

OVERVIEW OF THE STATUS OF KEY ECOLOGICAL RESOURCES (ASSETS)

ECOLOGICAL ASSETS

Captured Species (Fisheries and Stocks)

Annual stock assessments, including analyses of trends in catch and fishing activity, are used each year to determine the status of each of the State's most significant fisheries and are presented in detail in the rest of this document. This section provides an overview of the outcomes of the Department's management systems by collectively examining the status of all the commercial and recreational fisheries and harvested fish stocks in WA (Overview Table 4). The material presented in this section is based on the analyses and text presented in the Key Performance Indicators section of the Department of Fisheries Annual Report to the Parliament 2015/16.

The proportion of fish stocks identified as being at risk or vulnerable through exploitation

Annual stock assessments of the fisheries that are subject to management are undertaken by the Department. These assessments, together with trends in catch and fishing activity, have been used to determine the sustainability status of the State's most significant commercial and recreational fisheries.

Performance is measured as the proportion of fisheries (with sufficient data) where the breeding stocks of each of their target or indicator species are at sustainable levels given current fishing effort and normal environmental conditions; or they are recovering from a depleted state at an appropriate rate following management intervention. The Department's 2015/16 Budget Papers state that the target for the proportion of fisheries with breeding stocks at risk from fishing is to be less than 3%.

For the 2015/16 performance review, 39 fisheries have been reviewed, which includes two recreational-only fisheries. For the 39 fisheries reviewed, breeding stock assessments for the major species are available for 38 (97%) of these fisheries. The fishery where there was insufficient data to make a critical assessment on the target species has not operated for more than five years.

Within the group of 38 assessed fisheries, 31 were considered to have adequate breeding stock levels and a further three fisheries (the West Coast Demersal Scalefish Fishery [WCDSF]; the Shark Bay Crab Fishery and the Shark Bay Scallop Fishery) had breeding stocks considered to be recovering at acceptable rates (collectively 90% of fisheries).

The WCDSF targets relatively long-lived species so its recovery is expected to take a number of years to complete. The management actions taken in Shark Bay, combined with the conservative Total Allowable Commercial Catch (TACC) limits now imposed, are enabling the recovery of both the scallop and crab stocks from the impact of the heat-wave event five years ago. Of the remaining 10% of fisheries, only two fisheries have been assessed as having some stocks at inadequate levels to maintain usual effort levels (garfish in the West Coast Nearshore Fishery and cobbler within Wilson Inlet in the South Coast Nearshore Fishery). A further two fisheries were also assessed as having inadequate breeding stocks solely resulting from the negative impacts of environmental influences, not fishing.

The poor recruitment levels observed for scallops in the Abrolhos Islands region since the 2011 marine heat-wave have continued with the fishery still remaining closed. Similarly, with environmental factors still having an impact on the growth of crabs in Cockburn Sound and the stock's recruitment, this fishery has also remaining closed. Therefore, while a total of 10% of fisheries have stock levels that are not considered adequate, only stocks in two fisheries (or 5% of those assessed) are considered inadequate largely as a result of exploitation with revised management arrangements needed to deal with these issues (Overview Table 1).

Between 2006/07 and 2015/16 the percentage of acceptable fisheries was consistently high at approximately 80% or higher. In 2015/16, 95% of fisheries have acceptable breeding stock levels, with only 5% of fisheries at risk due to fishing, which was slightly higher than the target value of 3%.

OVERVIEW TABLE 1: *The proportion (%) of fisheries in which breeding stocks of the major target species are both assessed and considered to be at risk due to fishing.*

Year	Percentage of fish stocks considered at risk by fishing (%)	Target value as per budget (%)
2006/07	21	Not applicable
2007/08	23	Not applicable
2008/09	14	18
2009/10	11	15
2010/11	6	17
2011/12	6	14
2012/13	3	9
2013/14	3	6
2014/15	3	6
2015/16	5	3

The proportion of commercial fisheries where acceptable catches (or effort levels) are achieved

This indicator provides an assessment of the success of the Department's commercial management plans and regulatory activities in keeping fish catches at appropriate levels (including those in a recovery phase). For most of the commercial fisheries in WA, each management plan seeks to directly control the amount of fishing effort applied to stocks, with the level of catch taken providing an indication of the effectiveness of the plan. Where the plan is operating effectively, the catch by the fishery should fall within a projected range. The extent of this range reflects the degree to which normal environmental variations affect the recruitment of juveniles to the stock which cannot be 'controlled' by the management plan. Additional considerations include market conditions, fleet rationalisation or other factors that may result in ongoing changes to the amount of effort expended in a fishery which will in turn influence the appropriateness of acceptable catch ranges for certain fisheries.

