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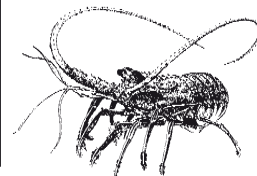
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Western Rock Lobster Fishery



Department of
Fisheries



Ecologically
Sustainable Development

Catching Sustainability

FRDC – Subprogram



Australian Government
Fisheries Research and
Development Corporation



Fish for the future

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1.0 Introduction

Ecologically Sustainable Development (ESD) is the concept that seeks to integrate short and long-term economic, social and environmental effects in all decision-making. The Western Australian Government is committed to the concepts of ESD and these principles are implicitly contained in the objectives of the *Fisheries Resources Management Act 1994* (FRMA). More recently, the Minister for Fisheries released a “*Policy for the Implementation of Ecologically Sustainable Development for Fisheries and Aquaculture within Western Australia*” (Fletcher 2002) to articulate, in a practical manner, how the Department of Fisheries can demonstrate to both the government and the broader community that these requirements are being achieved.

A major element of this policy was the requirement for reporting on the progress of each commercial fishery against the major ESD objectives by the end of 2003. This document forms part of this process being the ESD report for the *Western Rock Lobster Fishery*.

The reporting framework used to generate these ESD reports is the National ESD Framework for Fisheries (see Fletcher et al., 2002 or www.fisheries-esd.com for details). This framework operates by identifying the relevant issues for a fishery within 3 main categories of Ecological wellbeing, Human wellbeing and Ability to achieve completing a risk assessment on each of the identified issues and then providing suitably detailed reports on their status.

Due to recent changes in the Australian Government’s environmental legislation administered by the Department of Environment and Heritage*, all export fisheries are now required to have an assessment on their environmental sustainability. As a consequence, the initial series of assessments for fisheries has concentrated on the environmental and governance components of ESD of this fishery. The social and economic elements of ESD will be covered in the next phase of assessments.

The reporting of performance for each fishery is the responsibility of the Department in conjunction with the relevant Management Advisory group and/or associated stakeholders. Consequently, the completion of this report has involved a substantial level of consultation and input from many groups including a public comment period. The list of participants involved in this development is located in Appendix 1.

This material has also been used as the basis to submit an application to Environment Australia to meet the requirements of the Commonwealths’ *Guidelines for the Ecologically Sustainable Management of Fisheries*. A copy of the application section of this submission, which was submitted in October 2001, is located in Appendix 2. The Western Rock Lobster Fishery was awarded an exemption to Part 13A of the EPBCA for the next five years. A copy of the recommendations imposed for this exemption are located in Appendix 3. Where relevant, these conditions have now been incorporated into the Performance Reports of the fishery (see Section 5).

These ESD reports provide a comprehensive overview of the information pertaining to each fishery. A major element of which is the explicit determination of the operational objectives, performance measures and indicators that will be used to assess performance of the fishery. Most importantly these reports include appropriately detailed justifications for the levels chosen and the methods used. Therefore, the annual *State of the Fisheries* reports on the evaluation of performance of this fishery against these sets of “agreed” objectives/performance measures (ie the full justifications will not be presented in the *SoF* reports). This is summarised in Figure 1.

* Environment Australia (EA) is now called the Department of Environment and Heritage. Throughout this document references to EA should be taken to mean the DEH.

As stated in the Department's ESD policy, it is expected that the ESD report, and therefore the objectives and performance measures, will be reviewed every 5 years to ensure that they remain relevant and appropriate with current scientific protocols, social attitudes and prevailing environmental conditions. This will coincide with the next assessment cycle under the EPBCA. The material presented here relates to the time of the application, not time of publication.

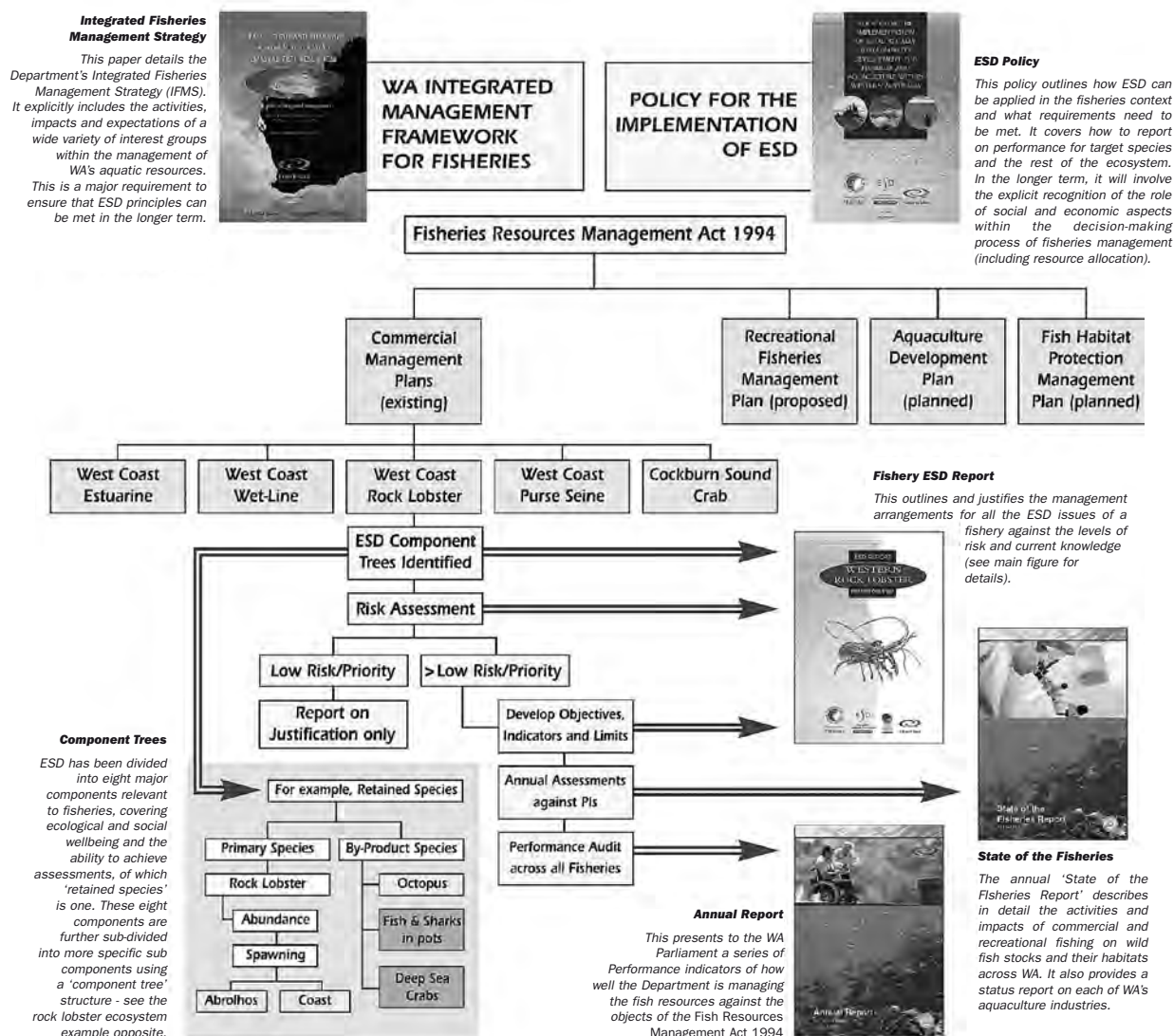


Figure 1. Summary of process for completing ESD reports and their relationship with the Annual Report and State of Fisheries Reports. (Example shown is for the West Coast Bioregion and the Western Rock Lobster fishery.)

2.0 Overview

The *Western Rock Lobster Fishery* (WRL) is the most valuable single-species fishery in Australia (with the catch worth between \$A200 and \$A400 million annually) which represents about twenty per cent of the total value of Australia's fisheries.

This fishery also supports a significant recreational fishery with about 37,000 rock lobster licences issued annually and around 80% who catch approximately 500 - 600 tonnes per year (approx. 5% of the total commercial and recreational catch).

As one of the first managed fisheries in Western Australia (and the world), data has been kept on the western rock lobster fishery since the early 1960s. The rock lobster fishery was declared limited entry in March 1963 when licence and pot numbers were frozen. Since 1963, boat numbers have declined due to management changes (pot reduction etc) from 836 to 570 (June 2002). The commercial catch has varied between 8,000 t and 14,500 t over the last 20 years. The record catch of 14,500 tonnes in the 1999/2000 season, was the highest annual catch for any country in the world fishing rock lobsters. The 2001/02 season produced 9,000 tonnes with improved catches predicted over the next 3 years. The settlement of puerulus (1 year old lobsters) is used reliably to predict catches three to four years ahead.

In coastal regions the lobster season occurs between 15 November and 30 June, with the lobsters fished using baited pots (commercial diving for lobsters is banned) The Abrolhos Islands region of the fishery remains closed until 15 March.

Between 1987/88 and 1991/92, 10 per cent (2% per season) of the lobster pots were removed permanently from the industry. In 1993 management measures were taken which have significantly improved the level of the breeding stock. These measures included an additional 18% pot reduction, a 1mm increase in the minimum size during the migration period from November to January, return of all mature females (not just berried females) and the introduction of maximum sizes for females.

The *Fish Resources Management Act, 1994* (FRMA) provides the legislative framework to implement the management arrangements for this fishery. The FRMA, and the specific management plan for the WRL fishery, adheres to arrangements established under relevant Australian laws with reference to international agreements as documented in (Section 5.4.2).

A summary of WRL Management Arrangements is as follows:

- Closed season July 1 to November 14 (Coastal Zones), July 1 to March 14 (Abrolhos Is.)
- Maximum Number of pot entitlements for fishery (currently 56,906 pots distributed amongst 594 boats)
- The licensee can only operate in the zone for which he/she is licensed
- Minimum size of carapace is 76 mm, except for a period of 2.5 months at the start of the season when the minimum size is 77 mm.
- It is illegal to take setose females or those carrying eggs, or tarspot.
- A maximum size of 115 mm for lobsters landed south of 30°S and 105 mm for landed north of 30°S (except for 2001/02 only).
- The configuration of pots and size and number of escape gaps (54 mm) are regulated.

- Pots may only be pulled during specified daylight hours.
- To operate in the managed fishery, a licence must have between 63 and 150 units of pot entitlement (note: 150 maximum pot rule has been reviewed due to NCP requirements).

Research and monitoring of the WRL fishery has been conducted for over 50 years and has one of the best biological and fishery datasets in the world. Currently, this work is mostly conducted by the Research Division of the Department of Fisheries. However, during the 1970s-80s, CSIRO was heavily involved in lobster and related ecological research and a number of tertiary institutions are also currently involved in lobster research, particularly in the area of post harvest technology.

Enforcement of the rules of commercial and recreational rock lobster fishing is a major part of the work of all Fisheries Officers on the west coast south of Shark Bay. Patrol boats are used for at sea inspection, policing fishing zone boundaries and pot numbers, and shore based officers inspect the landed lobsters, particularly within processing plants for compliance with minimum sizes etc. There is currently a high level of cooperation from the industry and a high level of compliance with the regulations.

In 1999, the WRL was the first fishery worldwide to be awarded Marine Stewardship Council (MSC) certification on the basis of demonstrating the ecological sustainability of its fishing and management operations. To achieve this, the WRL fishery was assessed by an international group of experts against the criteria set out in the MSC guidelines (see web site www.msc.org for details). A number of ongoing requirements had to be met to continue this accreditation including a risk assessment of the environmental risks associated with the fishery and the development and implementation of an Environmental Management Strategy (EMS) both of which have been incorporated into this document.

The Ecological Risk Assessment Workshop was conducted in February 2001 to provide a register of the potential ecological risks that arise from the various activities carried out by the western rock lobster fishery (WRLF). In total 33 impacts were identified across the WRLF. No high risks were identified during the risk assessment process. Risks associated with impacts identified were ranked as either moderate (12%) or low (88%).

The four moderate risks were:

- Sea lion pups may become entangled in pots with the potential for change to the population identified;
- Contact of pots with coral resulting in a potential change to coral abundance;
- Leatherback turtles becoming entangled in rope resulting in a change in population; and
- Dumping of domestic waste into the ocean at the Abrolhos Islands resulting in a potential reduction in the ocean environment quality.

A fifth moderate risk, maintaining breeding stocks at target levels, was added to the EMS independently of the ERA process by the Department of Fisheries since it was at the heart of the sustainability of the fishery.

Moderate risks were assigned principally on the basis that little quantitative data were available to evaluate the risk properly, and so a precautionary approach was adopted. The aims of the EMS are to more precisely quantify the effects of the fishery and then adopt strategies to minimise those impacts wherever that is appropriate.

Of these five risks, two key issues have been the focus of particular attention by the Department and the MSC assessment team; the interaction of the fishery with protected fauna such as sea lions and leatherback turtles, and the lack of research data about the ecological impacts of removing rock lobster biomass from the environment, particularly from deep water. These issues are being addressed by specific research projects.

The management regime for the WRL has met the *Guidelines for the Ecologically Sustainable Management of Fisheries* and was formally approved by the Federal Minister for the Environment on March 12 2003.

3.0 Background on the WRL Fishery

3.1 BIOLOGY OF ROCK LOBSTERS

Distribution

The western rock lobster, *Panulirus cygnus*, is a decapod crustacean of the family Palinuridae. Its area of distribution is the continental shelf on the west coast of Western Australia, with greater abundances off the mid west coast (Geraldton – Perth) than the northern and southern parts of the west coast.

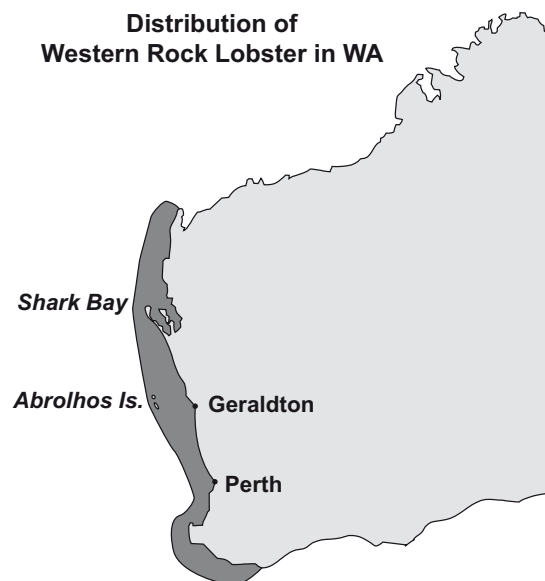


Figure 2. Lobster Distribution.

Life History

The species can live for over 20 years and reach sizes of up to 5.5 kg, although animals over 3 kg are rarely caught under current harvesting practices. In the southern areas of its distribution, the lobsters become mature at about 6-7 years old at a carapace length of about 90 mm. In the northern waters near Kalbarri and at the Abrolhos Islands, they mature at smaller sizes, usually at about 70mm carapace length.

When lobsters mate, the male attaches a package of sperm, which resembles a blob of tar, to the underside of the female. This “spermatophore” is generally called a tarspot and remains there until the female is ready to spawn her eggs. At spawning, the female releases eggs from small pores at the base of the third pair of walking legs, sperm is released at the same time by the female scratching the spermatophore and the eggs are fertilised as they are swept backwards and become attached to the sticky setae on the pleopods. Females with eggs attached under their abdomen are known as “berried” females. The eggs hatch in about 5-8 weeks (depending upon water temperature), releasing tiny larvae called phyllosoma into the water currents.

The phyllosoma larvae spend 9-11 months in a planktonic state, carried by ocean currents where they feed on other plankton before the last phyllosoma stage moults into what is called the puerulus stage. This stage is now capable of settling out of the plankton into suitable habitats which are mostly shallow inshore reefs where they can begin life as a tiny juvenile rock lobster.

Recruitment

Most lobster larvae do not survive their long oceanic journey. Many are eaten by predators or are not carried close enough to the shallow reefs by the ocean currents to allow them to settle. Therefore, the number settling can vary greatly from year to year largely as a result of changes in environmental factors. When the Leeuwin Current is flowing strongly, a higher proportion of the larval lobsters return to the coast. Westerly winds at the time of year when the puerulus are ready to settle may also help more to reach the shallow reefs along the coast.

The puerulus that successfully return to the coast, moult to become juveniles which look like miniature adults. These juveniles feed and grow on the shallow inshore reefs for the next three or four years. About four years after settlement, the lobsters undergo a synchronised moult in late spring when they change from their normal red shell colour into a paler colour. They are then known as “white” lobsters until they return to their normal red colour at the next moult a few months later. The white phase of a rock lobster’s life is the migratory phase. At this time (summer) they leave the coastal reefs and undergo a mass migration into deeper water where they become sedentary again on deeper reefs. A small percentage makes longer migrations, usually following the continental shelf in a northerly direction.

Ecology

Growth rates of rock lobster vary from place to place and also between individuals. In the central west coast region (the middle of the species distribution), most lobsters reach 76mm carapace length (the legal size for most of the fishery – see below) either in their third year after settlement, before they moult into the white phase or in their fourth year, after they have moulted into the white phase.

