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Estuarine and Nearshore Finfish Resource of South-West Western Australia Harvest Strategy 2020-2025 DRAFT

Department of Primary Industries and Regional Development

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Estuarine and Nearshore Finfish Resource of South-West Western Australia Harvest Strategy 2020-2025

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1.0	Fisheries Management Paper No. 274	First published harvest strategy for Peel-Harvey Estuary finfish fishery	May 2015
2.0	Fisheries Management Paper No. 274	Scope of harvest strategy broadened to the estuarine and nearshore finfish resource of South-West WA	May 2020

Important disclaimer

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LIST OF ACRONYMS

ARMA	*Aquatic Resources Management Act 2016*
CAES	Catch and Effort Statistics
DBCA	Department of Biodiversity, Conservation and Attractions
DPIRD	Department of Primary Industries and Regional Development
EBFM	Ecosystem Based Fisheries Management
EPBC (Act)	*Environment Protection and Biodiversity Conservation Act 1999*
ERA	Ecological Risk Assessment
ESD	Ecologically Sustainable Development
ETP	Endangered, Threatened and Protected (species)
FRMA	*Fish Resources Management Act 1994*
FRMR	*Fish Resources Management Regulations 1995*
HCR	Harvest Control Rule
MSY	Maximum Sustainable Yield
OCP	Operational Compliance Plan
RFBL	Recreational Fishing from Boat Licence
RNFL	Recreational Net Fishing Licence
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council

1 INTRODUCTION

Harvest strategies for aquatic resources in Western Australia (WA) that are managed by the Department of Primary Industries and Regional Development (DPIRD, the Department) are formal documents that support decision-making processes and ensure these are consistent with the principles of Ecologically Sustainable Development (ESD; Fletcher 2002) and Ecosystem Based Fisheries Management (EBFM; Fletcher et al. 2012). The objectives of ESD are reflected in the objects of the *Fish Resources Management Act 1994* (FRMA) and the *Aquatic Resources Management Act 2016* (ARMA), which will replace the FRMA once enacted.

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

The publication of this harvest strategy is intended to make the decision-making considerations and processes for the management of specified aquatic resources publicly transparent and provide a basis for informed dialogue on management actions with resource users and other stakeholders (Department of Fisheries 2015). The strategy provides guidance for decision-makers, but do not derogate from or limit the exercise of discretion required for independent decision-making by the Minister for Fisheries, the Chief Executive Officer (CEO) of DPIRD, or other delegated decision-makers in order to meet the objects of the FRMA or ARMA.

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

1.1 Review Process

The WA Harvest Strategy Policy recognises that fisheries change over time and that a review period should be built into each harvest strategy to ensure that it remains relevant (Department of Fisheries 2015). This document includes the second, updated version of the harvest strategy for the Peel-Harvey Estuary finfish fishery, which was successfully certified as sustainable by the globally recognised Marine Stewardship Council (MSC) in 2016. As outlined in Section 2, the scope of the harvest strategy has now been extended to include the broader estuarine and nearshore finfish resource of South-West WA, recognising that the stocks of several key species extend outside the estuary. The strategy will remain in place for a period of five years, after which time it will be fully reviewed. If required, however, this document may be subject to review and amended within this five-year period.

2 SCOPE

This harvest strategy relates to the estuarine and nearshore finfish resource of South-West WA and the fishing activities that impact this resource. For the purpose of this harvest strategy, the estuarine and nearshore finfish resource of South-West WA covers all nearshore and estuarine waters within the West Coast Bioregion (Black Point, east of Augusta, to the Zuytdorp Cliffs, north of Kalbarri, all land and water south of 27° S and west of 115° 30' E) (Figure 1). Estuarine and nearshore finfish are targeted by a number of small-scale commercial fisheries and recreational fishers. The majority of commercial catches are taken by haul and gillnetting, whilst recreational catches are taken by line fishing from the shore or from a boat as well as netting.

The estuarine and nearshore finfish resource in the South-West WA resource comprises more than 15 species, however, this harvest strategy is focused on one of the key target species for which biomass-based stock assessments are undertaken periodically — sea mullet (*Mugil cephalus*). Although often referred to as an indicator species, it is recognised that the status of this stock may not be indicative of the status of the overall resource, which includes marine and estuarine species with wide-ranging life history characteristics. Management action will thus be applied at the most appropriate level (area, stock, or broader resource) on a case-by-case basis.

Stocks of several estuarine and nearshore finfish species in South-West WA, including sea mullet, extend to the coastal waters off the South Coast Bioregion and northwards to Shark Bay in the Gascoyne Coast Bioregion. The assessments of these species against relevant ecological objectives are undertaken at the broader stock level, with that for sea mullet primarily considered within this South-West harvest strategy. A separate harvest strategy is being developed for estuarine and nearshore finfish in the Gascoyne Coast Bioregion, which will consider the assessments of stocks caught primarily in that region, as well as fishery-specific performance indicators relevant to the Shark Bay fishery. A separate harvest strategy will also be developed for Australian herring (*Arripis georgianus*) and West Australian salmon (*Arripis truttaceus*), the range of which extends across multiple jurisdictions.