A target catch or effort range has been determined for each of the major commercial fisheries (see the 'Stock Status and Catch Ranges for Major Fisheries' section of the Annual Report) by the Department's Science and Resource Assessment Division. The Department's 2015/16 Budget Papers state that the target is ninety five percent (95%).

For quota-managed fisheries, the measure of success of management arrangements is that the

majority of the Total Allowable Commercial Catch (TACC) is achieved, and additionally, that it has been possible to take this catch using an acceptable amount of fishing effort. If an unusually large expenditure of effort is needed to take the TAC, or the industry fails to achieve the TACC by a significant margin, this may indicate that the abundance of the stock is significantly lower than anticipated. For these reasons, an appropriate range of fishing effort to take the TACC has also been incorporated for assessing the performance of quota-managed fisheries (see 'Stock Status and Catch Ranges for Major Fisheries' section of the Annual Report).

The major commercial fisheries which have target catch or effort ranges account for most of the commercial value of WA's landed catch. Comparisons between the actual catches (or effort) with the target ranges have been undertaken for 29 of the 37 commercial fisheries referred to in 'Stock Status and Catch Ranges for Major Fisheries'. There is still a relatively high number of fisheries not assessed which is due to a combination of ongoing environmentally induced stock issues in some regions (see above) and poor economic conditions for some fisheries which meant a number of fisheries were either closed or did not have material levels of catches during this reporting period. This includes two fisheries (Cockburn Sound crabs, Abrolhos Islands and mid-west (scallops) trawl) affected by unusual environmental conditions continue to have their recruitment impacted to the extent that the scallop fisheries were again set to zero (0) catches. The setting of zero or very limited catches in these fisheries highlights the significant management interventions of the Department to facilitate recovery and rebuilding of these stocks. These stocks continue to be closely monitored to allow the fisheries to reopen when stocks have rebuilt to levels that support sustainable fishing.

Of the 29 fisheries where 'target ranges' were available and a material level of fishing was undertaken in the relevant reporting period, 11 were catch-quota managed with 18 subject to effort control management.

Nine (9) of the 11 Individually Transferable Quota (ITQ) managed fisheries operated within their target effort/catch ranges or were acceptably below the effort range (e.g. roe's abalone, pearl oysters, purse seine fisheries). The south coast greenlip/brownlip abalone fishery had an effort level that exceeded the acceptable level and a reduction in TACC will occur in the 2016 season and the decline in catch rate for Shark Bay snapper has triggered a review. In the 18 effort-controlled fisheries, 10 were within or acceptably above (1) or below (6) their target catch ranges. For effort controlled fisheries, the current catch level of cobbler in Wilson Inlet is too high and discussions with licence holders regarding

suitable adjustments to management have already been initiated.

In summary, 26 of the 29 commercial fisheries assessed (90%) were considered to have met their performance criteria, or were affected by factors outside the purview of the management plan/arrangements. This figure is close to the target level of 95% (Overview Table 2).

OVERVIEW TABLE 2: *The proportion (%) of commercial fisheries in which the catch or effort reported is acceptable relevant to the target management range being applied.*

Year	Percentage of fisheries with acceptable catch/effort	Target value as per budget
2006/07	80	Not applicable
2007/08	96	Not applicable
2008/09	96	85
2009/10	93	90
2010/11	94	90
2011/12	100	94
2012/13	97	88
2013/14	89	92
2014/15	89	95
2015/16	90	95

The proportion of recreational fisheries where acceptable catches (or effort levels) are achieved

This indicator provides an assessment of the success of the Department's management plans and regulatory activities in keeping fish catches by the recreational sector at appropriate levels for both stock sustainability (including those in a recovery phase) and to meet integrated fisheries management objectives.

