OVERVIEW FROM THE DIRECTOR GENERAL

The *Status Reports of the Fisheries and Aquatic Resources of Western Australia* provide the public with an annual update on the state of the fish and other aquatic resources of Western Australia managed by the Department. These reports outline the cumulative risk status for each of the ecological resources (assets) within WA's six Bioregions using an Ecosystem-Based Fisheries Management (EBFM) approach. This world leading approach details all the fisheries and fishing-related activities within each of the Bioregions but also includes analyses and reports on the activities and processes undertaken by the Department to manage the broader aquatic environment, such as habitats and ecosystems.

The *Status Reports of the Fisheries and Aquatic Resources of Western Australia* essentially summarise the outcomes of Departmental activities undertaken during 2011/12 and preceding years. It documents recent changes to management or policy settings, compliance and education operations, the assessment and monitoring of stock levels and ecosystem condition. This document should, therefore, provide a valuable reference point for the current status of Western Australian aquatic resources including those of major importance to the commercial and recreational fishing sectors, the aquaculture industry, the tourism industry, and for those in the community interested in the overall health of the aquatic environment.

Western Australia is one of the first fisheries jurisdictions in the world to fully implement a comprehensive and practical EBFM framework. EBFM provides a thorough, risk based framework for the overall management of aquatic resources because it explicitly considers all ecological resources and community values within a Bioregion to determine which may require direct management intervention. This approach is expected to provide the Department with a good basis for progressing the third party certification initiative that has recently been announced by the WA Government.

It is pleasing that a key finding from these reports is that the risk to most aquatic ecological resources in Western Australia are currently at acceptable levels. Given the comprehensive systems of management that are in place, fishing in WA does not present an unacceptable risk to the marine, estuarine and freshwater ecosystems underpinning them. The fishing methods that may affect the habitat (e.g. trawling) are highly regulated with over 90% of WA coastline effectively protected from these types of activities. The overwhelming majority of Western Australian fisheries have also been

assessed as posing only negligible or minor risks to bycatch species, protected species, habitats or the broader ecosystem. The small number of fisheries which have generated risks to these non-'capture species', and therefore require direct management, continue to meet their annual performance targets or have targeted research programs to reduce their interactions. The only ecosystems and component species in WA considered to be at unacceptable levels continue to be the estuarine and river systems of the south west region. These risks are not the result of fishing related activities.

The report also documents that the vast majority of Western Australia's significant fisheries continue to be in a healthy condition. For the first time all (100%) of managed fisheries had catches that are considered to be appropriate based on the status of the stocks involved and the current environmental and market conditions. Moreover, approximately 94% of commercial fisheries are now targeting stocks where no additional management is required to either maintain or achieve an acceptable breeding stock level. The research program to examine the status of the herring stocks in south west WA will be soon available to determine whether this stock is at acceptable levels.

A summary report from this document is included in the Department's *Annual Report* to Parliament, which includes the Department's non-financial (fishery) performance indicators. The *Annual Report* is available through the Department's website (www.fish.wa.gov.au).

I would like to take this opportunity to express my appreciation to all Departmental staff who contributed to this important, annual performance review of WA's aquatic resources. In addition, many commercial and recreational fishers, science collaborators and other stakeholders throughout the State are to be commended for their positive support for the Department's monitoring and research programs and management initiatives, without which such a high level of sustainability would not be achieved.

Stuart Smith
Director General

October 2012

EDITOR'S INTRODUCTION

The *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2011/12* uses the Ecosystem Based Fisheries Management (EBFM) framework which is now the basis for management of Western Australia's aquatic resources (Fletcher, *et al.,* 2010, 2012[1]). Consequently, the format for this document is fully consistent with the implementation of a risk-based approach to resource management (Fletcher 2012[2]).

The introductory section for each Bioregion outlines each of the key ecological resources (assets) within the region and summarises their current overall (cumulative) risk status. The assets that are examined in each bioregion include each of the IMCRA[3] meso-scale ecosystems plus the key habitats, captured species and protected species categories. There is also a section for the external drivers, such as climate change, coastal development and introduced pests/diseases, which may affect the Department's ability to effectively manage WA's aquatic resources.

For each Bioregion the set of individual fishery reports are now resource-based rather than activity (sector) based. Each of the different fisheries accessing the same category of ecological assets is now covered in a single report (e.g. West Coast Nearshore and Estuarine Finfish) with each report containing descriptions of all the commercial and recreational activities.Taking a Bioregional approach to the management of ecological assets ensures that the aggregate catch harvested from each stock is identified to enable their cumulative effect to be assessed. This approach is also consistent with the Department's IFM initiative and the dtructure of the reports should enable readers to more easily assess the interrelationships between fisheries and how the catch is shared among sectors.

The long-standing involvement by our commercial, recreational and aquaculture stakeholders in specific research projects and monitoring programs is recognised. This includes the provision of logbook data, biological samples,

access to vessels and information which are essential to the generation of many of the status reports presented in this document. The input from other science groups from WA, other parts of Australia and internationally is also acknowledged. There has been an increasing trend over the past decade for collaborative research projects to be undertaken to assist in the development of new monitoring and assessment techniques or to help further our understanding of issues that affect management (e.g. determining the causes of the recent low rock lobster puerulus settlement levels).

While the *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2011/12* provides the general public, interested fishers and other stakeholders with a ready reference source, it also meets the reporting requirements of the Department, including the need to annually report on the 'state of fisheries managed under' the FRMA[4] to the Western Australian Parliament and to the Commonwealth Government, on the performance of fisheries that are relevant under their EPBC Act.

The report is directly accessible on the Department's website (www.fish.wa.gov.au/docs/sof), where users are encouraged to download relevant sections for personal use. If quoting from the document, please give appropriate acknowledgment using the citation provided at the front of the report.

Finally, I would like to thank all of my Departmental colleagues across all Divisions who have assisted in the production of this volume and its many status reports. Thanks are once again due to Ms Karen Santoro who has managed both the coordination and publication processes to enable the production of this important report.

Dr Rick Fletcher
Executive Director Research

October 2012.

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[1] W.J. Fletcher, J. Shaw, S.J. Metcalf & D.J. Gaughan (2010) An Ecosystem Based Fisheries Management framework: the efficient, regional-level planning tool for management agencies. *Marine Policy* 34 (2010) 1226–1238

Fletcher, W.J., Gaughan, D.J., Shaw, J. and Metcalf, S.J. (2012) *Ecosystem Based Fisheries Management: Case Study Report West Coast Bioregion.* Fisheries Research Report No. 212, Department of Fisheries, Western Australia 104p.

[2] Fletcher, W.J., (2012) National Application of Sustainability Indicators for Australian Fisheries- Part 2: Ecosystem *based frameworks for aquaculture, multi-fishery and international applications.* FRDC Report – Project 2000/145 Part 2. Fisheries Research Report No 235 Department of Fisheries, Western Australia.

