans, cormorants and shearwaters sometimes interact with commercial fishing nets in estuaries and with recreational line-fishing gear but the risks to bird populations are considered to be **negligible**.

## HABITAT AND ECOSYSTEM INTERACTIONS

**Habitat:** The operation of gill nets and haul nets over predominantly sand and mud bottoms is unlikely to have any impact on these habitats in estuaries and nearshore waters. Similarly, the line fishing methods used by recreational fishers have a **negligible** impact on the bottom substrates. Anchoring by recreational fishing vessels may have localised impacts on habitats such as seagrass.

Haul nets may be deployed over low or medium density seagrass. This type of net tends to 'roll' over the surface of seagrass beds without removing attached leaves or uprooting plants. At times, haul nets may collect floating vegetation including seagrass leaves or algae. Hence there is a **negligible risk** to benthic habitats.

**Ecosystem:** Excessive removal by commercial and recreational fisheries of certain species, such as Australian herring or western Australian salmon, from the food chain could potentially impact on prey and predator species including larger fish, cetaceans and seabirds. However, commercial fishing effort directed towards these species in recent years has been declining and is very low compared to historic levels. Recreational fishing effort directed towards Australian herring is relatively high. Total removals by fishing currently pose a **low risk**.

## SOCIAL AND ECONOMIC OUTCOMES

### *Social*

The nearshore and estuarine recreational fisheries of the WCB provide a high social amenity for the WA community. There is currently a **moderate risk** to these values.

In 2015, there were approximately 27 commercial fishers employed in the South Coast Salmon Fishery and 25 in the South Coast Estuarine Managed Fishery. Additional employment is created by these fisheries in the processing and distribution networks and retail fish sales sectors. Western Australian salmon fisheries supply WA bait and human consumption markets. The South Coast Estuarine Fishery is an important source of fresh local fish to regional centres. Additionally, a small proportion of estuarine landings are sold to zoos across Australia as animal food. The use of beach seine nets by commercial salmon fishers may temporarily impact on beach access by members of the public.

### *Economic*

Estimated annual value (to fishers) for 2015:

#### **South Coast Estuarine Managed Fishery**

Level 2: \$1 to 5 million (finfish + invertebrates)

#### **South Coast Salmon Managed Fishery**

Level 1: <\$1 million

## GOVERNANCE SYSTEM

### *Annual Catch Tolerance Levels*

**South Coast Estuarine Managed Fishery:** 200 – 500 tonnes (finfish only).

Finfish catch was 177 t in 2015. This fishery has traditionally targeted finfish, but in recent years has harvested significant quantities of blue swimmer crabs (53 t in 2015), which have partly replaced finfish in the overall catch. Thus, the total catch by this fishery in 2015 is considered **adequate**.

**Australian Salmon Fisheries (all WA commercial fisheries):** 1200 – 2800 tonnes.

Catch was 157 t in 2015. The catch has now been below the range for 9 consecutive years. Recent catches continue to be low relative to historic levels, due to low effort from limited market demand. A review of the catch tolerance range needs to be undertaken.

### *Harvest Strategy*

This resource is harvested using a constant exploitation approach, where the annual catch taken varies in proportion to variations in the stock abundance. Indicator species are used to determine the status of the resource. All indicator species are assessed annually based on catch

and/or catch rate trends, where data is available (noting that recreational fishery data is limited for these stocks). Additionally, higher level assessments are periodically undertaken for some stocks. There is currently no formal harvest strategy developed for the South Coast Salmon Managed Fishery commercial or the South Coast Estuarine Managed Fishery.

### **Compliance**

The Department undertakes regular compliance inspections to ensure fishing is being undertaken in accordance with the governing legislation.

### **Consultation**

The Department undertakes consultation directly with licensees on operational issues. Industry Annual Management Meetings are convened by the West Australian Fishing Industry Council (WAFIC), who are also responsible for statutory management plan consultation under a Service Level Agreement with the Department. Consultation with the recreational sector is undertaken via the peak representative body, Recfishwest, and/or the Department's website when documents are released for public comment.

### **Management Initiatives/Outlook Status**

A recovery plan for the Wilson Inlet cobbler stock is being developed in conjunction with industry, WAFIC and Recfishwest.

### **EXTERNAL DRIVERS (*High Risk*)**

The abundance of fish species in SCB estuaries are strongly influenced by climatic and other environmental factors, independent of fishing. For example, high rainfall may contribute to higher catches of black bream. Catchment processes can have major effects on estuary condition and fishery production. Annual variations in coastal currents (particularly the Leeuwin and Capes Currents) influences the spawning, recruitment, distribution and catchability of species such as Australian herring and western Australian salmon. Cool inshore temperatures due to a strong Capes Current appears to have provided a favourable 'corridor' for fish to migrate northwards in 2016.

Fluctuating market demand is a significant factor affecting the annual commercial catch level of many species. Limited demand and low wholesale prices paid for Australian herring and western Australian salmon in recent years have limited commercial catch and effort levels. By purchasing only a limited quantity of these species each year, fish processors effectively restrict catch levels. Commercial fishers sometimes elect not to capture a school of fish, or release part of their catch, when a market is not available.

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## SOUTH COAST SMALL PELAGIC SCALEFISH RESOURCE STATUS REPORT 2016

*J. Norriss and G. Baudains*



### OVERVIEW

The five species comprising the south coast small pelagic scalefish resource are pilchards (*Sardinops sagax*), yellowtail scad (*Trachurus novaezelandiae*), Australian anchovy (*Engraulis australis*), scaly mackerel (*Sardinella lemuruand*) and maray (*Etrumeus teres*). Pilchards and yellowtail scad are the indicator species and dominate the catch, which is taken predominantly by the quota managed, limited entry South Coast Purse Seine Managed Fishery (SCPSMF) using purse seine gear in waters between Cape Leeuwin and the South Australian border. The SCPSMF is also entitled to take sandy sprat (*Hyperlophus vittatus*) and blue sprat (*Spratelloides robustus*), which form part of

the South Coast Nearshore and Estuarine Finfish Resource, but catches have been very small and infrequent. The SCPSMF has five management zones, centred on King George Sound, Albany, Bremer Bay, Esperance and a developmental zone near Augusta. The SCPSMF was the largest tonnage fishery in WA during the late 1980s and early 1990s, until a pilchard virus devastated stocks in 1995 and 1998/99. While surveys demonstrated recovery by 2005 the catches have remained below conservative TACs. The SCPSMF underwent pre-assessment for Marine Stewardship Council certification in 2014, but has not progressed to full assessment.