Whilst not considered primary species for the purpose of this harvest strategy, stock assessments are also undertaken occasionally for other estuarine and nearshore species important to commercial and/or recreational fishers in South-West WA, for example yellowfin whiting (*Sillago schomburgkii*). These assessments are typically triggered when annual risk assessments of all retained species (primarily based on catch information and inherent vulnerability to fishing) suggest that the risk to stocks may have increased (see Section 3.4.1.2).

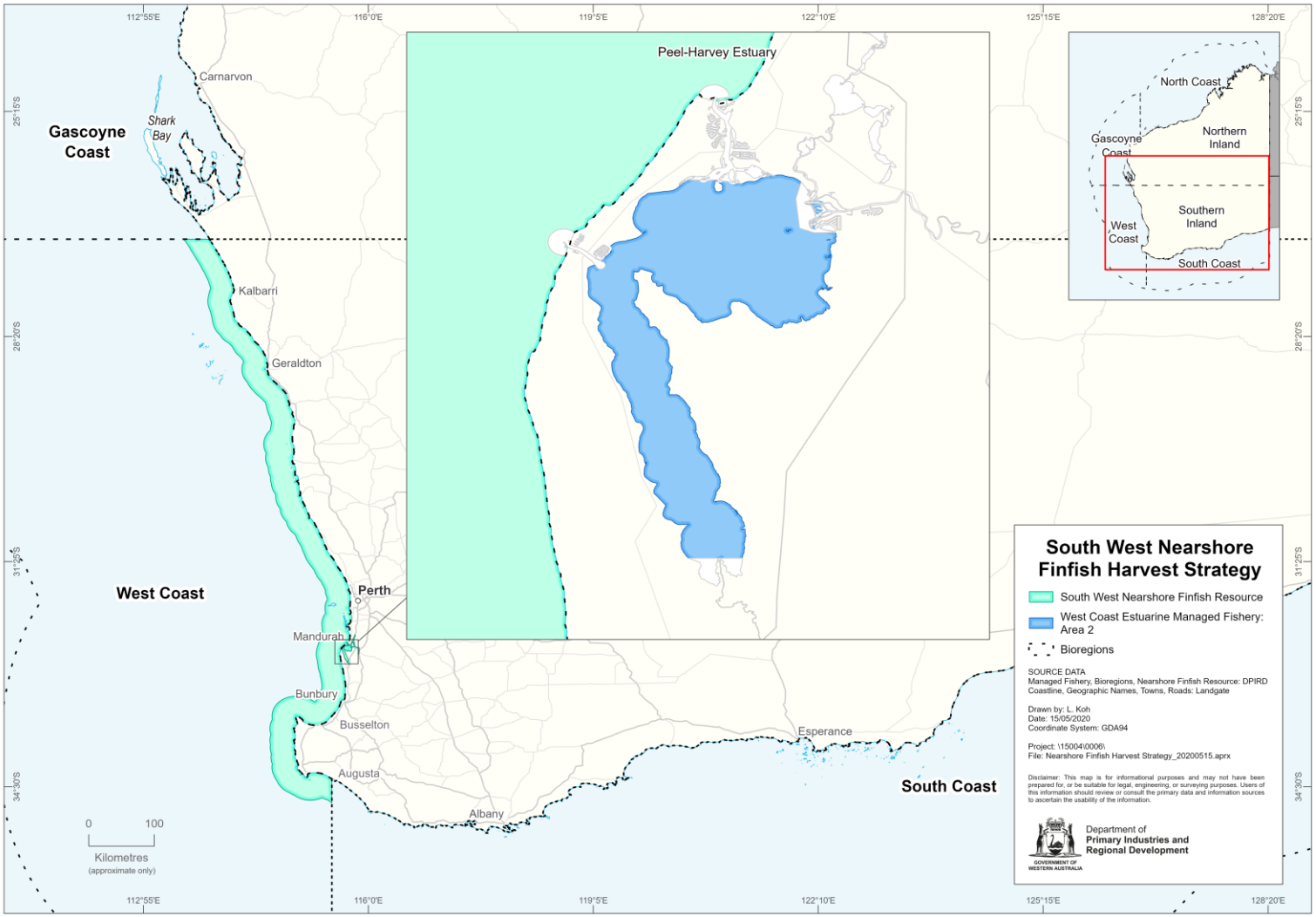

Figure 1. Extent of the Estuarine and Nearshore Finfish Resource of South-West WA and one of the key areas (Peel-Harvey Estuary) in which sea mullet are targeted.

In addition to considering fishing impacts on retained species, this harvest strategy also covers impacts on bycatch[1], endangered, threatened and protected (ETP) species, habitats and ecosystems, to ensure any risks to these elements are managed effectively. Note that this harvest strategy currently only considers the impact on these ecological components by recreational and commercial fishing activities in the MSC-certified Peel-Harvey Estuary fishery, where the majority of targeted fishing for sea mullet in South-West WA occurs.

2.1 Environmental Context

The marine environment of South-West WA is predominantly a temperate zone, with most rainfall occurring during the winter months. This region is heavily influenced by the Leeuwin Current that transports warm tropical water southward along the edge of the continental shelf. Coastal water temperatures range from around 18°C to 24°C in the West Coast Bioregion (Kalbarri to Augusta).

Within the West Coast Bioregion, there are two major marine embayments (Cockburn Sound and Geographe Bay) and four significant estuarine systems (the Swan-Canning, Peel-Harvey and Leschenault estuaries, and Hardy Inlet). All of these estuaries are permanently open to the sea and form an extension of the marine environment, except when freshwater run-off from winter rainfall displaces the oceanic water for a short period.