[3] Commonwealth of Australia (2006) A guide to the Integrated Marine and Coastal Regionalisation of Australia - version 4.0 June 2006 (IMCRA v4.0). http://www.environment.gov.au/coasts/mbp/publications/imcra/pubs/imcra4.pdf

[4] Section 263 of the FRMA.

HOW TO USE THIS VOLUME

To obtain full benefit from the information provided in this edition of the *Status Reports of Fisheries and Aquatic Resources of Western Australia*, readers need to understand various terms and headings used in the text and summarised in the fishery status overview table (which also appeared in the Department of Fisheries *Annual Report* 2011/12 to Parliament) and especially those associated with the ecological resource level reports.

The terms and headings are a combination of the reporting structures first outlined in the national Ecologically Sustainable Development (ESD) reporting structure (Fletcher *et al.* 2002)[1], plus the more recent Ecosystem Based Fisheries Management (EBFM) framework (Fletcher *et al.* 2010)[2] and Resource Assessment Framework (DoF, 2011)[3]. In addition to the explanations provided below, acronyms are expanded at their first occurrence in a section of the text and are also listed in a glossary at the end of the volume.

Bioregions

As noted above, with the adoption of the EBFM approach, readers need to note the fully bioregional structure of this report. A 'Bioregion' refers to a region defined by common oceanographic characteristics in its marine environment or by climate/rainfall characteristics in its inland river systems.

The marine bioregional boundaries used here are broadly consistent with "*A guide to The Integrated Marine and Coastal Regionalisation of Australia*" - version 4.0 June 2006 (IMCRA v4.0)[4] except for the inclusion of the Gascoyne Coast as a separate Bioregion, reflecting its nature as the transition zone between tropical and temperate waters.

The precise boundaries of the Bioregions reflect functional geographic separations and data recording systems. Each individual Bioregion has been provided with a general introduction outlining the main features of its aquatic environment, plus the major commercial and recreational fisheries and aquaculture industries that operate in the area.

It now also has a section that outlines the current risk status of each of the high level, ecological resources/assets located within each Bioregion (see below).

Assessment of Regional Level Ecological Resources (Assets) in each Bioregion

Consistent with the adoption of the EBFM framework for each bioregion we have identified the high level set of ecological resources/assets that are to be managed under the FRMA (see Introduction Figure 2). The ecological resources/assets in each Bioregion include the ecosystems and their constituent habitats, captured species and protected species. The potential complexity of EBFM is dealt with by using a step-wise, risk-based approach to integrate the individual issues identified and information gathered into a form that can be used by the Department. Similarly, the levels of knowledge needed for each of the issues only need to be appropriate to the risk and the level of precaution adopted by management. Implementing EBFM does not, therefore, automatically generate the need to collect more ecological, social or economic data or require the development of complex 'ecosystem' models, it only requires the consideration of each of these elements to determine which (if any) required direct management to achieve acceptable performance. Full details of how the EBFM process is undertaken are presented in Fletcher *et al.* (2012)[5] with a summary description outlined below.

Ecosystems: Within each Bioregion, one or more ecosystems, as defined by the IMCRA process, were identified with some of these further divided into estuarine and marine ecosystems where relevant.

Habitats: The habitat assets in each Bioregion were divided into estuarine and marine categories and again where necessary the latter category was further divided into nearshore and offshore components.

Captured Fish: The captured fish were subdivided into finfish, crustaceans and molluscs with each of these further divided into estuarine/embayments, nearshore, inshore and offshore demersal and pelagic (finfish only) suites (see also DoF, 2011).

Protected Species: This category was subdivided into protected 'fish' (e.g. White Sharks) and protected 'non-fish' as defined in the FRMA (e.g. mammals).

[1] Fletcher, W.J., Chesson, J., Fisher, M., Sainsbury, K.J., Hundloe, T., Smith, A.D.M. and Whitworth, B. 2002. National ESD reporting framework for Australian fisheries: The 'how to' guide for wild capture fisheries. Fisheries Research and Development Corporation (FRDC) project 2000/145, ESD Reporting and Assessment Subprogram, Fisheries Research and Development Corporation, Canberra.

[2] Fletcher, W.J., Shaw, J., Metcalf, S.J. & D.J. Gaughan (2010) An Ecosystem Based Fisheries Management framework: the efficient, regional-level planning tool for management agencies. Marine Policy 34 (2010) 1226–1238

[3] Department of Fisheries (2011) Resource Assessment Framework for Finfish Resources in Western Australia. Fisheries Occasional Publication. No. 85 24pp.

[4] http://www.environment.gov.au/coasts/mbp/publications/imcra/pubs/imcra4.pdf

[5] Fletcher, W.J., (2012) National Application of Sustainability Indicators for Australian Fisheries- Part 2: Ecosystem based frameworks for aquaculture, multi-fishery and international applications. FRDC Report – Project 2000/145 Part 2. Fisheries Research Report No 235 Department of Fisheries, Western Australia.

Risk Assessment Status

The risks associated with each individual ecological asset are examined separately using formal qualitative risk assessment (consequence x likelihood) or more-simple problem assessment processes, as detailed in Fletcher (2005, 2010)[1]. This enables the analysis of risk (using a five year time horizon) for objectives related to captured species, habitat and community structure/ecosystem sustainability, plus social and economic outcomes to be completed in a practical and consistent manner (Introduction Table 1).

The accepted international definition of risk is "the uncertainty associated with achieving objectives" (ISO, 2009)[2], therefore any uncertainties from a lack of specific data are explicitly incorporated into the assessment enabling the calculation of risk to be completed with whatever data are available. All risk scoring considers both current level of activities and management controls already in place or planned.

Within each Bioregion, the EBFM process initially identified hundreds of separate ecological assets, social, economic and governance issues and risks[3]. This complexity has been addressed by first assessing each of the individual risks and then consolidating these into bioregional or category level risks. The Department's primary objective is to manage the sustainability of the community's ecological assets from which economic or social outcomes are generated. Therefore the various ecological, social and economic risks and values associated with each of these ecological assets are integrated using a multi-criteria analysis into approximately 80 Departmental-level priorities distributed across the six Bioregions.

Breeding stock status

The assessments of breeding stock for captured species are undertaken using a number of techniques to determine if the stock is considered to be at an adequate level or not (see below).

Adequate: reflects levels of parental biomass of a stock where annual variability in recruitment of new individuals (recruits) to the stock is considered to be mostly a function of environmental effects or recruit survival, not the level of the breeding stock.

Recovering: reflects situations where the parental biomass has previously been depleted to unacceptable levels by fishing or some other event (e.g. the virus attacks on pilchards in the 1990s) but is now considered to be recovering at an acceptable rate due to management action and/or natural processes.

Inadequate: reflects situations where excessive fishing pressure (catch) or some external event has caused parental biomass to fall to levels where the breeding stock is depleted to levels that may affect recruitment and management of the stock is not currently in an acceptable recovery phase (often called recruitment overfished if caused by fishing).