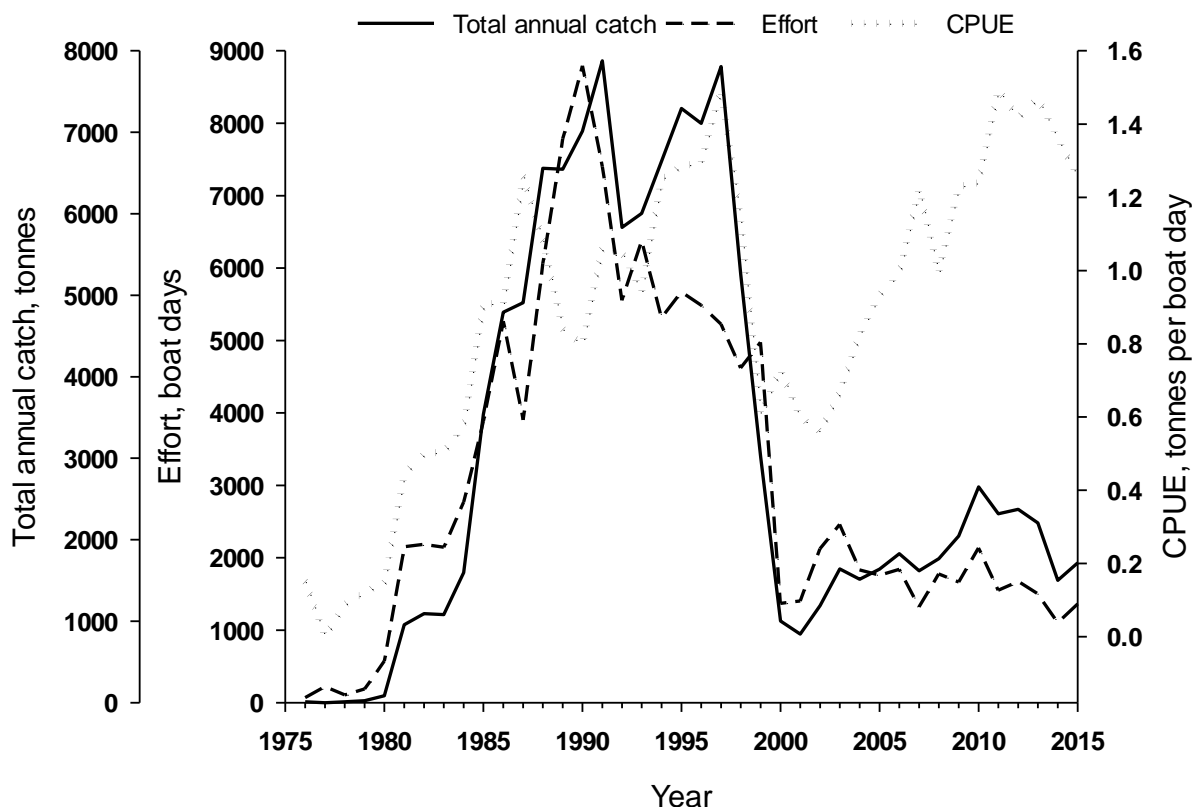
### SUMMARY FEATURES 2016

Fishery Performance		Commercial	Recreational
<b>Total Catch 2014/15</b>		1,734.5 t	<1 t (2013/14)
<b>Fishing Level</b>		Acceptable (≤5,683 t)	Acceptable
Stock/Resource Performance		Stock Status	Assessment Indicators
<b>South Coast small pelagic</b>		Sustainable - adequate	Egg surveys integrated with age model in mid 2000s, and subsequent catch and catch rate trends
EBFM Performance			
Asset	Level	Asset	Level
<b>Bycatch</b>	Negligible Risk	<b>Listed Species</b>	Medium Risk
<b>Habitat</b>	Negligible Risk	<b>Ecosystem</b>	Low Risk
<b>Social</b>	Low Amenity	<b>Economic</b>	GVP \$1-5 million
	Low Risk		Moderate Risk
<b>Governance</b>	Stable	<b>External Drivers</b>	Moderate Risk

### CATCH AND LANDINGS

The SCPSMF total catch of 1,734.5 t in the 2014/15 quota year was comprised of 993 t for the Albany region (zones 1 and 2 combined) and 742 t for Bremer and Esperance zone combined. The large majority (99%) was pilchards (1,715 t), a 14% increase from the previous year (South Coast Small

Pelagic Figure 1). The remainder of the catch was almost entirely comprised of 16.6 t of yellowtail scad, the highest annual catch for this species since 1998/99. Fishing effort in the 2014/15 quota year was 1,363 boat days by 13 active vessels, an increase of 24% from the previous year.



**SOUTH COAST SMALL PELAGIC FIGURE 1.** Time series of total annual catch, effort and catch per unit effort (CPUE) for pilchards in the SCPSMF since 1975/76.

## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

### *Pilchards (Sustainable-Adequate)*

The pilchard is a small, low trophic level pelagic species that feeds by filtering plankton. Longevity is up to 9 years and the maximum size is 200-250 mm SL. Three biological stocks are recognised in the South Coast Bioregion, centred on fishing ports at Albany (zones 1 and 2), Bremer Bay (zone 3) and Esperance (zone 4).