The shallow estuarine and nearshore waters of South-West WA support extensive stands of macroalgae and seagrasses, which play an important role in nutrient and carbon cycling. These plants support large populations of small invertebrates, which in turn form the basis of a food chain that supports other invertebrates, fish, birds and mammals. The Peel-Harvey Estuary is considered an internationally-significant habitat for waterbirds, forming part of the Peel-Yalgorup Wetland System listed as a Ramsar Wetland of International Importance.

South-West WA is predicted to be heavily influenced by the impacts of climate change (e.g. increasing sea temperatures and declines in rainfall). Estuaries within the West Coast Bioregion have also been identified as being at significant risk due to high nutrient runoff from surrounding catchments, which coupled with climate change has the potential to markedly affect fish and other communities. Fish mortality events have been periodically reported in Cockburn Sound and from within the Peel-Harvey and Swan-Canning estuaries.

2.2 Target Species

Sea mullet has a global tropical distribution and occurs around most of the eastern and western Australian coastline. Although a marine species, juveniles typically inhabit freshwater and estuarine environments, where they associate with shallow weed beds and bare substrate. Upon reaching maturity at 3 – 4 years of age, they move out into open coastal waters and undertake

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

a northward migration to spawn. Although genetic studies have not yet been undertaken to examine the stock structure of sea mullet in WA, available biological data suggest a single stock in South-West WA that extends as far north as Shark Bay.

The commercial catch of sea mullet in WA shows a gradual increase from 1941 to around 1980, peaking at just under 700 t. A subsequent reduction in fishing effort has seen the catches decline to the current level of around 200 t, which represents around 20-30% of the estuarine and nearshore finfish catch by commercial fishers in WA. Over the last five years, more than 60% of the commercial sea mullet catch has been taken in the West Coast Bioregion, of which the majority (approximately 70%) was landed in the Peel-Harvey Estuary. Catches by the recreational sector (mainly by gillnets) and customary fishers is considered to be low relative to commercial catches.

2.3 Fishing Activities

2.3.1 Governance

Estuarine and nearshore finfish in South-West WA are targeted by commercial, recreational and customary fishing sectors. Although not an exhaustive list, these fishing sectors are managed by the Department under the following key legislation:

- *Fish Resources Management Act 1994* (FRMA, will be replaced by the ARMA once enacted);
- *Fish Resources Management Regulations 1995* (FRMR);
- *Cockburn Sound (Fish Net) Managed Fishery Management Plan 1995*;
- *West Coast Estuarine Managed Fishery Management Plan 2014*;
- *West Coast (Beach Bait Fish Net) Limited Entry Fishery Notice 1995*; and
- *Prohibition on Commercial Fishing (South-West Coast Beach Net) Order 2010.*

Fishers must also comply with the requirements of:

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

2.3.2 Commercial Fishing

Finfish have been commercially targeted by net fishers in estuarine and nearshore waters of South-West WA since the 1800s (Walker and Clarke 1987). Annual catches peaked in the early 1990s but have since declined, mainly due to substantial reductions in fishing effort resulting from a number of Voluntary Fishery Adjustment Schemes (VFAS) and a declining demand for bait used in the western rock lobster fishery (Johnston et al. 2015).

A number of small-scale commercial fisheries still operate in the estuarine and nearshore waters of the West Coast Bioregion, mostly using haul nets (including beach seines) and gillnets to target finfish. Across these net fisheries, catches now typically fluctuate around 300-400 t annually. On average over the last five years, 35% of the commercial haul and gillnet catch of estuarine and nearshore species in the West Coast Bioregion has comprised sea mullet, followed by West Australian salmon (23%) and Australian herring (13%).

The majority of the commercial catch of estuarine and nearshore finfish in the West Coast Bioregion is taken by the Peel-Harvey Estuary Fishery (Area 2 of the WCEMF), which has been certified as sustainable against the highly regarded MSC Standard for Sustainable Fishing since 2016. Finfish catches are taken mainly using haul nets to visually target schools of fish, employing different net lengths and mesh sizes to catch fish of different species or sizes throughout the estuary. The fishers in the Peel-Harvey Estuary primarily target sea mullet and yellowfin whiting to supply local markets.

2.3.3 Recreational Fishing

Recreational fishing is a popular activity in WA, providing important social and economic benefits to the State's population. Most recreationally-caught finfish in estuaries and nearshore waters off South-West WA are taken by shore- or boat-based line fishing (angling). The most commonly targeted estuarine and nearshore finfish by recreational anglers in this region include Australian herring, West Australian salmon, whiting (*Sillago* spp.), tailor and black bream. Some shore-based net fishing for finfish is also undertaken by licenced recreational net fishers within some of the estuarine waters of South-West WA. Although data on recreational net catches are limited, they are considered to be minor compared to the annual catch landed by the commercial fishing sector.

2.3.4 Customary Fishing

The estuarine and nearshore finfish resources of South-West WA have provided sustenance to the native Noongar Peoples for thousands of years. Historically, the wider Noongar community would gather near the Peel-Harvey Estuary each year around March to trap schools of sea mullet moving up the Serpentine River (Gibbs 2011). There are no data on the current level of customary fishing for estuarine and nearshore finfish in South-West WA, however, anecdotal information suggests it is very low.