Retained Species (Stock Assessment Methods)

In only some cases is the breeding stock directly measured. In most cases a variety of indirect measures are used. Each of the status reports now clearly identifies what type of stock assessment method(s) have been used to determine the status of stocks. The specific methods used for monitoring and assessment vary among stocks and indicator species which is affected by many factors including the level of ecological risk, the biology and the population dynamics of the relevant species; the type, size and value of the fishery exploiting the species; data availability and historical level of monitoring. The methods therefore vary from the relatively simple analysis of catch levels and catch rates, through to more sophisticated analyses that involve sampling of the catch (fishing mortality), direct surveys up to highly complex and expensive age structured simulation models. The range of methods have been categorised into five broad levels:

Level 1	Catch data only
Level 2	Level 1 plus fishery-dependent effort or other relative abundance data
Level 3	Levels 1 and/or 2 plus fishery-dependent biological sampling of landed catch (e.g. average size; fishing mortality, etc. estimated from representative samples)
Level 4	Levels 1, 2 or 3 plus fishery-independent surveys of relative abundance, exploitation rate, recruitment etc.
Level 5	Levels 1 to 3 and/or 4 integrated within a simulation, stock assessment model.

Multi species assessments: For each marine bioregion, each species of finfish and invertebrate is now allocated to one of five 'suites' estuarine, nearshore, inshore demersal, offshore demersal or pelagic (DoF, 2011[4]). For each of these suites one or more 'indicator species' (which in general usually includes the most vulnerable species in the suite) have been selected to reflect the status of the entire suite. If one or more indicator species is considered to be at risk, the entire suite is considered to be at risk.

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[1] Fletcher W.J. (2005) Application of Qualitative Risk Assessment Methodology to Prioritise Issues for Fisheries Management. *ICES Journal of Marine Research* 2005; 62:1576-1587

Fletcher W.J. (2010) Planning processes for the management of the tuna fisheries of the Western and Central Pacific Region using an Ecosystem Approach. *Forum Fisheries Agency*, Honiara. Facilitators version 6.1 January 2010, 61pp http://www.fisheries-esd.com/a/pdf/EAFM%20BASED%20GUIDE%20FOR%20TMP%20DEVELOPMENT%20v6%201.pdf

[2] AS/NZS ISO 31000 (2009) Risk management – Principles and guidelines. Sydney, Australia: Standards Australia.

[3] Fletcher, W.J., Shaw, J., Gaughan, D.J. and Metcalf, S.J. 2011 Ecosystem Based Fisheries Management case study report – West Coast Bioregion. Fisheries Research Report No. 225. Department of Fisheries, Western Australia. 116pp.

[4] Department of Fisheries (2011) Resource Assessment Framework for Finfish Resources in Western Australia. Fisheries Occasional Publication. No. 85 24pp.

Non-retained species

This refers to any species caught during a fishing operation which are not the target of, or retained by, the fishing operation, and can include both potential impact on unwanted 'bycatch' species and any interaction with 'protected' species. In each case, an explanation is provided of the situation and the level of risk to the stock from fishing operations. This section does not include release of target species for reasons such as under size, over bag limits etc. these issues are already covered in the assessments of retained species.

Ecosystem effects

This refers to the indirect impacts generated by removing fish from the ecosystem, and physical interactions of fishing gear with the sea floor. Each fishery is considered in terms of its potential/relative effects on the food chain and the habitat, and an outline of the assessment of current ecological risk ('negligible', 'low', 'medium' or 'high') is provided.

Economic Effects

As part of the EBFM framework we have categorised the different levels of GVP into six levels. This provides a mechanism for reporting on all fisheries including those where the small number of operators would not allow specific values to be provided. It also covers situations where the calculation method for GVP are currently under review and specific values may not be appropriate

Level 0	nil
Level 1	< $1 million
Level 2	$1 – 5 million
Level 3	$5 -10 million
Level 4	$10 - 20 million
Level 5	> $20 million

Target catch (or effort) range (Current fishing level)

A target catch or effort range has been determined for each of the major commercial fisheries. This indicator provides an assessment of the success of the Department's management plans and regulatory activities in keeping fish catches at appropriate levels (including those in a recovery phase). This identifies if the stock is being subjected to overfishing or not.

For most of the fisheries in WA, the 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.

Target catch range: the expected range in annual catch levels, taking into account natural variations in recruitment to the fished stock, which can be expected under a fishing-effort-based management plan.

For quota-managed fisheries, the measure of success for the management arrangements is firstly that the majority of the Total Allowable Catch (TAC) is achieved, but 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 TAC 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 TAC has also been incorporated for assessing the performance of quota-managed fisheries.

Target effort range: the expected range in annual fishing effort, assuming natural variability in stock abundance, required to achieve a total allowable catch under a catch quota management plan.

The catch or effort for each major fishery is assessed annually and if the catch or effort remains inside the acceptable range it is defined as having acceptable performance. Where the annual catch or effort for a fishery falls outside of this range and the rise or fall cannot be adequately explained (e.g. environmentally-induced fluctuations in recruitment levels – like prawns, or low market prices reduce desired catch levels – e.g. pearl oysters), a management review or additional research to assess the underlying cause is generally required.

External factors

This refers to known factors outside of the direct control of the fishery legislation which impact on fish stocks or fishing. An understanding of these factors, which are typically environmental (cyclones, ocean currents) but might also include, for example, market factors or coastal development, is necessary to fully assess the performance of the fishery.

Season reported

Readers should also be aware that the individual fishery and aquaculture production figures relate to the latest full year or season for which data are available, noting the inevitable time-lags involved in collection and analysis. Therefore, the statistics in this volume refer either to the financial year 2010/11 or the calendar year 2011, whichever is more appropriate. This includes estimates of the value of the fishery which may vary from published estimates of GVP due to differences between financial year and entitlement year for a fishery, estimated value of secondary by products for individual sectors, and estimating the total value of several fisheries operating on a single resource.

Similarly, the statistics on compliance and educational activities are also for 2010/11, following the analysis of data submitted by Fisheries and Marine Officers.

In contrast, the sections on departmental activities in the areas of fishery management, new compliance activities and research summaries are for the current year, and may include information up to June 2012.

Performance measures

Many of the State's significant fisheries have now undergone assessment and achieved environmental certification under the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Consequently, the *State of Fisheries and Aquatic Resources Report* also reports on the ecological performance of the relevant fisheries against the specific performance measures used or developed during the EPBC Act assessment process. These may vary among future editions as EPBC conditions change and individual fisheries determine the need and value of maintaining and resourcing such accreditation.

Within the individual fishery status reports, each of these performance measures is shown in a highlighted box to assist the reader. The results are also summarised in Appendix 4.