The western rock lobster is an opportunistic omnivore feeding on a wide range of food items from coralline algae to molluscan and crustacean fauna (Joll and Phillips 1984; Edgar 1990a), the populations of which probably have high productivity, high turnover rates and short life cycles. Studies have found that juvenile rock lobsters show a range of diets and feeding strategies, varying greatly between seasons and between different habitats in the same season (Edgar 1990a). Edgar (1990a) reported that the diet of *P. cygnus* reflected the abundance and size distribution of benthic macrofauna available on all sampling occasions.

As juveniles, *P. cygnus* are eaten by a number of fish species whilst at large sizes they are one of a number of prey items for octopus and a variety of larger finfish. There are no predators that rely on western rock lobster as their only prey item.

3.2 DESCRIPTION OF THE FISHERY

The Western Rock Lobster (WRL) fishery began in the 1940s and expanded rapidly over the next 15 years to annual catches in excess of 8,000 tonnes in the mid 1950s (Figure 3; see Gray, 1999 for full details on history). During the last 20 years the annual catch has averaged approximately 10,000 tonnes but has varied from 8-14,000 tonnes due to natural variations in the level of recruitment. The catch in 1999/2000 was valued at over \$350 million and each transferable lobster pot entitlement (of which there are currently 56,906) has a value over \$25,000, which combined with the value of the nearly 600 boats in the fishery, results in a market capitalisation of at least \$2 billion.

The commercial fishery for Western Rock Lobster is a “potting” fishery. This activity occurs from inshore regions in shallow waters out to the edge of the continental shelf with the only allowable

method for capture being from the use of pots (traps) of a batten design made of wood slats or a beehive construction constructed from cane (the precise dimensions including escape gaps and neck sizes are specified in regulations). Baited pots are released (set) from boats in regions thought to have lobsters; often near reefs where the lobsters usually reside or in regions thought to be migration paths. This is based upon a combination of information gained from depth sounders, GPS systems, previous experience and recent catch rates in the area. The pots are left overnight during which time lobsters are attracted to the baits and enter the pots. The pots are generally retrieved (pulled) the following morning with the captured lobsters of legal size and of appropriate reproductive status (e.g. not berried etc.) placed into holding tanks and returned to on-shore processing plants where the majority are prepared for live shipments to overseas markets.

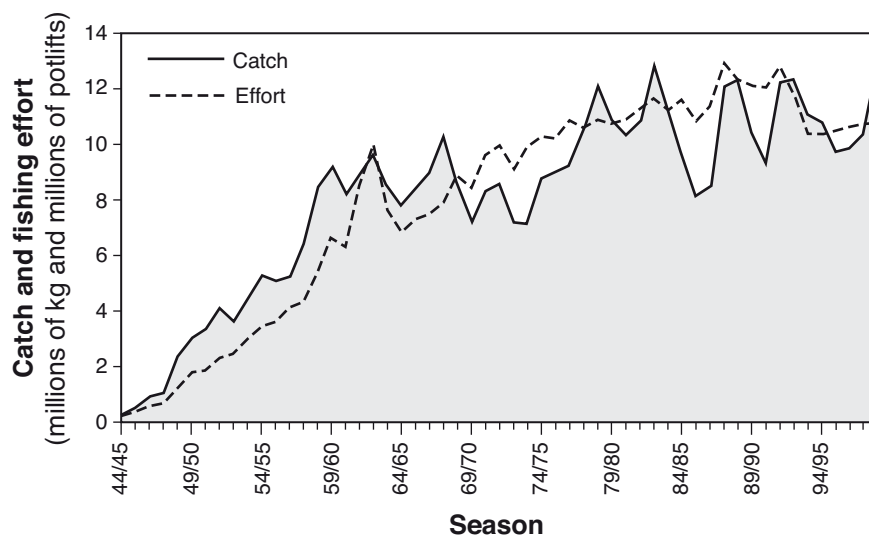


Figure 3. The catch and nominal effort for the Western Rock Lobster fishery.

The Western Rock Lobster Managed Fishery is a managed fishery under section 65 of the *Fish Resources Management Act 1994*. The primary management methods in the fishery are input controls, that is, controls that affect the way fishing may be undertaken in order to limit what can be caught. There is a practical limit on the number of licensees that can operate in the fishery (due to the minimum pot holding) and there is also a cap on the total number of pots that can operate in the fishery. Each licence has a number of pots associated with it and this limits the amount of gear that they can use at any given time within the fishing season. Both the managed fishery licences and the individual pot entitlements are transferable (within limits). This style of management for this fishery is often described as being an Individual Transferable Effort (ITE) fishery. It has the advantage that catch will, to a large extent, track any changes in relative abundance caused by recruitment variations without the need for yearly changes in management that would be necessary using output based (e.g. quota) methods. Changes in harvest rates can be made by varying the level of effort allowed either by changing the number of pots, the time/ areas of operation.

A number of biologically based measures are used to assist the management of this fishery including a minimum legal size for rock lobster of 77 mm carapace length from 15 November to 31 January and 76 mm carapace length from 1 February to 30 June in any year. This results in the lobsters being recruited to the fishery three or four years after they settle as puerulus. Although there are escape gaps fitted to the lobster pots to minimise the capture of animals below legal size, some are caught anyway and released back into the water. They generally survive this experience provided they are released within 5 minutes of reaching the deck of the boat.

The commercial WRL fishery operates from all the ports between Denham and Bunbury, and numerous anchorages on the whole of the west coast south of Turtle Bay (Shark Bay; Fig. 4). Effort is evenly split between the Southern (zone C) and Northern zones (A & B & Big Bank). Whilst recreational fishermen also fish the whole west coast, their activity is more intense around the main population centres of Perth and Geraldton.

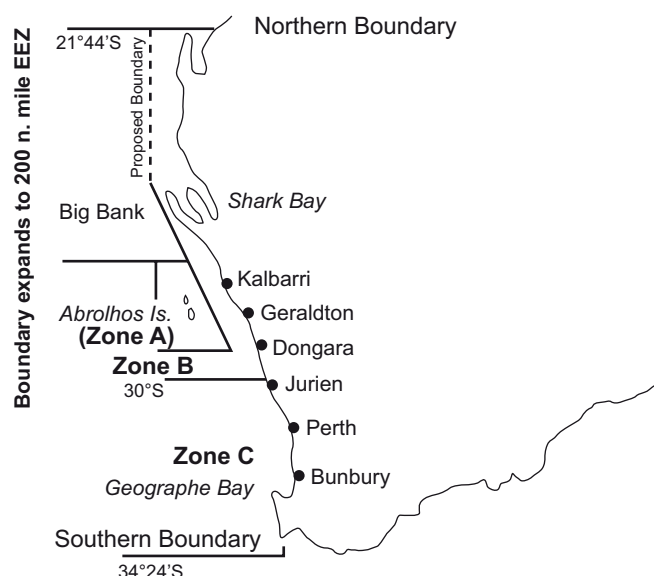


Figure 4. Western Rock Lobster Fishery Zones.

The fishing season in coastal waters opens on 15 November. At this time both the commercial and recreational fishermen fish the coastal reefs. When the “whites” (see above) run starts, most of the commercial fishermen follow the migration offshore. Many lobsters grow from less than legal minimum length to greater than legal minimum length as a result of moulting in November so at this time there is a sharp increase in the abundance of legal sized animals. The lobsters are also more catchable during this period, being in a post-moult, active feeding phase, therefore the commercial catch rates are high during the “whites run”.

There is another run of whites lobsters out of the Abrolhos Islands area northwards towards Big Bank in February. This is known as the “Big Bank run”. There is a restricted season for fishing the Big Bank whites run which is 10th February to the end of February.

The abundance of legal sized lobsters is reduced by fishing over the summer but is replenished by another moult of undersized lobsters in February, when they grow from undersized to legal size, resulting in a second peak in both commercial and recreational catches during March. The season for the Abrolhos Islands area opens on 15 March and catch rates are high for the first few weeks. Catches both on the coast and at the Abrolhos Islands taper off towards the close of the season on June 30.

The commercial fishery was declared a limited-entry fishery in 1963 with about 830 boats having access to the fishery at that time. The total number of pots has been controlled since 1965 when the restrictions on the length of replacement boats were introduced. With the passage of time about 25% of the original number of boats have sold their pot entitlements to other licensees, resulting in a reduction in the fleet size to 594 boats in March 2001. Because the commercial fishers have found many ways to increase their catching efficiency over the years (e.g. radar, GPS, engine power, pot winches etc.), additional fisheries management controls have been used to constrain fishing effort such that the rock lobster stock can continue to sustain the level of catch. Measures adopted in the past have included shortening the fishing season by six weeks and permanently reducing the pot numbers by 10%.

In the late 1980s and early 1990s the breeding stock had fallen to a level which could have resulted in a reduction in the average levels of recruitment to the fishery. In 1993 a management package was introduced aimed at rebuilding the breeding stock of western rock lobster to levels where this possibility was minimised. This package included a temporary reduction of a further 18% to the commercial pot numbers and prohibition on taking various reproductive stages of rock lobster (in addition to the berried female restrictions) to increase the flow-through of pre-breeding lobsters to the breeding stock and to increase the survival of breeding females.

This package of management measures was originally intended to remain in place for two years while RLIAC developed options for the long-term management of the fishery. However, as the package appeared to be succeeding in its objective of rebuilding the breeding stock, it was extended and has largely continued through to the 2001/02 season.

Summary of WRL Management Arrangements

Closed season July 1 to November 14 (Coastal Zones), March 14 (Abrolhos Is.)

Maximum Number of pots entitlements for fishery (currently 56906 pots distributed amongst 594 boats)

The licensee can only operate in the zone for which he/she is licensed

Minimum size of carapace is 76 mm, except for a period of 2.5 months at the start of the season when the minimum size is 77 mm.

It is illegal to take setose females or those carrying eggs, or tarspot.

A maximum size of 115 mm for lobsters landed south of 30°S and 105 mm for landed north of 30°S (except for 2001/02 only).

The configuration of pots and size and number of escape gaps (54 mm) are regulated.

Pots may only be pulled during specified daylight hours.

To operate in the managed fishery, a licence must have between 63 and 150 units of pot entitlement.

The commercial fishery is divided into a number of zones (see Figure 4). The boundary between the northern and southern zones is at 30°S. The northern zone is further divided in that only A Zone licences fish the Abrolhos Islands area (which does not open until after March 15) while B Zone licences can only fish the remaining coastal waters. There are also some small areas in the fishery from which all commercial and/or recreational fishing are excluded.

The recreational fishery for lobsters has not been limited in terms of the number of licences issued, but a recreational licence is necessary. There is, however, a limit of two pots per fisherman and a daily bag limit of eight lobsters with the total recreational catch estimated to be between 3% and 6% of the commercial catch. The number of recreational licences issues is monitored and from an annual phone survey, an estimate of the catch by this sector is made. The annual catch of the recreational fishery has comprised a similar percentage of the total catch for the past 8 years. Moreover, methods to forecast the following years recreational catch have now been developed.

The annual catches in the commercial fishery have varied over the past 20 years between 7000 and 14000 tonnes. The variation in the number of puerulus that successfully return to the shallow reefs each year is translated into the number of lobsters recruiting to the fishery, and consequently the catch, 3-4 years hence.

Research and monitoring of the WRL fishery has been conducted for over 50 years and has one of the best biological and fishery datasets in the world. Currently, this work is mostly conducted by the Research Division of the Department of Fisheries. However, during the 1970s-80s, CSIRO was heavily involved in lobster research and a number of tertiary institutions are also currently involved in lobster research, particularly in the area of post harvest technology.

The annual variation in puerulus settlement is estimated from samples taken at a number of locations on the west coast using artificial seaweed puerulus collectors. As well as being an indication of the success of the previous year's spawning, the puerulus estimate is used to predict the approximate size of the commercial catch three or four years ahead. A spawning stock survey is undertaken each year by research staff on commercial and research vessels. About one third of the commercial fishermen assist with monitoring of breeding stock and other facets of the fishery by completing a detailed daily log book. Finally, Department of Fisheries officers undertake sample monitoring of the fishery onboard commercial vessels where they collect information on the sizes of lobsters caught, noting the reproductive state of rock lobsters along with many other factors.

Enforcement of the rules of commercial and recreational rock lobster fishing is a major part of the work of all Fisheries Officers on the west coast south of Shark Bay. Patrol boats are used for at sea inspection, policing fishing zone boundaries and pot numbers, and shore based officers inspect the landed lobsters, particularly within processing plants for compliance with minimum sizes etc. There is currently a high level of cooperation from the industry and a high level of compliance with the regulations.

In 1999, the WRL was the first fishery worldwide to be awarded Marine Stewardship Council chain of custody certification on the basis of demonstrating the ecological sustainability of its fishing and management operations. To achieve this, the WRL fishery was assessed by an international group of experts against the criteria set out in the MSC guidelines (see web site www.msc.org for details). A number of ongoing requirements are needed to continue this accreditation including a risk assessment of the environmental risks associated with the fishery. This risk assessment formed part of the process for completing this report.

3.3 MAJOR ENVIRONMENTS

3.3.1 Physical environment

The rock lobster fishery operates off the lower-mid west coast of western Australia. This region is characterised by coastal limestone reefs covered in macroalgae. Offshore there are a series of deeper reefs that were formed under previous lower sea level conditions. In between these reefs are extensive areas of sand.

In the northern areas, particularly around the Abrolhos Islands, fishing occurs in regions where there are extensive areas of coral reef, interspersed with limestone reefs covered by macroalgae.

The water in this region is oligotrophic and is influenced greatly by the seasonal flow of the Leeuwin current, which is a warm body of water of tropical origin that flows most strongly during the winter months of April – September (Pearce et al., 1990). The strength of the Leeuwin current varies annually depending upon the value of the El Nino-Southern Oscillation index (ENSO), which is the difference

in air pressure between the Indian and Pacific Oceans. In turn, the strength of the Leeuwin current has been shown to have a major influence on western rock lobster catches and a number of other WA marine species (Caputi *et al.*, 1996)

3.3.2 Economic environment

The need to increase the live trade has altered some fishing practices but has increased the profitability of the fishery with the average price of lobsters having increased greatly over this period. The catch is exported either live or frozen, as whole cooked or whole raw lobsters to Taiwan, Japan, and Hong Kong/China or processed into frozen raw tails for the United States.

Small quantities of live and whole cooked lobster are now penetrating the European market.

The USA was once the sole market for WA lobster with product being sold as frozen tails, but the focus shifted dramatically to whole frozen and live trade to the Asian region in the 1990s. However, with the very large catch in 1998/99 and the record breaking catch of 1999/2000, the US tail market again became important as processors sought to distribute product to maintain returns.

A symbol of good fortune and happiness in Japan, and highly prized for weddings or other ceremonial occasions, a small red lobster in perfect condition will fetch top prices.

There is a small local market, mainly for whole cooked lobster.

3.3.3 Social environment

The fishery has had considerable impact on regional WA. It operates out of a large number of ports along the central coast of WA. The 600 or so vessels usually have a crew of 2 or 3 (a skipper and one or two deckhands), thus there are typically about 2000 people directly employed by this fishery. In addition there are around 6000 people employed by the lobster processing sector and the associated support and service industries.

Along with playing a role in the generation of significant levels of income and employment, for many coastal communities, much of the infrastructure associated with their ports, and in many cases the towns themselves, has been created as a result of this fishery. Consequently this fishery forms an important part of the culture of many small communities.

4.0 Outline of reporting process

4.1 SCOPE

This ESD report was generated by assessing “*the contribution of the Western Rock Lobster fishery to ESD*”. This assessment examined the benefits and the costs of the WRL fishery across all the major components of ESD (see Table 1). In doing so, it provides a report on the performance of the fishery for each of the relevant ecological, economic, social and governance issues associated with this fishery. Because of the limited criteria used in the “*Guidelines for the Ecologically Sustainable Management of Fisheries*” – only some elements of ESD are required to be reported here. These are outlined below in Table 1.

Table 1. Main National ESD Reporting Components.

Only those elements in **bold*** are reported in this application. A full ESD report covering all elements will be published shortly.

NATIONAL ESD COMPONENTS	
Contribution to Ecological Wellbeing	
	<i>Retained Species*</i>
	<i>Non-Retained Species*</i>
	<i>Other Environmental Issues*</i>
Contribution to Human Wellbeing	
	<i>Indigenous Community Issues</i>
	<i>Community Issues</i>
	<i>National Social and economic Issues</i>
Ability to Achieve	
	<i>Governance*</i>
	<i>Impact of the environment on the fishery</i>

4.2 OVERVIEW

There were four steps involved in completing the ESD report for the WRL fishery. It was based upon using the National ESD process which is outlined in detail in the WA ESD policy paper:

1. A set of “Component Trees” that identified the issues specific to the WRL fishery was developed from the 8 generic National ESD component trees.
2. A risk assessment/prioritisation process was completed that objectively determined which of these identified issues was of sufficiently significance to warrant specific management actions and hence a report on performance. Justifications for assigning low priority or low risk were, however, also recorded.
3. An assessment of performance for each issue of sufficient risk to require specific management actions was completed using a standard set of report headings where operational objectives, indicators and performance measures, management responses etc are specified.
4. An overview assessment of the fishery was completed including an action plan for activities that will need to be undertaken to enable acceptable levels of performance to continue or, where necessary, improve the performance of the fishery.