Population modelling, based on spawning biomass estimates (using the daily egg production method), catch-at-age and catch data, show that by the mid-2000s the stock had recovered from a mass mortality event in 1998/99 caused by a herpesvirus (Gaughan *et al.* 2008). The mid-2000s exploitation rate was around 3 per cent (less than 3,000 t from an estimated spawning biomass of approximately 97,000 t), and the total annual catch has never exceeded 3,000 t since then.

The nominal SCPSMF catch rate since 2008/09 has been consistently close to record highs (South Coast Small Pelagic Figure 1). The stock is

therefore not considered to be recruitment overfished. Under the current level of fishing pressure the biological stocks of pilchards are considered **adequate**.

### *Yellowtail scad (Sustainable-Adequate)*

Yellowtail scad is a schooling species common in temperate Australian waters. The population structure in WA is unknown. The maximum recorded age in Australia is 14 years although older ages have been recorded elsewhere. Low catches in both the SCPSMF since 1998/99 and the recreational sector suggest a low level of fishing pressure, so the biological stock is considered **adequate**.

## BYCATCH AND PROTECTED SPECIES INTERACTIONS

The SCPSMF is a species-restricted fishery, and the capture of species not listed in the management plan or under FBL conditions is prohibited. Small quantities of bycatch species are sometimes captured incidentally, but this occurs infrequently and the majority are released from the net unharmed.

Interactions with endangered, threatened and protected species must be reported to the Department of Fisheries on Catch and Disposal Records for each fishing trip, and on Catch and Effort Statistics returns that must be lodged monthly. The SCPSMF has adopted a protocol to minimise the impacts from the interactions. Low capture rates of dolphins, sea lions and seals that have been released unharmed have been recorded. There have also been interactions with seabirds, particularly shearwaters becoming entangled in nets, with most released alive but mortalities recorded. Industry has led and funded trials to mitigate shearwater entanglements which are ongoing.

## HABITAT AND ECOSYSTEM INTERACTIONS

Purse seine nets are pelagic in nature, with no impact on benthic habitats during normal operations. On rare occasions nets may be deployed in shallow waters and come into contact with sensitive habitats such as seagrass beds. The light structure of the net is expected to cause minimal damage to benthic habits when this occurs, and would be kept to a small, localised area. The SCPSMF is therefore considered to be a **negligible risk** to these habitats.

Pilchards are a low trophic level species important for ecosystem structure and function, although their abundance is subject to large natural variation in response to environmental conditions. With catch quotas estimated to be <10% of spawning biomass, and trophic modelling indicating minor impacts on top order predators from the much larger South Australian pilchard fishery (Goldsworthy *et al.* 2013), the ecosystem impact from fishing is considered **low**.

## SOCIAL AND ECONOMIC OUTCOMES

### *Social*

Local employment was provided by 13 active vessels as well as local processing factories in Albany, Bremer Bay and Esperance. The only small pelagic species detected in the catch of boat-based recreational fishers by recent surveys was a small take of yellowtail scad.

### *Economic*

A small proportion of the catch is sold for human consumption but the large majority for bait, aquaculture feed or pet food. The estimated gross

value of product (GVP) for the SCPSMF in 2014/15 was level 2 (\$1-5 million).

## GOVERNANCE SYSTEM

### *Allowable Catch Tolerance Levels*

The SCPSMF total annual catch for all species combined in the 2014/15 quota year was less than half the total allowable catch (TAC, South Coast Small Pelagic Table 1). Catches are therefore at **acceptable** levels.

### *Harvest Strategy*

No formal harvest strategy has been developed for the SCPSMF. Proposed changes to the TAC would be made with regard to total catches and nominal catch rates, and in consultation with stakeholders.

### *Compliance*

Licensees are allocated individual transferable quotas and catches are assessed against quotas by the submission by fishers of trip Catch and Disposal Records to the Department of Fisheries. Compliance is monitored via aerial patrols and both at-sea and on-land inspections.

### *Consultation*

Consultation with licensees occurs directly on operational issues and through industry Annual General Meetings convened by the West Australian Fishing Industry Council (WAFIC), who are responsible for statutory management plan consultation under a Service Level Agreement with the Department.

### *Management Initiatives/Outlook Status*

The south coast small pelagic scalefish resource will continue to be monitored using catch and catch rates.

**SOUTH COAST SMALL PELAGIC TABLE 1.** 2014/15 catches and total allowable catches (TAC) for each of the major Management Zones of the South Coast Purse Seine Managed Fishery.

Management Zone	TAC (t)	2014/15 catch (t)	Active vessels	2014/15 catch as per cent of TAC
Albany (Zones 1 and 2)	2,683	993	8	37.0%
Bremer Bay (Zone 3)	1,500	*	2	-
Esperance (Zone 4)	1,500	*	3	-
Total for Fishery	5,683	1,734	13	30.5%

\* Insufficient vessels operated in 2014/15 so cannot be reported.

## EXTERNAL DRIVERS

Licensed operators in the Commonwealth Small Pelagic Fishery are permitted to take pilchards in waters adjacent to the West Australian coast line but none were taken in those waters in 2013/14, the last year reported for that fishery (Moore and Mazur 2015).

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## TEMPERATE DEMERSAL GILLNET AND DEMERSAL LONGLINE RESOURCE STATUS REPORT 2016

M. Braccini and J. O'Malley



### OVERVIEW

The Temperate Demersal Gillnet and Demersal Longline Fishery (TDGDLF) comprises the West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery (WCDGDLF), which operates between 26° and 33° S, and the Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery (JASDGDLF), which operates from 33° S to the WA/SA border. Most of the operators employ demersal gillnets to target sharks with scalefish being a byproduct. Demersal longline is also permitted but is not widely used.

Gummy (*Mustelus antarcticus*), dusky (*Carcharhinus obscurus*), whiskery (*Furgaleus macki*), and sandbar (*C. plumbeus*) sharks are the main shark species targeted (~80% of the fisheries' shark catch) and they have been identified as indicators for the status of the temperate shark 'suite' because they represent the range of life history strategies of other shark species caught by these fisheries. For further details see Braccini *et al* (in prep) and SAFS (2016).