Previously, WA's aquatic resources were shared mainly on an implicit basis, with no explicit setting of catch shares within an overall total allowable catch or corresponding total allowable effort. The Department is now implementing an Integrated Fisheries Management (IFM) approach where the aggregate effects on WA's aquatic resources by all fishing sectors are taken into account. This involves the use of a framework in which decisions on optimum resource use are determined (i.e. allocation and re-allocation of fish resources) and implemented within a total sustainable catch for each fishery or fished stock. IFM is being

progressively phased in and it is anticipated it will take around 10 years to bring the majority of the State's shared fisheries under this new framework.

The Department is beginning to determine an annual tolerance catch or effort range for each of the major recreational fisheries. This indicator has only been measured since 2013/14 and the Department's 2015/16 Budget Papers state that the target is 80%.

For the purposes of this indicator, 13 fisheries or stocks have been identified as having a 'material' recreational catch share. Over time, the indicator may need to expand to include reference to fisheries or stocks for which there are other 'material' sectoral shares (e.g. customary fishing). Of these 13, only five currently have explicit catch tolerance ranges developed and another eight have implicit ranges that can be used to assess acceptability. Of these 13 stocks or fisheries, all had catch levels that were within an acceptable catch range. Consequently the percentage of recreational fisheries with acceptable catch levels was 100%, which exceeds the target level of 80%. This has improved from last year where the percentage of recreational fisheries with acceptable catch levels was 85% (Overview Table 3).

OVERVIEW TABLE 3: *The proportion (%) of recreational fisheries in which the catch or effort reported is acceptable relevant to the target management range being applied.*

Year	2013/14	2014/15	2015/16
Percentage of fisheries with acceptable catch/effort	77	85	100
Target value as per budget	80	80	80

Listed species

In accordance with EBFM principles, risk-based assessment of the impact of commercial and recreational fishing activities on listed fish and non-fish species is undertaken. Specific detail may again be found within each bioregional risk assessment of ecological assets. Risks associated with interactions with listed species were generally assessed as being negligible to low with the exception of risks to mammals (dolphins) resulting from the Pilbara trawl fishery. Dolphin exclusion devices have subsequently reduced the incidence to acceptable levels. Risks associated with birds and mammals (sea lions) in the South Coast Bioregion were also assessed as moderate and appropriate

management measures continuing to be undertaken to mitigate these risks. The level of entanglements of whales in pot ropes has successfully been reduced following completion of research that, in collaboration with industry, identified appropriate and practical mitigation techniques¹.

Ecosystems and Habitats

A range of monitoring tools is used to assess the condition of ecosystems and associated biodiversity within the context of Ecosystem Based Fisheries Management. Detailed assessments of risk to the structure and benthic habitat of specific ecosystems can be found within each bioregional chapter. Across the marine bioregions, risks to benthic habitat and ecosystem structure and biodiversity have been generally assessed as ranging from negligible to at most only moderate. The exceptions to this are the estuarine ecosystems of the West Coast Bioregion which are identified as being at significant risk due to pressures from external (non-fishing) pressures largely associated with deteriorating water quality.

EXTERNAL IMPACTS

Introduced Pests and Diseases

The Department of Fisheries is the lead state government agency responsible for the management of aquatic biosecurity in Western Australia. Aquatic biosecurity threats include disease outbreaks in wild and farmed fish and the introduction of marine and freshwater pest species that are not native to WA.

Introduced marine species are organisms that have moved, or been moved from their natural environment to another area. Many of these organisms remain inconspicuous and innocuous causing no known adverse effects. However, some can potentially threaten human health, economic values or the environment, in which case they are then referred to as marine pests. Introduced marine species have been identified as a global problem, second only to habitat change and loss in reducing global biodiversity (Millennium Ecosystem Assessment, 2005)².

The introduction of marine species into a new region can be deliberate or accidental. Deliberate introductions may result from aquaculture practices or releases from aquariums. Accidental introductions are primarily due to shipping and

recreational craft moving from country to country and between Australian jurisdictions, with the pests being transported in ballast water, on ship hulls, or within a vessel's internal seawater pipes. Introduced marine species also arrive naturally via marine debris and ocean currents.

