

# SOUTH COAST BIOREGION

## ABOUT THE BIOREGION

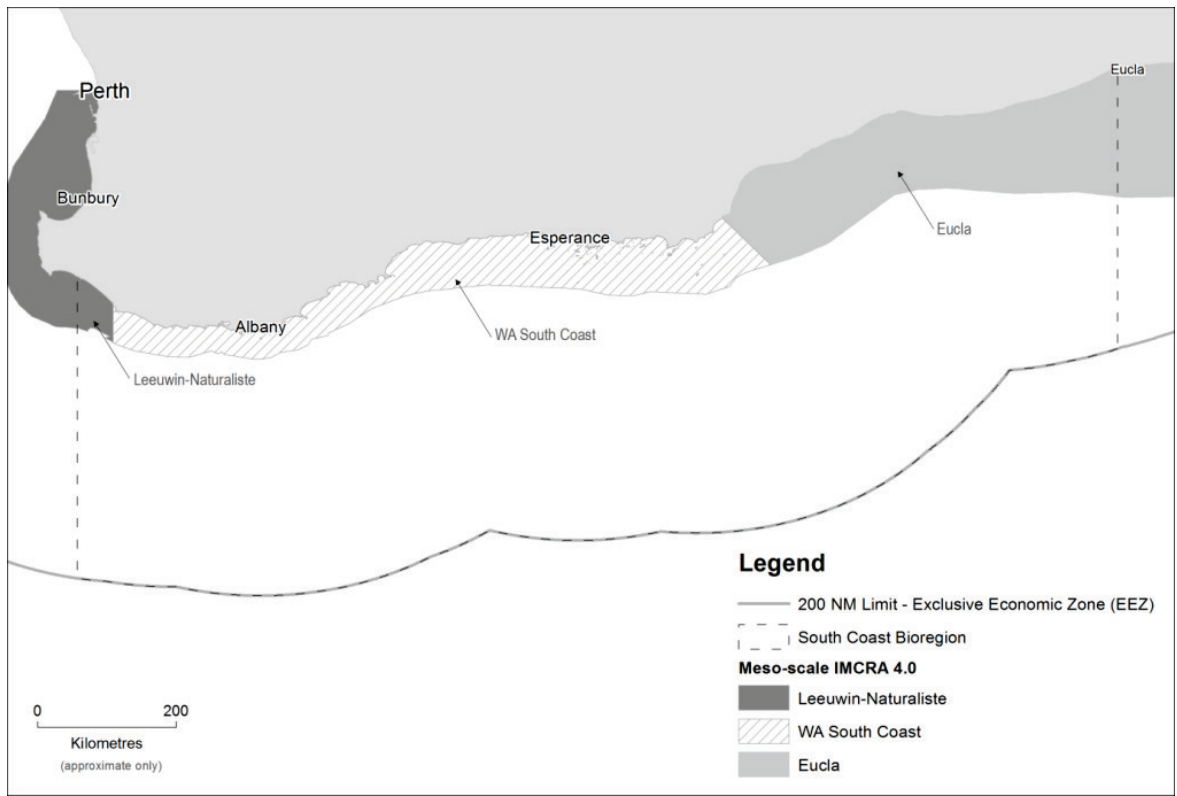
The continental shelf waters of the South Coast Bioregion (South Coast Overview Figure 1) are generally temperate but low in nutrients, due to the seasonal winter presence of the tail of the tropical Leeuwin Current and limited terrestrial run-off. Sea surface temperatures typically range from approximately 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 have affected 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 and 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 (160 km) 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 experiencing 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.

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

### Climate Change

Some of the key environmental trends that may be affecting ecosystems in WA include:

- Increasing frequency of El Niño/Southern Oscillation (ENSO) events;
- More years with a weaker Leeuwin Current;
- Increase in water temperature off the west coast of WA, particularly the lower west coast;
- Increase in salinity, which includes some large annual fluctuations;
- Change in the frequency and location of storms (and rainfall) affecting the lower west coast; and
- Change in the frequency of cyclones (and summer rainfall) affecting the north-west coast.

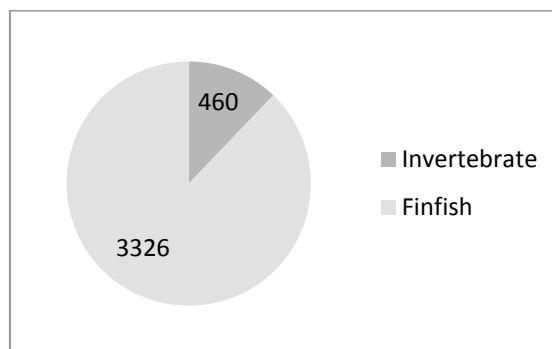
The South Coast Bioregion is predicted to be at enhanced risk from the effects of climate given that it spans a transitional zone between tropical and temperate regions. The variables expected to drive climate change impacts include changes in water temperature, ocean currents, winds, rainfall, sea level, ocean chemistry and extreme weather conditions.

It is apparent that climate change will impact the biological, economic, and social aspects of many fisheries, and both positive and negative impacts are expected. Climate change can influence biological systems by modifying the timing of spawning, range and distribution, composition and interactions within communities, exotic species invasions and impacts, and the structure and dynamics of communities, including changes in productivity. Species distribution shifts are the most commonly reported changes and are often the easiest to recognise and measure. Changes in the

distribution of key species are monitored in a national citizen-science program ([www.redmap.org.au](http://www.redmap.org.au)) in which the Department is a collaborator.

### Commercial Fishing

The major commercial fisheries of the South Coast Bioregion are the abalone fishery (which achieved Marine Stewardship Council certification in 2017), a trap fishery targeting southern rock lobsters and deep-water crabs, 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 the intermittent scallop trawl fishery. There is also a commercial net fishery for finfish operating in a number of South Coast estuaries. Commercial fishers also target demersal scalefish offshore with droplines and handlines under general commercial 'wetline' provisions which are currently under review. South Coast commercial fishing vessel operators often hold a number of licences to create a viable year-round fishing operation.

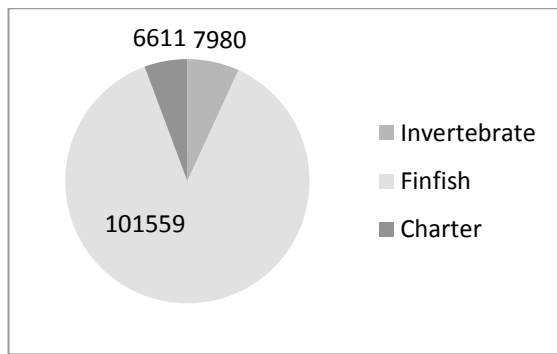


**SOUTH COAST OVERVIEW FIGURE 2**

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 major population and holiday centres. The major target species for beach and rock anglers are West Australian salmon, Australian herring, whiting and trevally, while boat anglers target snapper, queen snapper, Bight redfish and King George whiting. The third major component of the recreational fishery is the dinghy and shoreline fishing in 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. There is a current South Coast Aquaculture Project aiming to identify a network of suitable areas for aquaculture development, mostly focussed on shellfish including edible oysters. In addition, an offshore abalone farm near Augusta is growing-out abalone 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 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.

(between Kangaroo Island, South Australia and Shark Bay), is likely to result in increased zoning arrangements for Marine Protected Areas off the South Coast of WA (South Coast Overview Figure 5).

The Commonwealth Government’s Marine Bioregional Planning process for the South-West marine region

**SOUTH COAST ECOSYSTEM MANAGEMENT TABLE 1**

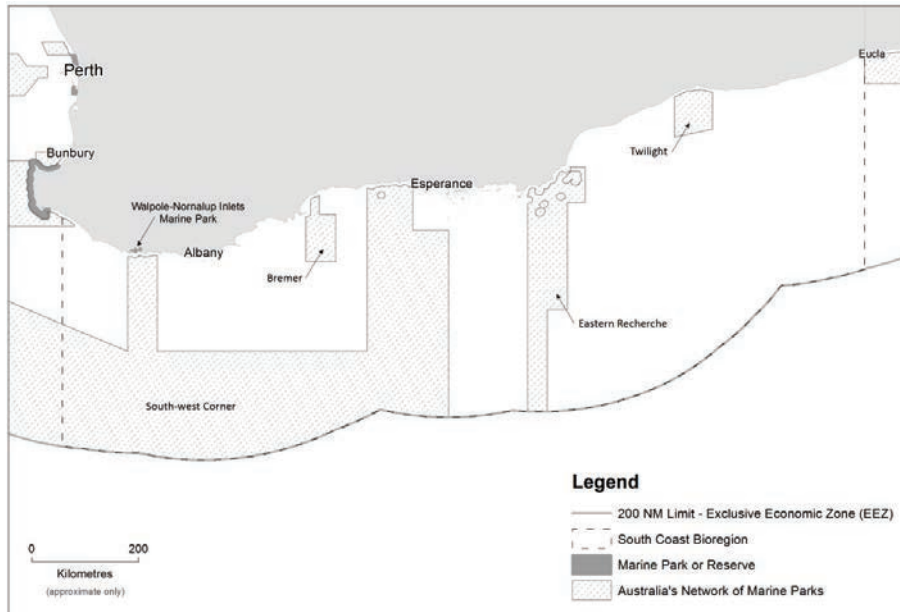
The areas and proportions of the South Coast Bioregion making up State Waters and all continental shelf waters, out to 200 m depth, which meet the IUCN criteria for classification as marine protected areas. This table does not yet include the closures that may be implemented by the Commonwealth as part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