4.3 ISSUE IDENTIFICATION (COMPONENT TREES)

The National ESD reporting framework has eight major components which fall into three categories of the “contributions to ecological wellbeing”, “contributions to human wellbeing” and the “ability to achieve” the objectives (Table 1). Each of the major components is broken down into more specific sub-components for which ultimately operational objectives can be developed.

To maximize the consistency of approach amongst different fisheries, common issues within each of the components identified by the then SCFA and ESD reference groups within each of the major component areas were arranged into a series of “generic” component trees (See WA Policy paper and the fisheries-esd.com web site for a full description). These generic trees were used as the starting point for this assessment and were subsequently adapted into trees specific to the WRL fishery during an open consultative process involving all stakeholder groups. This is achieved by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (see Fig. 5).

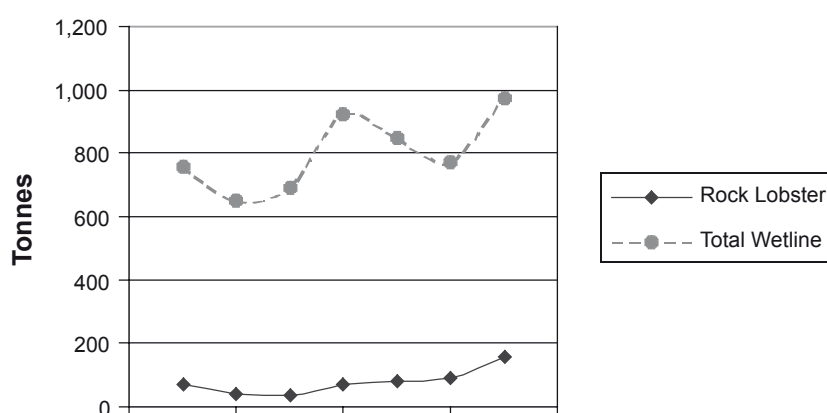


Figure 5. Example of a component tree structure.

The trees for the WRL fishery were developed at a meeting held over two days during August 2000. The stakeholders present during this meeting covered the commercial industry, recreational fishers, environmental groups, Environment Australia, Department of Environmental Protection, Department of Fisheries staff and the FRDC project team (full attendance list in Appendix 1.1)

4.4 RISK ASSESSMENT/PRIORITISATION PROCESS

After the components/issues were identified with the component trees, a process to prioritise each of these was completed. The environmental issues were assessed as part of the requirements for continued MSC accreditation using a formal risk assessment that was conducted by independent consultants, International Risk Consultants (see IRC, 2001 for full details) using a two-day meeting held in January 2001. The participants at this meeting included a large number who attended the SCFA-FRDC meeting along with a number of other relevant stakeholders and experts (a full list of participants is located in Appendix 1.2).

4.4.1 Environmental risk assessment

Full details of the risk assessment are located in the report to MSC (IRC, 2001 – see attached PDF). In summary, the risk assessment framework that was applied at the workshop was in line with the

Australian Standard AS/NZS 4360:1999 Risk Management - concentrating on the hazard identification and risk assessment components.

Risk Assessment considers the range of potential consequences and how likely those consequences are to occur. The consequence and the likelihood are combined to produce an estimated level of risk associated with the particular hazardous event in question.

A realistic estimate was made by the group for the consequence level from 1-5, with 1 being minor and 5 being catastrophic/irreversible. This assessment was based upon the collective judgement of the participants at the workshop who together have considerable expertise in the areas examined. Similarly, in assigning likelihood to one of six levels from remote to likely, the workshop group considered the likelihood of the hazardous event actually occurring based upon their collective wisdom including an understanding of the scale of impact required.

From these two figures (consequence and likelihood), the overall level of Risk Level which is the mathematical product of the consequence and likelihood levels $\text{Risk} = \text{Consequence} \times \text{Likelihood}$. In addition each issue was then assigned a *Risk Ranking* within one of three categories: High, Moderate and Low (see Table 2)

Table 2. Risk Ranking Definitions².

H	Greater than and equal to 15	High Risk. Immediate action is required. For example, Senior Fisheries staff attention required to advise CEO and Minister, call a special meeting of Rock Lobster Industry Advisory Committee and undertake immediate action.
M	Greater than and equal to 5 but less than 15	Moderate Risk. Risks are acceptable as long as risk reduction is applied, or continued to be applied, to reduce risks to ALARP ³ . For example, Fisheries staff attention is required to prepare report with recommendations for next scheduled RLIAC meeting, e.g. phase in effort reduction.
L	Less than 5	Low Risk. Risks are broadly acceptable and are managed by current procedures.

This process was completed for each of the identified issues with a risk ranking developed and the rationale for assigning these rankings recorded.

4.5 COMPONENT REPORTS

Only the issues of sufficient risk or priority that require specific management actions have a full performance report completed (which form sections 5 of this report). Nonetheless, the rationale for classifying issues as low risk/priority were also documented and forms part of the report so that stakeholders can see where all the identified issues have finished (Section 6 for this report).

For each of the lowest level sub-components (assessed as being of sufficient risk/priority to address), a detailed assessment of performance is generated. The then SCFA Working Group in conjunction with the ESD Reference Group has agreed upon a set of 10 standard headings that each need to be addressed (Table 3). Added to this list a further heading, “**Rationale for inclusion**”, has been added. This specific heading allows the issues raised within the risk assessment process to be explicitly recorded.

² Note this risk table, and the consequence tables have been substantially updated since this meeting.

³ ALARP - as low as reasonably practicable.

Table 3. The National ESD Report headings used in this report.

1. Rationale for Inclusion
2. Operational Objective (+ justification)
3. Indicator
4. Performance Measure (+ justification)
5. Data Requirements
6. Data Availability
7. Evaluation
8. Robustness
9. Fisheries Management Response
- Current
- Future
- Actions if Performance Limit exceeded
10. Comments and Action
11. External Drivers

The completion of these component reports was begun at the initial SCFA-FRDC meeting back in August 2000. Examples from each of the main component areas were sketched out during this meeting to allow an understanding of what data were required to be generated by the group for each of the issues. Progress towards completing these reports was subsequently made by a variety of Department of Fisheries staff with many aspects assisted by completing the risk assessment document for the MSC accreditation process.

4.6 APPLICATION TO MEET EPBCA REQUIREMENT

The material generated by the ESD reporting process, which is contained with the risk assessment and performance reports was used to meet the requirements of the Commonwealth Environment Protection and Biodiversity Conservation Act (1999). This involved submitting an application that addressed each of the criteria of the Commonwealth guidelines for the assessment of sustainable fisheries. This information is provided in Appendix 7.

4.7 OVERVIEW TABLE

The following table provides a summary of the material presented in the report. For more details, click on the blue highlighted hyperlinks to view the full contents of the relevant section. There are appropriately placed return links back to this overview table.

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	EA Guidelines Covered	Actions
RETAINED SPECIES (Component Tree)						1.1	
5.1.1.1 Spawning Biomass of Lobsters	Yes	Spawning biomass at Abrolhos I and Coastal Regions	Above 22% unfished level	Acceptable	High	1.1.1-1.1.7	Continue current monitoring, management and assessment arrangements
5.1.2.1 Octopus	Yes	Catch rate of Octopus in monitoring program	Catch rate not to drop outside of historic range by greater than 10%	Acceptable	Medium	1.1.8	Analyse the observer information on octopus catches/catch rate
5.1.2.2 SCALEFISH & SHARKS	No – Low Risk	NA	NA				Re-assess when review of wet line fishing is completed
5.1.2.3 DEEP-SEA CRABS (INCLUDING SPINY CRABS)	No – Low Risk	NA	NA				Re-assess depending upon changes to crab management arrangements
NON RETAINED SPECIES Component Tree						2.1, 2.2	Risk Assessment Completed
5.2.1.1 Sea Lion	Yes	Begun in 2001	No Increase in rate of capture	Acceptable	Low	2.2.2, 2.2.4, 2.2.6	Initiate Monitoring Examine Other Fisheries
5.2.1.2 :Moray Eels	No –Low Risk	N/A	N/A	NA		2.2.2	Low Risk –Review next assessment
5.2.1.1 Leatherback Turtles	Yes	Begun in 2001	No increase in rates of interactions	Acceptable	Low	2.2.2, 2.2.4, 2.2.6	Initiate Monitoring of interactions
5.2.1.2 Whales and Dolphins	Yes	Begun in 2001	No increase in rate of interactions	Acceptable	Low	2.2.2, 2.2.4, 2.2.6	Monitor numbers caught
5.2.2.3 : Manta Ray	No –Low Risk			NA			Low Risk – Review at next major assessment

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	EA Guidelines Covered	Actions
GENERAL ENVIRONMENT (Component Tree)						2.3	Risk Assessment Completed
5.3.1.1 Impacts on ecosystem (trophic levels)	No –Low Risk	N/A	N/A/	N/A	N/A	2.3.1-2.2.5	Monitor overall lobster biomass
5.3.1.2 Impacts on Coral	Pending Further Study	Awaiting Further Data		Acceptable		2.3.1-2.2.5	Implement Recommendations from Abrolhos Is. Workshop
5.3.1.3 Impacts on Limestone Reefs	No –Low Risk	N/A		NA			Review Risk at Next Major Assessment
5.3.1.4 Impacts on Seagrass	No –Low Risk	N/A		NA			Review Risk at Next Major Assessment
5.3.2.1 Bait Usage (impacts on ecosystem)	No –Low Risk	N/A		NA			Review Risk at Next Major Assessment
5.3.2.2 Bird and Dolphin Behaviour	No –Low Risk	N/A		NA			Review Risk at Next Major Assessment
5.3.3.1 Camping at the Abrolhos Islands	Draft	N/A		Acceptable	NA	2.3.1-2.2.5	Management Plan for Abrolhos Is. developed
Waste Dumping at the Abrolhos	Pending Action	N/A		Acceptable	NA	2.3.1-2.2.5	Being addressed by ban of dumping waste
5.3.3.2 Air Quality	No- Low Risk			NA		2.3.1-2.2.5	
5.3.3.3 Debris	Draft			NA		2.3.1-2.3.5	A number of possible indicators identified, requires selection by industry
GOVERNANCE Component Tree							
5.8.1.1 Management Effectiveness	Yes	Actual Catch vs Predicted Catch	Difference > 10%	Acceptable		Background	Continue monitoring of catch and puerulus to calculate predicted catch levels.
5.8.1.2 Management Plans	Yes	The extent to which the “Plan” covers the 10 required principles	Must cover 100%	Acceptable		Background	Revising to incorporate Harvest Rules to clarify future management responses

Issue	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	E/A Guidelines Covered	Actions
5.8.1.3 Compliance	Draft	Draft		Acceptable		Background	Continue to refine methods to ensure cost effectiveness remains adequate. Current focus of FRDC project
5.8.1.5 Interagency coordination	Draft					Background	
5.8.3.1 Consultation	Draft			Being Reviewed		Background	
5.8.3.2 Reporting	Yes	State of Fisheries (annual); Full assessment ESD (5 yearly)		Acceptable		Background	Developing MOU with EPA and OAG to undertake annual audits of performance and 5 yearly assessments of criteria

5.0 Performance reports

5.1 RETAINED SPECIES

Component tree for retained species

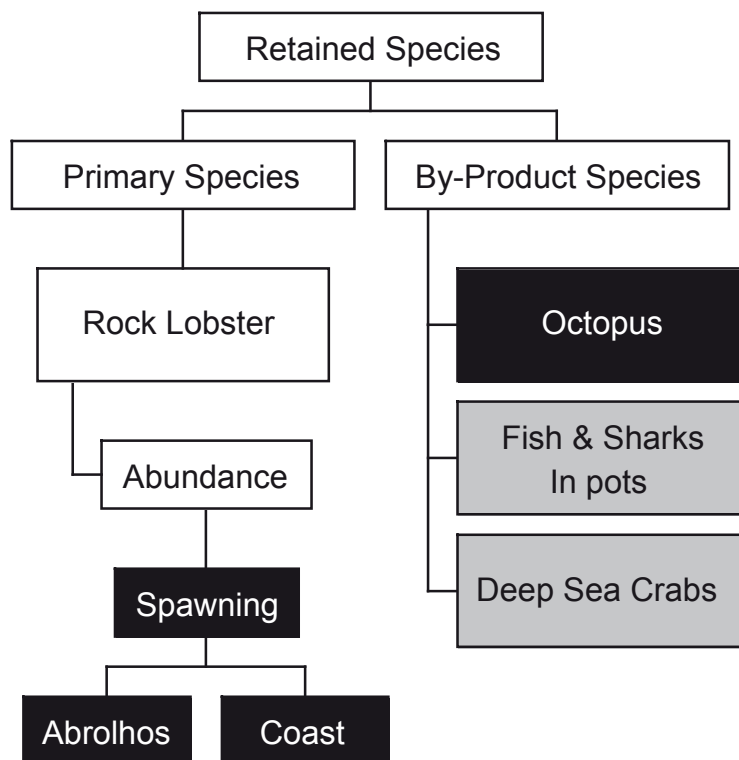


Figure 6. Component tree for the retained species.

Note: No major Generic Components were deleted from this tree when it was developed at the August 2000 workshop. Black boxes indicate that the issue was considered high enough risk at the January 2001 Risk Assessment workshop to warrant having a full report on performance, Grey boxes indicate the issue was rated a low risk and no specific management is required - only this justification is presented.

5.1.1 Primary species

5.1.1.1 Spawning biomass of lobsters

Rationale for Inclusion

The western rock lobster *Panulirus cygnus* is the main target species of the fishery which has a commercial range extending from Shark Bay to Bunbury (see Figure 2), and has an annual average commercial catch of about 10,500,000 kg (10 year average). It has been recognised that to maintain both the biological sustainability and the long-term economic success of commercial exploitation (by maintaining catches as close as possible to the annual average), the breeding stock needs to be maintained above a minimum level. In particular, the Abrolhos Island stock is considered to be a significance source of recruitment for the whole fishery. However, to ensure that any trends indicating a decline in breeding stock levels is not overlooked data is collected from breeding stocks throughout the fishery. The spawning stock for the Coastal and Abrolhos Islands regions are collected and assessed both separately and as an aggregate (Chubb, 2000; Hall and Brown, 2000).

ERA Risk Rating – not completed during January meeting

Subsequent Assessment of Risk – Impact on Breeding Stock (C2 L5- Moderate Risk)

Operational Objective

Ensuring there is sufficient breeding stock⁴ to continue recruitment at levels that will replenish that taken by fishing, predation and other environmental factors by maintaining the spawning stock of western rock lobster at or above a level that minimises the risk of recruitment overfishing.

Justification

Whilst there is not a direct relationship between the size of the WRL breeding (spawning) stock and subsequent levels of recruitment across the entire range of stock sizes, there will be a level of reduction in stock (and therefore the level of egg production), when recruitment levels are likely to become adversely impacted. This phenomenon is often defined as recruitment over-fishing. Therefore, as a minimum, the breeding stock (or levels of egg production) should be maintained at levels above where these adverse impacts are likely to occur.

Indicator

Estimates (indices) of the level of breeding stock and the associated level of egg production are obtained from two programs conducted by the Department of Fisheries (Chubb, 2000):

- At-sea monitoring of the abundance and size frequency of breeding females in the commercial catch. This is referred to as the “*monitoring spawning index*”. It provides indices for the two coastal areas based on monitoring at Dongara and Jurien for the northern index and Lancelin and Fremantle for the southern index. This index is not calculated for the Abrolhos Islands region because it is not open during the spawning season. Furthermore, given the small size at maturity at this location means that the total catch in this region can be used as an indicator of spawning biomass.
- A fishery independent, systematic survey of the breeding grounds is conducted immediately prior to the rock lobster season (in October), which is at the beginning of the breeding season. The survey is carried out using charter vessels that fish to research specifications. It is referred to as the “*independent breeding stock survey index*” and is made up of a coastal index, with sampling taking place at Fremantle, Lancelin, Jurien, Dongara and Kalbarri, and an Abrolhos Island index, with sampling taking place throughout the Island groups.

Performance measure

For acceptable performance, the best estimate of the current level of egg production should be above the agreed limit reference point. This limit reference point is the estimated level egg production that was present of during the late 1970s, currently estimated to be approximately 22% of the unfished level (Hall and Brown, 2000).

Justification

In the early 90's the stock assessment analyses showed that spawning biomass for the lobsters had continued to decline and was probably less than 15% of the unfished levels (Walters et al. 1993). Whilst even at this low level there was no evidence of an impact on recruitment levels, there was increasing concern that this may begin to occur. Consequently, the management objective in the 93/94 management

⁴ The level of breeding stock should not be confused with the level of the exploitable biomass, the latter is the component of biomass that is susceptible to harvesting.

package (which has subsequently become the longer term performance limit measure) was to return the spawning biomass to levels above those that were present about 15 years previously i.e. before 1980. Consequently, the 93/94 target of moving the spawning biomass back above the 1980 level was instigated as a precautionary measure and, therefore, this limit itself can be deemed precautionary.