As an ocean bound nation Australia relies heavily on maritime transport, with over 95% of our imports and exports carried by sea. The large ocean going vessels that transport these goods represent one of the largest vectors of introduced species, while recreational vessels represent the major secondary vector that can spread pests from ports and marinas around the coastline. For these reasons our ports and marinas become high risk areas for the introduction of a marine pest.

In recognition of an increasing risk presented by aquatic pests to WA associated with increasing international travel, transport and trade, the Department has developed the capacity for rapid detection and identification of aquatic pests. Rapid detection of introduced aquatic pests is important in preventing their spread and establishment. The Department working with our Port stakeholders have developed a state-wide marine biosecurity surveillance system to try and detect any introduced species that arrive in Australian port waters.

Additional to this the Department undertakes risk based marine pest surveillance in high value assets such as the Swan River system, Cockburn Sound and the Houtman Abrolhos. Details the introduced species details the introduced species and pests detected in 2015/16 surveillance are provided in Overview Table 5.

The Department provides the Federal Department of Agriculture Forestry and Fisheries with a quarterly report on nationally notifiable aquatic diseases detected in Western Australia. This information is compiled with that of other Australian jurisdictions and is provided quarterly to the World Organisation for Animal Health (OIE). Summary data is available at <http://www.oie.int/>.

The Department coordinates the fish kill response program within Western Australia. This program forms part of a national program endorsed by Primary Industries Standing Committee and Natural Resource Management Standing Committee in December 2006. The number and cause of fish kills is also a key indicator in the "State of the Environment Report" (SOE) issued from time to time by the environmental protection authority (IW19 Number and location of significant fishkills). The number of total number of significant fish kills and fish kills investigated in Western Australia since the last SOE report is shown in Overview Table 6.

¹ How et al., (2015) Effectiveness of mitigation measures to reduce interactions between commercial fishing gear and whales. FRDC Project 2013/037 Fisheries Research Report, WA. 267.

² Millennium Ecosystem Assessment (2005) Ecosystems and human well-being: Biodiversity synthesis. World Resources Institute, Washington DC. 86 pp.

OVERVIEW TABLE 4*Stock Status, Catch & Effort Ranges for WA's Major Commercial and Recreational Fisheries*

NA - Not applicable, Q - Quota management, TAC - Total Allowable Catch, TACC - Total Allowable Commercial Catch

Fishery / Resource	Stock assessment method and level	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes), Effort (days/hours) and Catch rate for season reported ^{1,2} 2014/15 or 2015	Catch (or effort or catch rate) level acceptable and explanation if needed
WEST COAST BIOREGION					
West coast rock lobster	Size-structured Population Model (Level 5)	Sustainable: Adequate	Commercial: 6000 (TACC) Recreational: 401 t (TARC)	Commercial: 6086 (t) Recreational: 267-394 t	Acceptable Due to the conservative nature of the TACC, egg production and catch rates have been at record high levels in recent years. The TARC and recreational catch are likely to increase in the next few years as the strong recruitment pulse passes through the fishery.
Roe's abalone	Catch Rates & Direct Survey (Level 4)	Sustainable: Adequate (some areas)	Commercial: 87 (Q) (530 – 640 days) Recreational: 20t	Commercial: 51 t (467 days) Recreational: 15-25 t	Acceptable Area 8 still closed due to catastrophic mortality following a marine heat wave. Area 7 (Perth area) survey abundance of recruitment and spawning stock at low levels which required additional management actions being implemented including the TARC being reduced to 20 t.
Octopus	Catch Rates (Level 2)	Sustainable: Adequate	Commercial: 50 – 250 Recreational: Not Developed	Commercial: 274t Recreational: 2t (boat only)	Acceptable The fishery is in a new interim management phase. An increase in allowable trap use has resulted in an increased catch for 2015. The catch tolerance range will be reviewed in 2016.
Abrolhos Islands and mid west trawl	Direct Survey & Catch Rates (Level 4)	Environ. Limited	Commercial: 95 – 1,830 (set to 0 for this year) Recreational: NA	Commercial: 0 t	NA The continued low abundance is due to the ongoing effects of the extreme marine heat-wave in the summer of 2010/11 and above-average water temperature in the following two summers. The low recruitment has resulted in a very low spawning stock despite no fishing activity for three years.