2.4 Catch-Share Allocations

Historically, the estuarine and nearshore finfish resource of South-West WA has been fished by commercial and recreational sectors without any explicit catch share allocation between sectors. Whilst recognising the naturally fluctuating catch levels of finfish due to variable recruitment and seasonal movements between the marine and estuarine environments, this harvest strategy specifies annual catch tolerance levels for some of the key species (see Section 3.5). Where stock levels are adequate, catch information is compared to these tolerance levels as a way to monitor the performance of the fisheries. This provides the management flexibility required for highly variable stocks, while acknowledging that catches below the overall tolerance level would be unlikely to affect the sustainability of the resource.

A VFAS is currently underway to reduce the number of commercial licenses in the Peel-Harvey Estuary[2]. Although the key objective of the VFAS was to re-allocate a component of the blue swimmer crab resource to recreational fishers and the ecosystem, it also includes an objective relating to the catch of yellowfin whiting in the Peel-Harvey Estuary (see Section 3.5).

3 HARVEST STRATEGY

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

This harvest strategy is structured to describe, hierarchically:

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

This is followed by a more detailed description of:

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

[2] As of 1 January 2020, the number of commercial net fishing licences in the Peel-Harvey Estuary had been reduced from 11 to nine.

3.1 Long-term Objectives

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

3.1.1 Ecological Sustainability

1) To maintain spawning stock biomass of each target species at a level where the main factor affecting recruitment is the environment;
2) To maintain spawning stock biomass of each other retained species at a level where the main factor affecting recruitment is the environment;
3) To ensure fishing impacts do not result in serious or irreversible harm[3] to bycatch species populations;
4) To ensure fishing impacts do not result in serious or irreversible harm to endangered, threatened and protected (ETP) species populations;
5) To ensure the effects of fishing do not result in serious or irreversible harm to habitat structure and function; and
6) To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

3.1.2 Economic and Social Benefits

1) To provide commercial fisheries with reasonable opportunities to maximise their livelihood in supplying seafood to the community, within the constraints of ecological sustainability; and
2) To provide fishing participants with reasonable opportunities to maximise cultural, recreational and lifestyle benefits of fishing, within the constraints of ecological sustainability.

3.2 Operational Objectives

Long-term management objectives are typically operationalised as short-term (e.g. annual or periodic) objectives through one or more performance indicators that can be measured and assessed against pre-defined reference levels so as to ascertain actual performance. Within the context of the long-term ecological objectives provided above, operational objectives aim to

[3] Serious or irreversible harm relates to a change caused by the fishery that fundamentally alters the capacity of the component to maintain its function or to recover from the impact.

maintain each resource above the threshold level (and, where relevant, close to the target level), or rebuild the resource if it has fallen below the threshold or the limit levels.

3.3 Harvesting and Management Approach

The estuarine and nearshore finfish resource of South-West WA is harvested using a constant exploitation approach, where the catches are assumed to vary in proportion to variations in stock abundance.

In line with this approach, the commercial and recreational fisheries targeting this resource are managed using a range of input and output controls. Commercial effort is typically constrained by a cap on the number of licences/vessels operating in each fishery (limited entry) and restrictions on fishing gear (net length and mesh sizes). Recreational fishing effort is managed by gear controls (e.g. number of lines per fisher, length of nets) and daily bag and boat limits. Recreational fishers operating from a boat are required to hold a current Recreational Fishing from Boat Licence (RFBL). Unlicensed fishers on recreational boats can fish if at least one other person on board has an RFBL, provided the total catch of everyone on board stays within the bag limits of the licenced fisher(s) (or combined boat limit). Additionally, a Recreational Net Fishing Licence (RNFL) is required for all recreational net fishing using set (gill) nets, haul nets or throw nets.

Some estuarine and nearshore waters of South-West WA are permanently closed to commercial fishing (e.g. Leschenault Estuary) and can only be accessed by recreational fishers. In the estuaries open to commercial fishing, additional restrictions typically apply during weekends. All commercial and recreational fishers must abide by the minimum legal size limits in place for some of the captured species, as prescribed in the FRMR.

3.4 Ecological Sustainability

A formal, resource-level review process is undertaken by the Department to assess the status of relevant target stocks and performance in relation to each ecological objective. Suitable indicators have been selected to determine the status of the estuarine and nearshore finfish resource of South-West WA, and other ecological assets, against defined reference levels established to separate acceptable from unacceptable performance (Section 3.4.1). Where relevant, these levels include:

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

Harvest Control Rules (HCRs) define the management actions that relate to the status of each indicator compared to the reference levels (Section 3.4.2). A summary of the management objectives, performance indicators, reference levels and HCRs is provided in Table 1.

3.4.1 Performance Indicators and Reference Levels

3.4.1.1 Target Species

The status of primary target species of the estuarine and nearshore finfish resource in South-West WA is assessed periodically (at least every five years) using a weight-of-evidence approach of all available data. The current harvest strategy for sea mullet is primarily based on estimates of biomass (B) relative to the unfished level (B_0), or a suitable proxy (Table 1). The estimates of B/B_0 are periodically compared to reference levels as outlined in the Department's Harvest Strategy Policy (Department of Fisheries 2015).