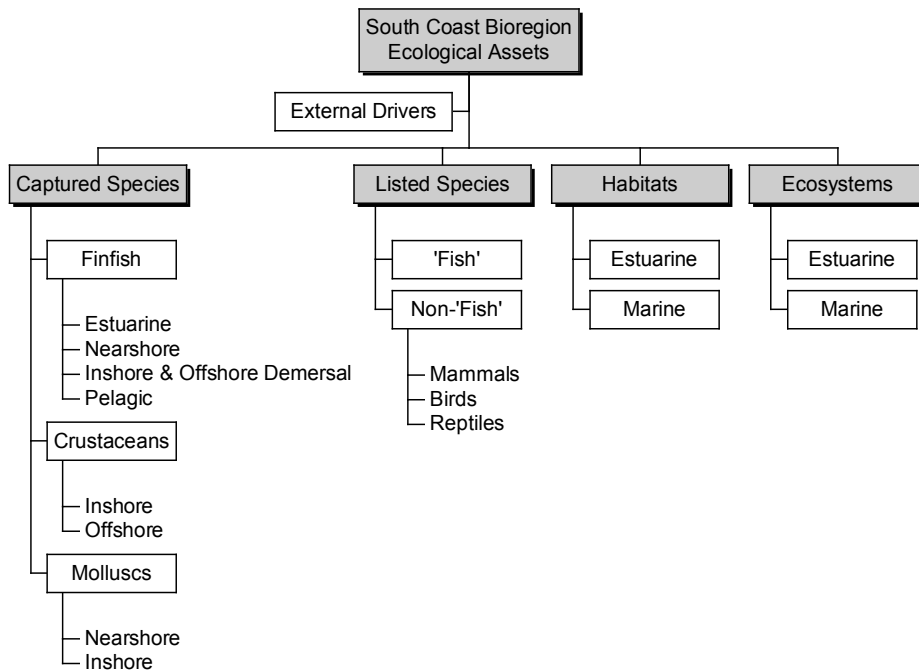
**SOUTH COAST OVERVIEW FIGURE 5**

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>1</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.



**SOUTH COAST ECOSYSTEM MANAGEMENT FIGURE 6**

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

<sup>1</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.

## 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. However, this species is under management and risk of further spread is regarded as low.

## Captured Species

### FINFISH

#### Estuarine

| Captured Species | Aquatic zone | Ecological Risk |
|------------------|--------------|-----------------|
| Finfish          | Estuarine    | HIGH            |

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 of many nearshore indicator species (e.g. Australian salmon) have been declining since the mid-late 1990s mainly as a result of reduced market

demand. A new assessment of Australian herring and Australian salmon is planned for September 2017.

### 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 moderate (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, however western rock lobster catches in Augusta/Windy Harbour have improved since 2014/15.

### 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>1</sup> (ETP) species can be found within the South Coast Bioregion, including cetaceans, pinnipeds, 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 (*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 2). 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 2) following 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. Further monitoring was undertaken using observers in 2017.

### Habitats and Ecosystems

The South Coast Bioregion, extends from 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 is 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 exposed to ocean swells. Seagrasses perform the following important ecosystem functions: primary production, nutrient cycling, stabilising sediments and habitat provision.

<sup>1</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.

**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,

historical eutrophication 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>1</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 (potentially due to climate change) and changes in tidal exchange due to opening and closing of sand-bars at river mouths.



# SOUTH COAST CRUSTACEAN RESOURCE STATUS REPORT 2017

J. How and M. Yerman



## OVERVIEW

The South Coast Crustacean Managed Fishery (SCCMF) 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*).

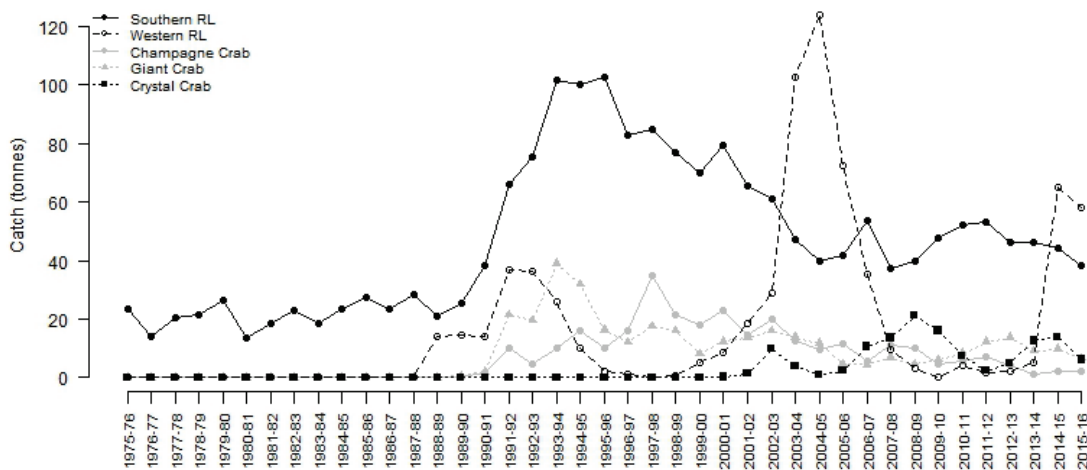
## SUMMARY FEATURES 2017

| Fishery Performance        |                                   | Commercial             | Recreational                              |
|----------------------------|-----------------------------------|------------------------|---|
| Total Catch 2015/16        |                                   | 112 t                  | < 5 t                                     |
| Fishing Level              |                                   | Acceptable             | Acceptable                                |
| Stock/Resource Performance |                                   | Stock Status           | Assessment Indicators                     |
|                            |                                   | Sustainable - Adequate | Annual: Catch and Catch Rates             |
| EBFM Performance           |                                   |                        |   |
| Asset                      | Level                             | Asset                  | Level                                     |
| Bycatch                    | Low Risk                          | Listed Species         | Moderate Risk                             |
| Habitat                    | Low Risk                          | Ecosystem              | Low Risk                                  |
| Social                     | Moderate Amenity<br>Moderate Risk | Economic               | GVP Level 3 - \$6.9 mill<br>Moderate Risk |
| Governance                 | Stable                            | External Drivers       | Moderate Risk                             |

## CATCH AND LANDINGS

The total landings of crustacean from this resource in 2015/16 accessed by the SCCMF was 111.5 t, comprising 38.2 t of southern rock lobster, 58.2 t of

western rock lobster, and 6.2 t of crystal, 6.7 t giant and 2.1 t of champagne crabs retained (South Coast Crustacean Figure 1).



**SOUTH COAST CRUSTACEAN FIGURE 1.**

Total landings in the South Coast Crustacean Fishery by species.

1 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.

## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

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

The dominant species retained in the catch from this zone is western rock lobster. The western rock lobster in this zone represents the southern edge of the distribution of the stock. The catches and catch rates in 2014/15 and 2015/16 have been above the historic average catch (South Coast Crustacean Figure 1 and 2a). Evidence suggests that the source of recruitment for western rock lobsters in the SCCMF is the West Coast Rock Lobster Managed Fishery (WCRLMF), which is assessed as **sustainable-adequate**.

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

Crystal crab, which is found on the west and south coasts of Western Australia (WA), 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 decreased from 13.9 tonnes in 2014/15 to 6.1 tonnes in 2015/16 (South Coast Crustacean Figure 1). It was not possible to calculate a standardised catch rate for crystal crabs in this region for the 2015/16 season from the monthly returns due to a lack of targeted effort. Effort associated with catch of crystal crab also contained significant catches of other deep sea crab and rock lobster species.

Volunteer daily logbook which provides targeted effort information, was available for the last two seasons

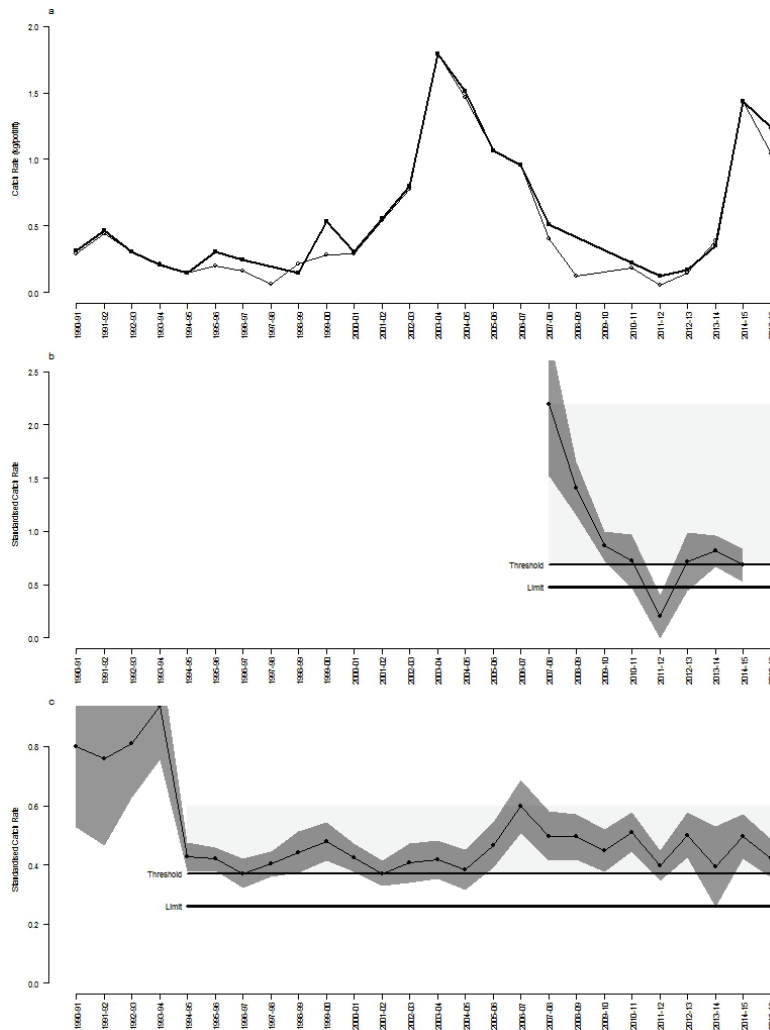
(2014/15 and 2015/16). It showed catch rates remaining steady between these seasons, with logbook catch accounting for about 50% of the total catch of crystal crabs in these seasons. As the 2013/14 and 2014/15 seasons were assessed as being above the threshold level (South Coast Crustacean Figure 2b), the stock status for 2015/16 was assessed as **sustainable-adequate**.