INTRODUCTION TABLE 1

Risk Categories, descriptions and likely management responses (modified from Fletcher 2005[1]).

| Risk Category	Description	Likely Reporting Requirements	Likely Management Response
Negligible	Not an issue	Minimal	Nil
Low	Acceptable; no specific control measures needed	Justification required	None specific
Moderate	Acceptable; with current risk control measures in place (no new management required)	Full performance report	Specific management and/or monitoring required
High	Not desirable; continue strong management actions OR new and/or further risk control measures to be introduced in near future	Full performance report	Increases to management activities needed
Significant	Unacceptable; major changes required to management in immediate future	Full performance report	Increases to management activities needed urgently

[1] Fletcher W.J. (2005) Application of Qualitative Risk Assessment Methodology to Prioritise Issues for Fisheries Management. *ICES Journal of Marine Research* 2005; 62:1576-1587

DEPARTMENT OF FISHERIES
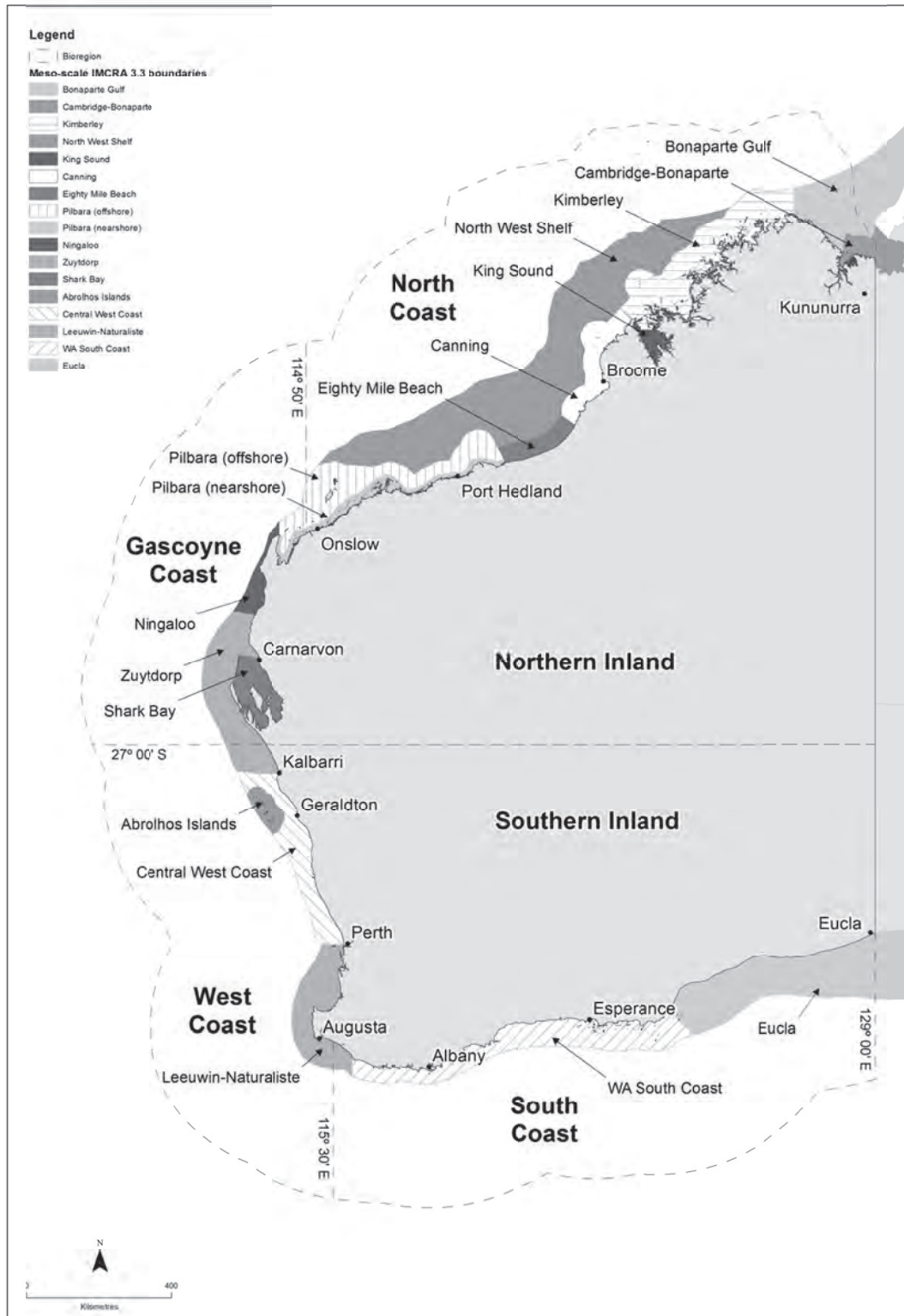
INTRODUCTION FIGURE 1

Map of Western Australia showing the general boundaries of the Bioregions referred to throughout this document and the meso-scale ecosystems based on IMCRA 4.0 boundaries[1].

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[1] http://www.environment.gov.au/coasts/mbp/publications/imcra/pubs/imcra4.pdf
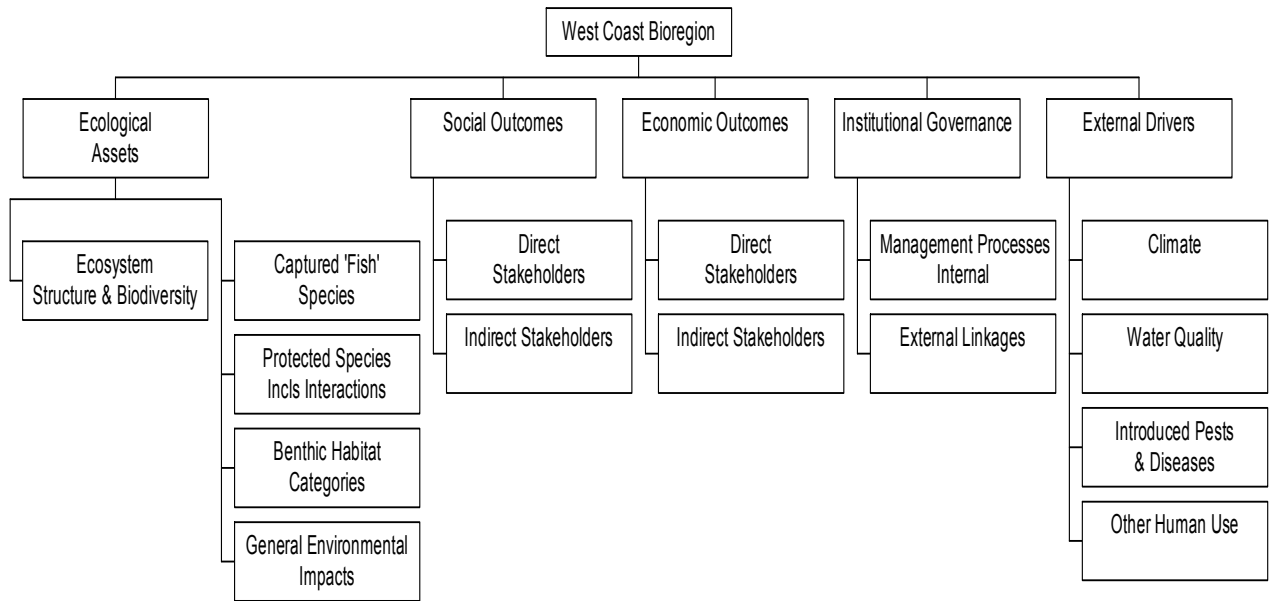
INTRODUCTION FIGURE 2

The basic EBFM component tree framework. Each of the Bioregions has their own tailored EBFM component tree in which each of the ecological components have been subdivided into the set of ecological resources/assets relevant to that Bioregion.