Recognising the naturally fluctuating stock levels of many estuarine and nearshore finfish species, this harvest strategy aims to maintain the stock at a level above that at which Maximum Sustainable Yield (MSY) can be achieved, i.e. $B>B_{MSY}$ (Table 1). Any stock size above this level is therefore consistent with meeting the objectives for biological sustainability and also satisfy stock status requirements under the MSC standard for sustainable fishing.

Due to the inherent uncertainty around estimates of B_{MSY} and the selection of suitable proxy reference points (e.g. Punt et al. 2014), this is applied as a threshold reference level (i.e. below which exploitation will be reduced) rather than as a target level, to ensure management is more precautionary. Where B_{MSY} can be estimated, the limit reference level for each stock is set at $0.5B_{MSY}$, which is consistent with guidelines for meeting the MSC standard.

3.4.1.2 All Retained Species

Risk (vulnerability) assessments are undertaken annually for estuarine and nearshore finfish species in South-West WA to identify if there have been any substantial changes, particularly in the catches of these species relative to historic levels. If an increase in risk is identified, the reasons for the variation will be assessed (Table 1).

For example, an increase in the commercial catch of yellowfin whiting in the Peel-Harvey Estuary in 2013 and 2014 triggered the collection of age composition data to determine if the increased catch posed a risk to the sustainability of the broader stock (Smith et al. 2019). The assessment demonstrated that the increase in catch was associated with a period of above-average recruitment to the fishery and the stock was assessed to be at an acceptable level.

3.4.1.3 Other Ecological Components

Other ecological assets incorporated in this harvest strategy include bycatch, ETP species, habitats and ecosystem processes that may be affected by commercial and recreational fishing activities in the Peel-Harvey Estuary (Table 1). For all ecological components, reference levels have been set to differentiate acceptable fishery impacts from unacceptable fishery impacts according to the risk levels defined in Fletcher (2015). An ecological risk assessment for the Peel-Harvey Estuary fishery will be undertaken in 2020 to inform these components of the harvest strategy, with these risk scores to be reviewed after no more than five years (see Section 3.6.2.3).

3.4.2 Application of Harvest Control Rules

For each ecological performance indicator and reference level, an accompanying HCR directs the management needed to meet sustainability objectives (Table 1). These HCRs are designed to maintain the resource above the threshold (i.e. at the target level), or rebuild it where it has fallen below the threshold (undesirable) or the limit (unacceptable) levels.

For each primary target species, a decrease in stock levels below the threshold reference level (i.e. B_{MSY}) will trigger a reduction in catch by up to 50% of the current harvest level, applicable to each relevant fishery/sector (Table 1). A review will be undertaken within three months to determine the level of reduction that is expected to rebuild the stock to the target level (i.e. above threshold), which will be dependent on the extent by which the threshold has been breached and the required rebuilding rate.

For the commercial sector, the harvest level from which the catch reduction is calculated is the average catch observed in the three years leading up to the breach, to allow for inter-annual variability in catches. The catch reduction may be achieved by setting a nominal catch limit to ensure commercial catches do not exceed the benchmark that is expected to rebuild the stock. Alternatively, an equivalent decrease in catch can be achieved by reducing the fishing effort, for example through gear restrictions or reducing the length of the fishing season through the implementation of temporal closures.

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

If a primary target species falls below the limit reference level (i.e. $0.5B_{MSY}$), measures to reduce the catch (average of last three years) by at least 50% will be implemented as soon as practicable (Table 1). Within three months of the breach, the review will then determine what

additional management actions are needed to recover the stock within two generation times (see section below on recovering depleted stocks).

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

3.4.2.1 Recovering Depleted Stocks

A resource that has fallen below the acceptable level, and for which suitable management adjustments have been implemented to reduce catch and/or effort (as outlined in the HCRs), is considered to be in a recovery phase (Department of Fisheries 2015). For target stocks that fall below the limit reference level, a recovery strategy will be developed and implemented to ensure that the resource can rebuild at an acceptable rate (i.e. within two generation times). Where the environmental conditions have led, or contributed significantly, to the resource being at an unacceptable level, the strategy needs to consider how this may affect the speed and extent of recovery.

Table 1. Harvest strategy performance indicators, reference levels and control rules for the estuarine and nearshore finfish resource of South-West WA, and other ecological assets that may be impacted by fishing activities in the Peel-Harvey Estuary.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference Levels	Control Rules
Target species	To maintain spawning stock biomass of each target species at a level where the main factor affecting recruitment is the environment.	Primary target species: • Sea mullet	Periodic (at least every five years) estimates of biomass relative to the unfished level (B/B_0)	**Target:** $>B_{MSY}$	Continue management aimed at achieving ecological, economic and social objectives.
				Threshold: B_{MSY}	If the threshold level is breached, a review will be completed within three months to develop an appropriate management response. Management action (applicable to all relevant fisheries/sectors) will be taken to reduce catches by up to 50%[4] of the current harvest level to return stock to the target level.
				Limit: $0.5B_{MSY}$	If the limit level is breached, management action (applicable to all relevant fisheries/sectors) will be taken as soon as practicable to reduce catches by at least 50% of the current harvest level. A review will be completed within three months to determine what additional management actions (up to 100% catch reduction[4]) are required to rebuild the stock to the target level within two generation times (i.e. informing the recovery strategy for the stock).