### SUMMARY FEATURES 2016

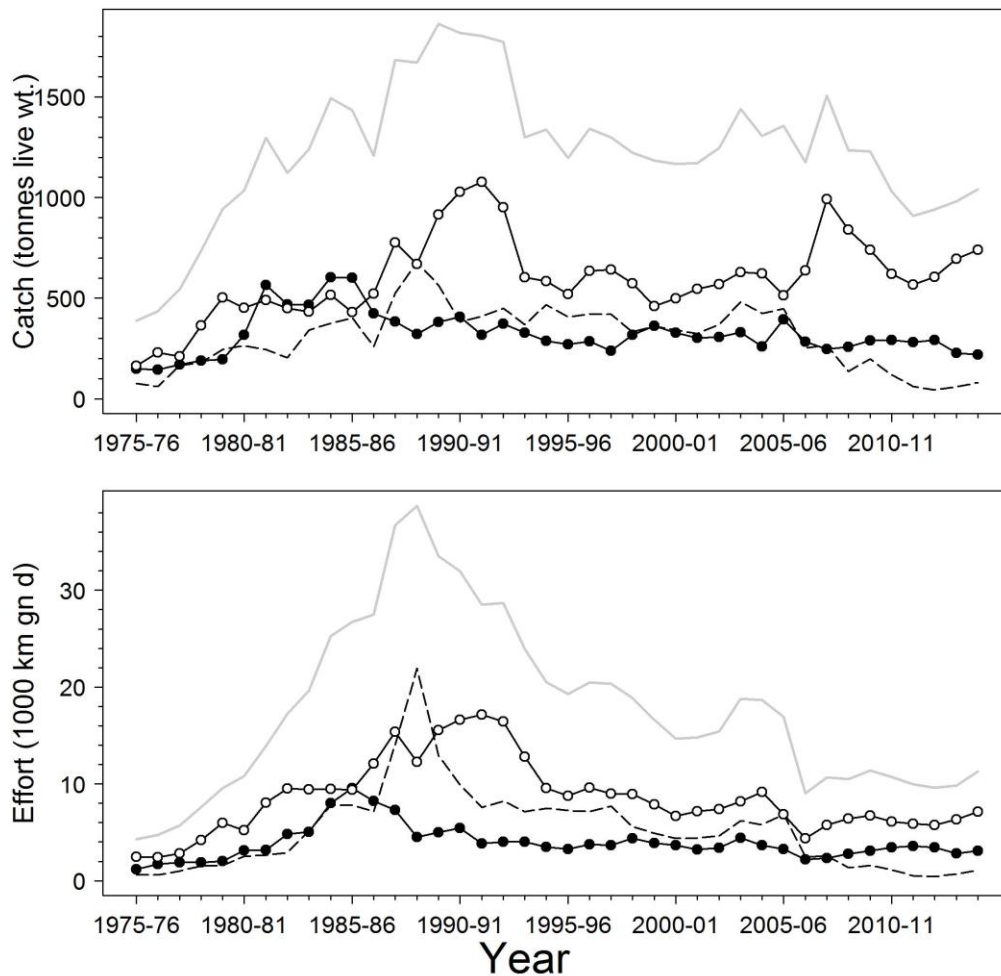
Fishery Performance	Commercial	Recreational	
<b>Total Catch 2014-15</b>			
Sharks and rays*	1040 t	< 5% of commercial catch	
Scalefish*	156 t		
<b>Fishing Level</b>	Acceptable	Acceptable	
Stock/Resource Performance	Stock Status	Assessment Indicators	
Sharks South & West	Sustainable - Recovering	Annual: Catch, CPUE; Periodic: Total Biomass	
EBFM Performance			
Asset	Level	Asset	Level
<b>Bycatch</b>	Low Risk	<b>Listed Species</b>	Negligible-Low Risk
<b>Habitat</b>	Negligible Risk	<b>Ecosystem</b>	Low Risk
<b>Social</b>	Medium Social Amenity and Severe Social Risk	<b>Economic</b>	GVP Level 3. (\$5-10 million)
<b>Governance</b>	Moderate Risk	<b>External Drivers</b>	Moderate Risk

\*All reported weights are live weight

### CATCH AND LANDINGS

For the TDGDLF, elasmobranch reported catches and fishing effort peaked during the late 1980s and early 1990s and have stabilised at much lower levels in recent years (Temperate Demersal Figure 1). The catch of sharks in other WA commercial fisheries is **negligible** (< 10 t). Additionally, recreational fishers retain very small numbers of

sharks in WA (Ryan *et al.* 2015). Scalefish catches are reported in the West Coast and South Coast Demersal Scalefish Resource Status Report chapters, respectively. For a detailed historic account of shark catch and effort in WA refer to Braccini *et al.* (in prep.).



**TEMPERATE DEMERSAL FIGURE 1.** Total elasmobranch catches, and demersal gillnet and longline effort (in km gillnet days, km gn d). Black circles = JASDGLF Zone 1; white circles = JASDGLF Zone 2; dashed black line = WCDGDLF; plain grey line = total from the three management zones.

## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

Based on the available evidences, the current status of the whiskery and gummy shark stocks is **adequate** whereas the dusky and sandbar shark stocks are currently **recovering**. It is highly likely that the four stocks are above the point where recruitment would be impaired by the operations of the TDGDLF.

The most recent stock assessment for gummy sharks estimated the 1997-98 biomass at 42% unfished levels, which is above the 40% target. Effective (i.e. the regions of the fisheries that overlap each species' primary distribution) CPUE has increased since the mid 1980s (Temperate Demersal Figure 2). As gummy shark catches are almost exclusively comprised of large juveniles and adults, this trend suggests that breeding biomass

has increased following reductions in demersal gillnet fishing effort commencing in 1992.