OVERVIEW OF THE STATUS OF KEY ECOLOGICAL RESOURCES (ASSETS)

ECOSYSTEM STRUCTURE AND BIODIVERSITY

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 fisheries and commercially harvested fish stocks in WA. 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 2011/12.

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

To measure the performance of management, the proportion of fisheries for which the breeding stocks of each of their major target or indicator species are being maintained at acceptable levels (or they are now recovering from a depleted state at an appropriate rate following management intervention), is measured annually.

For the 38 fisheries reviewed, the 'Stock Status and Catch Ranges for Major Commercial Fisheries' section of the Annual Report records that breeding stock assessments are available for the major species taken in 36 (94%) of these fisheries. For the other two fisheries, insufficient data were available on the target species to make a critical assessment. In situations where unmonitored stocks are assessed as having the potential to become overfished, they are given priority for new research and/or management.

Within the group of 36 assessed fisheries, 31 involve stocks that were considered to have adequate breeding stock levels (86 per cent of fisheries). Three additional fisheries have breeding stocks considered to be recovering at acceptable rates (West Coast Demersal Scalefish Fishery, Shark Bay Snapper Fishery, Southern Shark Fishery[1]). These are all relatively long lived species so their recovery takes a number of years to complete following the introduction of additional management restrictions. The reductions in catch levels for Shark Bay Snapper and the West Coast Demersal Scalefish Fishery have now been in place for a number of years and more detailed reassessments are scheduled to be undertaken in 2012/13 to determine the extent to which these actions have been successful. For the Southern Shark Fishery, a detailed review of catch and effort data for the southern shark fishery and a re-assessment of the stocks has revealed that

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[1] The Southern Shark Fishery is reported in the South Coast Bioregion as the Demersal Gillnet and Longline Fishery.

previous management interventions have had a positive impact on the sustainability of dusky shark and whiskery sharks but their full recovery will take further time. In conclusion, a combined total of 6 per cent of fisheries have breeding stock management that are not considered satisfactory (Overview Figure 1) which is better than the target level.

Of the two remaining fisheries, while the current catch of sandbar sharks in the Northern Shark fishery is currently zero, uncertainty regarding long term management of this fishery is still required. Finally, research to examine the status of the stocks of herring in the south-west region will determine whether the recent low catch levels result from environmental conditions, a reduction in the breeding stock leading to lowered recruitment, reduced fishing effort, or some combination of the above. This result should be known before the end of 2012.

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

A target catch or effort range has been determined for each of the major commercial fisheries (see Overview Table 1). This indicator provides an assessment of the success of the Department's management plans and regulatory activities in keeping fish catches at appropriate levels (including those in a recovery phase).

For most of the 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. An additional consideration is that market conditions, fleet rationalization or other factors 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.

For quota-managed fisheries, the measure of success for the management arrangements is firstly that the majority of the Total Allowable Catch (TAC) is achieved, but 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 TAC 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 TAC has also been incorporated for assessing the performance of quota-managed fisheries (see 'Stock Status and Catch Ranges for Major Commercial Fisheries' section of the Annual Report).

Comparisons between the actual catches (or effort) with the target ranges have been undertaken for 32 of the 38 fisheries

referred to in 'Stock Status and Catch Ranges for Major Commercial Fisheries ' section one less than the number used last year. The fisheries which have target catch or effort ranges account for most of the commercial value of WA's landed catch.

Of the 32 fisheries where 'target ranges' were available and a material level of fishing was undertaken in 2010/11, ten were catch-quota managed [through a TAC allocated through Individually Transferable Quotas (ITQ)] with 22 subject to effort control management.

All of the ITQ-managed fisheries operated within their target effort/catch ranges or were acceptably below the effort range (Roe's abalone, pearl oysters). In the 22 effort-controlled fisheries, all 22 produced catches that were within (13) or acceptably above (2) or below (7) their target catch ranges. Given the changes in the operations of the Pilbara trawl fishery this was not assessed this year as there is some uncertainty about the impact on gear efficiencies following the introduction of new bycatch reduction devices to minimise protected species interactions.

In summary all 32 fisheries assessed (100%) were considered to have met their performance criteria, or were affected by factors outside the purview of the management plan/arrangements (Figure 2) which is above the target level.

Benthic Habitat and Biodiversity

Monitoring

A number 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 risk assessment of ecological assets. Across the marine bioregions, risks to benthic habitat and ecosystem structure and biodiversity have been generally assessed as ranging from negligible to 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.

Management

Based on the results of marine ecosystem monitoring coupled to specifically identified management objectives, different degrees of protection are afforded to areas in accordance with categories established by the International Union for the Conservation of Nature (IUCN; http://www.iucn.org/about/work/programmes/pa/pa_products/wcpa_categories/) . These categories range from sustainably managed multiple use categories (Category VI) to complete no take areas where no extractive activity is permitted (Category I). Spatial closures are identified following a risk based assessment of ecological parameters within a defined bioregion, and can involve total or partial closures to fishing activity. Closures can be used alone, but are often used in combination with other fisheries management tools to achieve specific objectives.

Mechanisms in use for the protection of marine habitats in Western Australian state waters include:

i) Spatial closure to trawl-based fisheries under the Fish Resources Management Act 1994 (IUCN management category IV)

ii) Establishment of Fish habitat Protection Areas (FHPAs; IUCN management category I)

iii) Closures to fishing under section 43 of the Fish Resources Management Act 1994 (IUCN management category III)

iv) Establishment of marine parks through the Conservation and Land Management Act 1984 (CALM Act) and the Fish Resources Management Act 1994 (IUCN management categories I-VI)

Marine protected areas can also be created in Commonwealth waters under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC).

A summary of the effective protection afforded to state waters is detailed in Overview Table 2.

Protected Species

In accordance with EBFM principles, risk-based assessment of the impact of commercial and recreational fishing activities on protected fish and non-fish species is undertaken. Specific detail may again be found within each bioregional risk assessment of ecological assets. Risks to protected 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 reduced the incidence to acceptable levels and further refinements to net design are in progress. Risks to birds and mammals (sea lions) in the South coast bioregion were also assessed as moderate and appropriate management measures are being undertaken to attempt to mitigate these risks.

GENERAL ENVIRONMENTAL 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, they can potentially threaten human health, economic values or the environment, in which case they are then referred to as marine pests. Introduced marine species are a global problem, and second only to habitat change and loss in reducing global biodiversity (Millennium Ecosystem Assessment, 2005).

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, 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.

In recognition of an increasing risk presented by aquatic pests and diseases to WA associated with increasing international travel, transport and trade, the Department has developed its capacity for rapid detection and identification of aquatic pests and diseases. Rapid detection of introduced aquatic pests and diseases is important in preventing their spread and establishment. This section provides an overview of the Department's activities with respect to marine pests and diseases monitoring in the state in 2011/12. Further detail is reported at the bioregional level and further information on Departmental activity in this field may be found in the appendix (Activities of the Fish Health Unit during 2011/11 and Activities of the Biosecurity Research Group 2011/12).