[4] The level of catch reduction to the relevant fisheries/sectors will be dependent on the extent by which the reference level has been breached, and the required rebuilding rate.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference Levels	Control Rules
Retained species	To maintain spawning stock biomass of each retained species at a level where the main factor affecting recruitment is the environment.	All retained species	Annual risk (vulnerability) assessments incorporating: • current management arrangements, • available data on fishing effort and catch (relative to MSY or historical levels), • fishery-independent recruitment information, • species information, and • other available research.	**Target:** Fishing impacts are expected to generate an acceptable risk level to all retained species' populations, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic and social objectives.
				Thresholds: A potentially material change to risk levels is identified; or Fishing impacts are considered to generate an undesirable level of risk to any retained species' populations, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable. This may include additional monitoring and/or undertaking a biomass-based stock assessment.
				Limits: Fishing impacts are considered to generate an unacceptable level of risk to any retained species' populations, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.
Bycatch (non-ETP) species	To ensure fishing impacts do not result in serious or irreversible harm to bycatch species' populations.	All (non-ETP) bycatch species in the Peel-Harvey Estuary	Periodic risk assessments incorporating: • current management arrangements,	**Target:** Fishing impacts are expected to generate an acceptable risk level to all bycatch species' populations, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic and social objectives.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference Levels	Control Rules
			• annual commercial fishing effort and catch (including unwanted catch that is discarded), • available information on recreational fishing effort and catch (including unwanted catch that is discarded), • review of alternative measures to minimise unwanted catch, • species information, and • other available research	**Thresholds:** A potentially material change to risk levels is identified; or Fishing impacts are considered to generate an undesirable level of risk to any bycatch species' populations, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.
				Limit: Fishing impacts are considered to generate an unacceptable level of risk to any bycatch species' populations, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.
Endangered, threatened and protected (ETP) species	To ensure fishing impacts do not result in serious or irreversible harm to ETP species' populations	All ETP species in the Peel-Harvey Estuary	Periodic risk assessments incorporating: • current management arrangements, • annual commercial fishing effort and catch, • available information on recreational fishing effort and catch, • number of reported ETP species interactions, • species information, and • other available research	**Target:** Fishing impacts are considered to generate an acceptable level of risk to all ETP species' populations, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic and social objectives.
				Thresholds: A potentially material change to risk levels is identified; or Fishing impacts are considered to generate an undesirable level of risk to any ETP species' populations, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference Levels	Control Rules
				Limit: Fishing impacts are considered to generate an unacceptable level of risk to any ETP species' populations, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.
Habitats	To ensure the effects of fishing do not result in serious or irreversible harm to habitat structure and function	Benthic and nearshore habitats in the Peel-Harvey Estuary	Periodic risk assessments incorporating: • current management arrangements, • annual commercial fishing effort, • available information on recreational fishing effort, • extent of area fished, and • other available research	**Target:** Fishing impacts are considered to generate an acceptable level of risk to all benthic habitats, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic and social objectives.
				Thresholds: A potentially material change to risk levels is identified; or Fishing impacts are considered to generate an undesirable level of risk to any benthic habitats, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.
				Limit: Fishing impacts are considered to generate an unacceptable level of risk to any benthic habitats, i.e. severe risk.	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.
Ecosystem	To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes	Trophic interactions Community structure (in the Peel-Harvey Estuary)	Periodic risk assessments incorporating: • current management arrangements,	**Target:** Fishing impacts are expected to generate an acceptable level of risk to all ecological processes within the ecosystem, i.e. medium risk or lower.	Continue management aimed at achieving ecological, economic and social objectives.

Component	Management objectives	Resource / Asset	Performance Indicators	Reference Levels	Control Rules
			• annual fishing effort and catch, • number of reported ETP species interactions • species information, • extent of area fished annually, and • other available research	**Thresholds:** A potentially material change to risk levels is identified; or Fishing impacts are considered to generate an undesirable level of risk to any ecological processes within the ecosystem, i.e. high risk.	Review the reasons for this variation within three months and implement an appropriate management response to reduce risk to an acceptable level as soon as practicable.
				Limit: Fishing impacts are considered to generate an unacceptable level of risk to any ecological processes within the ecosystem, i.e. severe risk	Initiate an immediate management response to reduce the risk to an acceptable level as soon as practicable.

3.5 Fishery Performance

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

Annual commercial catch tolerance levels have been developed for two of the key target species part of the estuarine and nearshore finfish resource in South-West WA (Table 2). For sea mullet, the tolerance level for the commercial fishery in the Peel-Harvey Estuary has been based on historical catch data for periods in which the fishery is assumed to have operated sustainably (i.e. catches from the overall stock below MSY). For yellowfin whiting, the tolerance level for the Peel-Harvey Estuary has been based on historical catch data and arrangements agreed between commercial and recreational fishing sectors as part of the ongoing VFAS as an approach to measure performance against the social objective. This catch-sharing agreement sets out a commercial catch tolerance level of <12 t, with a 10 t 'trigger level'. If the 10 t trigger level is reached, the Department will initiate a meeting between stakeholders to evaluate the appropriateness of the 12 t tolerance level for the present season in relation to environmental and fishing factors.