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

The assessment for these zones is determined using southern rock lobster as the indicator species. Southern rock lobster 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 that 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 SCCMF have declined in recent seasons, with catch landings outside of the target catch range of 50-80 tonnes (South Coast Crustacean Figure 1). This is due to in part to reduced targeted effort for southern rock lobsters, particularly in Zone 4. 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-moderate sustainability risk) and the SCCMF stock biomass is above its threshold level and is therefore **sustainable-adequate**.

SOUTH COAST BIOREGION



**SOUTH COAST CRUSTACEAN FIGURE 2.**

Annual nominal catch rate (grey line open circles), targeted catch rate (heavy line solid circles) or standardised catch rate (line and open circles with grey 95CI) for a) western rock lobster in Zone 1 (Windy Harbour-Augusta), b) crystal crab in Zone 2 (Albany) and c) southern rock lobster in Zones 2-4. Target region (light grey), threshold (thin horizontal line) and limit (heavy horizontal line) reference points are presented when applicable.

**BYCATCH AND PROTECTED SPECIES INTERACTIONS**

**Bycatch (Low risk):** 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 (Moderate risk):** The SCCMF operates in areas adjacent to Australian Sea Lion (ASL) colonies. Pots fished in areas potentially frequented by juvenile ASLs are required to be fitted with a Sea Lion Exclusion Device (SLED). These devices are designed to stop the entrance and accidental drowning of ASLs. 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 Primary Industries and Regional Development, Fisheries Division (Fisheries) to establish suitable mitigation measures to reduce potential ASL interactions and minimise any impact on fisher catches.

In the 2015/16 season there were no whale entanglements attributed to the SCCMF.

Turtles can also get caught in the float rigs of lobster pots. In 2015/16 no turtles were reported to have been entangled in lobster fishing gear.

**HABITAT AND ECOSYSTEM INTERACTIONS**

**Habitat (Low risk):** Potting is considered to have a low impact on the habitat over which the SCCMF operates.

**Ecosystem (Low risk):** The effect of the removal of lobster and deep sea crabs has been assessed for the West Coast Deep Sea Crustacean Fishery and WCRLMF 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

The SCCMF 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 WA. **Moderate** risk.

### Economic

The beach value of the fishery was about \$6.9 million in 2015/16 with the majority of the catch sold live to Asian markets both locally and internationally. **Moderate** risk.

## GOVERNANCE SYSTEM

### Annual Catch Tolerances

#### Southern Rock Lobster – 50-80 t

#### Current fishing level – Acceptable

Under the SCCF Management Plan, the SCCMF 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 SCCMF, the large amount of latent effort which existed in Zones 2 and 4 was dramatically reduced. The re-structuring which occurred as part of the SCCMF's establishment has also seen a reduction in effort in Zone 4 which may have in part contributed to the catch of 38 t for 2015/15 being below the level of 50-80 t of southern rock lobster.

### Harvest Strategy (Under Development)

A preliminary harvest strategy has been developed and will be formally presented to industry in upcoming seasons to ratify.

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### 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 Fisheries website.

Consultation with non-fisher stakeholders is undertaken in accordance with the Department's Stakeholder Engagement Guidelines.

### 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

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. **Moderate** risk.

# SOUTH COAST GREENLIP/BROWNLIP ABALONE RESOURCE STATUS REPORT 2017



*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).

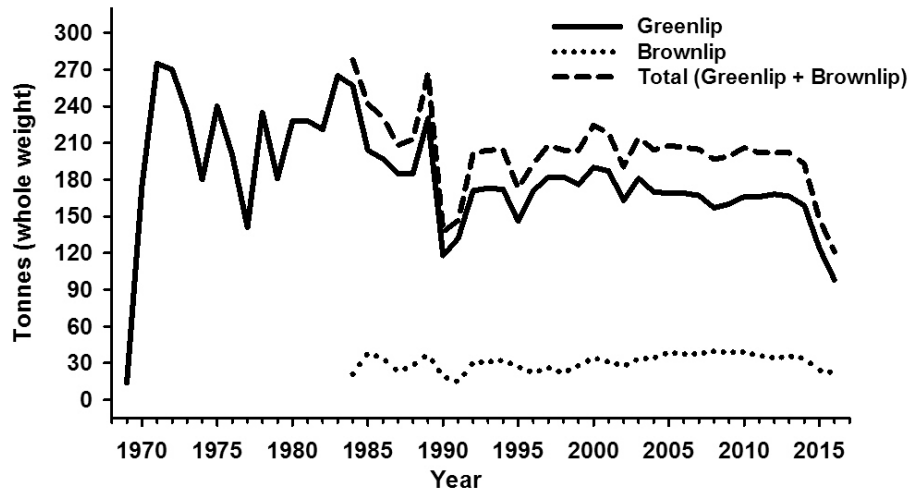
## SUMMARY FEATURES 2017

| Fishery Performance        |                              | Commercial             | Recreational  |
|----------------------------|------------------------------|------------------------|---|
| Total Catch 2016           |                              | 121 t                  | 8 t   |
| Fishing Level              |                              | Acceptable             | Acceptable  |
| Stock/Resource Performance |                              | Stock Status           | Assessment Indicators                               |
| Greenlip abalone           |                              | Sustainable - Adequate | Annual: Catch, Catch Rates, Sizes, Surveys          |
| Brownlip abalone           |                              | Sustainable - Adequate | Annual: Catch, Catch Rates, Sizes, Integrated Model |
| EBFM Performance           |                              |                        |   |
| Asset                      | Level                        | Asset                  | Level   |
| Bycatch                    | Negligible Risk              | Listed Species         | Negligible Risk                                     |
| Habitat                    | Negligible Risk              | Ecosystem              | Negligible Risk                                     |
| Social                     | Low Amenity                  | Economic               | GVP Level 3 - \$5.1 mill                            |
|                            | Low Risk                     |                        | Moderate Risk                                       |
| Governance                 | MSC full assessment complete | External Drivers       | Moderate Risk                                       |

## CATCH AND LANDINGS

In 2016 the total commercial Greenlip/Brownlip abalone catch was 121 t whole weight (Greenlip 99 t and Brownlip 22 t), which was 83% of the combined TACC (145 t whole weight) and represents the lowest catch in over 40 years (Greenlip/Brownlip Abalone Figure 1). The lower catch in 2016 was due to reductions in TACC (Greenlip 25 t) and a commercial

industry decision to not fish a proportion of the quota (17 t of Greenlip abalone in 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.

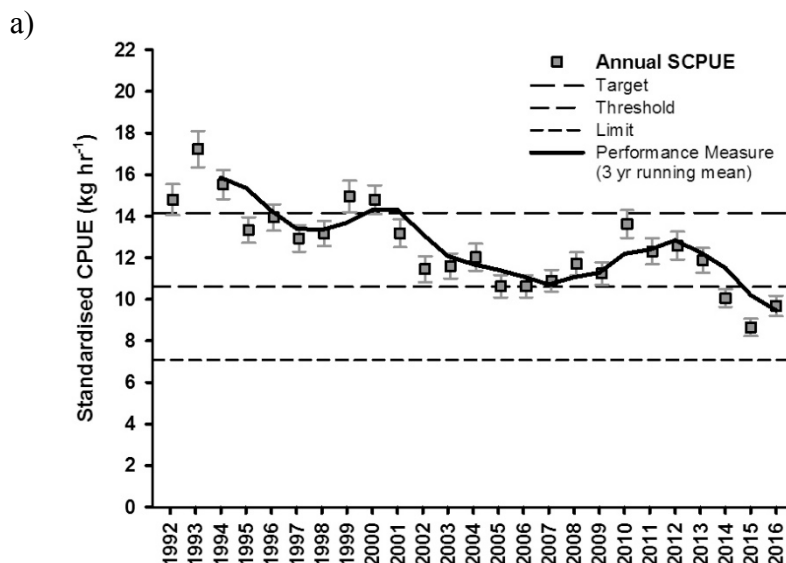
## INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