For dusky shark, catches comprise mostly of neonates and one to two year old fish. Effective effort has significantly declined since the late 1980s (Temperate Demersal Figure 2), recent catches (which include catches of bronze whaler, *C. brachyurus*, which cannot be accurately separated in catch returns data prior to 2006/07) have been reduced to approximately half of the quantity determined to be sustainable in 1994-95 and 1995-96 and comprehensive measures to mitigate cryptic mortality of older dusky sharks that have been introduced since 2006. Hence, current management arrangements are considered suitably to allow gradual recovery of the breeding stock. The recent decline in effective CPUE (Temperate Demersal Figure 2) will be



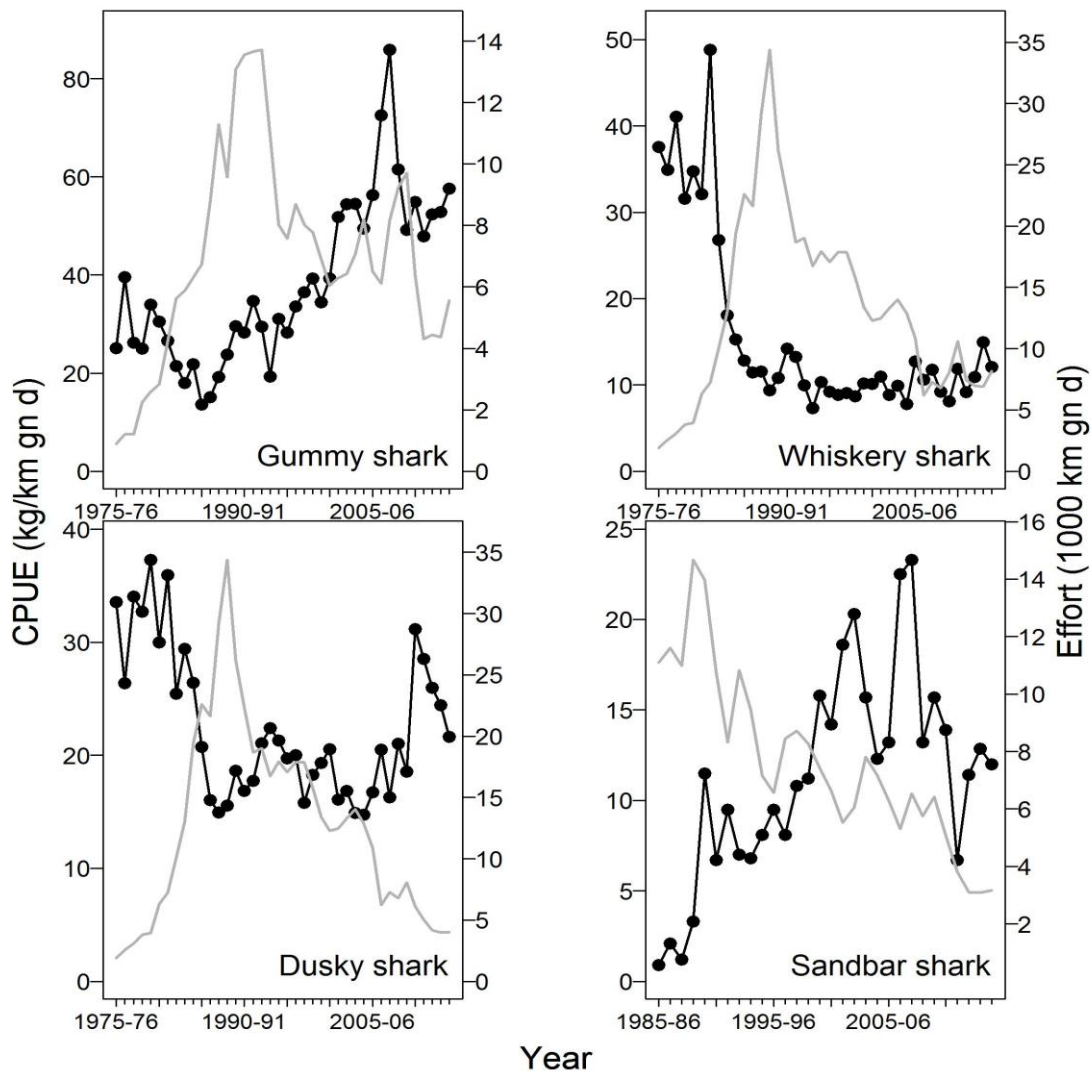
considered in more detail during development of the new stock assessment models (Braccini *et al.* in prep.).

For whiskery shark, the most recent stock assessment estimated the 2009-10 biomass at 52% unfished levels, which is above the 40% target level. Significant decline in effective CPUE in the early 1980s (Temperate Demersal Figure 2) is likely a result of changes in targeting practices (Simpfendorfer *et al.* 2000). Since the 1990s, the effective CPUE has remained stable, with a moderate increase in recent years. For sandbar shark, effective effort has significantly declined since the late 1980s and the effective CPUE has

shown an increasing trend between mid 1980s and mid 2000s and has fluctuated subsequently at relatively high levels trend ever since.

Sandbar shark catches in the TDGDLF since 2008/09 have been at levels that would allow a gradual recovery of the breeding stock.

For gummy and whiskery sharks, the current level of fishing pressure is such that the biological stocks are classified as **adequate**. For dusky and sandbar sharks, the above evidence indicates that the current level of fishing pressure should allow the stocks to recover from overfishing. The biological stocks are classified as **recovering**.



TEMPERATE DEMERSAL FIGURE 2. Effective effort (grey line) and CPUE (black circles) by species.

## BYCATCH AND PROTECTED SPECIES INTERACTIONS

**Bycatch:** The TDGDLF have low levels of discarded bycatch of unsaleable species of sharks, rays and scalefish (McAuley & Simpfendorfer 2003). As maximum potential fishing effort is now explicitly capped at less than 70% of the mid to late 1990s levels, bycatch in all management zones has reduced. Based on ESD risk assessment of these fisheries, all fishery impacts on stocks of bycatch species impose a **low risk** to their ongoing sustainability.