The justification for this being a precautionary limit is that if there hadn't been a problem with the levels of lobster recruitment during the 15 year period when spawning stock levels were below the 1980 level, then there was virtually no chance there would a problem when the spawning stock levels were significantly above it (i.e. > 50% above the lowest point).

The breeding stock level at the end of the 1970s was estimated using the current model to be 22% of unfished levels. The method used to calculate this value is further elaborated in (Hall & Chubb, 2002). It is a "physical" limit based on experience rather than being a "philosophically" based limit. Consequently, this is one of the more robust estimates of a "safe level" of spawning biomass because it uses a long history of recruitment data, combined with relatively accurate estimates of the biomass trajectory during this period.

Data requirements for indicator

Data Requirement	Availability
Results from an independent survey of breeding stock undertaken by Department of Fisheries. (i.e. the independent breeding stock survey indices (see Chubb 2000))	Yes; available on an annual basis – since 1991
Information on the relative number and sizes of breeding (berried, setose and spawning size) lobsters collected At sea monitoring by fishermen and Department of Fisheries research staff, - see Chubb 2000 for more details	Yes; available on an annual basis – since 1970
Computer modelling and simulations based on catch data, puerulus settlement and breeding stock estimates. (see Hall and Brown, 1999; Hall and Chubb in press)	Undertaken on annual basis but extent of analysis may vary.

Evaluation

Summary: *The current analyses indicate that in most parts of the fishery, the breeding stock is at or above the agreed reference point of 22% of unfished biomass. Consequently, the current performance of the fishery for maintaining a sufficient level of spawning biomass is acceptable.*

Management measures introduced during the 1993/94 season have essentially remained unchanged and the breeding stock has responded positively to these measures generally showing upwards trends (Figures 7 - 9).

The fishery-dependent *monitoring spawning stock indices*, for the north (Jurien and Dongara) and south (Fremantle and Lancelin) coastal regions are presented in Figure 7. The *independent breeding stock indices* of egg production for the Abrolhos Islands and coastal sampling sites are shown in Figures 8 and 9 respectively.

All indices show a substantial and very significant increase in the breeding stock in response to the management package introduced for the 1993/94 season, which specifically aimed at improving egg production. Although the Abrolhos breeding stock has declined slightly in the last 5 years, it is significantly above the levels of the early 1990s. Current indications from both sets of indices used to monitor the breeding stock are that egg production has now reached or is above the target levels set in 1993/94 (i.e. > 22%).

The slight decline in egg production in the Abrolhos Islands since 1996 is not an issue for a number of reasons. In this area, the size at maturity is below the legal-size limit, consequently, the breeding stock at the Abrolhos did not suffer the large declines seen in the coastal areas in the late 1980s and early 1990s. Moreover, current levels, despite the recent decline, are still more than 50% above the levels prior to the introduction of the 1993/94 management measures. Finally, the fluctuations seen since 1996 merely reflect natural variations in the recruitment strength of cohorts moving through the fishery. The trend in abundance of the breeding stock at the Abrolhos will continue to be monitored every year using a fishery-independent survey. Some additional analyses will be undertaken in 2002 to determine what areas of the Abrolhos are contributing to this decline.

Indices of egg production derived from fishery-based data may become distorted as a result of the effects of technology and increases in fishing efficiency; variations in the distribution of fishing effort in response to annual variations in puerulus settlement and subsequent recruitment to the fishery; fishers' responses to the regulations (e.g. the setose regulation), and/or market-driven factors. Therefore, the fishery-independent breeding stock surveys to assess the strength of egg production will continue, and will act as a calibration for indices derived from fishery data.

The protection of large females is being withdrawn in the 2001/02 season by the relaxation of the maximum size rule for only that season. This change was instigated following a submission from RLIAC to the Minister based upon a modelling exercise that showed that this proposal would have less than a 1% impact on the breeding stock. The rationale for this proposal was that the spawning biomass had increased to levels well above the performance limit and there are suggestions that larger number of big lobsters in the deepwater may inhibit subsequent recruitment of smaller lobsters into these areas. The maximum size rule will be reinstated next season (2002/03) and an assessment of the impact will be made. This is an example of an adaptive management strategy – making small temporary changes to see what affect they have - which should improve our longer term understanding. Egg production indices are being closely monitored and future years may see more frequent adjusting of management measures to keep the index at levels similar to those that are currently being recorded.

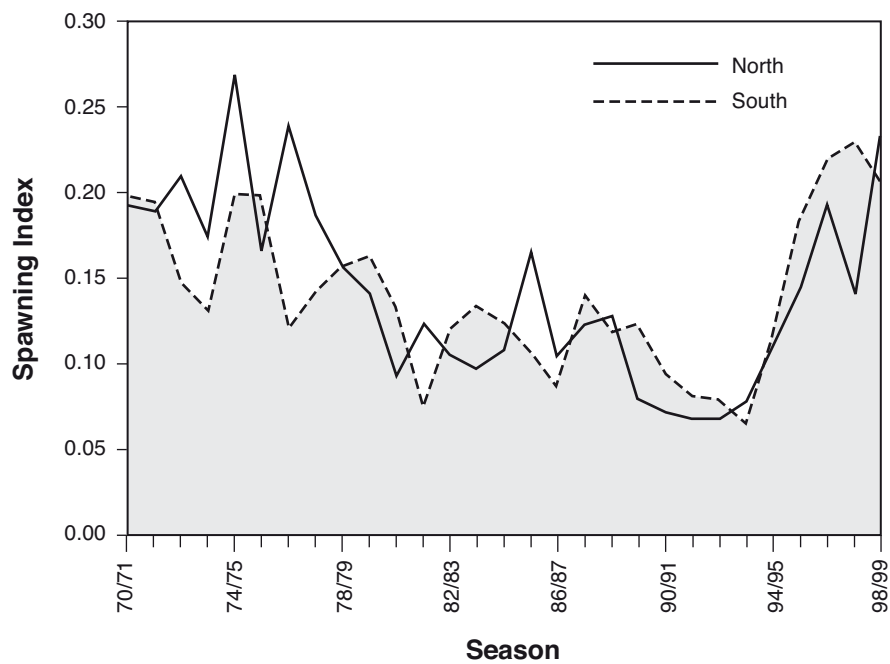


Figure 7. Time series of the monitoring spawning stock index (an index of numbers of eggs/pot lift integrated over the whole season) for the north (Jurien and Dongara) and south (Fremantle and Lancelin) coastal regions.

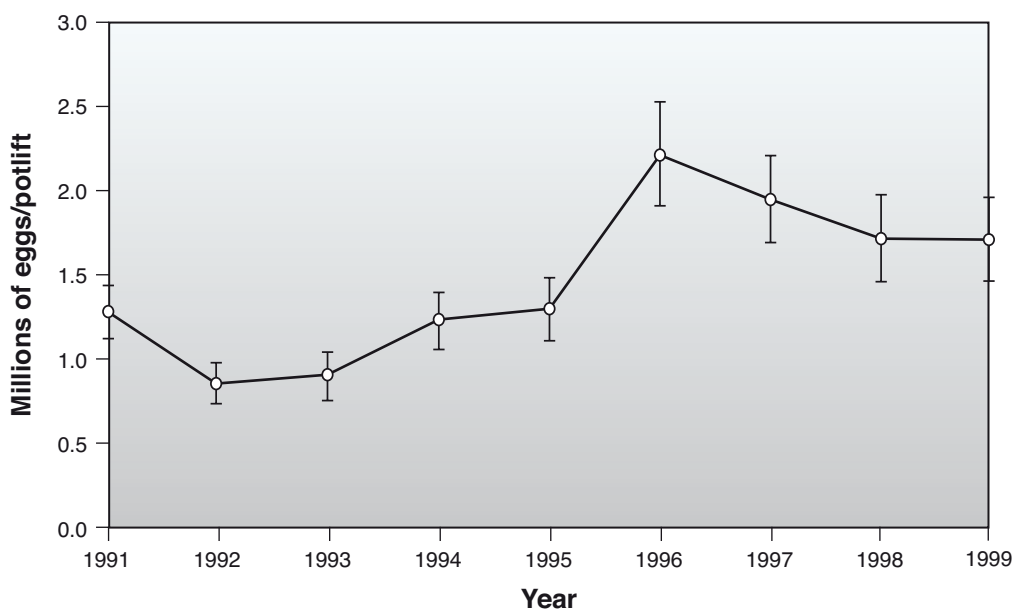


Figure 8. Egg production indices as measured by the independent breeding stock survey at the Abrolhos Islands.

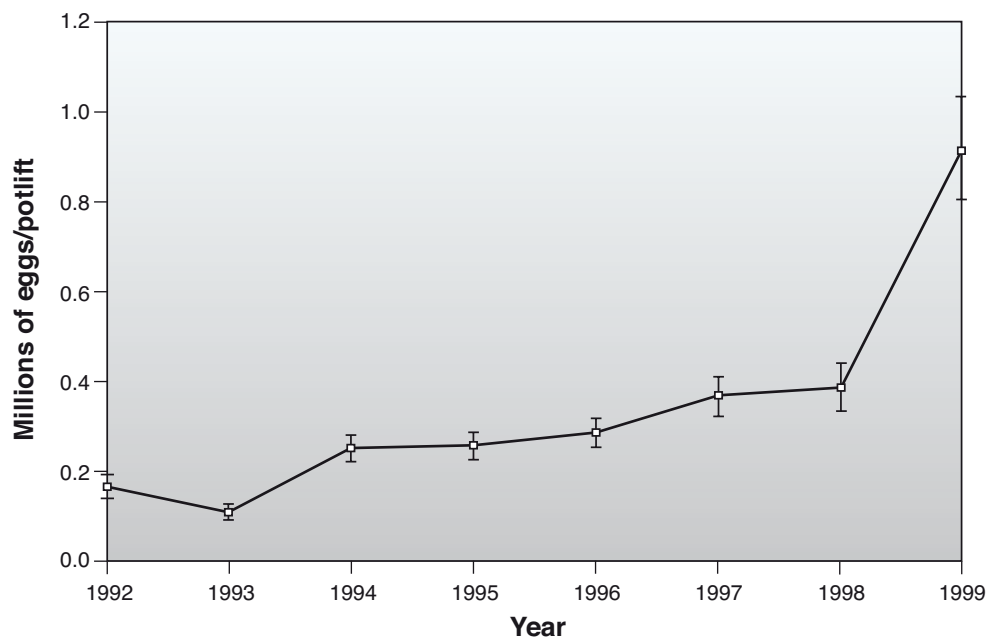


Figure 9. Egg production indices as measured by the independent breeding stock survey at the coastal sampling sites.

Robustness

High

Both the measurements for the indicators and the performance limit used are both considered extremely robust as they:

- Provide a statistically demonstrated high degree of confidence.
- Use multiple methods to verify estimates.
- They are direct estimates of egg production.
- Some estimates are calculated by a source independent of the fishermen.
- Research has been peer reviewed both in scientific journals (see reference list) and also by scientific review panels (e.g. MSC)

Fisheries management response

Current: To ensure maintenance of the required level of breeding stock:

- The fishery is managed through input controls based on individual transferable effort (tradable units that allow fishermen to use a finite number of pots according to the number of units they hold) with the ability to vary the total number of pots used in the fishery during a fixed fishing season.
- The annual fishing season is for a fixed period from 15 November to 30 June limiting the opportunity for fishermen to take lobsters.
- There is a limit on the total number of pots used (69,288 - of which only 56906 pots can be used after pot reductions and pots lost through prosecutions) within the fishery, within each zone of the fishery and by each vessel in the fishery.
- There are prohibitions on the taking of berried, setose, tar-spot, oversize females (>105 mm north of 30°S and >115 mm south of that line) and animals smaller than < 76mm

- e. A zone-based management system reduces the risk of local concentrated fishing effort depleting key elements of the breeding stock (eg. Abrolhos Islands).
- f. Compliance policing focuses on checks of the legality of lobsters consigned to processors.
- g. Policing that the pot use by individuals does not exceed that allowed on the licence.
- h. Escape gaps that decrease the opportunity for undersize lobster to remain entrapped in pots.
- i. Limits on the size and structure of pots used to trap lobster are designed to maintain the current level of fishing efficiency.
- j. Limits on the use of new technology that may increase fishing efficiency.

Future: The success of the management arrangements over the past 8 years have seen the abundance of large breeding females increase greatly. As explained above, during the 2001/02 season only, the maximum size limit will be removed. However, as the setose and other regulations remain in place, this will only have a minimal impact on the level of exploitation of these sizes. The maximum size limit will be reinstated for the following season (2002/03).

The formulation of explicit decision rules to improve the management of the breeding stock levels in a more predictable manner are currently being developed – ie determination of maximum as well as the minimum trigger points.

Actions if Performance Limit Exceeded: Strategies available to offer further protection to the breeding stock if required include:

- a. Further reductions in the total number of pots that may be used in the fishery.
- b. A reduction in the length of the fishing season or within season closures.
- c. Changes to minimum and maximum size gauges to protect juvenile and large breeding female rock lobsters.
- d. Area closures.

These actions can be initiated within a season or prior to the beginning of the next season.

With fishermen continually improving their fishing efficiency, it is very likely that there will be a need to periodically reduce effective fishing effort through reductions in the total number of pots that may be used in the fishery. Research into the change in fishing efficiency should allow this to happen in advance of any significant reduction in the estimated level of breeding stock. In any event, past experience suggests that, if there is any significant decrease in the estimates of breeding stock levels appropriate measures such as “pot reductions”: can be readily implemented to address the risk to the fishery’s sustainability.

It should be noted that if monitoring suggests that the breeding stock increases to an as yet undetermined upper reference point, short term measures might also be adopted to temporarily increase the commercial exploitation rates (i.e. pot reductions could be lifted or the total number of pots allowed to be used in the fishery increased or size limits varied). This is where the development of explicit harvest strategies based upon the level of spawning biomass will be valuable.

Comments and action

There has been a process of continual improvement in the ongoing development and refinement of the modelling and simulations used to determine the breeding stock estimates to measure performance

against this objective. This involves both the collection of information and the method of analysis. Furthermore, there is ongoing monitoring of environmental sciences and advances that might improve the reliability of estimates as well as the relationships between breeding stock, environmental factors and annual recruitment. For example, oceanographic modelling and genetic fingerprinting may be used to determine if any parts of the stock are likely to have more significance in supplying recruitment and to better understand what seasonal environmental effects and ocean currents have on the level and geographic distribution of annual puerulus settlement.

It is envisaged that the trigger points and decision rules regarding the actions that will be taken depending upon the level of the spawning biomass will be developed over the coming year by a subcommittee of RLIAC. This will result in a more structured and formal approach being taken to this and other related management issues with these proposed to be formally published in Ministerial Guidelines.

External driver check list

Environmental factors such as climatic changes and in particular variations in the strength of the Leeuwin Current are known to affect the annual levels of recruitment of lobsters (see later) which impact on the level and productivity of breeding stock. In the long term, the most significant risk factors in the context of external drivers are probably climate change which may alter long term patterns of recruitment (global warming) and significant environmental pollution (i.e. oil or chemical spills in key breeding areas) or habitat degradation in juvenile areas (ocean based developments).

5.1.2 By-products

General

The bycatch that is taken by the rock lobster pots is minimal, few individuals of other species actually remain in the pots because they are designed to catch legal-sized rock lobsters. The increase in the number of escape gaps from 1 to 3 or 4 and the reduction in fishing effort since 1993/94 would have further reduced the amount of bycatch caught in the pots. There is already an observer based monitoring program that records the by-products and non retained species – only species caught in relatively large number were discussed in the report. The amount of fish that is actually captured in the pots is minimal, most of the catch reported by this fleet is actually caught as part of the wet line fishery – the management arrangements of which will be reviewed in the next year.

The data on the other bycatch species from pots that has been recorded by the observer program is currently being entered onto a database. The reports on this data will become part of the ongoing monitoring system for the fishery from next year.

5.1.2.1 Octopus

Rationale for Inclusion

Octopuses have always been taken in rock lobster pots. As predators of rock lobster, it would appear that they are attracted to the pots by the opportunity of an “easy meal.” There has been increasing interest both in overseas and local markets in octopus. This by-product was previously discarded or sold as bait, but is now being retained for sale to processors. At the same time, there has been increased interest in octopus fishing by both recreational and commercial fishers outside the rock lobster fishery. As a lobster predator, the octopus is also likely to be an important element in the rock lobster’s ecosystem. Despite the low risk rating, currently lobster fishers are the main group impacting upon this species and there

is a potential for a dedicated fishery to develop. Hence it is precautionary that this group be monitored annually.

ERA Risk Rating: Possible changes to octopus population (C1 L2 LOW)

- Octopus have a short (1 year) lifespan and their recruitment appears to be highly variable (Joll 1977a). Their habitat extends beyond the habitat utilised by the rock lobster fishery e.g. sea grass, so that only a proportion of their population would be exploited.
- The increase in the number escape gaps in the rock lobster pots has allowed more octopus to escape from the pots.