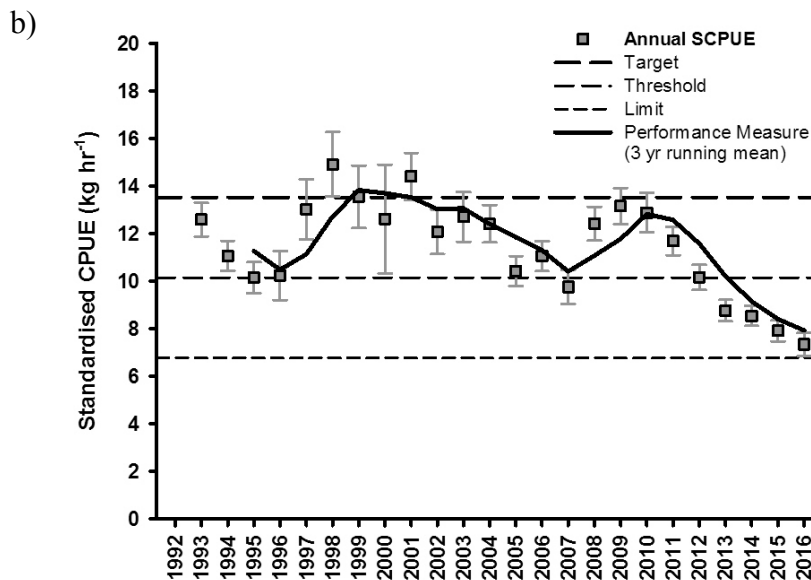
### Greenlip abalone (Sustainable-Adequate)

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 performance indicator (PI) of standardised catch per unit effort (SCPUE) as a 3 year mean which uses commercial catch and effort statistics, and other measures such as fisheries-independent sampling. In Management Area 2

(Esperance) there has been a declining trend in annual SCPUE since 2010, until a slight increase occurred in 2016. The PI is still below the threshold but above the limit reference level (Greenlip/Brownlip Abalone Figure 2a). In Management Area 3 (Albany), since 2013 the annual SCPUE and PI have declined to below the threshold but remain 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. 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. Stock status of Greenlip abalone is considered **sustainable-adequate**.





**GREENLIP/BROWNLIP ABALONE FIGURE 2.**

The standardised CPUE (kg.hr<sup>-1</sup>) for Greenlip abalone with the performance indicator (3 year running mean) and reference levels (target, threshold and limit) 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 Brownlip abalone 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 performance indicator (3 year mean of SCPUE) were used for the assessment of the 2017 TACC for each management area. In Management Area 2 (Esperance) the annual SCPUE and PI for Brownlip abalone were relatively stable above the target reference level between 1999 and 2012, however over the last four years they have declined markedly and are now below the threshold but above the limit reference level. In Management Area 3 (Albany) the SCPUE and PI for Brownlip abalone fluctuated greatly during 1999 to 2010 (above the target), before remaining relatively stable from 2011 to 2016 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 2016 as above the target reference level. Consequently the stock status of Brownlip abalone is considered to be **sustainable-adequate**.

### BYCATCH AND PROTECTED SPECIES INTERACTIONS

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. **Negligible** risk.

### HABITAT AND ECOSYSTEM INTERACTIONS

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. **Negligible** risk.

### SOCIAL AND ECONOMIC OUTCOMES

#### Social (Low Risk)

There are 17 vessels operating in the Commercial Greenlip/Brownlip Abalone Fishery, employing approximately 35 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 18,002 recreational abalone licenses issued in 2016 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 2016 was \$5.1 million, based on the estimated average price received by commercial fishers of \$117/kg meat weight (\$44/kg whole weight) for Greenlip abalone and \$92/kg meat weight (\$37/kg whole weight) for Brownlip abalone. Greenlip abalone prices in 2016 were higher than prices in 2015 (\$107/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 - Acceptable; Recreational - Acceptable)**

**Commercial:** 145 t (TACC) (3,440 – 5,270 fishing hours)

**Recreational:** Not formal

Commercial effort (4411 hours) was within tolerance range following TACC reductions. Non-achievement of TACC was due to commercial Industry decisions. Recreational catch not considered a risk to these stocks.

### **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 biological reference levels for both species in each management area. A recent review (2015) of the harvest control rules 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 2017/18 season using the harvest strategy, for Greenlip abalone they are 3 t in Area 1, 48 t in Area 2 and 65 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. 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. Consultation with non-fisher stakeholders is undertaken in accordance with the Department's Stakeholder Engagement Guidelines.

### **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 has undergone full MSC assessment and achieved certification (<https://fisheries.msc.org/en/fisheries/western-australia-abalone-fishery/@@view>).

## **EXTERNAL DRIVERS**

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. 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.

**Moderate** risk.



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# SOUTH COAST NEARSHORE AND ESTUARINE FINFISH RESOURCE STATUS REPORT 2017



*K. Smith, G. Baudains, M. Holtz and E. Bunbury*

## 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 gill net, haul net and beach seine. 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 mainly comprised of western Australian salmon (*Arripis truttaceus*), southern school whiting (*Sillago bassensis*), Australian herring (*Arripis georgianus*) and King George whiting (*Sillaginodes punctatus*). Landings of estuarine finfish are mainly comprised of sea mullet (*Mugil cephalus*), estuary cobbler (*Cnidoglanis macrocephalus*) and black bream (*Acanthopagrus butcheri*).

## SUMMARY FEATURES 2016

| Fishery Performance        |   | Commercial              | Recreational   |
|----------------------------|---|-------------------------|--|
| Total Catch 2016           |   | 279 t                   | 13–21 t (2015/16 boat-based only)                              |
| Fishing Level              |   | Acceptable              | Acceptable   |
| Stock/Resource Performance |   | Stock Status            | Assessment Indicators  |
| Nearshore                  |   | Sustainable - Adequate  | Annual: Catch, Catch Rate;<br>Periodic: Fishing Mortality, SPR |
| Estuarine                  |   | Inadequate<br>(Cobbler) | Annual: Catch, Catch Rate;<br>Periodic: Fishing Mortality, SPR |
| EBFM Performance           |   |                         |  |
| Asset                      | Level   | Asset                   | Level  |
| Bycatch                    | Low Risk  | Listed Species          | Negligible Risk  |
| Habitat                    | Negligible Risk   | Ecosystem               | Low Risk (from fishing)  |
| Social                     | High Amenity<br>Moderate Risk                               | Economic                | GVP Level 2 - (\$1-5 mill)<br>Moderate Risk                    |
| Governance                 | Recovery Plan for Wilson Inlet<br>Cobbler under development | External Drivers        | High Risk (Environment)  |

## CATCH AND LANDINGS

In 2016, the total commercial catch of nearshore and estuarine finfish in the SCB was 279 t, comprising 23 t from ocean waters and 256 t from estuaries (South Coast Nearshore and Estuarine Finfish Table 1). The commercial catch was taken by the SCEMF (256 t), 'open access' commercial fishers (20 t) and the SCSMF (3 t).

The top 10 nearshore and estuarine species (or species groupings) in the South Coast represented 95% of the

total boat-based recreational catch (kept by numbers) in 2015/16. The estimated boat-based recreational harvest range for the top 10 nearshore and estuarine species in the South Coast was steady in 2015/16 compared with estimates from previous statewide surveys (95% CI 13–21 tonnes compared with 20–31 in 2013/14, but lower than 37–52 in 2011/12) (Ryan *et al.* 2017). No recent estimates of shore-based recreational catches are available.

**SOUTH COAST NEARSHORE AND ESTUARINE FINFISH TABLE 1.**

Total catches (tonnes) of finfish by commercial fisheries in nearshore and estuarine waters in the South Coast Bioregion in previous five years.

| Species                   | Scientific name                  | 2012  | 2013  | 2014  | 2015  | 2016  |
|---------------------------|----------------------------------|-------|-------|-------|-------|-------|
| Black bream               | <i>Acanthopagrus butcheri</i>    | 42.7  | 42.1  | 31.2  | 29.7  | 71.9  |
| Estuary cobbler           | <i>Cnidoglanis macrocephalus</i> | 53.1  | 67.2  | 57.0  | 53.3  | 70.2  |
| Sea mullet                | <i>Mugil cephalus</i>            | 30.6  | 25.5  | 27.9  | 17.7  | 27.8  |
| Australian herring        | <i>Arripis georgianus</i>        | 134.4 | 250.6 | 104.0 | 23.7  | 20.9  |
| King George whiting       | <i>Sillaginodes punctatus</i>    | 9.9   | 11.5  | 13.3  | 22.5  | 17.2  |
| Tarwhine                  | <i>Rhabdosargus sarba</i>        | 3.9   | 4.6   | 6.0   | 7.5   | 12.1  |
| Pink snapper              | <i>Chrysophrys auratus</i>       | 2.1   | 0.6   | 2.2   | 4.4   | 10.3  |
| Leatherjackets            | Monacanthidae                    | 11.1  | 11.2  | 11.7  | 8.7   | 10.1  |
| Western Australian salmon | <i>Arripis truttaceus</i>        | 75.0  | 139.4 | 303.4 | 119.3 | 5.0   |
| Southern garfish          | <i>Hyporhamphus melanochir</i>   | 5.4   | 14.0  | 6.7   | 7.2   | 6.9   |
| Flatheads                 | Platycephalidae                  | 3.1   | 4.9   | 3.0   | 5.3   | 6.9   |
| Yelloweye mullet          | <i>Aldrichetta forsteri</i>      | 4.9   | 3.4   | 5.2   | 4.4   | 3.5   |
| Snook                     | <i>Sphyraena novaehollandiae</i> | 1.7   | 1.9   | 1.5   | 3.4   | 2.2   |
| Other finfish             |                                  | 11.6  | 13.0  | 15.5  | 13.5  | 14.3  |
| Total                     |                                  | 389.6 | 589.9 | 588.6 | 320.5 | 279.5 |

## 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)

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 2016 commercial catch was 103 t, with 86% taken by the South West Coast Salmon Managed Fishery, 3% by the SCSMF and 11% by other fisheries.