Fishery / Resource	Stock assessment method and level	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes), Effort (days/hours) and Catch rate for season reported ^{1,2} 2014/15 or 2015	Catch (or effort or catch rate) level acceptable and explanation if needed
Cockburn Sound crab	Direct Survey (Level 4)	Environ. Limited	Commercial: Under Revision Recreational: Under Revision	Commercial: 0 t Recreational: 0t	NA The 2013/14 egg production and juvenile indices were both below their limit reference points and the commercial fishing season ceased in April 2014. Juvenile and egg production indices for 2014/15 remain below their limits and the commercial and recreational fisheries remain closed.
Peel-Harvey West Coast Crab	Commercial Catch Rates (Level 2)	Sustainable: Adequate	Commercial: 45-105 t Recreational: Not formal	Commercial: 95 t Recreational: 50-66 t (boat only)	Commercial catch rates and catch within allowable range. Both the commercial and recreational crab fishery in this region achieved third-party Marine Stewardship Council certification in 2016. The commercial standardised catch rates are used as a proxy for the recreational sector in the assessment of stock sustainability.
West Coast Nearshore and Estuarine finfish	Yes (Level 2)	Inadequate (actions taken)	Commercial: 75 – 220 (Peel-Harvey only) Recreational: Not Developed	Commercial: 130 t Recreational: 69-87 t (boat only)	Acceptable The high levels of shore based recreational fishing require an index of this catch. Status of herring stock resulted in reduction to recreational bag limit and closure of commercial south coast trap net fishery.
West coast beach bait and south west beach seine	Catch (Level 1)	Sustainable: Adequate	Commercial: 60 – 275 (whitebait only) Recreational: Not applicable	Commercial: 97t	Acceptable Annual whitebait catch has fluctuated in response to normal environmental variations. Low catches in previous three years followed exceptionally warm ocean temperatures with the 2014/15 catch being consistent with the recent levels being environmentally driven.
West coast purse seine	Catch (Level 1)	Sustainable: Adequate	Commercial: 0 – 3,000 (Q) Recreational: Not applicable	Commercial: 1,253 t (scaly mackerel and pilchard combined)	Acceptable Total catch for all zones combined is the highest since the mid-2000s while the nominal catch rate remains within the range observed since the mid-1990s.

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Fishery / Resource	Stock assessment method and level	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes), Effort (days/hours) and Catch rate for season reported ^{1,2} 2014/15 or 2015	Catch (or effort or catch rate) level acceptable and explanation if needed
West coast demersal scalefish	Annual (Level 1) Periodic: Fishing Mortality (F) (Level 3)	Sustainable:Recovering	Commercial: < 450 t Recreational < 250 t	Commercial: 283 t Recreational: 139-166 t(boat only) 45 t (charter)	Acceptable The total catch of the demersal suite by all commercial and recreational fisheries in the West Coast Bioregion were within the allowable ranges. Management changes introduced in 2015 to the West Coast Demersal Scalefish Interim Managed Fishery successfully reduced catches of snapper by this fishery to acceptable levels.
GASCOYNE COAST BIOREGION					
Shark Bay prawn	Direct Survey/Catch Rate (Level 4)	Sustainable: Adequate	Commercial: 1,350-2,150 Recreational: Not Applicable	Commercial: 2067t	Acceptable Brown tiger prawn annual landings were within their acceptable range while western king prawn landings were above their allowable range as result of good recruitment.
Exmouth Gulf prawn	Direct Survey/Catch rate (Level 4)	Sustainable: Adequate	Commercial: 771 – 1,276 Recreational: Not Applicable	Commercial: 1076 t	Acceptable The landings of brown tiger prawns were within their acceptable range, western king prawns were below their acceptable range and endeavour prawns were above their acceptable range.
Shark Bay scallop	Catch Rates and Direct Survey (Level 4)	Environ. Limited	Commercial: Trial Quota 500t (Denham Sound Only) Recreational: NA	Commercial: 450 t	Acceptable Limited commercial fishing occurred under a trial quota system in Denham Sound where the stock levels had recovered sufficiently to allow fishing. There was ongoing low recruitment and stock in northern Shark Bay due to the continued influence of the extreme environmental conditions and therefore no fishing was permitted in that part of the fishery.
Shark Bay Crabs	Catch Rates & Direct Survey (Level 4)	Sustainable: Recovering	Commercial 450 t (Q) Recreational: NA	Commercial: 341 t	Acceptable Increased levels of recruitment and spawning biomass were observed during 2014, which led to an increase in the TACC to 450 t for the 2014/15 fishing season. Non-achievement of this TACC was largely due to unused quota.