The Marine Biosecurity Research group has implemented a system to monitor high risk ports around the state for the presence of marine pests. 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. The Commonwealth Government, together with the states and territories have developed a national system of policies and procedures to try and reduce the risk of marine pests arriving in Australian waters. Part of this system includes the monitoring of high risk ports, which are those ports that receive large numbers of vessels, high risk vessels (such as dredges) or are geographically close to areas with known invasive marine species. This section details the results of the monitoring conducted in 20011/12 for detection of introduced marine pests (Overview Table 3). Further detail of both the surveillance and research activities undertaken by the Marine Biosecurity research group may be found in the appendix.

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 significant fishkills investigated in Western Australia since the last SOE report is shown in Overview Table 4.

OVERVIEW TABLE 1

Stock Status, Catch & Effort Ranges for the Major Commercial Fisheries

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

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
WEST COAST BIOREGION						
West coast rock lobster	Size-structured Population Model (Level 5)	> early 1980s level	Adequate	5,500 (Q)	5,501 t	Acceptable. A TACC of 5,500 t was set for the 2010/11 season to accommodate the recent series of low puerulus settlements.
Roe's abalone	Catch Rates & Direct Survey (Level 4)	Effort (by zone) remains < within range Survey catch rate > minimum	Adequate	92.8 (Q) (530 – 640 days)	81.6 t (426 days)	Acceptable. TAC, catch and effort down by 10 t due to closure of Kalbarri region of the fishery following a marine 'heatwave' generated mortality event.
Octopus	Catch Rates (Level 2)	CPUE > 70kg/day	Adequate	50 - 250	166 t	Acceptable. Fishery in developing phase. Target range to be reviewed following completion of current study.
Abrolhos Islands and mid west trawl	Direct Survey & Catch Rates (Level 4)	Fishing ceases at catch rate threshold.	Adequate	95 – 1,830	2203 t	Acceptable. Total landings were above the target range due to good recruitment.

DEPARTMENT OF FISHERIES

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
WEST COAST BIOREGION (continued)						
Cockburn Sound crab	Direct Survey (Level 4)	Residual stock above threshold	Adequate	Not Applicable	53 t	NA This is the 2nd year since the fishery re-opened following a 3 year closure. The catch did not increase due to the large number of small sized crabs.
Deep sea crab	Catch (Level 1)	Catch range	Adequate	154 (Q)	145 t	Acceptable. The TACC began in 2008. An acceptable effort range will be determined.
Estuarine finfish (west coast)	No	Not Applicable	Not Applicable	75 – 220 (Peel-Harvey only)	73 t (PH)	Acceptable. Catches of west coast estuarine finfish have been stable since 2000.
West coast beach bait	Catch (Level 1)	Catch range	Adequate	60 – 275 (whitebait only)	35 t (whitebait only)	Acceptable. Yearly fluctuations in whitebait catch still match environmental variations.
West coast purse seine	Catch (Level 1)	Catch range	Adequate	0 - 3000 (Q)	Less than three licences operated	NA Continued low catches due to market competition, irregular availability of fish resulting in low fishing effort levels.

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
WEST COAST BIOREGION (continued)						
West coast demersal scalefish	Catch by sector (Level 1) Fishing Mortality (F) (Level 3)	$F < 3/2\,M$	Recovering	< 449 – 469 (All Demersal Scalefish) <450 (Demersal Suite)	438 t 340 t – West Coast Demersal Scalefish (interim) Managed Fishery 81 t – Other fisheries, including West Coast Demersal Gillnet and Longline (Interim) Managed Fishery	Acceptable Total catch includes all relevant commercial fisheries. The stock is deemed to be recovering with the next full assessment scheduled for completion in 2012/13.
GASCOYNE BIOREGION						
Shark Bay prawn	Direct Survey/Catch Rate (Level 4)	Survey catch rates > minimum level	Adequate	1,501 – 2,330	2,014 t	Acceptable. King and tiger prawns were within the historical target range.
Exmouth Gulf prawn	Direct Survey/Catch rate (Level 4)	Survey catch rates > minimum level	Adequate	771 – 1,276	976 t	Acceptable. The total catch was in the target range but catches of tiger prawns were above and king prawns were below their individual target levels.
Shark Bay scallop	Catch Rates and Direct Survey (Level 4)	Fishing ceases at threshold level	Adequate	1,250 – 3,000	295 t	Acceptable Catch well below target range due to small size of scallops and poor recruitment due to La Nina effects. A heat wave and floods in late 2011 will impact stock abundance in 2012.

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
GASCOYNE BIOREGION (continued)						
Shark Bay Crabs	Catch Rates/Size Distributions (Level 3)	Catch rate > minimum level	Adequate	Under development	860 t	NA The catch comes from a dedicated trap fishery and prawn trawlers. A heat wave and floods over the 2010/11 summer have impacted on the crab stock available for the 2012 season.
Shark Bay beach seine and mesh net	Catch Rates (Level 2)	Catch rate > minimum level	Adequate	235 – 335	250	Acceptable. Total catch was similar to 2010. Catch rates of key species were generally maintained.
Shark Bay snapper	Composite Assessment (Level 5)	% unfished levels. Target 40%; Limit 30%	Recovering	277 (Q) (380 - 540 days)	236 t (419 days) plus 60 recreational catch	Acceptable. At the current TACC, the spawning biomass is projected to recover to the target level by 2014. The next full assessment is scheduled for late 2012.
NORTH COAST BIOREGION						
Onslow prawn	Catch (Level 1)	Catch range	Adequate	60 – 180	16 t	Acceptable. The low catch was associated with lowest recorded fishing effort because of the cost of fishing, high fuel prices and low returns.

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed

NORTH COAST BIOREGION (continued)

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort for season	Catch (or effort) level acceptable and explanation if needed
Nickol Bay prawn	Catch (Level 1)	Catch range	Adequate	90 – 300	178 t	Acceptable. Catch of banana prawns were lower than the projected catch range but within the target catch range
Broome prawn	Catch (Level 1)	Catch range	Adequate	55 – 260	6 t	NA The very low level of effort continued because of the cost of fishing, high fuel prices and long distances to steam and low returns.
Kimberley prawn	Catch (Level 1)	Catch range	Adequate	240 – 500	155 t	Acceptable. The number of boats fishing here was the lowest for 30 years because of high catch rates in the NPF.
Kimberley gillnet and barramundi	Catch Rates (Level 2)	Rates > minimum level	Adequate	25 – 40 (barramundi)	28 t	Acceptable. Listed catch is an underestimate due to missing returns but total still likely to be within the acceptable range.