The estimated boat-based recreational harvest range for Western Australian Salmon in the SCB was steady in 2015/16 (95% CI 1–5 tonnes compared with 2–6 in 2013/14 and 4–11 in 2011/12, but shore-based recreational catches are believed to be substantial for this species (Ryan *et al.* 2017).

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 **sustainable-adequate**.

### Australian herring (Sustainable-Recovering)

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

### Sea mullet (Sustainable-Adequate)

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 2016 was 27.8 t. The 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 1). On the basis of this evidence, the SCB sea mullet stock is classified as **sustainable-adequate**.

### 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 from populations in adjacent ocean waters.

Since 2000, 95% of commercial landings of cobbler have been caught in the SCB, with the remainder in the WCB. From 2000 to 2016, the total SCB catch ranged from 40 to 98 t (South Coast Nearshore and Estuarine Figure 2). Over this period, 79% 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 70 t in 2016, including 61 t from Wilson Inlet.

Annual fishery-independent surveys since 2007 indicate that juvenile recruitment and adult abundance has been steadily declining in Wilson Inlet. Currently, the SPR for the Wilson Inlet stock is estimated to be below the limit reference level of 20%. On the basis of this evidence, the Wilson Inlet stock is classified as **inadequate**.

### 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. In 2016, the SCB catch was 72 t, mainly from Beaufort Inlet (52% of landings), Wilson Inlet (14%), Stokes Inlet (9%), Oyster Harbour (7%), Princess Royal Harbour (7%), and six other estuaries. In 2016, a record high catch of 38 t was taken from Beaufort Inlet (the previous highest was 26 t in 2005) and the 3<sup>rd</sup> highest catch (10 t) was taken in Wilson Inlet.

The estimated boat-based recreational harvest range for black bream in the SCB was steady in 2015/16 (95% CI 1–6 tonnes compared with 1–3 in 2013/14 and 3–11 in 2011/12 (Ryan *et al.* 2017). 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 recreational fishing in SCB estuaries indicated that the highest recreational catches of black bream were taken in Walpole-Nornalup Inlet (Smallwood and Sumner 2007). The current stock status in Walpole-Nornalup Inlet cannot be assessed due to lack of recent data.

Catch rate trends suggest abundance is stable in Wilson Inlet and Oyster Harbour, increasing in Beaufort Inlet and decreasing in Stokes Inlet (South Coast Nearshore and Estuarine Figure 3).

The catch and catch rate in each estuary is within the historical range. On the basis of this evidence, the

black bream stocks in these four estuaries are classified as **sustainable-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 appropriate size ranges. 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 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 have lower risks of barotrauma-related injuries than deep water oceanic 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.

## SOUTH COAST BIOREGION

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, 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 2016, there were approximately 8 commercial fishers employed in the South Coast Salmon Fishery and 32 in the South Coast Estuarine Managed Fishery. Additional employment is created by these fisheries in 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. 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 2016:

#### South Coast Estuarine Managed Fishery

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

#### South Coast Salmon Managed Fishery

Level 1: <\$1 million

**Moderate Risk**

## GOVERNANCE SYSTEM

### Annual Catch Tolerance Levels

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

Finfish catch was 256 t in 2016. This fishery has traditionally targeted finfish, but in recent years has harvested significant quantities of blue swimmer crabs (24 t in 2016), which have partly replaced finfish in the overall catch. The total catch by this fishery in 2016 is considered **adequate**.

### Australian Salmon Fisheries (all WA commercial fisheries): 0 - 1200 tonnes.

Catch was 103 t in 2016. This is the lowest catch since the fishery commenced in the 1940s. Recent catches continue to be low relative to historic levels, due to low effort from limited market demand.

### 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. Indicator species are assessed annually based on catch and/or catch rate trends, where data are 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 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.

Consultation with non-fisher stakeholders is undertaken in accordance with the Department's Stakeholder Engagement Guidelines.

### Management Initiatives/Outlook Status

**Australian herring workshop:** The Department is convening a workshop in 2017 that will undertake a formal assessment of the most recent herring data using the Weight of Evidence approach to update herring stock status. It is the Department's intention that workshop involve Department staff (research and management) as well as external scientists and representatives from WAFIC and Recfishwest. The workshop will also direct some focus towards salmon and utilise the opportunity to identify knowledge gaps and research opportunities relating to salmon assessment.

**WAFIC Review:** WAFIC commissioned an independent review of minor commercial fisheries on the south and lower west coasts in relation to the potential establishment of an industry representative association. The review was undertaken by Dr Peter Rogers. His report “The Case for Establishing the Southern Seafood Producers (WA) Association” sets out his findings and makes recommendations including reforms/development for many SC and SW fisheries. The Department will work with WAFIC during 2017 and 2018 to address the recommendations as appropriate.

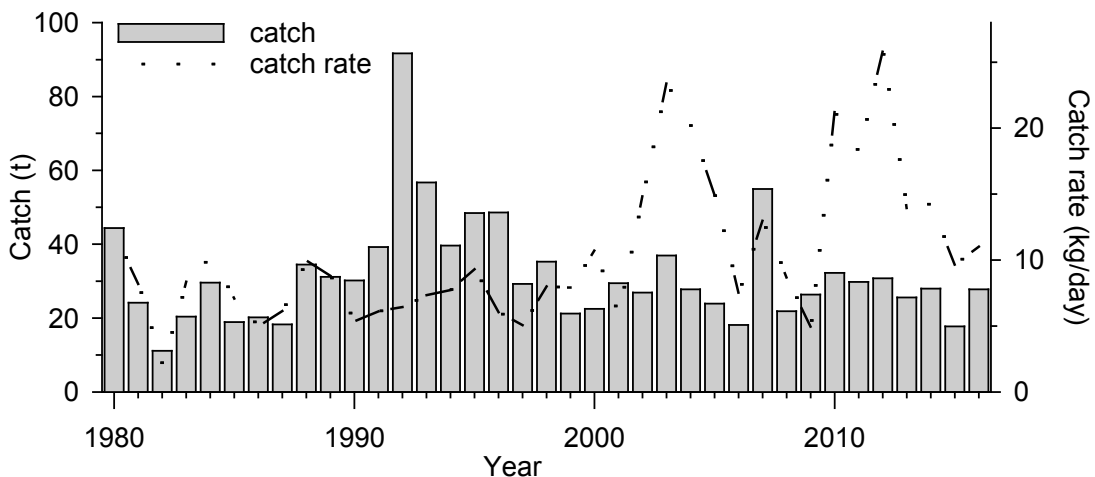
**Wilson Inlet cobbler sustainability:** Consultation with stakeholders is underway to determine the most appropriate management response to address the sustainability concerns for cobbler in Wilson Inlet. Management measures should be implemented in late 2017 and will take into account the possibility of future changes to the SCEMF as recommended by the WAFIC review and consistent with the resource based approach adopted under the (impending) Aquatic Resources Management Act.

**EXTERNAL DRIVERS**

The abundance of fish species in SCB estuaries are strongly influenced by climatic and other environmental factors, independent of fishing. Catchment processes (e.g. runoff) can have major effects on estuary condition and fishery production. Annual variations in coastal currents (particularly the Leeuwin and Capes Currents) influence spawning, recruitment, distribution and catchability of species such as Australian herring and western Australian salmon. Cool inshore temperatures due to a strong Capes Current appear to have provided a favourable ‘corridor’ for fish to migrate northwards in 2016, with exceptionally high numbers of salmon observed along the west coast during the autumn spawning period, and some fish travelling as far north as Exmouth

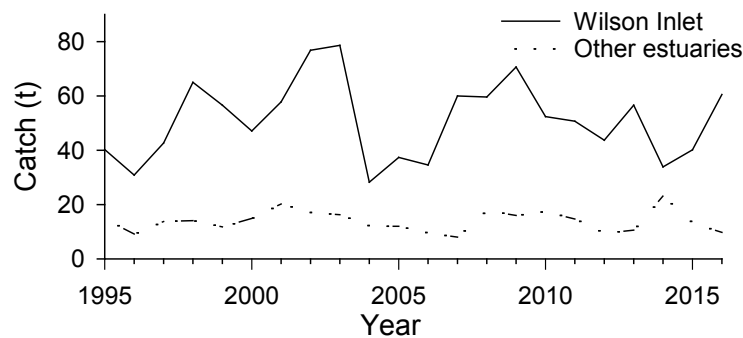
Fluctuating market demand is a significant factor affecting the annual commercial catch level of many species. On the basis of market demand and price commercial fishers sometimes elect not to capture a school of fish, or release part of their catch, when a market is not available. This is particularly relevant to Western Australian salmon.