Operational Objective

Minimise the risk of overfishing by limiting catches of the WRL fishery to historical, sustainable levels.

Justification

Octopuses are widely distributed along the Western Australian coast including waters not subject to rock lobster or other forms of octopus fishing. These refuge areas, in combination with the inefficiency of the current lobster pots to catch and retain the octopus should provide sufficient protection and ensure that sustainable populations are maintained.

Indicator

Recorded catch rate information for octopus by lobster fishing by independent observers.

Performance measure

A decline in the calculated rate per pot lift more than 25% outside the range of recorded variation.

Justification

*The biology and ecology of the species of octopus caught by the WRL suggests that they should be very resilient to overfishing. The main species is *O. tetricus* has a life cycle of only 12- 15 months (Joll, 1977a) but all octopus species have relatively short life cycles (Kailola et al., 1993). The limited range of fishing compared to the extensive range of the species (see Kailola et al. 1993) means that there will always be a major portion of the breeding stock not accessible to fishermen, ensuring biological sustainability will not be at risk. Thus the inclusion of this performance measure is a precautionary approach.*

Data requirements for indicator

Annual weight of octopus per pot and trap lift as calculated from:

Data Required	Availability
Catch of octopus from rock lobster pots.	Yes, from fishery independent observer data

Evaluation

With respect to octopus, again the pot designs now have escape gaps which would reduce the catchability of these species. Furthermore, their catch rates are monitored and any significant decline would result in a review of the arrangements. This is, however, considered unlikely given the short lived, highly productive life history strategy exhibited by all these species.

The independent monitoring data is obtained from 6 locations throughout the fishery and from all depths covered by fishing for each month that the fishery operates. This enables a good coverage of the octopus catch rates from independent observers. Data are available from four locations for over 30 years indicates that there has not been a decline in their abundance.

Octopus are caught in the pots generally in shallow water (0-20 fathoms; 0-37m) and catch rates of about 0.02–0.03 octopus per pot lift were recorded in voluntary research log-book data between 1992/93 and 1999/2000. This led to an estimated 220,000 to 300,000 octopus caught in all zones in each of the past eight seasons. The species composition of the octopus bycatch is composed primarily of *O. tetricus*, although a small number of the other species are also taken.

Robustness

Medium

This data being collected by fisheries staff is of good quality covering the majority of the areas and times of fishing. Furthermore, there have been suggestions that faster pot hauling speeds now employed may have increased the catching efficiency of the commercial sector regardless of the introduction of escape gaps. There has been no assessment of catchability or catching efficiency of lobster pots for octopus.

The use of this indicator (catch by lobster fishers) will only be appropriate while there is no directed commercial fishery for octopus. The establishment of a commercial octopus fishery is currently under consideration. If this does become established, then more sophisticated analyses may be necessary.

Fisheries management response

Current: Despite the increase in pot hauling speeds, it is considered the increase in the number of required escape gaps and pot reductions introduced over the past 20 years has greatly reduced their potential catch.

Future: Under the developing fisheries policy a number of commercial octopus fishermen will be licensed. Their records of catch and effort should allow a more informed measurement of stock abundance and more refined management may be developed if necessary.

Actions if Performance Limit is Exceeded: If the performance limits were triggered, a review of the situation would be initiated. If there was any evidence of a risk of stock collapse, measures that would need to be put in place to reduce the catch of octopus. This could include - a prohibition on rock lobster fishermen taking octopus or an annual limit of the catch taken by rock lobster fishermen.

These actions can be initiated within a season or prior to the beginning of the next season.

Comments and action

Formal procedures for the assessment of octopus stocks through the analysis of catch records needs to be introduced. Monitoring of any new, dedicated octopus fishery would have to be introduced and the indicator of performance may have to change to reflect that more than one sector is targeting the resource.

External driver check list

There has been ongoing and increasing interest in octopus fishing by both other commercial sectors and recreational fishers. Rock lobster traps may make it easier for octopus to catch rock lobster and the lobster fishery may have both a positive and negative impact on octopus populations.

Increased levels of recreational fishing, boating and tourism and associated developments in the more geographically isolated parts of the octopus range may also have an unforeseen impact on both the catchability of octopus and the survival rates of juvenile octopus. The long-term impact of conservation measures and possible population increases of turtles, sea lions, dolphins and whales may also have an impact on the octopus population levels.

5.1.2.2 Scalefish and sharks

ERA Risk Rating - Impact on Breeding stocks of scalefish and sharks (C1 L1 - LOW)

Full Justification

Scalefish and sharks are taken by rock lobster fishermen both in pots and by wetlining. As the wetlining activity is a legitimate part of another fishery only pot caught fish are considered here. However as rock lobster fishers only take 7% of the total wetfish catch (Figure 11) including that by wetlining (Crowe *et al.*, 1999) their total annual catch is usually tens of tonnes rather than hundreds but includes prized recreational species such as cod and baldchin groper as well as wobbegong sharks.

It should be noted that the environmental sustainability of the entire wetline fishery will be assessed separately, at which time all catches by the rock lobster fishers of these species will be incorporated within the assessment.

The pot catch is frequently agreed to be the property of the crew and supplements their wages, but sometimes it is retained by the licensee and, depending on the species, either sold, eaten or used as bait. Thus, this is largely an allocation issue, not a sustainability issue and hence needs to be treated as such.

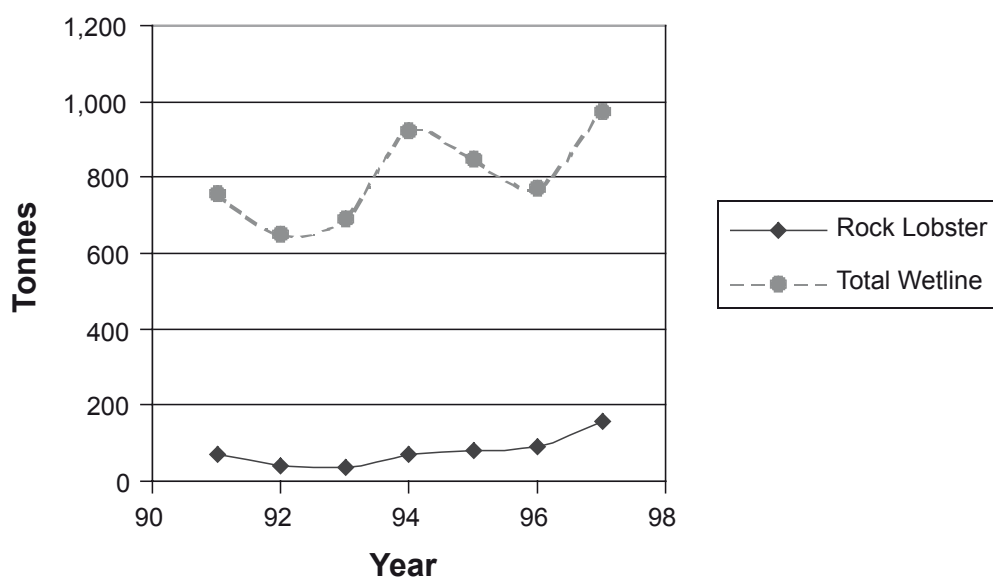


Figure 10. Catch of scalefish by lobster fishers (all methods –majority by line not pot) compared to total amounts caught.

The recorded catch level of scale fish taken in lobster pots (as distinct from those caught by lines on the same vessels) is currently not available. It would probably be necessary to make it a licence condition if this information was to be collected because it is beyond the scope of voluntary log book detail but it is anecdotally a small percentage of the total.

The accuracy of return for incidental catch has not been tested by independent surveys and the accuracy of returns from rock lobster fishing has not been tested. Usually, the scalefish catch by wetlining and the pot catch are included together and the extent of under-recording where scalefish are used as bait rather than sold or eaten, is unknown.

Catch levels of fish caught by pots during the 1970s were likely to be much higher than currently due to lack of escape gaps. The higher price usually received for rock lobster and the likelihood that pot caught scalefish are usually predators that may deter rock lobster from entering pots, probably discourages rock lobster fishermen from targeting scalefish by pot fishing.

Given that scalefish are always going to be attracted by rock lobster bait and that rock lobster fishermen can use such fish as bait, it is not considered practicable to reduce or prevent scalefish and sharks being taken in pots. In the wider context of the Western Australian scalefish catch, the volume of pot caught scalefish and shark (not that caught by line from lobster vessels) is relatively insignificant.

Until the results of this inquiry are known it would not be sensible to embark on a major data gathering or management planning exercise.

The management of the entire wetline fishery for scalefish off the west coast, including the whole question of the retention of scalefish by rock lobster fishers (caught by any method), is currently the subject of allocation review process (Toohey Committee). It is expected that more refined management arrangements, including more explicit allocations amongst sectors, will be developed for all relevant commercial fisheries and recreational fisheries taking wet fish in this region, during the next 2 – 3 years.

5.1.2.3 Deep sea crabs (including spiny crabs)

ERA Risk Rating: Possible changes to deep-sea crab population (C2 L1 LOW)

- The rock lobster fishery has only affected the population of spiny deep-sea crabs in the depth range of 150-200 m. while the specialised deep-sea crab fishery has demonstrated that the core population is beyond 200 m that is generally beyond the range of rock lobster fishing.

Full Justification

Deep-Sea crabs, particularly spiny (champagne) crabs but also king and snow crabs, are taken in small numbers in rock lobsters pots. The spiny crab is seen as vulnerable to overfishing, and therefore the catch that could potentially be taken by rock lobster fishers if they were to target them would be expected to rapidly collapse this small fishery. Total annual catch has historically been less than 10 tonnes per annum but in the last three years has been three to four times that figure but this is still less than half the total amount of crabs taken in WA.

Rock lobster fishermen have been known to target spiny crabs on rare occasions when the price of rock lobster has been relatively low and the pot catch of spiny crabs has been greater than for lobsters (so the gross return per pots for spiny crabs has been greater). However, most spiny crabs are retained for consumption by boat crews and their families and are not sold.

A proposal to limit rock lobster fishermen from retaining any deep sea crabs altogether or alternatively imposing a daily catch limit (50 kg/boat) is currently with the Minister. In the past fishers tended to remove the claws of the crabs and discard the body, but legislation has been introduced requiring all spiny crabs to be landed whole. A minimum size limit of 92 mm CW has been introduced to protect the brood stock. At this minimum size limit more than 90% of females are protected from being harvested and tag recaptures have shown that it is possible for discarded crabs to survive after being brought to the surface and returned to the water.

The ability of the Department to impose catch restriction on rock lobster fishermen will depend on both the willingness of the Minister to support the proposal and the willingness of rock lobster fishermen to accept such restrictions.

Specialised fishermen are developing a spiny and deep sea crab fishery on the west coast. Currently, catches by the WRL fishery are included in the overall assessment of the deep water crab fisheries which was completed under the Section 10a regulations of the old WPA which is reported elsewhere. If there are any significant changes in these management arrangements, the arrangements for the capture of these species within the WRL fishery may need to be altered.

There is a joint FRDC research project underway, part of which is a PhD project at Murdoch University which is finding that these species of crabs can survive capture and release extremely well when they are returned to the water in a timely fashion.

5.2 NON-RETAINED SPECIES

Component Tree For Non-Retained Species

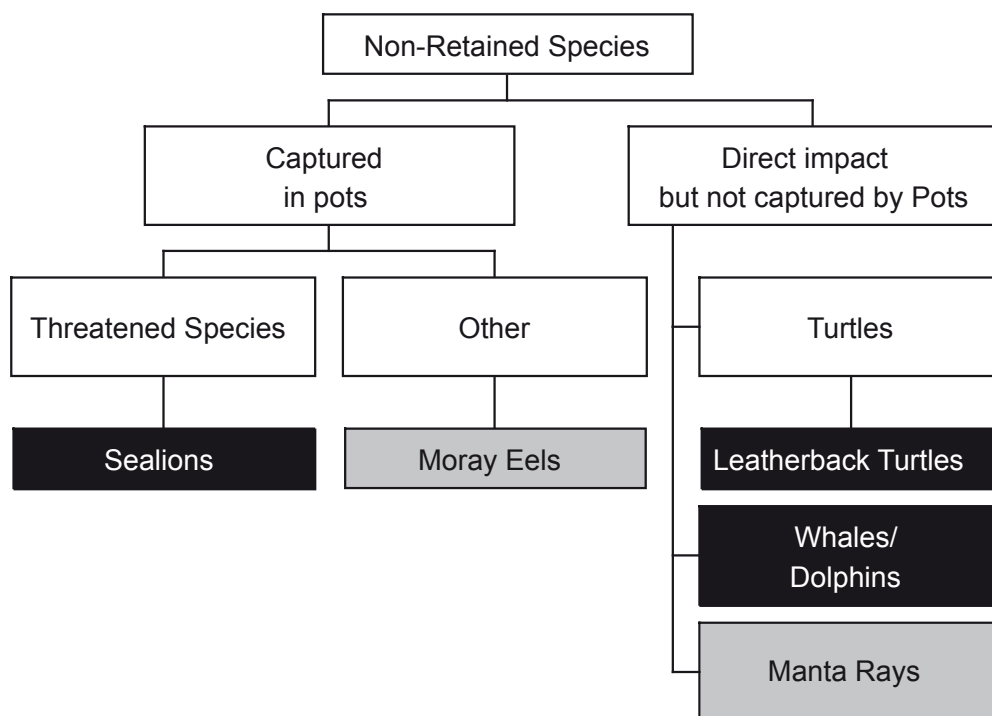


Figure 11. Component tree for the non-retained species

Note: No major Generic Components were deleted from this tree when it was developed at the August 2000 workshop). Black boxes indicate that the issue was considered high enough risk at the January 2001 Risk Assessment workshop to warrant having a full report on performance. Grey boxes indicate the issue was rated a sufficiently low risk that only the justification for this decision is presented and no specific management is required.

5.2.1 Captured in pots

5.2.1.1 Threatened/listed species Australian white-naped hair sea lion

Rationale for Inclusion

Interactions with seals, sea lions and their pups are recorded in most fisheries around the world and there have been occasional reports of sea-lion pups being caught and drowning in rock lobster pots. While in Western Australia such incidents appear rare, the concern for the welfare of this species, which is a listed threatened species, requires that formal strategies to deal with these interactions need to be developed. In addition, the MSC assessment of the fishery identified sea lions as an “icon species” with recorded interaction in the fishery requiring a level of management.

ERA Risk Rating: Sea lion pups entanglement in pots (C3 L4 MODERATE)

- One survey indicated that about 150 sea lion pups are born in the mid-west region around Beagle Is., North Fisher Is., and Buller Is. every 18 months and about 20 are born near Abrolhos Is. (mainly Middle group). Five tags have been returned from dead pups from fishers out of 150 tag releases (N Gales, formerly of CALM, pers. comm.).
- West coast populations of sea lions appear stable or slightly decreasing (N Gales).
- Reduction in the numbers of pots (10% in the 80s and 18% in the early 90s) should have reduced any impact.
- Department of Fisheries has commenced data gathering to monitor interactions with rock lobster gear.

Operational Objective

To minimise capture and direct interactions with sea lions and therefore the impact of fishing on the sea lion population

Justification

While the species has a wide range, extending from the Abrolhos Islands to Kangaroo Island in South Australia, it is a listed threatened species. The avoidance of capture and therefore impact is therefore an appropriate objective for the fishery

Indicator

The relative number of sea lions found in traps or related fishing gear (per pot lift) and other fishery interactions recorded by Department of Fisheries observers and fishers log books.

Performance measure

Observer Program

Any increase in the relative number of observations, or interactions causing sea lion deaths exceeding an average of one per year within the observer program will be interpreted as a signal that more direct measures need to be actively pursued to reduce such interaction.

Log book Program

Any increase in the relative level of recorded interactions with sea lions leading to their death.

Justification

With the historically low levels of interactions, there is no evidence to suggest that the WRL fishery has been having a major impact on the population size of sea lions. However, with the sea lion populations in this region under a level of threat, a precautionary approach of reviewing arrangements if there is any increase in mortality rates as a result of the fishery will be undertaken.

Data Requirements and Availability

Data Required	Availability
Number of sea lion interactions observed By WA Fisheries Staff	Has been collected since the start of the 2001 fishing season
Number of sea lion interactions recorded in fisherman's log books	Has been collected since the start of the 2001 fishing season
Information from CALM re advice on population levels and interaction with lobster fishing.	Data availability presently unknown but formal requests will be made to CALM for access.

Evaluation

The WRL fishery interacts with the Australian sea lion, *Neophoca cinerea* (status based on IUCN (1994) criteria: lower risk, near threatened), in two ways. The first is due to the discard at sea of the plastic bands around boxes of bait and the subsequent snaring of the bands around the sea lion's neck or body. This is not common and education has reduced significantly the at-sea discard rate of the bands. The second interaction is the drowning of sea-lion pups in rock lobster pots as the pups attempt to rob the traps of either bait or rock lobsters. Such incidents appear to be very rare and are only reported to occur where pots are set adjacent to the few islands on which this species breeds.