Fishery / Resource	Stock assessment method and level	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes), Effort (days/hours) and Catch rate for season reported ^{1,2} 2014/15 or 2015	Catch (or effort or catch rate) level acceptable and explanation if needed
					Acceptable
Shark Bay beach seine and mesh net	Annual: Catch Rates (Level 2) Periodic: Fishing mortality (Level 3)	Sustainable: Adequate	Commercial: 235 – 335 t Recreational: NA	Commercial: 164 t	Total catch remained below the acceptable range due to a further reduction in effort (lowest on record) and low catches of sea mullet and tailor. Catch of yellowfin bream was above the 10-year average.
West Coast Deep sea crab	Catch Rate (Level 2)	Sustainable: Adequate	Commercial: 154 t (Q); 61 k-101.5 k potlifts Recreational: NA	Commercial: 154 t (68 k potlifts)	Acceptable The effort is within the target effort range, with the standardised catch rate of legal crabs at one of the highest levels in a decade.
Gascoyne Demersal Scalefish (Snapper)	Composite Assessment (Level 5)	Sustainable: Adequate	Commercial 277 (Q) (380 – 540 days) Recreational: Not formal	Commercial: 196 t (446 days): Recreational: 88-110 t (boat only)	Not Acceptable Spawning biomass close to target but catch rate has fallen below the threshold level. Updated stock assessment and review of catch and catch rate to be completed. The recreational catch of spangled emperor has decreased to be within an acceptable range.
NORTH COAST BIOREGION					
Onslow prawn	Catch (Level 1)	Sustainable: Adequate	Commercial: 60 – 180 t Recreational: NA	Negligible	NA Minimal fishing occurred in 2015.
Nickol Bay prawn	Catch (Level 1)	Sustainable: Adequate	Commercial: 90 – 300 t Recreational: NA	87 t	Acceptable The total landings were just below the allowable range but landings of banana prawns, which are the target species, were within their normal catch range and slightly above their predicted catch range.
Broome prawn	Catch (Level 1)	Sustainable: Adequate	Commercial: 55 – 260 t Recreational: NA	0	NA Minimal fishing in 2015.
Kimberley prawn	Catch (Level 1)	Sustainable: Adequate	Commercial: 240 – 500 t Recreational: NA	Commercial: 175 t	Acceptable Banana prawns were below the catch prediction and the allowable range. Endeavour and brown tiger prawns were also below the range because of the early targeting of banana prawns and very low fishing effort in the second part of the season.