**High risk.**



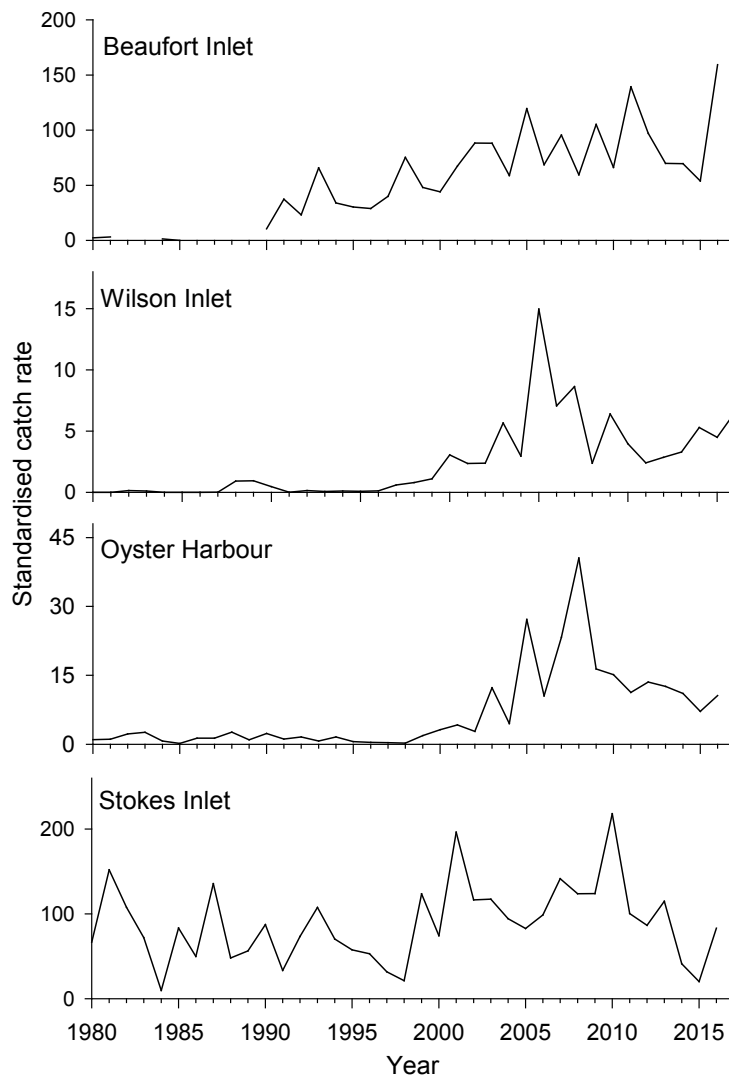
**SOUTH COAST NEARSHORE AND ESTUARINE FIGURE 1.**

Sea mullet i) total commercial catch in the South Coast Bioregion, and ii) nominal annual commercial catch rate in Oyster Harbour, 1980 to 2016.



**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 2016.



### SOUTH COAST NEARSHORE AND ESTUARINE FIGURE 3.

Annual commercial catch rates of black bream in key South Coast Bioregion estuaries, 1980 to 2016.

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# SOUTH COAST SMALL PELAGIC SCALEFISH RESOURCE STATUS REPORT 2017



*J. Norriss and E. Bunbury*

## 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, however

this catch is very small and infrequent. The SCPSMF has five management zones, centred on King George Sound (Zone 1), Albany (Zone 2), Bremer Bay (Zone 3), Esperance (Zone 4) and a developmental zone near Augusta (Zone 5) where very minor catch has been recorded in recent years. 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 strong recovery by 2005 catches have remained well below the total allowable catch (TAC), which was conservatively set at 5,683 t. The SCPSMF underwent pre-assessment for Marine Stewardship Council certification in 2014.

## SUMMARY FEATURES 2016

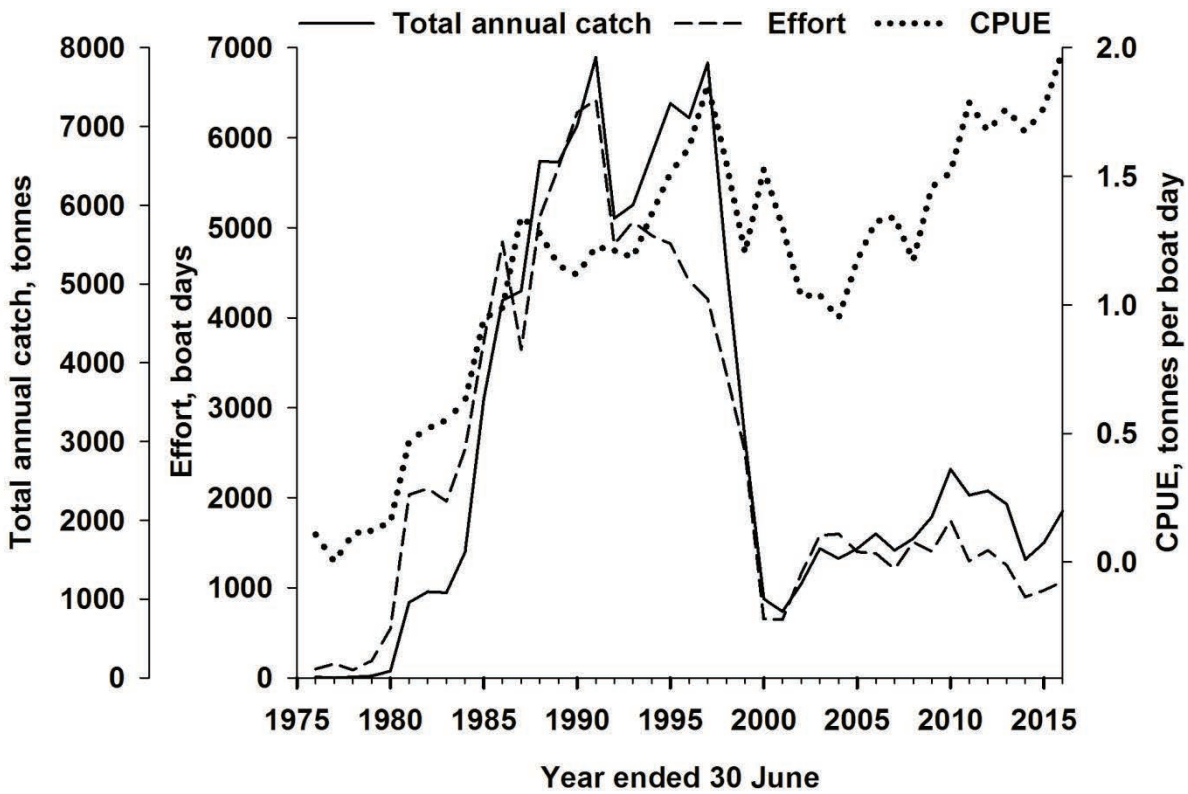
| Fishery Performance        | Commercial                   | Recreational   |                                 |
|----------------------------|------------------------------|--|---------------------------------|
| Total Catch 2015/16        | 2,149 t                      | <1 t (2015/16 boat-based only)   |                                 |
| Fishing Level              | Acceptable ( $\leq 5,683$ t) | Acceptable   |                                 |
| Stock/Resource Performance | Stock Status                 | Assessment Indicators  |                                 |
| South Coast small pelagic  | Sustainable - adequate       | Egg surveys integrated with age model in mid 2000s, and subsequent catch and catch rate trends |                                 |
| EBFM Performance           |                              |  |                                 |
| Asset                      | Level                        | Asset  | Level                           |
| Bycatch                    | Negligible Risk              | Listed Species   | Moderate-high Risk              |
| Habitat                    | Negligible Risk              | Ecosystem  | Low Risk                        |
| Social                     | Low Amenity<br>Low Risk      | Economic   | GVP \$1-5 mill<br>Moderate Risk |
| Governance                 | Stable                       | External Drivers   | Moderate Risk                   |

## CATCH AND LANDINGS

The SCPSMF total catch of 2,149 t in the 2015/16 quota year was comprised of 1,515 t for the Albany region (zones 1 and 2 combined) and 632 t for Bremer and Esperance (zones 3 and 4) combined. The large majority (99%) was pilchards (2,118 t), a 24% increase from the previous year (South Coast Small Pelagic

Figure 1). The remainder of the catch was comprised mostly of yellowtail scad (20 t), the highest annual catch for this species since 1998/99. Fishing effort in the 2015/16 quota year was 1,065 boat days by 9 active vessels, an increase of 10% from the previous year.





**SOUTH COAST SMALL PELAGIC FIGURE 1.**

Time series of total annual catch, effort and nominal catch per unit effort (CPUE) for pilchards in the SCPSMF from 1975/76 to 2015/16.

**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 management units 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 relatively high, and for 2015/16 is the highest on record (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 **sustainable-adequate**.

**Yellowtail scad (Sustainable-Adequate)**

Yellowtail scad is a schooling species common in temperate Australian waters. The population structure in WA is unknown but assumed to be a single stock. 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, and the biological stock is considered **sustainable-adequate**.

**BYCATCH AND PROTECTED SPECIES INTERACTIONS**

The SCPSMF is a species-restricted fishery and accordingly landing any species not listed in the management plan is prohibited. Small quantities of fish bycatch species are sometimes captured incidentally, but this occurs infrequently and the majority are released from the net unharmed. **Negligible** risk.

All interactions with endangered, threatened and protected species are required to be recorded on Department of Fisheries Catch and Disposal Records for each fishing trip and on statutory monthly Catch and Effort Statistics returns. Bycatch of Flesh-footed Shearwaters (FFS) have consistently been recorded. FFS opportunistically feed on fish trapped during purse seine net operations and may drown if caught in the net. Low capture rates of dolphins, sea lions and seals have also been recorded, which are usually released unharmed. Interactions with protected species are

mitigated and managed through the implementation of a voluntary SCPSMF Code of Practice which industry reviews and sometimes refines annually. Measures applied include an annual Special Management Period (SMP, from 15 March to 30 April) when the risk of FFS interactions is highest. During the SMP fishers avoid fishing at dawn and dusk to minimise interactions. **Moderate** risk.

## 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 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. 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 9 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. **Low** risk.

### 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 2015/16 was level 2 (\$1-5 million). **Moderate** risk

## GOVERNANCE SYSTEM

### Allowable Catch Tolerance Levels

The SCPSMF total annual catch for all species combined in the 2015/16 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

The SCPSMF is managed under a constant catch harvest strategy, with catches limited up to zonal TACs. Any proposed changes to the TAC are made with regard to total catches and nominal catch rates, in consultation with stakeholders.