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
NORTH COAST BIOREGION (continued)						
Northern demersal scalefish	Catch and Catch Rates/ Integrated Model (Level 2 & 5)	% unfished levels. Target 40%; Limit 30%	Adequate	Total 600 – 1,000 (goldband <561) (red emperor <195)	Total 1,037 t (goldband 487) (red emperor 128)	Acceptable. Total catch close to upper limit. Catches of goldband snapper and red emperor were both within the acceptable catch range. Full assessments and review of catch ranges scheduled over next two years.
Pilbara fish trawl	Catch and Catch Rates/ Fishing Mortality/ Integrated Model (Level 2, 3 & 5)	% unfished levels. Target 40%; Limit 30%	Adequate	2,000 – 2,800	1,085 t	Under Revision Reduced catch partly due to reductions in effort since 2009. Full assessment and review of catch range scheduled in the next two years.
Pilbara demersal trap and line	Catch and Catch Rates/ Fishing Mortality/ Integrated Model (Level 2, 3 & 5)	% unfished levels. Target 40%; Limit 30%	Adequate	400 – 600 (trap) 50 – 115 (line)	459 t (trap) 112 t (line)	Acceptable Both the trap and line catch were within the acceptable ranges.
Mackerel	Catch (Level 1)	Catch range	Adequate	410 (Q) 246 - 410 (all except grey mackerel)	284 t	Acceptable. Catch rates are stable or increasing in all three management areas.

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
NORTH COAST BIOREGION (continued)						
Northern shark	Sandbar shark: Catch (relative to previous direct survey) (Level 3) Blacktip sharks: Catch (Level 1)	Under review	Sandbar shark: Inadequate Blacktip shark: Adequate	< 20 (sandbar)	No fishing or catch reported	NA No fishing effort continued for this year. To enable a recovering status, management needs to ensure on-going low catches. The black tip assessment is based on NT analysis
Pearl oyster	Catch rate predictions, standardised CPUE (Level 3)	Area < 60% Rates > min.	Adequate	1,600,000 oysters (Q) (14,071 – 20,551 dive hours)	796,158 oysters (13,917 dive hours)	Acceptable Pearl oyster catches are at 2nd highest historical level, but still only 50% of TAC due to exceptional abundance.
Beche-de-mer	Catch Rate (Level 2)	Catch range	Adequate	Sandfish 20 – 100 Redfish 40 - 150	Sandfish 56 Redfish 0	Acceptable. No fishing occurred for Redfish in 2011. Sandfish within historical range.
SOUTH COAST BIOREGION						
South coast crustacean	No	NA	NA	50 – 80 (southern rock lobster)	70.3 t (lobster and crab combined catch; 52 t for lobsters)	Acceptable The management arrangements, including the acceptable catch range, are currently being reviewed.

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
SOUTH COAST BIOREGION (continued)						
Abalone (greenlip/ brownlip)	Standardised Catch Rate/ Fishing Mortality (Level 3)	Indicators > threshold value	Adequate	213 (Q) (907 – 1,339 days)	202 t (1,224 days)	Acceptable. No issues
Estuarine finfish (south coast)	Catch Rates (Level 2)	> Minimum level	Adequate	200 – 500	201 t (finfish) 15 t (crab)	Acceptable Stock levels of key species are considered adequate.
WA salmon	Catch Rates (Level 2)	Catch Range	Adequate	1,200 – 2,800	171 t	Acceptable Recent catches continue to be low relative to historic levels, due to low effort from limited market demand. A review of the target catch range needs to be undertaken.
Australian herring	Catch Rates (Level 2)	Catch Range	Uncertain	475 – 1,200 (south coast only)	110 t (south coast only)	Acceptable Formal stock assessment and review of acceptable catch range due for completion in late 2012. Commercial catch continues to be low relative to historic levels.
Albany/King George Sound purse seine	Catch (Level 1)	Catch < TAC	Adequate	2,683 (Q)	1,241 t	Acceptable. Catch was lower than 2009/10 due to lower effort.

OVERVIEW

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
SOUTH COAST BIOREGION (continued)						
Bremer Bay purse seine	Catch (Level 1)	Catch < TAC	Adequate	1,500 (Q)	Less than three licences operated	Acceptable. Catch levels similar to previous years and acceptable given effort levels.
Esperance purse seine	Catch (Level 1)	Catch < TAC	Adequate	1,500 (Q)	Less than three licences operated	Acceptable. Catch levels are higher than previous years and acceptable given effort levels.
Southern and West Coast demersal gillnet and longline	Gummy shark - CPUE (relative to previous Level 5 assessment) (Level 2) Dusky shark - CPUE (relative to previous Level 4 assessment) (Level 2) Sandbar shark - CPUE (relative to previous Level 4 assessment) (Level 2) Whiskery shark - Age Structured Model (Level 5)	Mature biomass above 40% or is increasing	Gummy and whiskery sharks - adequate. Dusky and sandbar likely to now be recovering	725 – 1,095 (key species only)	828 t (key species only)	Acceptable. Total catch was within range as were the catches of gummy sharks, dusky and sandbar. Whiskery catch was slightly below the historical range due to the intended effects of seasonal closure and effort reductions.

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed

NORTHERN INLAND BIOREGION

Fishery/ Resource	Stock assessment method and level	Breeding stock performance measures/limits	Breeding stock assessment	Target catch (and effort) range in tonnes (days)	Catch (tonnes) and Effort (days/hours) for season reported[1]- 2010/11 or 2011	Catch (or effort) level acceptable and explanation if needed
Lake Argyle catfish	Catch (Level 1)	Catch range	Adequate	95 - 155	Less than three licences operated	Acceptable. Catch is within the acceptable range.

1 Catch figures supplied for latest year/ season available.

OVERVIEW TABLE 2 - EFFECTIVE PROTECTION STATUS OF BENTHIC HABITAT IN WESTERN AUSTRALIAN STATE WATERS

The areas and proportions of the West Coast Bioregion making up continental shelf waters (< 200 m depth) where habitats are protected from the physical disturbance of trawl fishing. The areas which are formally closed to trawling would be equivalent to meet the IUCN criteria for classification as marine protected areas as category IV. The area of habitat effectively protected refers to the area where trawling doesn't occur.

Bioregion	Total Area of Shelf (sq nm)	Area of shelf equivalent to IUCN marine protected area ≤Category IV (sq nm) (%)	Maximum area of Actual trawling activity (sq nm)	Total area of habitat effectively protected (%)
West Coast	19600	11000 (56%)	300	19300 (98%)
Gascoyne	15800	5600 (35%)	1100	14700 (93%)
North Coast	98600	40700 (41%)	10500	88100 (89%)
South Coast	31800	-	500	31200 (98%)

OVERVIEW TABLE 3 - DETECTION OF MARINE PEST SPECIES IN 2011/12 RESULTING FROM SURVEILLANCE AT MAJOR PORTS

No pest monitoring was conducted in the Gascoyne or South Coast Bioregions in 2011/12.