If the catch of a species in a year exceeds the specified catch tolerance level and this cannot be adequately explained (e.g. clear environmental impacts or agreed arrangements between sectors), the performance is termed 'Unacceptable'. This would trigger a review to determine if management arrangements are still appropriate and if a re-assessment of resource status is necessary to inform adjustments to the HCRs and/or tolerance levels. It is anticipated that future versions of this harvest strategy will incorporate such tolerance levels for additional species/fisheries, once developed and agreed to between the fishing sectors.

The economic objective for the fisheries that target the estuarine and nearshore finfish resource in South-West WA does not have an explicit performance measure within this harvest strategy. Rather, it is through the formal consultation process (facilitated by annual management meetings with the commercial fishers) that regulatory impediments to maintaining economic return, or opportunities for enhancing economic return, are discussed. If measurable indicators for monitoring performance against the economic objectives are identified, these will be included in future revisions of this harvest strategy.

Table 2. Annual commercial catch tolerance levels (tonnes, t) for key estuarine and nearshore finfish species in South-West WA.

Species/Fishery	Commercial
Sea mullet (Peel-Harvey Estuary)	< 150 t
Yellowfin whiting (Peel-Harvey Estuary)	< 12 t (10 t soft trigger)

3.6 Monitoring and Assessment Procedures

3.6.1 Information and Monitoring

3.6.1.1 Commercial Fishing Information

3.6.1.1.1 Commercial Catch and Effort Reporting

Commercial fishers are required to report all retained species catches (kg), effort (e.g. days fished, net length) and any ETP species interactions in statutory monthly catch and effort (CAES) returns, which have been in use since 1975. These data are compared annually to historical catch levels to assess the risk of fishing having an unacceptable impact on stocks. The catch and effort data are also used to calculate catch rates for key species/fisheries, which inform the broader weight-of-evidence assessments of primary target stocks. All CAES returns are checked by Departmental research staff, and any possibly erroneous entries or gaps are verified directly with skippers or the relevant licensees.

3.6.1.1.2 Commercial Monitoring

An observer monitoring program of the haul and gill net fishery in the Peel-Harvey Estuary was implemented in 2017 to periodically collect information on bycatch in the fishery. For a 12-month period, Departmental research staff observed fishing trips on-board commercial vessels twice a month to obtain data on the retained and discarded component of catch for each net shot. Together with bycatch data recorded by fishers on their CAES returns for the same period, this information was used to inform a risk assessment that considered the impacts of the fishery on the broader ecosystem (see Section 3.6.2.3). It is intended that this commercial monitoring program will continue to be undertaken every five years to inform future risk assessments.

3.6.1.2 Recreational Fishing Information

3.6.1.2.1 Recreational Fishing Surveys

Estimates of recreational catches of key estuarine and nearshore finfish in South-West WA are available from recreational fishing surveys undertaken periodically by the Department since the early 1990s. Some of the surveys have focused on specific areas or estuaries, while others have been designed to provide broader-scale bioregional estimates of recreational fishing catch and effort. As the scope of these survey differ, estimates are often not comparable. Surveys of shore-based and/or boat-based recreational fishing have been undertaken in the West Coast Bioregion in 1996/97, 2005/06 and 2010/11 (Sumner and Williamson 1999; Sumner et al. 2008; Smallwood et al. 2011) and South Coast Bioregion in 2002/03 (Smallwood and Sumner 2007).

Since 2011, state-wide boat-based recreational surveys have been undertaken every two to three years to collect information on private (non-charter), boat-based recreational fishing in WA (Ryan et al. 2013; 2015; 2017; 2019). The survey uses three complementary components, off-site phone diary surveys, on-site boat ramp surveys and remote camera monitoring, to collect information on fishing catch, effort, location and other demographic information. Each survey provides a state-wide and bioregional estimate of the boat-based recreational catch of key species.

A state-wide, voluntary recreational angler logbook program (the "Research Angler Program") commenced in 2004 and collects opportunistic catch and effort information from recreational anglers. There is currently no available estimate of shore-based recreational net catches of finfish in South-West WA.

3.6.1.3 Fishery-Dependent Catch Sampling

Otoliths are extracted from samples of fish for the purpose of estimating ages to derive age composition information for primary target species, which feed into the overall weight-of-evidence assessments of these stocks. These samples are predominantly collected by periodic fishery-dependent sampling of commercial and/or recreational catches. Efforts are made to ensure samples are as representative as possible of the population by considering the stock structure and movements of each species at different stages of their life cycles, and the selectivity of methods used to sample the stocks.

3.6.2 Assessment Procedures

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

3.6.2.1 Target Species

Stock status of sea mullet is primarily assessed based on estimates of biomass relative to unfished levels, derived from a Schaefer biomass dynamics model, fitted to catch information for the Gascoyne, West and South Coast bioregions, and catch rate data from the Shark Bay fishery which is assumed to provide a measure of abundance for the spawning stock. The biomass estimates are updated periodically (at least every five years) and compared to associated reference points to determine the status of the stock.

3.6.2.2 All Retained Species

Annual risk (vulnerability) assessments are undertaken to identify any marked changes, primarily in the level of catch (relative to available estimates of MSY or long-term levels) of estuarine and nearshore finfish species. Where the risk is considered unacceptable, a management response will be implemented to ensure the risk can be reduced as soon as

practicable. This may involve additional analyses of data to estimate the biomass of the stock relative to unfished levels.

3.6.2.3 Risk Assessments

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

An ecological risk assessment for the Peel-Harvey Estuary fishery will be undertaken in 2020 to consider the ecosystem impacts of the fishing activities targeting the resource, assessed both individually and cumulatively.