## Compliance

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

## Consultation

Consultation with licensees on operational issues occurs on an as needs basis, and more formally via industry Management Meetings convened by the West Australian Fishing Industry Council (WAFIC) pursuant to a Service Level Agreement with the Department of Fisheries.

Consultation with non-fisher stakeholders is undertaken in accordance with the Department's Stakeholder Engagement Guidelines.

## Management Initiatives/Outlook Status

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

In 2017 staff from the Fisheries Division will conduct an independent observer program to record FFS interactions during the SMP. Results will inform future bycatch mitigation strategies.

## 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 no fishing in these waters was identified in 2015/16, the last year reported for that fishery (Moore and Mazur 2016). **Moderate** risk.

**SOUTH COAST SMALL PELAGIC TABLE 1.**

2015/16 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) | 2015/16 catch (t) | Active vessels | 2015/16 catch as per cent of TAC |
|------------------------|---------|-------------------|----------------|----------------------------------|
| Albany (Zones 1 and 2) | 2,683   | 1,515             | 6              | 56.5%                            |
| Bremer Bay (Zone 3)*   | 1,500   | 632               | 2              | 21.1%                            |
| Esperance (Zone 4)*    | 1,500   |                   | 1              |                                  |
| Total for Fishery      | 5,683   | 2,149             | 9              | 37.8%                            |

\* Insufficient vessels operated in 2015/16 so catch cannot be reported.

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## TEMPERATE DEMERSAL GILLNET AND DEMERSAL LONGLINE FISHERIES RESOURCE STATUS REPORT 2017



*M. Braccini & 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 fishers employ demersal gillnets to target mainly 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’ as 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 2017

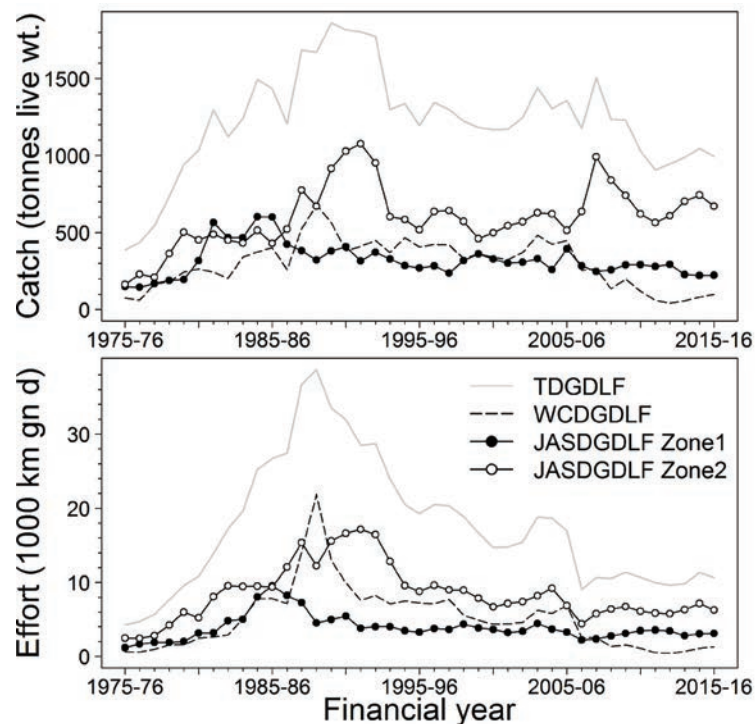
| Fishery Performance        |  | Commercial               | Recreational  |  |
|----------------------------|--|--------------------------|---|--|
| Total Catch 2015-16        |  |                          |   |  |
| Sharks and rays*           |  | 994 t                    | < 5% of commercial catch  |  |
| Scalefish*                 |  | 143 t                    |   |  |
| Fishing Level              |  | Acceptable               | Acceptable  |  |
| Stock/Resource Performance |  | Stock Status             | Assessment Indicators   |  |
| Sharks South & West        |  | Sustainable - Recovering | Annual: Catch, standardised catch rates;<br>Periodic: Total biomass |  |
| EBFM Performance           |  |                          |   |  |
| Asset                      | Level  | Asset                    | Level   |  |
| Bycatch                    | Low Risk   | Listed Species           | Negligible- Low Risk  |  |
| Habitat                    | Negligible Risk                                    | Ecosystem                | Low Risk  |  |
| Social                     | Moderate Social Amenity<br>Significant Social Risk | Economic                 | GVP Level 2. (\$1-5 mill)   |  |
| Governance                 | Moderate Risk                                      | External Drivers         | Moderate Risk   |  |

\*All reported weights are live weight

## CATCH AND LANDINGS

For the TDGDLF, reported catches of elasmobranchs 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, boat-based recreational fishers retain very small numbers of sharks

in WA (Ryan *et al.* 2017). 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<sup>-1</sup>). 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

### Gummy shark (Sustainable - Adequate)

The most recent stock assessment for gummy shark estimated the 1997-98 biomass at 42% unfished levels, which is above the 40% target. Standardised catch rates peaked in the mid/late 2000s and have been stable at lower levels ever since (Temperate Demersal Figure 2). This trend will be further examined in a new stock assessment, which will be completed in 2017. On the basis of the above, the current status of gummy sharks is **sustainable-adequate**.

### Dusky shark (Sustainable - Recovering)

Catches of dusky shark comprise mostly of neonates and one to two year old fish. Recent catches (which include catches of bronze whaler, *C. brachyurus*, that 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 have been introduced since 2006. In addition, risk ratings for the issues identified through risk assessments are at acceptable levels (Braccini *et al.* 2017). Hence, current management arrangements are considered suitable to allow gradual recovery of the breeding stock. The recent stable trends in standardised catch rates

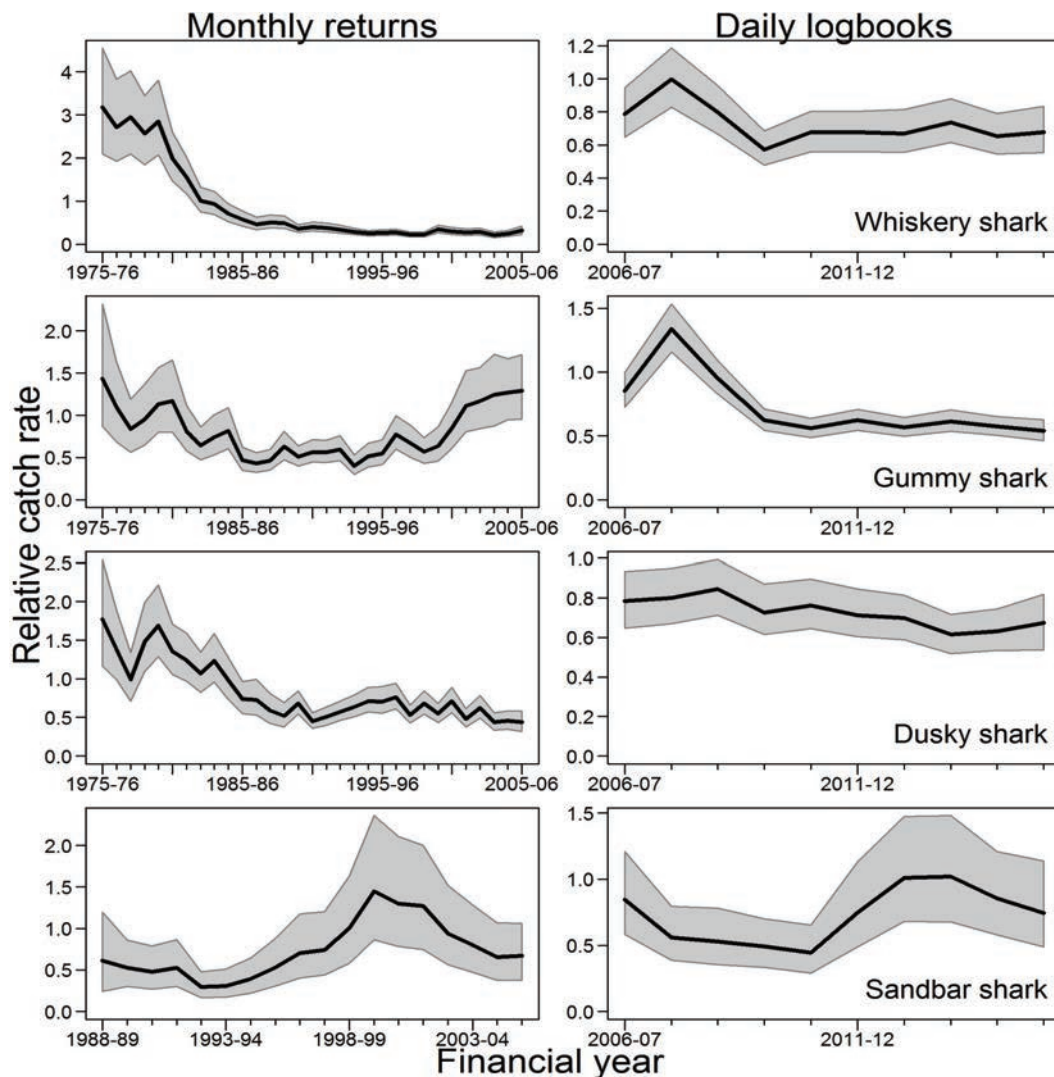
(Temperate Demersal Figure 2) will be considered in more detail during development of the new stock assessment models in 2017. On the basis of the above, the current status of dusky sharks is **sustainable-recovering**.