The ecological risk assessment (ERA) identified this issue as a moderate risk until further data were collected to quantify the risk to the sea-lion population. However, the mortality rate from lobster potting is expected to be very small and perhaps insignificant when compared to the reported highly variable mortality suffered by pups up to 5 months old in Western Australia. This rate varied between 7 and 24% and depended upon whether pupping occurred in summer or winter respectively (Shaughnessy 1999). Significant non-fishery factors responsible for the high mortality rate of young sea lions are attacks on pups by territorial bulls and adverse environmental conditions (Shaughnessy 1999).

One survey indicated that about 150 sea lion pups are born in the mid-west region around Beagle Is., North Fisher Is., and Buller Is. every 18 months and about 20 are born near Abrolhos Is. (mainly Middle group). Five tags have been returned from dead pups from fishers out of 150 tag releases (N Gales, formerly of CALM, pers. comm.).

Robustness

Low-Moderate

Even after formal data collection methods are implemented, the data is likely to have a low to moderate level of robustness as:

Anecdotal evidence suggests that while sea lion pups occasionally drown in rock lobster pots, fishermen may be understandably reluctant to report such incidents. Nonetheless, many responsible fishermen

have indicated a willingness to report such incidents on a confidential basis to the Department. In addition, Research and Regional Services staff can provide unbiased estimates of the impacts as they extensively monitor rock lobster fishing activities and can report these incidents.

The observer program completed by Department is relatively comprehensive in terms of seasonal and spatial coverage of the fishery. A total of 180 trips are undertaken per year and these are completed in a consistent manner through time. However, the incidence of sea lion interactions resulting in death are exceedingly rare (<1 per thousand), the area of the fishery where such interactions are likely to happen comprises only a small percentage of the total fishing area. Consequently, the level of change in the mortality rate to be distinguished using only observer data would have to be large.

The data recorded within fishermen's log books may provide a more comprehensive coverage of the fleet's activities (along with all interactions with other marine mammals) but the accuracy of the information recorded may suffer from the sensitivity of the information.

Fisheries management response

Current: Department of Fisheries monitors efforts to avoid capture of fauna such as sea lions in the rock lobster and other pot based fisheries around the world. As a result of the Marine Stewardship Council certification, a data collection system to obtain the level of interaction between lobster gear and sea-lion pups, whales, turtles, seabirds, etc. commenced during the 2000/01 season using a log book and survey approach. The data collected from these systems will be reviewed at the end of year.

Future: Increase awareness of the issue with fishers.

If performance level triggered: If there is any evidence of significant adverse interaction with sea-lions, measures may be taken to limit fishing activities adjacent to favoured sea-lion habitat. Another solution may be to trial the use of techniques to discourage sea lion pups from entering traps or otherwise interacting with lobster fishing activities.

Issues for other agencies: CALM and Environment Australia may collect data on sea lion abundance to ascertain if the level of interaction is significant, also to assist in the interpretation of any change in encounter rates (either increase or decrease).

They may also assist commercial lobster fishers by advising on methods to reduce such interaction.

Comments and action

There are reports that South Australian fishermen deter "seals" from entering lobster traps by placing a sharp steel spike on the base of the pot facing the entrance. The success or otherwise of these sea lion deterrents needs to be investigated. If evidence of significant interaction with sea-lions surfaces, targeted observation programmes could be implemented. Action could also be taken (targeted media campaign) to encourage fishermen to report all interactions.

The main areas where interactions are likely to occur appear to be in the vicinity of sea lion breeding colonies where the juveniles are learning to feed for themselves. A possible action could be to radio track sea lion juveniles to determine patterns of feeding and likely encounter rates and times.

This species of seal only breeds every 18 months and there is variation in the timing among the different colonies which makes setting a closed season impractical.

The main actions are to gather more data to determine the real extent of this problem. This will include developing a data collection system using the log books to generate an annual estimate of interactions of sea lion pups with gear to be implemented for the 2001/02 season. A peer reviewed report that includes a review of pot modifications options and the results of any gear trials should be completed by June 2004.

External Drivers Checklist

Sea lion interactions may be related to:

- Increased protection given to sea lions and the resulting increase in populations and therefore an increase in incidence in interactions.
- The abundance of rock lobster and how close in proximity they are to areas frequented by sea-lion pups/juveniles.
- The stock status of sea lion predators (e.g. great white sharks).
- Changes in the timing of the breeding season.

5.2.1.2 Other non-retained: Moray eels

ERA Risk Rating: Impacts on Moray Eels (C1 L1- LOW)

Fishermen catch a large number of moray eels in rock lobster pots. These moray eels are returned to the water and are not reported in catch logs. Moray eels are always returned to the water and they are abundant in the catch. Whilst there has been no research to determine if their capture has any significant impact on the moray eel population or the ecosystem, the fact that large numbers are being taken by lobster pots, which are an inefficient way of catching them, would suggest that there continue to be large numbers present on the lobster grounds.

They are of no value to fishermen and present a safety risk to crews while they are aboard the vessel; it is in fishermen's interests to return them to the water as soon as possible.

5.2.2 Direct impact but not caught in pots

5.2.2.1 Sub-component: Leatherback turtles

Rationale for Inclusion

There are consistent, but low frequency (i.e. 1-2 per year for both boat strikes by all vessels and rope entanglements), reports of leatherback turtles becoming entangled in lobster pot ropes. This species is listed as "Vulnerable"⁵ within the Commonwealth EPBC Act and "Special Protected Fauna" under WA Legislation, and therefore all forms of mortality need to be minimised.

ERA Risk Rating: Rope entanglement of leatherback turtles (C3 L4 MODERATE)

- CALM reports that based on the few cases reported/investigated each year, that the salvage cases examined appear to be due in equal numbers to rope entanglement or from boat strikes. Those examined also have been all juveniles (R Prince, CALM, pers. comm.).

⁵ The major impact on these stocks is the capture of adults and the removal of eggs within the SE Asian region.

- Museum records from 1972-91 indicate that 65% of deaths are associated with rock lobster activities. Some of the records in the WA Museum file were from documented media articles. The museum records appear to be related to dead or collected animals, some with photos. (Nick Dunlop).
- The continued reduction in the numbers of vessels in the rock lobster fleet from about 800 in the 1960s to less than 600 currently, and the reduction in the numbers of pots by 10% in the late 1980s and a further 18% in 1993/94 should reduce the impact.
- Department of Fisheries has commenced data gathering to monitor interactions with rock lobster gear.

Operational Objective

Minimise direct and indirect interactions and therefore the impacts of the WRL fishery on leatherback turtles.

Justification

This is consistent with the Department of Conservation and Land Management's objectives within state waters and with Environment Australia's objectives under the within Commonwealth waters for this species which is listed as "vulnerable".

It needs to be recognised that the actions taken within the management of the WRL fishery only forms part of the package needed to affect the management of this species. Other activities (managed by other agencies) which impact on this species also require management and coordination. Thus even if all interactions with the WRL were removed, this would not significantly alter the leatherback turtle's status.

Indicator

The number of recorded deaths and captures of leatherback turtles, assessed annually.

Performance measure

Any increase in the number of logged observations, media reports or other recorded interactions with leatherback turtles. Department of Fisheries observers and fishers log books will provide for the recording of all interactions with turtles.

Justification

The nature of the indicators used in monitoring are relatively vague and imprecise, therefore, the precautionary approach of responding immediately there is any sign that the rates of interactions are increasing is needed.

Data Requirements and Availability

Data Required	Availability
Number of leatherback turtle interactions observed by WA Fisheries Staff	Has been collected since the start of the 2001 fishing season
Number of leatherback turtle interactions recorded in fisherman's log book reports	Has been collected since the start of the 2001 fishing season
Information from CALM re advice on population levels and interaction with lobster fishing.	Data availability presently unknown, but formal requests will be made to CALM for access.
Information from media and press reports of incidents relating rock lobster fishing to interactions with leatherback turtles	Data availability presently unknown, but searches of past media and press reports will be undertaken in the future

Evaluation

Lobster fishing rarely affects turtles of any species. Anecdotal information suggests a very occasional (about one per year) entanglement of leatherback turtles in pot ropes. This was identified as a moderate risk by the ERA and data are being collected through as many sources as possible to establish the level of mortality caused by rock lobster fishing. It is understood that leatherback populations are in decline worldwide. Recent research by Spotila *et al.* (1996, 2000) suggests Indian Ocean and western Pacific populations cannot withstand even moderate levels of adult mortality and that the current level of indigenous harvest and incidental mortality in commercial fisheries will lead to the extinction of these populations if they continue. The interaction in these regions with fisheries relates to bycatch from shrimp/prawn trawls without turtle exclusion devices and longlines, gill nets and shark nets. The indigenous harvest of leatherbacks in Indonesia and other south-east Asian countries and the poaching of eggs from nests in this region are highly significant causes of mortality for this endangered species. By comparison, the occasional entanglement of one marine turtle in a pot rope, assuming that all entanglements result in death, is unlikely to be a significant cause of mortality for any turtle species.

There is generally only anecdotal evidence of interactions of the WRL with turtles and the lack of documented media coverage suggests such interactions are very uncommon. Whilst additional anecdotal evidence suggests that where leatherback turtles have become entangled in fishing ropes, that they may still be alive when untangled and released, for the reported data within CALM files, only one of 10 was released alive. However, these data are biased towards only those interactions resulting in deaths or moribund animals because the main source of data comes from dead turtles found washed ashore. Information from fishers on first hand observations of interactions indicate that most are released alive.

Department of Fisheries Research and Regional Services staff are in a position to monitor rock lobster fishing activities and report these incidents that occur during the observer program and from direct reports from fishers. Similarly, it is acknowledged that leatherback turtles are most common in deeper water and are not often in the vicinity of the lobster fleet.

Robustness

Low

Even after formal data collection methods are implemented, the data is likely to have low robustness as:

- There will only be around 180 sea days per year of independent observer data.
- Whilst the anecdotal evidence and press reports to date suggests that while leatherback turtles very rarely get entangled in rock lobster pot ropes fishermen are understandably reluctant to report such incidents. Therefore these historic figures may not be accurate.
- Similarly, fishermen may perceive there is no incentive to honestly record interactions with turtles on their log books in the future; indeed some are likely to see it as not in the best interests of the fishing industry to record such data.
- Commonwealth environmental legislation penalties may deter rather than encourage reporting.
- The objective relates only to the interactions of these turtles with the fishery and not the stock of turtles directly – this is, however, beyond the scope of this report.

Fisheries management response

Current: Department of Fisheries monitors efforts in other pot-based fisheries to develop techniques to discourage and minimise the interaction between commercial lobster fishermen and turtles.

Pots are generally pulled daily which increases the chance that any tangled turtles can be released alive (particularly as they are most likely to be entangled near the surface).

Total pot numbers have been reduced over the past few years (18% reduction in 93/94) lessening the chances of interactions.

Future: Department of Fisheries has contacted CALM to determine if the interaction between commercial lobster fishermen and turtles is monitored and recorded.

Most of the recorded information on turtle sightings have come from the 1 or 2 dead turtles which are washed ashore (R. Prince, CALM) each year. Participants at the workshop suggested that it would be useful to understand the temporal and spatial distribution of the various species of turtles if commercial and recreational fishers provided information about the sighting of all turtles. Interest in this area could be generated by popular articles about turtles in fishing magazines and requesting information about all sightings (live and dead) and possibly photographs of the turtles.

As a result of the Marine Stewardship Council certification, the Department has commenced a data collection system to obtain the level of interaction between lobster gear and sea-lion pups, whales, turtles, seabirds, etc. during the 2000/01 season using a log book and survey approach. The data collected from these systems will be reviewed at the end of the year.

If performance level triggered: A review of the potential methods to reduce the level of interactions would be instigated.

Issues for other agencies

CALM and Environment Australia may collect data on turtles with commercial lobsters fishers and may also be able to advise on methods to reduce such interaction.

The recovery plan for this species needs to incorporate the management arrangements imposed by this fishery and utilise the information that can be obtained from the monitoring conducted by this fishery.

Comments and action

The main actions are to gather more data to determine the real extent of this problem. This will include developing a data collection system using the log books to generate an annual estimate of interactions of turtles with lobster gear to be implemented for the 2001/02 season with reliable estimates available by June 2003.

Articles will be written for newsletters and magazines to encourage fishers and others to record sightings of live and dead turtles.

External driver check list

The effectiveness of conservation procedures in the breeding areas for the leatherback turtle will impact upon the numbers of individuals passing through the region of lobster fishing and hence affect the encounter rate.

5.2.2.2 Threatened/Listed Species: Whales and Dolphins

Rationale for Inclusion

There are rare reports of migrating whales being entangled in rock lobster pot ropes. Bottle nosed dolphins sometimes follow rock lobster vessels in the hope of feeding on the discarded bait.

ERA Risk Rating: Rope entanglement of threatened spp. e.g. whales (C1 L2 LOW)

- CALM has encountered 13 whales entangled with rock lobster rope since 1985 (Doug Coughran, CALM, pers. comm.). None of those encountered were found dead.
- Department of Fisheries has commenced data gathering to monitor interactions with rock lobster gear.

Operational Objective

Minimise direct and indirect interactions with dolphins and whales.

Justification

This is consistent with the Department of Conservation and Land Management's and Environment Australia's objectives for the management of cetaceans.

Indicator

The annual number of recorded and press reported whale and dolphin interactions with the WRL fishery.

Performance measure

Any increase in the number of logged observations, media reports or other recorded interactions with whales and dolphins. Fishermen's log books will also provide for the recording of all interactions with whales, dolphins and other marine mammals.

Justification

Anecdotal evidence and press reports suggests that while whales very rarely get entangled in rock lobster pot ropes fishermen are understandably reluctant to report such incidents. Nonetheless, many responsible fishermen have also indicated a willingness to report such incidents to Department of Fisheries. Department of Fisheries Research and Regional Services staff are in a position to extensively monitor rock lobster fishing activities and report these incidents. Similarly, it is acknowledged that dolphins often follow commercial rock lobster fishing vessels and there is some risk that a boat or fishing gear may accidentally injure a dolphin. Anecdotal evidence suggests that there have been no serious injuries or deaths of dolphins resulting from their interaction with commercial lobster fishing vessels.

Data Requirements and Availability

Data Required	Availability
Number of whale and dolphin interactions observed by WA Fisheries Staff	Has been collected since the start of the 2001 fishing season
Number of whale and dolphin interactions recorded in fisherman's log book reports	Has been collected since the start of the 2001 fishing season
Information from CALM re advice on population levels and interaction with lobster fishing.	Data availability presently unknown, but formal requests will be made to CALM for access.
Information from media and press reports of incidents relating rock lobster fishing to interactions with whales and dolphins	Data availability presently unknown, but searches of past media and press reports will be undertaken in the future

Evaluation

Only anecdotal evidence of interaction with dolphins and whales exists. This, and the lack of much documented media coverage (although interaction with whales has been reported in the past) suggests such interaction are very uncommon.

Robustness

Low

Even after formal data collection methods are implemented, the data is likely to have low robustness as:

- There will only be around 180 sea days per year of independent observer data.
- Fishermen may perceive there is no incentive to honestly record interactions with dolphins and cetaceans; indeed some are likely to see it as not in the best interests of the fishing industry to record such data.
- Commonwealth's EPBC legislation penalties may deter rather than encourage reporting.

Fisheries management response

Current: Department of Fisheries monitors efforts in other pot based fisheries to develop techniques to discourage and minimise the interaction between commercial lobster fishermen and whales and dolphins.

Future: Department of Fisheries has contacted CALM to determine if the interaction between commercial lobster fishermen and whales and dolphins is monitored and recorded. They have also been asked to advise on how the feeding of dolphins should be treated in the context of returning protected rock lobster (i.e. undersized) to the water.

If performance level triggered: A review of the potential methods to reduce the level of interactions would be instigated.

Issues for other agencies

CALM and Environment Australia may collect data on whale and dolphin interactions from commercial lobster fishers and may also be able to advise on methods to reduce such interaction.

External driver check list

The behaviour of other recreational and commercial fishermen in feeding dolphins with bait and unwanted catch may encourage dolphins to follow commercial fishing vessels. The resurgence of whale populations may increase the risk of their entanglement in pot ropes. Changes in rope technology (nylon rather than degradable hemp) may also be a consideration in terms of whale entanglement.

5.2.2.3 Non-retained: Manta ray

ERA Risk Rating: Manta Rays caught in Pot Ropes (C1 L1 LOW)

There have only been rare reports of Manta Rays running up against pot ropes and these ropes being caught between the ray's horns. Anecdotal evidence suggests on rare occasions manta rays have subsequently become entangled in the ropes and dragged lobster pots a considerable distance. Manta rays are perceived by many as beautiful and benign fish with eco-tourism value. The risk assessment score for this issue was low and there are no specific management actions that would reduce this incidence. Moreover, there are no reports of Manta Rays actually being killed through interactions with rock lobster pot ropes.