**Protected Species:** The TDGDLF have low interactions with listed species (McAuley & Simpfendorfer 2003). For 2014-15, fishers reported catching and releasing 3 dead muttonbirds, 4 dead and 20 alive grey nurse sharks, and 3 dead and 16 alive white sharks and are therefore considered **negligible-low risk**. For a detailed description of species interactions refer to Braccini *et al.* (in prep).

## HABITAT AND ECOSYSTEM INTERACTIONS

**Habitat:** The level of effort in the TDGDLF is such that the gear is deployed infrequently over approximately 40% of the fisheries' areas and under normal circumstances the physical impact of the gear on the benthic habitat is minimal. Moreover the very small footprint of each net would combine to make a very small percentage (< 5%) of the area that would be contacted by these gears annually therefore representing a **negligible risk** to benthic habitats.

**Ecosystem:** There is no evidence of any systematic change in species diversity, richness or trophic index (Hall & Wise 2011), indicating that the TDGDLF is not having a material impact on food chain or ecosystem structure therefore representing a **low risk** to the ecosystem. For a detailed description of habitat and ecosystem effects refer to Braccini *et al.* (in prep).

## SOCIAL AND ECONOMIC OUTCOMES

### Social

Fishing returns reported that between 68 and 79 skippers and crew were employed in the JASDGLF and between 14 and 15 skippers and crew were employed in the WCDGDLF during 2014-15. As sharks are generally not targeted by recreational fishers in Western Australia, their direct social

importance to this group is **negligible**. However, at the community level the capture of sharks generates a high level of community interest and debate, creating **medium** social amenity and **severe** social risk.

### Economic

Shark meat is mostly sold in the Western Australian fish and chip shop market (WCDGDLF and Zone 1 of the JASDGLF) or sold to wholesalers in Adelaide and Melbourne (Zone 2 of the JASDGLF). However, anecdotal evidence suggest that recent tourism expansion in the South West of the State may have resulted in a higher proportion of shark meat having been sold to restaurants and fish retailers around landing ports. The estimated annual value (to fisheries) for 2014-15 is \$4.7 and \$0.4 million for JASDGLF and WCDGDLF, respectively (GVP level 3).

## GOVERNANCE SYSTEM

### Allowable Catch Tolerance Levels

All key shark species: 725 - 1,095 t (gummy shark: 350 - 450 t; dusky shark: 200 - 300 t; whiskery shark: 175 - 225 t; sandbar shark: < 120 t). The catch levels of both the commercial and recreational sectors indicate that the fishery performance for both sectors is considered **acceptable**.

For 2014-15, total elasmobranch catches were within target range, similar to previous years and considered acceptable given effort levels. Total gummy, dusky, sandbar and whiskery shark catches were 492 t, 197 t, 46 t, and 147 t, respectively. As gummy shark CPUE appears to have been maintained at a relatively high level since the mid 2000s, this year's catch is still considered acceptable with no concern for the stock. Whiskery catch was maintained below historical allowable levels due to reductions in targeted effort.

### Harvest Strategy

While there is currently no formalised harvest strategy developed for the TDGDLF, the operational management objective of the TDGDLF has been 'to maintain the biomass of the fisheries' for the three traditional target stocks (gummy, whiskery and dusky sharks) at or above 40% of their unfished levels'. Management is via input controls in the form of transferable time/gear effort units and restrictions on mesh and hook sizes, net height ('drop') and maximum net length.

Maximum acceptable effort levels for each management zone have been based on their respective 2001/02 (daily) levels (Zones 1 & 3 of the JASDGLF: 84,075 km gn.hr -1 or 3,503 km gn.d-1; Zone 2 of the JASDGLF: 144,102 km gn.hr -1 or 7,205 km gn.d-1; WCDGLF: 67,692 km gn.hr-1 or 2,832 km gn.d-1).

### Compliance

TDGDLF vessels are fitted with an Automatic Location Communicator (ALC) that enables the Department to monitor vessels using a Vessel Monitoring System (VMS) and manage compliance with temporal and spatial closures. The Department also undertakes regular vessel inspections to ensure fishing is being undertaken in accordance with the governing legislation.

### Consultation

The Department undertakes consultation directly with licensees on operational issues. Industry Annual General Meetings are convened by the West Australian Fishing Industry Council (WAFIC), who are also responsible for statutory management plan consultation under a Service Level Agreement with the Department.

### Management Initiatives

In 2015, the TDGDLF was reaccredited under Part 13 and 13A of the Environment Protection and Biodiversity Conservation Act 1999. The Wildlife Trade Operation export approval expires on 24 August 2018 and it carries conditions associated with addressing interactions between the TDGDLF and Australian sea lions (ASL). It was proposed that closures of 25km and 20km to gillnet fishing be implemented around identified ASL colonies in the WCDGLF and the JASDGLF respectively to meet these conditions. The State and Commonwealth are still in negotiations. For further governance details refer to Braccini *et al.* (in prep).

### EXTERNAL DRIVERS

The TDGDLF key target species span multiple regional boundaries but risks to the stocks are currently **low** due to low catches from other fisheries or catches from tightly-managed fisheries (gummy sharks). Environmental drivers pose **low risk** to shark stocks. The main external risk to the viability of the TDGDLF is the introduction of Commonwealth Marine Reserves and future ASL closures.

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## SOUTH COAST DEMERSAL SCALEFISH RESOURCE STATUS REPORT 2016

*J. Norriss and S. Walters*



### OVERVIEW

The south coast demersal scalefish resource (SCDSR) includes demersal species taken predominantly in marine waters deeper than 20 metres in the South Coast Bioregion (SCB). Indicator species are snapper (*Chrysophrys auratus*), Bight redfish (*Centroberyx gerrardi*), blue morwong (*Nemadactylus valenciennesi*), western blue groper (*Achoerodus gouldii*) and hapuku (*Polyprion oxygeneios*). The commercial wetline sector takes these species predominantly by hook

and line. The Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery (JASDGDMF), which uses demersal gillnets to take mostly sharks, also takes demersal scalefish as a legitimate part of their catch, particularly blue morwong and western blue groper (see Temperate Demersal Gillnet and Demersal Longline Fisheries Resource Status Report). Recreational and charter catches are almost exclusively boat-based using hook and line.