### Whiskery shark (Sustainable - Adequate)

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 standardised catch rates in the early 1980s (Temperate Demersal Figure 2) is likely a result of changes in targeting practices (Simpfendorfer *et al.* 2000). Since the 1990s, standardised catch rates have remained stable, with a moderate increase in recent years. A new stock assessment will be completed in 2017. On the basis of the above, the current status of whiskery sharks is **sustainable-adequate**.

### Sandbar shark (Sustainable - Recovering)

For sandbar shark, standardised catch rates have shown an increasing trend between mid 1980s and early 2000s and have fluctuated subsequently at relatively high levels ever since. Sandbar shark catches in the TDGDLF since 2008/09 have been at levels that would allow a recovery of the breeding stock. In addition, risk ratings for the issues identified through risk assessments are at acceptable levels (Braccini *et al.* 2017). On the basis of the above, the current status of sandbar sharks is **sustainable-recovering**.



TEMPERATE DEMERSAL FIGURE 2.

Standardised catch rates by species (shaded areas indicate 95% confidence intervals).

## 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 finfish, all fishery impacts on stocks of bycatch species impose a **low risk** to their ongoing sustainability.

**Protected Species:** The TDGDLF has low interactions with listed species (McAuley & Simpfendorfer 2003). For 2015-16, fishers reported catching and releasing 15 dead and 11 alive grey nurse sharks, 1 alive turtle, and 3 dead and 11 alive white sharks (Appendix 3) 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 51 and 60 skippers and crew were employed in the JASDGLF and between 17 and 20 skippers and crew were employed in the WCDGLF during 2015-16. 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 sharks generate a high level of community interest and debate, creating **moderate** social amenity and **significant** social risk.

### Economic

Shark meat is mostly sold in the Western Australian fish and chip shop market (WCDGLF 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 2015-16 is \$4.3 and \$0.5 million for JASDGLF and WCDGLF, respectively (GVP level 2).

## GOVERNANCE SYSTEM

### Allowable Catch Tolerance Levels

The 2015-16 total catch of sharks and rays was 994 t (419 t, 220 t, 41 t, and 143 t for gummy, dusky, sandbar and whiskery sharks, respectively), similar to previous years and within the acceptable catch ranges (725–1,095 t for the four key species and 350–450 t, 200–300 t, < 120 t, and 175–225 t for gummy, dusky, sandbar and whiskery sharks, respectively). Whiskery catch was maintained below historical allowable levels due to reductions in targeted effort.

The catch levels of both the commercial and recreational sectors indicate that the fishery performance for both sectors is considered **acceptable**.

### Harvest Strategy

The TDGDLF is managed under a constant catch harvest strategy. Although the harvest strategy has not been formally developed, 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<sup>-1</sup> or 3,503 km gn.d<sup>-1</sup>; Zone 2 of the JASDGLF: 144,102 km gn.hr<sup>-1</sup> or 7,205 km gn.d<sup>-1</sup>; WCDGLF: 67,692 km gn.hr<sup>-1</sup> or 2,832 km gn.d<sup>-1</sup>). The 2015-16 effort levels were maintained within these ranges (49,600 km gn.hr<sup>-1</sup> or 3,081.9 km gn.d<sup>-1</sup> for Zones 1 & 3 of the JASDGLF; 114,200 km gn.hr<sup>-1</sup> or 6,263.6 km gn.d<sup>-1</sup> for Zone 2 of the JASDGLF; 27,100 km gn.hr<sup>-1</sup> or 1,296 km gn.d<sup>-1</sup> for WCDGLF).

### 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 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 non-fisher stakeholders is undertaken in accordance with the Department’s Stakeholder Engagement Guidelines.

### 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 is proposed that closures 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. **Moderate** risk.

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# SOUTH COAST DEMERSAL SCALEFISH RESOURCE STATUS REPORT 2017

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## 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*). Commercial fishers take these species predominantly

by hook and line, however some demersal scalefish are taken by demersal gillnet as part of the the Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery (JASDGLMF) (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 2017

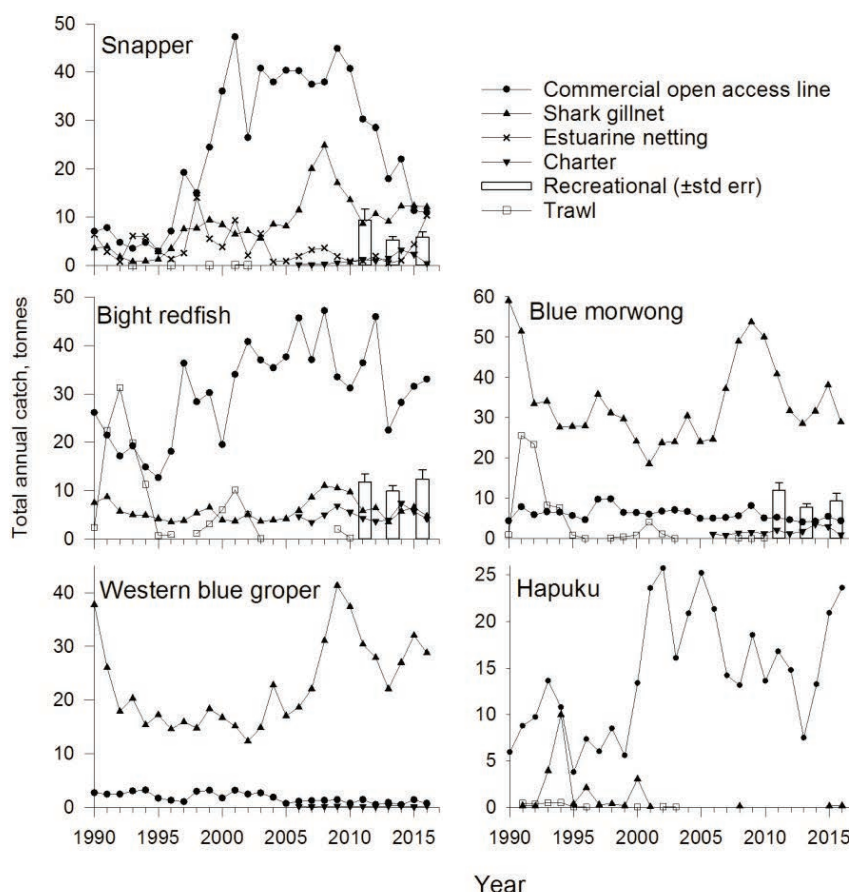
| Fishery Performance        |                               | Commercial             | Recreational                          |  |
|----------------------------|-------------------------------|------------------------|---------------------------------------|--|
| Total Catch 2016           |                               | 180 t                  | 38–51 t (2015/16 boat-based only)     |  |
| Fishing Level              |                               | Acceptable             | Acceptable                            |  |
| Stock/Resource Performance |                               | Stock Status           | Assessment Indicators                 |  |
| Demersal                   |                               | Sustainable - Adequate | Annual: Catch, Fishing Mortality, SPR |  |
| EBFM Performance           |                               |                        |                                       |  |
| Asset                      | Level                         | Asset                  | Level                                 |  |
| Bycatch                    | Low Risk                      | Listed Species         | Negligible Risk                       |  |
| Habitat                    | Negligible Risk               | Ecosystem              | Low Risk                              |  |
| Social                     | Moderate Amenity<br>High Risk | Economic               | GVP \$1-5 mill<br>Moderate Risk       |  |
| Governance                 | Under Review                  | External Drivers       | 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).

The top 10 demersal species in the South Coast represented 96% of the total boat-based recreational catch (kept by numbers) in 2015/16. The estimated

boat-based recreational harvest range for the top 15 demersal species in the South Coast was steady in 2015/16 (95% CI 38–51 tonnes compared with 30–38 in 2013/14 and 47–63 in 2011/12), with steady estimated recreational harvests for Bight Redfish, Blue Morwong, Breaksea Cod, Foxfish, Harlequin Fish, Pink Snapper, Sea Sweep, West Australian Dhufish and Swallowtail (Ryan *et al.* 2017).



**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 **moderate** for snapper, Bight redfish and blue morwong, and low for western blue groper, i.e. the levels of breeding stocks for these species were therefore considered **sustainable-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 catches beyond recent historical levels would constitute an unacceptable risk. A historically high catch of snapper by estuarine netting in 2016 has been offset by a decline in the commercial wetline catch over recent years.

### 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.

### Hapuku (Sustainable-Adequate)

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).

## 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. **Low risk.** 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). **Low risk.**

## SOCIAL AND ECONOMIC OUTCOMES

### Social

The annual estimated boat-based recreational fishing effort in the SCB was steady in 2015/16 (24,444 boat days, SE=2,042) compared with 2013/14 (28,277, SE=2,323), but lower than 2011/12 (40,073, SE=3,354) (Ryan *et al.* 2017). In recent years approximately 50 to 60 commercial wetline vessels have each employed up to three crew. Several seafood processors in the SCB and in Perth have also provided employment. **High risk.**

### 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 South Coast commercial line fishery currently operates under open-access arrangements (as opposed to a 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 a number of SC open access and other fishing activities (see Management Initiatives/Outlook Status below). Consultation occurs with commercial fishers and the West Australian Fishing Industry Council on management issues and initiatives. 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.

Consultation with non-fisher stakeholders is undertaken in accordance with the Department's Stakeholder Engagement Guidelines.

**Management Initiatives (Under Review)**

South Coast commercial fish trap, G-net and open-access line, net and squid jig fisheries are currently under review. 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 comments the IAP submitted their final report to the Department in late 2016. The Department is currently providing advice (including the IAP's final report) to the Minister for Fisheries for his consideration and in-principle decisions regarding matters of access and allocation 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 Curtotti 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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