The general objective is to ensure interaction between rock lobster fishing and manta ray is maintained at the existing low level. Department of Fisheries observers now record interactions with Manta Rays and the level of incidence and any trends will be examined in five years time or when there is a full review of the issues affecting this fishery.

5.3 GENERAL ENVIRONMENT

Component tree for the general environment

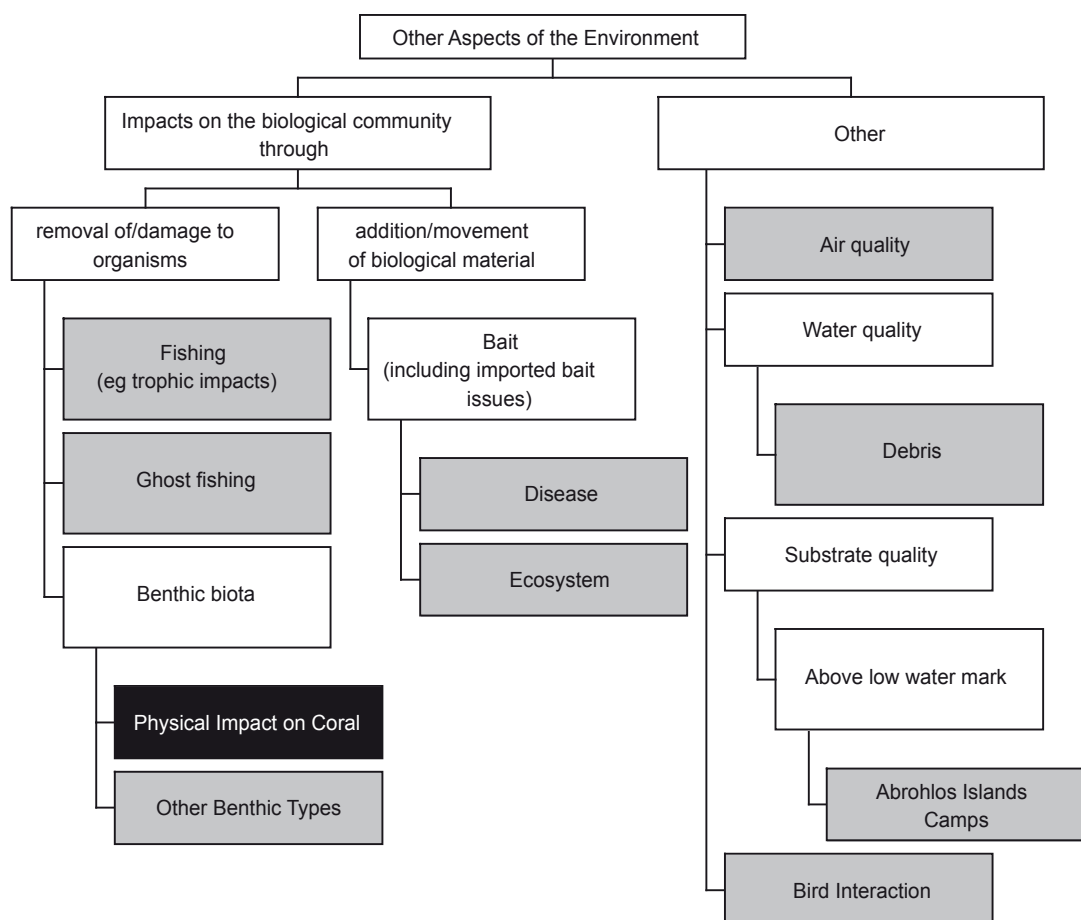


Figure 12. Component tree for other aspects of the environment related to the wrf fishery.

Note: The Generic Components deleted from this tree included impacts of Bait collection (another fishery), Stock Enhancement (does not occur), Translocation (does not occur). Issues such as ballast water were also considered by the workshop participants and dropped from the Generic Component tree as they were not considered relevant to the rock lobster fishery.

Black boxes indicate that the issue was considered high enough risk at the January 2001 Risk Assessment workshop to warrant having a full report on performance, Grey boxes indicate the issue was rated a low risk and only this justification is presented and no specific management is required.

5.3.1 Impacts from removal or damage to environment

5.3.1.1 Fishing impacts, through lobster removals, on ecosystem (both higher and lower trophic levels)

ERA Risk Rating: Items eaten by lobsters (Consequences 1, Likelihood 4, Ranking LOW)

- The variation in total catch in last 30 years has been from 7,200 tonnes to 14,400 tonnes which indicates a 50% fluctuation in annual abundance of exploitable section of the stock (Penn, 2000).
- The abundance of the breeding stock indicates that it is currently as high now as it has been over the last 30 years (Penn, 2000) whilst juvenile levels are unaffected by fishing.

- Examination of abundance from puerulus to legal-size rock lobsters near Dongara undertaken by Phillips et al. (2001) have provided an indication of ratio of biomass of undersize to legal-size lobsters of over 4 to 1 so that removal of legal-size lobsters probably only affects the overall biomass by about 10% - much less than the impact of natural variations (which is 50%).
- The current total biomass levels of lobsters are likely to be at least 80% to 90% of the unfished levels.

ERA RISK RATING: Removal of lobster on higher trophic levels (C1 L3 LOW)

- Increases to the minimum size during the migration phase of the lobsters (Nov-Jan) and reduction in the number of pots allowed to be used have significantly increased the number of lobsters migrating to deep water each year.
- The predators of the rock lobsters such as sharks have been significantly reduced to about 35-40% of original biomass (Penn, 2000) hence there should be sufficient rock lobsters available as food for the remaining predators and they prey upon many other species besides rock lobsters.
- The current estimates of the total biomass levels of lobsters suggest that they are at least 80% to 90% of the unfished levels.
- The total removals of lobsters are only in the order of 5kg/hectare/year - which is a trivial amount in terms of the total level of production within this system. In addition any such impact is likely to be ameliorated through the addition of a similar quantity of bait.

The conclusion being that the management of the stocks of lobsters is sufficient by itself to ensure that there will only be minimal/negligible trophic level effects resulting from the rock lobster fishery

Full justification for low rating

The justification for rating the impacts of the rock lobster on trophic interactions as low risk relates to the level of total biomass of lobsters remaining in comparison to unfished levels, reviews of situations worldwide where fishing for lobsters has been associated with changes in ecosystem and a comparison to the circumstances present off WA.

Biomass Levels

Two quantitative studies provide information on the current biomass of lobsters present off the WA coast in comparison to unfished conditions. It is logical that any trophic level impacts, both lower trophic level interactions (those organisms that form the prey of lobsters), and higher-level interactions (where the lobsters are prey), would be affected by the relative level of reduction in biomass compared to unfished levels. One study used information from FRDC project 98/302 (Phillips et al., 2001) that examined puerulus settlement rates in comparison to subsequent recruitment into the fishery and beyond. The other study used the length frequency data collected as part of the fishery independent monitoring program to estimate impacts.

Biomass Levels based on Puerulus Modelling

This method used estimates of the number of puerulus that settled in the Dongara region⁶ each year during a 30-year period (1968-1998). Relationships were then developed to estimate the number of animals surviving from each cohort through time making use of catch and effort data to estimate the required parameters including natural mortality, density-dependent mortality and fishing mortality. The model then used the age-weight key determined by Morgan (1977) to estimate total biomass. This was

⁶ It is assumed that this region is typical of the lobster fishery given that it is in the middle of their distribution.

done with and without fishing to determine the average reduction in biomass caused by fishing for any given level of puerulus settlement.

Biomass estimates were calculated using the minimum (60 million), maximum (1200 million) average (338 million) and median (600 million) puerulus recruitment levels that occurred during the previous 30 years. The basic pattern was the same for each scenario, with the distribution of biomass levels within each age class of lobsters showing that the majority of total lobster biomass is contained within the juvenile sections, even under unfished conditions (Fig. 13, Table 4).

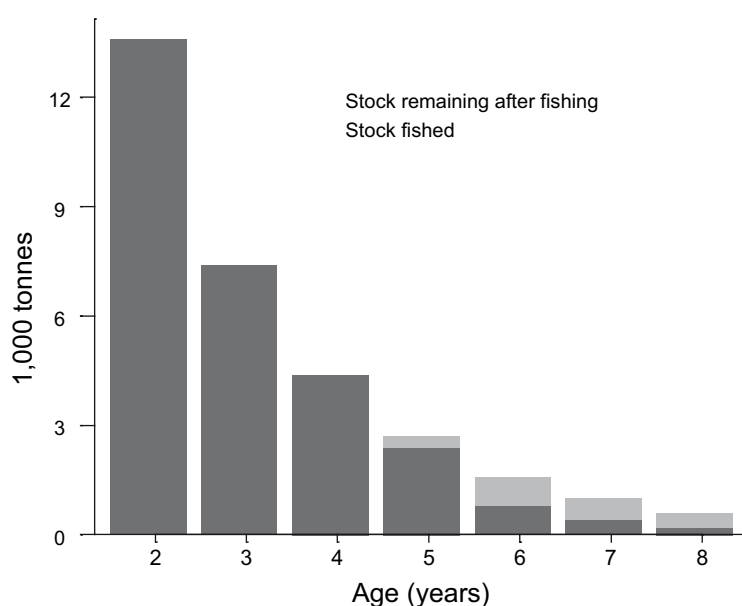


Figure 13. Plot of the biomass remaining of each year class at the end of the fishing season in comparison to that biomass that would have been there in the absence of any fishing.

(This scenario is calculated for average puerulus settlement of 338 million. The level of fishing used is that experienced in 1991/92 (2.55 million pot lifts) that ignores the effect of the extra 93/94 management arrangements. e.g. 18% pot reduction)

Table 4. Biomass of each year class remaining at the end of the fishing season, and the biomass caught during that season, using an integral method based upon average (338 million) puerulus recruitment levels.

Age	Bio mass remaining (1,000 t)	Bio mass fished (1,000 t)	Weight/lobster (kg)
2	13.6	0	0.19
3	7.4	0	0.27
4	4.4	0	0.36
5	2.4	0.3	0.45
6	0.8	0.8	0.55
7	0.4	0.6	0.66
8	0.2	0.4	0.77

This method allowed the reduction in total biomass due to fishing to be calculated (Table 5). Under all recruitment scenarios, the total percentage reduction in biomass due to fishing is less than 10% with the most likely reduction, based upon average conditions, being only 7%.

Table 5. The percentage of total biomass that is of legal size and the total reduction in biomass due to fishing at 4 levels of puerulus recruitment.

Recruitment (millions)	Legal Biomass (%)	Biomass Reduction (%) From Fishing
Low (60)	23.0	8.7
Average (338)	19.1	7.3
Median (600)	18.2	7.0
High (1200)	17.2	6.5

Length Monitoring Assessments

Information collected from the length-monitoring program completed each year provides the length distribution of lobsters in each zone of the fishery. From this the biomass for all length classes to be calculated. It also allows the determination of the biomass protected from fishing (either by size and/or setose rules), the unprotected (legally exploitable) biomass, and the amount that has been removed by fishing activities.

Figures 14 and 15 show the length frequency distributions of lobsters in fishing areas A and C. Whilst these distributions have been adjusted from the effects of escape gaps, the length classes less than 65 mm will still be underrepresented and the sizes below that are not represented at all. This is equivalent to not having years 2 and 3 in the previous puerulus based analyses.

Zone A carapace* length March 2000

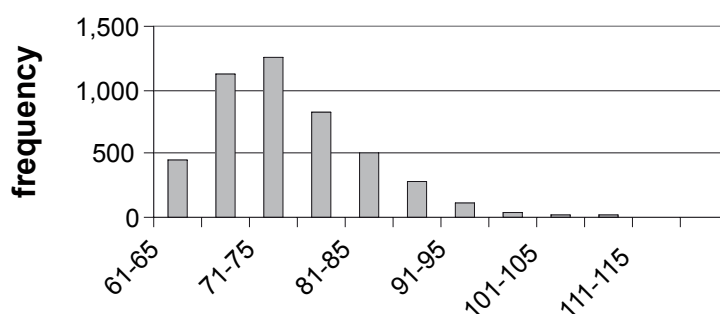


Figure 14. Length frequency of lobsters within Zone A developed from monitoring data and modified for escape gap retention rates.

Zone C carapace length March 2000

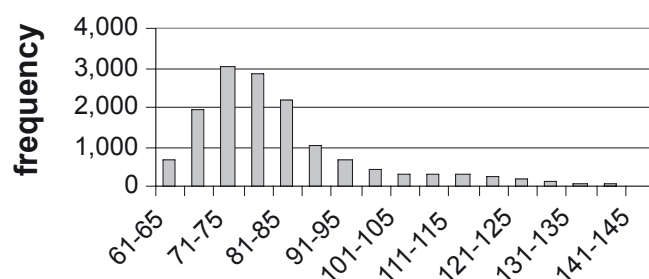


Figure 15. Length frequency of lobsters within Zone C developed from monitoring data and modified for escape gap retention rates.

Using the modelling performed on single age classes (for the 4 puerulus settlement scenarios) enabled a comparison to be made between the total biomass of a first year cohort and the biomass of the same cohort in its second, third and fourth years until fully recruited into the fishery. By making two simplifying assumptions (a) within each scenario puerulus settlement is constant between years (which is a conservative approach), and (b) the biomass vulnerable to the fishery (B^*) is represented by 4 year and older animals (which is known from the extensive catch sampling work over the past 20 years), it was possible to determine the relationship between the biomass vulnerable to the fishery and the total lobster biomass in each region. The table below summarises the calculations

Table 6. Biomass of lobsters modelled using the 4 recruitment scenarios in Zone B.

	Scenario1	Scenario2	Scenario3	Scenario4
Age	biomass	biomass	Biomass	biomass
2	13.6	19.6	4.7	16.7
3	7.4	9.5	3.0	8.5
4	4.4	5.5	2.0	5.0
5	2.3	2.9	1.1	2.6
6	0.8	1.0	0.4	0.9
7	0.4	0.4	0.2	0.4
8	0.2	0.2	0.1	0.2
yr2&3	21.0	29.1	7.7	25.2
yr4on	7.9	9.8	3.7	8.9
(B^*)				
all ages	28.9	38.9	11.4	34.1
$B^*/$ Total	0.273356	0.251928	0.324561	0.260997

Averaging the ratios in the last line over all four scenarios indicates that B^* was 27.7% of the total biomass in March 2000 (Table 7). Thus, the total biomass will be 3.6 times B^* . For Zone B, the total rock lobster biomass is 21234 tonne, and the catch of 1888 t therefore only represents about 9% of the total biomass (Table 7). This percentage is very similar to the values calculated above (which were 6-9%).

Allowing for levels of error in the calculations of both these estimates, it is clear that the total biomass remaining after fishing is likely to be greater than 90% of unfished levels and would certainly be greater than 80%. Such a small drop is extremely unlikely to have any significant impact on other trophic levels unless lobsters are responsible for a very strong forcing role in community structure (which is not the case in WA – see below), and probably not even then.

Trophic Interactions of the Western Rock Lobster

Juvenile lobsters are mostly to be found in the shallow water inshore areas where the fishery has very little impact (see above). Howard (1988) has recorded a number of small fish such as sand bass, sea trumpeters, brown-spotted wrasse and gold-spotted sweetlips as being predators of pueruli and post-pueruli. None of these fish are commercial species and little is known of their biology, but there has been almost no impact on the abundances of these life stages of lobsters. Octopus are important predators of larger lobsters (Joll, 1977b), but their numbers are being monitored (see earlier references in the document). In the deeper water lobsters are generally larger in size and consequently have fewer predators. There are no known predators that rely on western rock lobster as their only prey item (see food web in Figure 17).

Western rock lobsters are generalist feeders, known to consume a range of different plant and animal material), with the major components being coralline algae, molluscs and crustaceans (Jernakoff et al. 1993, Joll and Phillips 1984), which are also eaten by other predators (Edgar, 1990). Small gastropod species, such as *Solemya* sp, are known to be consumed by juvenile western rock lobsters in areas where they occur in large numbers (Joll and Phillips 1994). This latter species has been studied by Rainer and Wadley (1991) and has been shown to have year-round recruitment and high production to biomass ratios, indicating that they have a high mortality, and therefore high turnover rates. Juvenile rock lobsters at Seven Mile Beach and Cliff Head showed a range of diets and feeding strategies, with diets at the former location varying greatly between seasons and between lobsters feeding in different habitats in the same season (Edgar 1990a). Edgar (1990a) further reported that the diet of *P. cygnus* reflected the abundance and size distribution of benthic macrofauna on all sampling occasions.

Rock lobsters significantly reduced the densities of a number of gastropod species found in seagrass areas (Edgar 1990a, b). But while Edgar (1990c) found that the western rock lobster caused the autumn and winter declines in the seasonally abundant trochid gastropod *Cantharidus lepidus*, that settle in extremely high densities at Cliff Head in summer (Edgar 1990a). Other predators, such as the blue swimmer crab (*Portunus pelagicus*) are likely to be interspecific competitors for the same prey items (Edgar 1990b). Moreover, rock lobsters were shown by Edgar (1990a, b) to have substantially less impact on one of their key prey species at this study site than other seagrass-associated epifaunal predator species.