Bioregion	Common Name	Scientific Name	Type of Organism	Pest status
West Coast	Mediterranean fanworm	*Sabella spallanzanii*	Polychaete	Pest
	Scallop	*Scaeochlamys livida*	Mollusc	Introduced species
	Aeolid nudibranch	*Godiva quadricolor*	Mollusc	Introduced species
		Alexandrium catanella	Dinoflagellate	Pest
	Ciona	*Ciona intestinalis*	Ascidian	Introduced species
	Asian paddle crab	*Charybdis japonica*	Crab	Pest
	Ivory barnacle	*Balanus improvisus*	Barnacle	Pest
		Balanus pulchellus	Barnacle	Introduced species
	Asian green mussel	*Perna viridis*	Mussel	Pest
	Asian date mussel	*Musculista senhousia*	Mussel	Pest
		Didemnum perlucidum	Ascidian	Introduced species – likely pest
North Coast		*Theora fragilis*	Mollusc	Introduced species
		Didemnum perlucidum	Ascidian	Introduced species – pest-like characters

OVERVIEW TABLE 4

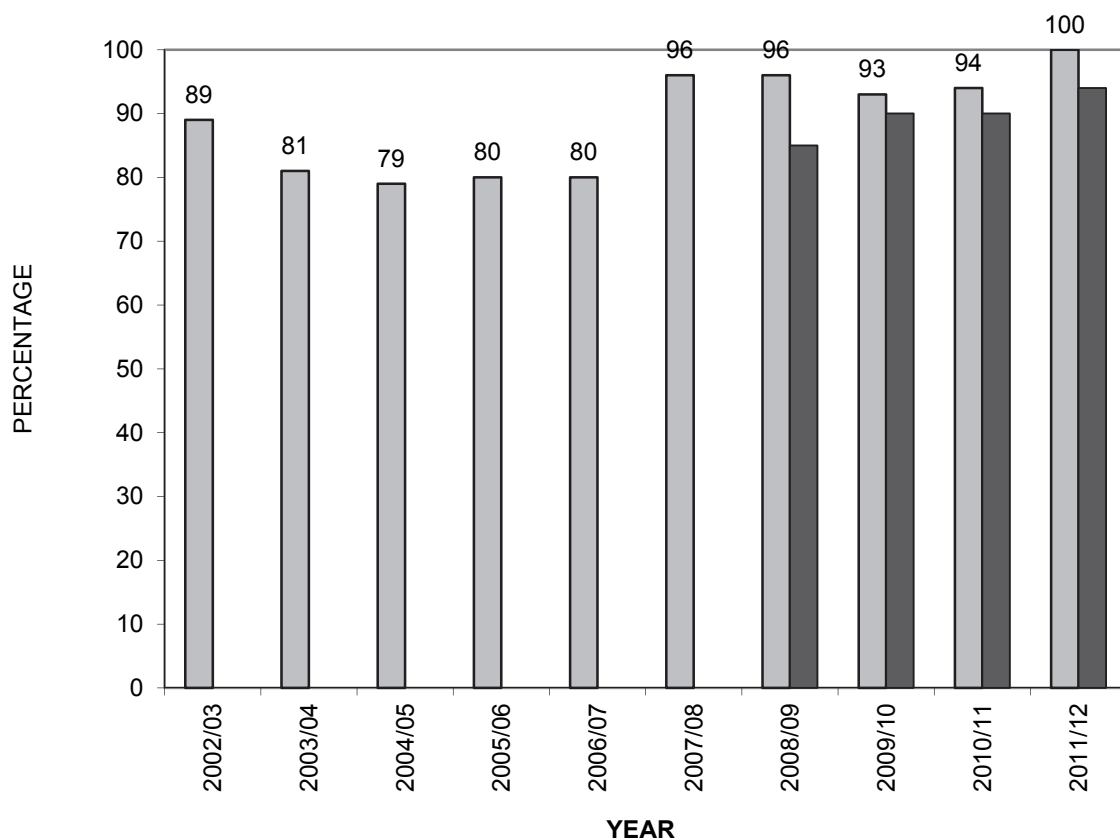The number of significant fishkills investigated in Western Australia since the last SOE report

Year	Number of FishKills
2007	23
2008	36
2009	18
2010	18
2011	29
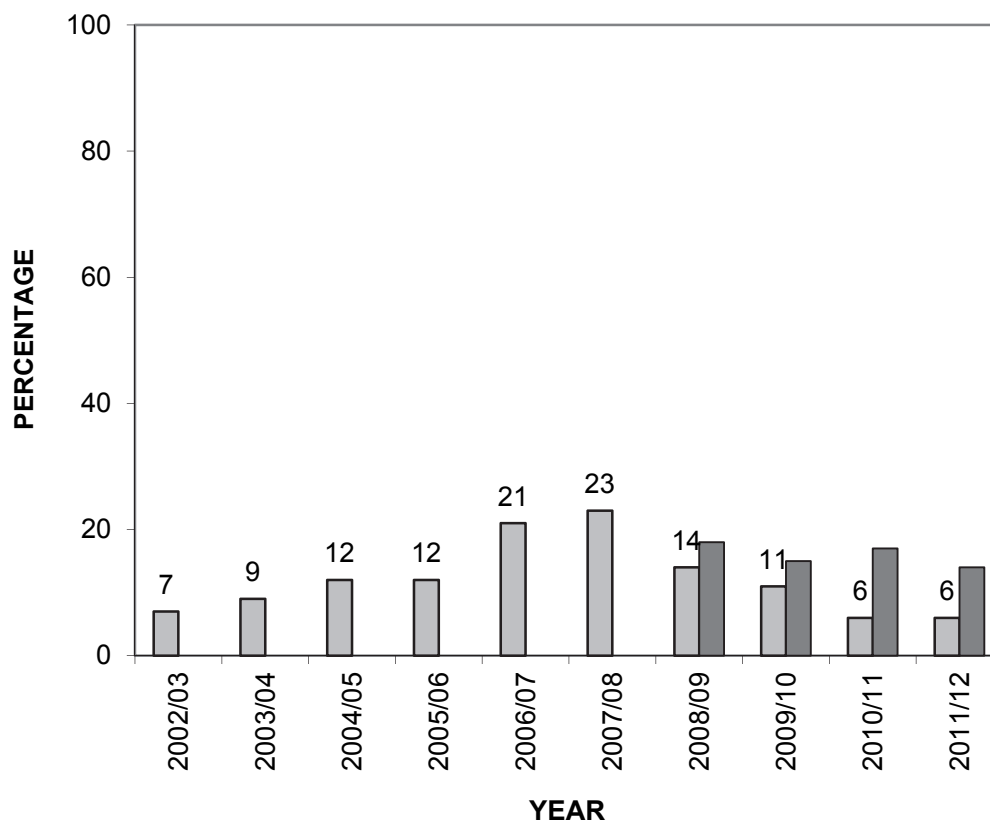
OVERVIEW FIGURE 1

The proportion (%) of commercial fisheries where breeding stocks of the major target species are both assessed and considered to be at risk. Dark bars indicate target levels.

OVERVIEW FIGURE 2

The proportion (%) of commercial fisheries where the catch or effort reported is acceptable relevant to the management range being applied. Dark bars indicate target levels.