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Fishery / Resource	Stock assessment method and level	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes), Effort (days/hours) and Catch rate for season reported ^{1,2} 2014/15 or 2015	Catch (or effort or catch rate) level acceptable and explanation if needed
North Coast Nearshore and Estuarine	Catch Rates (Level 2)	Sustainable: Adequate	Commercial: 33–45 t (barramundi) Recreational: Not formal	Commercial: 52 t (barramundi) 82 t (total) Recreational: 11-19 t (boat)	Acceptable The catch of barramundi is above the allowable tolerance range but as the catch rate is at its highest level since 1990 this catch was still considered acceptable.
Northern demersal scalefish	Catch and Catch Rates/ Integrated Model (Level 2 & 5)	Sustainable: Adequate	Commercial: Under revision Recreational: Not Formal	Commercial: 1,111 t (total) Recreational: 48-64 t (boat only)	NA While the formal commercial catch range is being revised, the catches of goldband snapper and red emperor were both within their longer-term ranges. The current recreational catch levels are not considered to pose any stock issues.
Pilbara fish trawl	Catch and Catch Rates/ Fishing Mortality/ Integrated Model (Level 2, 3 & 5)	Sustainable: Adequate	Commercial: Under revision Recreational: NA	Commercial: 1172 t Recreational: Covered above	NA Reduced catch levels due to ongoing reductions in effort quota. Full assessment and review of catch range currently under revision.
Pilbara demersal trap and line	Catch and Catch Rates/ Fishing Mortality/ Integrated Model (Level 2, 3 & 5)	Sustainable: Adequate	Commercial: 400 – 600 t (trap) 50 – 115 t (line)	Commercial 510 t (trap) 97 t (line)	Acceptable Total catch of the trap and line fisheries in 2015 were both within their allowable catch ranges.
Mackerel	Catch (Level 1)	Sustainable: Adequate	Commercial: 246 – 410 t(Q, Spanish Mackerel) Recreational: Not formal	Commercial: 302 t Recreational: 22-37 t (boat only)	Acceptable The commercial catch is at the average even with lower effort. Current recreational catch levels do not pose any stock issues.
Northern shark	No Assessment	NA	< 20 (sandbar)	0	NA There continued to be no fishing effort for this year.
Pearl oyster	Catch rate predictions, standardised CPUE (Level 3)	Sustainable: Adequate	Commercial 667,350 oysters (Q) (14,071 – 20,551 hours) Recreational: NA	Commercial: 627,634 oysters (12,976 dive hours)	Acceptable Low catch rates contributed to relatively high effort level, but still within tolerance range. Oysters at relatively low abundance levels in 2015 due to low spat settlement, but predicted to significantly increase in 2016. Quota not achieved due to economic reasons as vessels switched to seeding operations.

Fishery / Resource	Stock assessment method and level	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes), Effort (days/hours) and Catch rate for season reported ^{1,2} 2014/15 or 2015	Catch (or effort or catch rate) level acceptable and explanation if needed
Sea cucumber	Catch Rate (Level 2)	Sustainable: Adequate	Commercial: Sandfish 20 – 100 Redfish 40 – 150 Recreational: NA	Commercial: Sandfish 37 t Redfish 0 t	Acceptable No fishing for redfish in 2015. Catch rate for sandfish above the performance target.
SOUTH COAST BIOREGION					
South Coast crustacean	Standardised Catch Rate (Level 2)	Sustainable: Adequate	Commercial: 50 – 80 (southern rock lobster) Recreational" NA	Commercial: 44 t	Acceptable Commercial catch of southern rock lobster below the tolerance range but the catch rate remained in the targeted region and is therefore acceptable. Catch and catch rates of deep sea crabs are currently being assessed.
Abalone (greenlip/brownlip)	Standardised Catch Rate plus Fishing Mortality (Level 3)	Sustainable: Adequate	Commercial: 170 t (Q) (3440 - 5270 hours) Recreational: Not formal	Commercial: 152 t (5293 hours)	Not Acceptable Commercial effort exceeded tolerance range due to lower abundance with TAC reduced in 2016 for both species. Current recreational catch levels not considered to pose a stock issue.
South Coast Nearshore and Estuarine finfish	Catch Rates (Level 2)	Inadequate (cobble in Wilson Inlet)	Commercial: Under review Recreational: Not formal	Commercial: 157 t (salmon) 230 t (other) Recreational: 19-27 t (boat only)	NA Cobbler in Wilson Inlet is inadequate, but cobbler from other regions and other key species considered adequate. Recent commercial catches of salmon still low relative to historic levels, due to low effort and limited market demand. High level of shore-based recreational fishing requires an index developed.
Albany/King George Sound purse seine	Catch (Level 1)	Sustainable: Adequate	Commercial: 2,683 t (Q) Recreational: NA	974 t	Acceptable Catch and effort higher than in 2013/14.
Bremer Bay and Esperance purse seine	Catch (Level 1)	Sustainable: Adequate	Commercial: 3000 t(Q) Combined Recreational: NA	Commercial: 741 t	Acceptable In Bremer Bay the catch was similar to 2013/14 with the effort slightly lower. In Esperance the catch was higher than in 2013/14 with the effort similar.