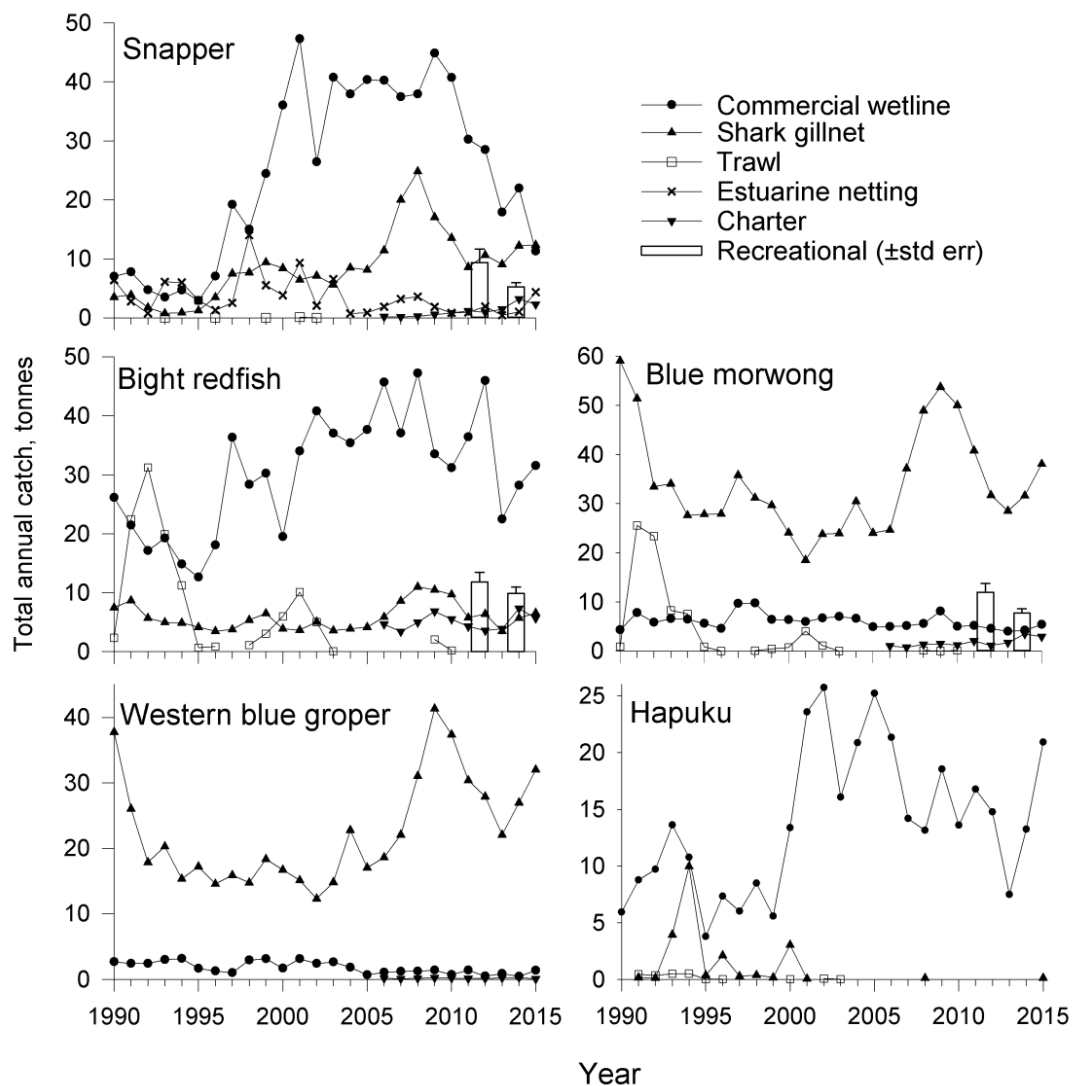
### SUMMARY FEATURES 2016

<b>Fishery Performance</b>	<b>Commercial</b>	<b>Recreational</b>	
<b>Total Catch 2015</b>	194 t	34 t (2013/14, top 10 species).	
<b>Fishing Level</b>	Acceptable	Acceptable	
<b>Stock/Resource Performance</b>	<b>Stock Status</b>	<b>Assessment Indicators</b>	
<b>Inshore Demersal</b>	Sustainable - Adequate	Annual: Catch, Fishing Mortality, SPR	
<b>Offshore Demersal</b>	Sustainable - Adequate	Annual: Catch, Fishing Mortality	
<b>EBFM Performance</b>			
<b>Asset</b>	<b>Level</b>	<b>Asset</b>	<b>Level</b>
<b>Bycatch</b>	Low Risk	<b>Listed Species</b>	Negligible Risk
<b>Habitat</b>	Negligible Risk	<b>Ecosystem</b>	Low Risk
<b>Social</b>	Moderate Amenity	<b>Economic</b>	GVP \$1-5 million
	High Risk		Moderate Risk
<b>Governance</b>	Under Review	<b>External Drivers</b>	Moderate Risk

### CATCH AND LANDINGS

Commercial catches of SCDSR indicator species have increased over the last two years following low catches around 2013, with the exception of snapper which has seen reduced catches over the

last five years (South Coast Demersal Figure 1). Surveys of boat based recreational fishing show the catch by that sector is substantial for snapper, Bight redfish and blue morwong (Ryan *et al.* 2015).



**SOUTH COAST DEMERSAL FIGURE 1:** Annual catches by sector for each demersal indicator species in the South Coast Bioregion since 1990.

## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

Demersal species on the south coast are typically long lived ( $\geq 24$  years) and slow growing, making them inherently vulnerable to overfishing. Snapper in the SCB, and Bight redfish throughout their distribution in southern WA, comprise single genetic stocks. The stock structure of the other three indicator species is less well known.

### *Inshore Demersal (Sustainable-Adequate)*

A weight-of-evidence assessment that incorporated catch-at-age sampling in 2013 and 2014 indicated risk profiles to be medium for snapper, Bight redfish and blue morwong, and low for western blue groper, i.e. the levels of breeding

stock for these species were therefore considered **adequate** (Norriss *et al.* 2016).

### *Snapper and Bight redfish (Sustainable-Adequate)*

Age-based estimates of fishing mortality (F) and spawning potential ratio (SPR) show these parameters were unlikely to have breached management intervention threshold levels (1.0 and 0.30, respectively), and only a remote chance of breaching the limit reference points (1.5 and 0.20 respectively). However, any significant increase in catch beyond recent historical levels would constitute an unacceptable risk.

***Blue morwong (Sustainable-Adequate)***

Age-based estimates of F and SPR for females show an almost zero likelihood of breaching the management intervention threshold levels (1.0 and 0.30, respectively). Males were unlikely to have breached these thresholds and there was only a remote likelihood they breached the limit reference points (1.5 and 0.20 respectively). There is only a slight capacity for increased catches beyond recent historical levels before risk levels become unacceptable.

***Western blue groper (Sustainable-Adequate)***

Age-based estimates of F (both sexes) and SPR for females shows an almost zero likelihood of breaching management intervention thresholds (1.0 and 0.30 respectively). The male SPR estimate showed that a breach of the threshold was unlikely and a breach of the limit reference point only a remote possibility. There is a small capacity for increased catches beyond recent historical levels before risk levels become unacceptable.

***Offshore Demersal (Sustainable-Adequate)******Hapuku***

An age-based assessment estimated F to be within target and threshold levels, suggesting harvest rates in 2005 and 2006 were sustainable (Wakefield *et al.* 2010). However, if longevity of south coast hapuku is found to be older than currently recorded and in fact approaches what is known elsewhere, then those harvest rates were likely to be at sustainable limits, indicating a level of uncertainty about the status of the resource.

**BYCATCH AND PROTECTED SPECIES INTERACTIONS**

Line fishing for demersal species using baited hooks is highly selective for demersal scalefish, with only low levels of catches of non-retained species. Interactions with protected species are **negligible**.

**HABITAT AND ECOSYSTEM INTERACTIONS**

Line fishing using baited hooks has little physical impact on the benthic environment and therefore constitutes a negligible habitat risk. An analysis of a long time series of commercial fishery data showed no reduction in mean trophic level in the

finfish catches within the SCB (Hall and Wise 2011).

**SOCIAL AND ECONOMIC OUTCOMES*****Social***

A recent survey of recreational boat based fishing estimated annual fishing effort in the SCB to be 28,277 boat days (Ryan *et al.* 2015). In recent years approximately 50 to 60 commercial wetline vessels have each employed up to about three crew. Several seafood processors in the SCB and in Perth have also provided employment.

***Economic***

The estimated gross value of product (GVP) for the SCDSR in 2015 was level 2 (\$1-5 million). There is currently a **moderate** level of risk to this level of return.

**GOVERNANCE SYSTEM**

The commercial wetline sector is not subject to specific legislative management arrangements (Notice or Management Plan) although this is currently under review (see below). The recreational sector is managed through a range of input and output controls such as bag and size limits authorised under the Fish Resources Management Act 1994 and Fish Resources Management Regulations 1995.

***Allowable Catch Tolerance Levels (Acceptable)***

Not developed, but a recent stock assessment recommended catches remain within recent historical limits (Norriss *et al.* 2016).

***Harvest Strategy***

A formal harvest strategy has not been developed for this resource.

***Compliance***

Fisheries and Marine Officers conduct both at-sea and on-land inspections.

***Consultation***

A broad consultation process is currently in progress as part of a review of management arrangements for the SCB wetline sector (see Management Initiatives/Outlook Status below). Consultation with commercial wetline fishers occurs directly on operational issues. For the recreational sector, consultation processes are facilitated by Recfishwest under a Service Level Agreement although the Department undertakes

direct consultation with the community on specific issues.

### *Management Initiatives (Under Review)*

A review of South Coast commercial fish trap, G-net and open-access line, net and squid jig fisheries commenced in December 2013. As part of this review a discussion paper was released for public consultation on the Department's proposed future direction for management of these fisheries (DoF 2015). Following this discussion paper process, the Minister for Fisheries approved the development of a South Coast line, fish trap and squid jig managed fishery and a South Coast nearshore net managed fishery. In February 2016, an Independent Access Panel (IAP) was engaged by the Department to provide recommendations relating to access to the proposed new fisheries. The IAP released a draft report with proposed access criteria recommendations in August 2016 for public consultation. Following consideration of the comments the IAP will review and submit their final report to the Department. The Department

will then provide advice (including the IAP's final report) to the Minister for Fisheries for his in-principle decisions regarding access criteria for these fisheries. Following the Minister's decision, the two new management plans will be developed and will be informed by the recent stock assessment of snapper, Bight redfish, blue morwong and western blue groper stocks on the South Coast (Norriss *et al.* 2016).

### **EXTERNAL DRIVERS**

Bight redfish are an important component of the catch of the Great Australia Bight Trawl Sector, a Commonwealth managed fishery permitted to operate across southern Australia as far west as Cape Leeuwin. Their 2014/15 season Bight redfish catch was 218 t, predominantly in waters off South Australia but also from the western Great Australian Bight off the WA coast (Moore and Cutotti 2015). Otolith chemistry has shown that Bight redfish from the waters surrounding Albany and Esperance constitute separate stocks to those of the main South Australian fishing grounds.

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