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

4 MANAGEMENT MEASURES AND IMPLEMENTATION

4.1 Management Measures

There are a number of management measures in place for the fisheries that target the estuarine and nearshore finfish resource of South-West WA (Table 3). These measures can be amended as needed to ensure management objectives are achieved, however, they do not preclude the consideration of other options.

Table 3. Management measures and instrument of implementation for fisheries targeting the estuarine and nearshore finfish resource of South-West WA.

Measure	Description	Instrument
Limited Entry	Estuarine and nearshore finfish can only be commercially fished by licenced fishers with authority to catch this resource.	Management Plans Licence conditions
Effort restrictions	Licenced commercial fishers can only fish within the specified capacity of their fishery (e.g. maximum net length).	Management Plans Licence conditions
	Licenced recreational net fishers are only permitted to use one net per person at a time.	FRMR
Gear Restrictions	Commercial fishers have to comply with restrictions on overall net size, mesh size and set depth for set and/or haul nets.	Management Plans Licence conditions
	Recreational line fishers are only permitted to use three baits or lures on each line. Shore-based fishers can use a maximum of two fishing lines.	FRMR
	The only permitted recreational net fishing methods in the Peel-Harvey Estuary are set (gill) netting and throw (cast) netting.	FRMR
Spatial Closures	Parts of estuarine and nearshore waters of South-West Australia are permanently closed to commercial fishing activities.	Section 43 Prohibition Orders
	All waters of the West Coast Bioregion are closed to recreational set netting, except the waters of Peel-Harvey Estuary, Leschenault Estuary and Hardy Inlet. All ocean waters of the South Coast Bioregion are closed to recreational set netting.	*Closed Waters Recreational Netting Restrictions (Rivers, Estuaries, Inlets and Lakes South of 23° South Latitude) Notice 1992*
Seasonal Closures	Recreational set netting is not permitted in the Peel-Harvey Estuary and Leschenault Estuary during the main cobbler breeding season between August and October. Recreational set netting is banned in the Hardy Inlet between June and August to protect black bream stocks.	*Closed Waters Recreational Netting Restrictions (Rivers, Estuaries, Inlets and Lakes South of 23° South Latitude) Notice 1992*
Temporal Closures	In some commercial fisheries, fishers have to abide by specific weekend and daytime closures.	Management Plans
	Recreational set netting is only permitted on particular days of the week and during specific time periods.	FRMR
Species Restrictions	Only commercial fishers in the SCSMF and SWSMF are permitted to retain West Australian salmon.	Management Plans FRMF
Size Limits	Species-specific size limits are in place for some finfish species.	FRMR
Recreational Bag and Boat Limits	Mixed species and individual species daily bag limits are in place for many estuarine finfish species.	FRMR
Reporting	Licenced commercial fishers are required to report all retained species catches, effort, ETP species interactions and fishing location in statutory monthly logbooks.	FRMR

4.2 Implementing Changes to the Management Arrangements

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

There are two main processes for making decisions about the implementation of management measures and strategies for the estuarine and nearshore finfish resource of South-West WA:

- Annual decision-making processes that may result in measures to meet the short-term, operational fishery objectives (driven by the control rules); and
- Longer-term decision-making processes that result in new measures and / or strategies to achieve the long-term fishery objectives (i.e. changes to the management system).

However, if there is an urgent issue, consultation with stakeholders may be undertaken to discuss the issue and determine appropriate management action, as needed.

4.2.1 Consultation

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

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

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

4.2.1.1 Commercial Sector Consultation

Under its funding agreement with the Department, WAFIC is required to undertake statutory consultation functions related to fisheries management and the facilitation of management meetings for licensed fisheries. Commercial fishers in South-West WA are represented by the Southern Seafood Producers Association. The commercial Peel-Harvey Estuary fishers are also represented by the Mandurah Licenced Fishermen's Association.

Management meetings between the Department, WAFIC and licence holders in the fisheries that target the estuarine and nearshore finfish resource in South-West WA are generally held annually and are important forums to consult on the management of these fisheries. During

these meetings, Departmental (science, management and compliance) staff, licence holders and WAFIC discuss current and future management issues that may have arisen during the previous fishing season and any proposed changes to the management plan. Follow-up meetings may be held as required.

4.2.1.2 Recreational Sector Consultation

Under the funding agreement with Recfishwest, the Department is required to consult with Recfishwest as the recognised peak body for recreational fishing in WA. Recfishwest is required to engage and consult with recreational fishers as necessary in order to meet its obligations.

4.2.1.3 Consultation with Other Groups

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

4.3 Compliance and Enforcement

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

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

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

The Department's compliance model is based on the Australian Fisheries National Compliance Strategy 2016-2020 (the National Strategy). DPIRD's compliance program is aligned to support the three key compliance strategies recommended by the National Strategy:

- maximising voluntary compliance;
- effective deterrence; and

- organisational capability and capacity.

Management arrangements for the estuarine and nearshore finfish resource of South-West WA are enforced under Operational Compliance Plans (OCPs) that are informed and underpinned by a compliance risk assessment, which is reviewed every two years. These OCPs have the following objectives:

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

Compliance strategies and activities that are used in the fisheries targeting the estuarine and nearshore finfish resource of South-West WA include:

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

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