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Fishery / Resource	Stock assessment method and level	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes), Effort (days/hours) and Catch rate for season reported ^{1,2} 2014/15 or 2015	Catch (or effort or catch rate) level acceptable and explanation if needed
South Coast Demersal	Gummy and Whiskery shark - CPUE (relative to previous Level 5 assessment) Dusky and Sandbar shark - CPUE (relative to previous Level 4 assessment) Demersal finfish: Level 3 Age Structure SPR	Gummy and whiskery sharks and Demersal finfish: Sustainable: Adequate. Dusky and sandbar sharks: Recovering.	Commercial: shark 725 – 1,095 Finfish: under Development Recreational: Not formal	Commercial: 880 t (key species only) Recreational: 31-38 t (boat only)	Acceptable Total commercial catch of key shark species within allowable tolerance range. Gummy shark catch slightly above (<10%) its range but catch rates are high so the catch is still considered acceptable. Stock assessments indicate that indicator demersal finfish species have acceptable stock levels.
NORTHERN INLAND BIOREGION					
Lake Argyle catfish	Catch (Level 1)	Sustainable: Adequate	Commercial: 93 – 180 t Recreational: NA	91 t.	Acceptable The catch was slightly below the allowable range due to low effort in the fishery.

1. Catch figures supplied for latest year/ season available.

2. Where there are three or less licences operating in the fishery annual catch levels are not reported due to confidentiality requirements.

OVERVIEW TABLE 5: Detection of introduced and pest species in 2015/16 resulting from surveillance activities.

(Shading indicates species has been detected in that Bioregion. Y or N indicates if species was detected in recent surveillance in that bioregion. * indicates species was detected on vessel and is not known to be established in wild).

Common Name	Scientific Name	Type of Organism	Pest status	Year first detected	Bioregion			
					North Coast	Gascoyne Coast	West Coast	South Coast
Mediterranean fanworm	<i>Sabella spallanzanii</i>	Polychaete	Pest	2012/13			Y	Y
Scallop	<i>Scaechlamys livida</i>	Mollusc	Introduced species	2012/13			Y	N
Aeolid nudibranch	<i>Godiva quadricolor</i>	Mollusc	Introduced species	2013/14			Y	Y
	<i>Alexandrium catanella</i>	Dinoflagellate	pest-like if in bloom	2012/13			N	
	<i>Alexandrium sp.</i>	Dinoflagellate	pest-like if in bloom	2014/15			N	
Ciona	<i>Ciona intestinalis</i>	Ascidian	Introduced species	2013/14			Y	Y
Asian paddle crab	<i>Charybdis japonica</i>	Crab	Pest	2013/14			N	
Ivory barnacle	<i>Balanus improvisus</i>	Barnacle	Pest	2013/14*			N	
	<i>Balanus pulchellus</i>	Barnacle	Introduced species	2013/14*			N	
	<i>Amphibalanus amphitrite</i>	Barnacle	Introduced species	2014/15			N	
Asian green mussel	<i>Perna viridis</i>	Mussel	Pest	2011/12*	N		Y*	
Asian date mussel	<i>Arcuatula senhousia</i>	Mussel	Pest	2012/13			Y	Y
	<i>Didemnum perlucidum</i>	Ascidian	Introduced species pest-like characters	2012/13	Y	Y	Y	Y
Striped Sandgoby	<i>Acentrogobius pflaumi</i>	Goby	Introduced species	2014/15			Y	
	<i>Theora fragilis</i>	Mollusc	Introduced species	2012/13	N			
Dead man's fingers	<i>Codium fragile subsp. fragile</i>	Algae	Pest	2014/15				Y

OVERVIEW TABLE 6: The total number of fishkills in Western Australia and the total number of fish kill investigated by the Fish Health Laboratory since the last SOE report.

Year	Total Number of Fish Kills	Number of fish kill investigated
2007	23	11
2008	36	21
2009	18	6
2010	18	9
2011	29	12
2012	34	12
2013	25	5
2014	21	6
2015	18	8
2016	27	9