Finally, natural changes in lobster abundance amongst different years are in the order of 50% caused by variations in recruitment levels (see above). In some regions of the coast this natural variation in lobster abundance is even greater. Consequently the ecosystem is subjected to much larger changes in lobster biomass through natural causes than is generated by the fishery.

While the impact of larger lobsters (>80mm carapace length) on the population dynamics is not known, the bulk of the lobster biomass comprises lobsters less than this size and so the impacts on trophic levels by the extraction of the legal catch are assumed to be minimal.

Preliminary observations of the areas where the larger lobsters live in deeper waters suggest that these regions generally do not have complex habitats, being mostly limestone reefs and sand. Consequently, there appears to be little risk of this environment being affected significantly by the reduction in lobster biomass. The most likely impact from having removed a percentage of the larger lobsters in this region is that there may now be less cannibalism on smaller recruiting lobsters. Negative impacts on rates of recruitment at high stock levels is a common phenomenon. This is why there is now a plan to manage the level of spawning biomass at optimum levels for the fishery.

It is, however, possible that the description of habitats and the diet of WRL in these deeper waters could be confirmed by a more rigorous study. The investigation of the diets of rock lobsters in these deeper waters was not done during the previous work by CSIRO in the 1980s because standard methodologies would have resulted in any data collected being confounded by the need to use baited traps to capture the individuals. There is already a proposal to work on the catchability of lobsters in these deep-water areas, this could be expanded to include diet and habitat issues as additional components.

Comparison to other Systems

The WRL does not appear to have the dominant forcing effect that has been hypothesised for *Jasus lalandii* in South Africa or for *Homarus americanus* in Canada.

In South Africa in areas where rock lobsters were absent or in low densities, benthic fauna is comprised of dense mussel beds, sea urchins, sea cucumber and many whelks but little macroalgae. In contrast, areas having large assemblages of rock lobsters had a dense flora of seaweeds but very few other benthic organisms (Barkai and Branch 1988, Barkai 1986, Barkai and Barkai 1985). Tarr *et al.*'s (1996) hypothesis that increased abundance of *J. lalandii* can cause high mortality of juvenile abalone has been supported by recent research reporting a negative correlation between the densities of rock lobster and sea urchins, and the existence of a positive correlation between juvenile abalone and sea urchins (Mayfield and Branch 2000). The juvenile abalone remain concealed under sea urchins and thus avoid predation. The indirect negative effects of *J. lalandii* on juvenile abalone clearly poses a threat to the abalone industry, already under stress from poaching (Mayfield and Branch 2000).

In New Zealand, the abundance of *Jasus edwardsii* and the local sea urchin (*Evechinus chloroticus* – which is capable of forming barren grounds - Ayling, 1981) in a marine reserve at Goat Island near Leigh (north-eastern New Zealand) showed no clear pattern of change despite a striking increase in the number of rock lobsters within the reserve (Cole *et al.* 1990). In the Maria Island Reserve in Tasmania, Edgar and Barrett (1997) also reported increased densities of rock lobsters (*J. edwardsii*), and significant increases in densities of sea urchins and in the mean size of abalone between 1992 and 1993, shortly after the reserve was declared. Thus it would appear that temperate Australian and New Zealand rock lobster populations have a significantly less “influential” ecological role in determining community structure than their South African counterpart. Moreover, in Western Australia, there are no populations of subtidal sea urchins even capable of creating “barren grounds”.

In Canada, Breen & Mann (1976); Mann (1977, 1982) suggested that the “barren grounds” that were present off Nova Scotia were due to a lack of predation by the lobsters on the sea urchins (*Strongylocentrotus droebachiensis*) caused from the overfishing of lobsters in this region. However, subsequent studies have suggested that the lobsters could not have controlled the abundance of sea urchins and the increases and declines in urchins were due to variations in recruitment and disease levels respectively (Miller, 1985, Jennings & Kaiser, 1998).

Given the large levels of lobster biomass remaining, the weak interactions of the lobsters with both their prey species and their predators, the overall impact of the rock lobster fishery on the wider ecosystem through trophic effects is assessed as being minimal. Therefore the management of this issue is covered by the maintenance of lobster biomass at their current high levels. This is outlined above (5.1).

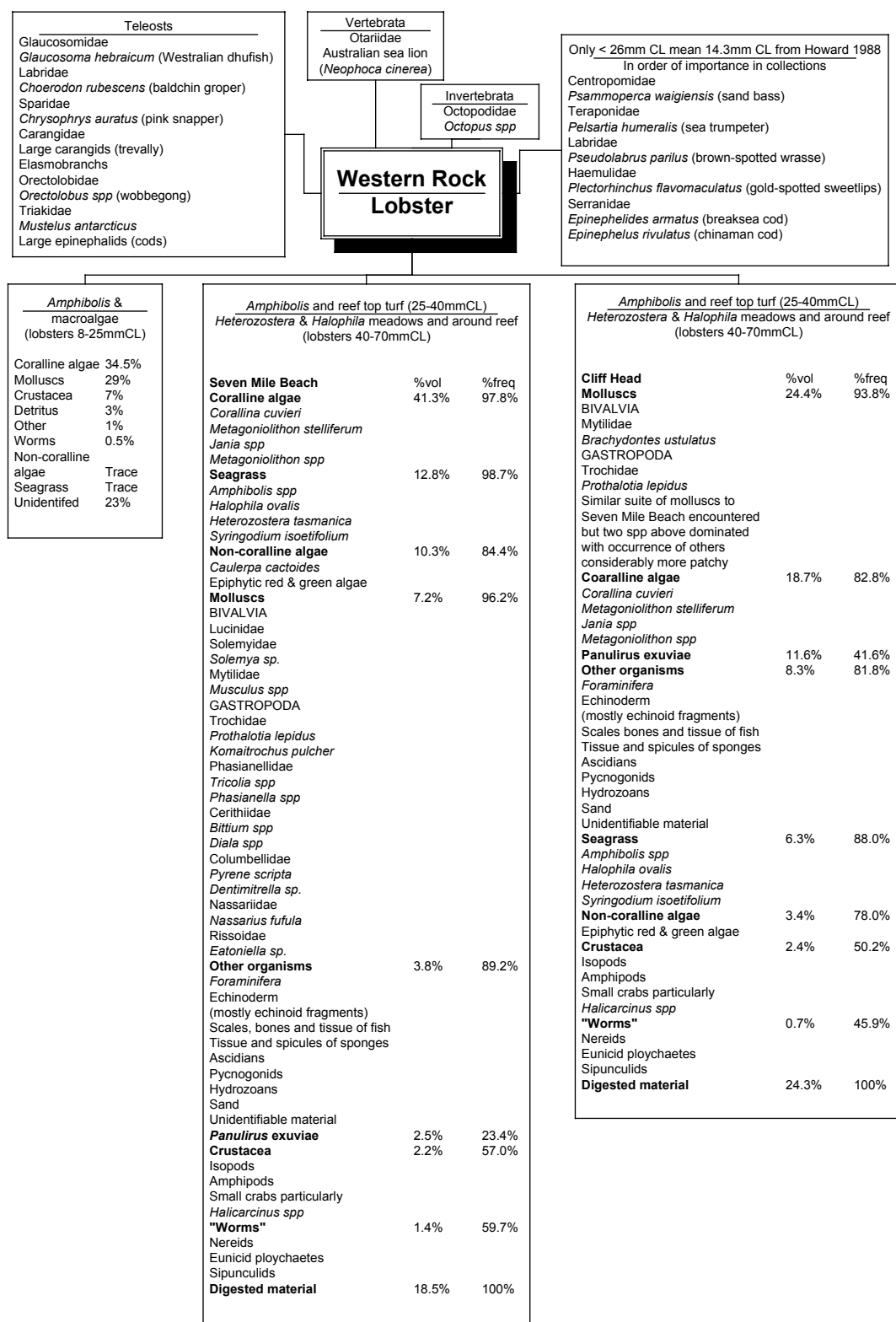


Figure 16. Predators and prey of the western rock lobster, *Panulirus cygnus*. Data collated from Joll and Phillips (1984), Edgar (1990a), Howard (1988) and unpublished Department of Fisheries records.

5.3.1.2 Ghost fishing

The design of commercial rock lobster pots minimises the chances of significant impacts of ghost

fishing occurring. Hence this issue is determined to be of LOW RISK.

Pots for WRL must have a single, unobstructed entrance and a minimum of three escape gaps. The pots are made from steel or wooden bases with wooden slats or cane and tee-tree sticks on the other sides. These products decay readily, which prevents any significant ghost fishing problems arising. The number of commercial pots lost throughout the fishery each season is unknown but is currently being assessed. Fisheries Officers recovered about 30 pots on the south side of Rottne Island following the 2000/01 season. Anecdotal evidence and underwater observation by Fisheries staff clearly shows that rock lobsters (and other large animals) are rarely seen in any type of unbaited pot.

5.3.1.3 Physical impacts on coral from potting

Rationale for Inclusion

The coral habitat in the Abrolhos Islands and northern part of the western rock lobster fishery has enormous tourism potential because it is relatively unspoiled compared to many other areas in the world. There is a view that rock lobster fishing, through the use of pots and anchoring of boats, could lead to coral damage, in this way impacting on the coral ecosystem and potential for tourism.

ERA Risk Rating: Potential change to coral abundance (C3 L4 Moderate)

- The reductions in the numbers of pots and limits to pot size that have been introduced should have reduced any impact.
- Observations by Museum/Department of Fisheries divers indicate limited damage to corals due to pots relative to storm damage.
- Setting of pots is generally adjacent to corals not on the sensitive reef areas.
- Fishermen use permanent moorings rather than using anchors.
- Most of the accidental groundings of vessels in this area occur on the reef tops which are flat, hard limestone - not the sensitive branched corals.
- It is appropriate to compare the relative impacts that may be caused by boats versus storms on this habitat. Such an analysis suggests that this is insignificant.

A workshop was held on the issue of fishing impacts on the Abrolhos Islands in July 2001. A major report is being compiled on these issues (FRDC 2000/166 Chubb et al. in press). The following is the extract of this report that relates to rock lobster fishing.

EXTRACT FROM THE ABROLHOS ISLANDS WORKSHOP REPORT

It is important to recognise that rock lobster fishing at the Abrolhos is undertaken for only three and a half months of the year, from March 15 to June 30. Pots are soaked there for a week before hand but are placed together (unbaited) in sandy sediments in areas defined and patrolled by compliance staff and so have no impact on the marine habitats. It is also important to note that on average 25%, 18% and 9% of the total potting effort at the Abrolhos occurred in depths of less than 20m at the Wallabi/ North Island Group, the Easter Group and the Pelsaert Group respectively. Furthermore much of that effort was directed at prime rock lobster habitats, most of which contain biological communities of low or moderate sensitivity. The moderately sensitive communities are the mixed macrophytes, stands of *Sargassum* and the coral-macroalgal assemblages, all of which are relatively resistant to the physical impacts of pot fishing.

Nevertheless, some effort was targeted at lobsters living in sensitive habitats where corals can have greater than 50% cover and comprise robust forms such as thick branching, tabulate and encrusting corals, delicate forms *e.g.* thin branching, foliose and plating corals and species-rich mixtures including massive and solitary forms depending upon their position in the habitat and the strength of water flow. Even though rock lobster fishers generally set their pots on edges, ie, on sand but adjacent to reefs, there is potential for damage in these biological communities each time a pot is deployed and lifted. The physical impact of such activity would be the fracturing of the fragile corals such as the branching, tabulate and plating forms. Anecdotal evidence suggests that if damage occurs it happens where the pot settles after deployment. Pot ropes also may be tangled around fragile corals which may fracture when the pot is lifted.

Wright *et al.* (1988), using data from Hatcher *et al.* (1988), did identify less than 10% of the Abrolhos reef area (total area) in which there was evidence of recent physical damage, or in which there was a significant potential for damage to benthic biota. The total area of high biological sensitivity (fragile) habitat for the Abrolhos was 9.2% according to Hatcher *et al.*'s (1988) habitat classifications, ie less than 10%. Fragile biological communities comprised 6.5%, 5.6% and 17.0% of the Wallabi/North Island, Easter and Pelsaert Groups respectively. An estimated impact of potting on fragile habitat can be calculated using the 2001 seasonal potting densities and an assumption that each rock lobster pot will disturb an area of coral or sponge (fragile) habitat equivalent to 4 sq. metres each and every time it is set. The percentage of fragile habitat so disturbed would be between 0.1% and 0.3% of the surface area of such habitat in each island group (Table 8). Similar estimates of 0.2 – 0.4% of the surface area of moderately sensitive habitat would be affected (Table 8).

Table 7. Estimates of the percentage surface area of low, moderate and high sensitivity biological communities impacted by rock lobster pots (see text for assumptions).

Group	Low	Moderate	High
Wallabi/North Is.	0.36	0.39	0.31
Easter	0.27	0.26	0.11
Pelsaert	0.14	0.18	0.23

Due to the low densities of pots set in fragile areas during a season, disturbance is likely to be isolated rather than general. However, the actual extent to which damage is caused by pot fishing in these sensitive communities is unknown and is in need of investigation. The biological impact on the corals also needs to be quantified, given Harriot (1998) has recorded rapid rates of growth (mean of about 5-7cm/yr) for branching *Acropora formosa* and that the regeneration of coral colonies from fragments is possible (Dr A. Heyward pers. comm.). It also is important to note that rock lobster fishing is prohibited between July 1 and March 14, allowing a substantial recovery period of 8.5 months for any damaged habitat.

Rock lobster vessels do not move at night and are either tied alongside jetties or moored in well defined areas close to the jetties. Rarely do rock lobster vessels anchor at sea during the day. Boats that work the Abrolhos from the mainland may either return to port each day or anchor in appropriate places overnight. The larger boats with large pot allocations tend to operate in the deeper waters surrounding the Abrolhos reefs. Thus, not all of the 149 vessels that have Abrolhos concessions work in the shallow water areas. However, boat activity in shallow water can cause minor damage to reef structures when the hulls of vessels “ground” occasionally when manoeuvring to lift or set pots. The frequency with

which this happens is unknown and this type of physical damage is not confined to the rock lobster fleet. Pleasure craft that do not know the waters similarly may impact on the marine habitats when underway. The physical impact of vessel “groundings” may be minimal when compared to the effects of violent storms on the marine habitats.

There is evidence that plastic banding used to hold bait cartons together and the cartons themselves are being thrown overboard by some industry members at the Abrolhos. For a number of years there has been an ongoing education programme to eliminate this polluting behaviour and, fortunately, this practice is not prevalent any more. Most Abrolhos fishers take all rubbish material back to their camps where either it is burnt or sent to the mainland to be disposed of in an appropriate manner, as is the case with engine oil for example. The impact of the discard of rubbish at sea is likely to be minimal.

The rock lobster industry’s considerable use of imported bait each season was cause for some concern following the pilchard mortalities of recent years. Bait remaining in pots is, in some cases, discarded at sea but it is very quickly recycled by all manner of organisms. A very thorough risk assessment conducted by Jones and Gibson (1997) concluded there was very little likelihood of disease introduction through the use of imported baits. Bait use has no impact on the Abrolhos marine habitats.

Issues for consideration

- Pot fishing in fragile areas: what is the extent of any disturbance? What is the response (growth and regeneration) of corals? What is the contribution of lobsters in these areas to catches.
- The frequency of groundings by rock lobster vessels and extent of damage caused. “Collateral damage”?

Comments and Actions

The above issues for consideration identified at the workshop should be progressed over the next 2 to 3 years as part of the overall management requirements of the Abrolhos Islands.

5.3.1.4 Impacts on limestone reefs

ERA Risk Rating: Potential change to limestone reef habitat (C1 L4 LOW)

- Reduction in the numbers of pots and limits to pot size should have reduced any impact.
- Setting of pots is generally adjacent to limestone reefs and during migration period setting of pots is on sand.
- Reef covered with algae that regenerates rapidly and subject to large variation due to storms.
- Reef system subject to erosion due to high energy system.
- Level of pot damage would be minimal relative to extensive reef system. For example, assessment of the area of reef near Dongara up to 30 m depth (Phillips et al., 2001) indicates an area of 382 million m² compared to the area affected by the pots in about pots 2 million potlifts per year of about 0.4%.

According to Hatcher *et al.* (1990), among biological communities, low energy coral assemblages are the most susceptible to physical damage because of their dominance by fragile branching corals. Communities dominated by macrophytes are much less sensitive to physical damage because of their

flexible structure and relatively high growth rates.

The video evidence obtained from lifting substantially larger traps in similar habitats (Moran & Jenke 1989)⁷ is that they almost always lift off vertically, they do not scrape along the bottom. Furthermore, unpublished video studies on the lobster fishery conducted in the 1980s (R.S Brown, unpublished) found similar results. Thus, the smaller lobster pots almost never scraping across the substrate when they are pulled and therefore they pose no threat to benthic habitats such as seagrass.

5.3.1.5 Impacts on seagrass

ERA Risk Rating: Potential change to seagrass habitat (C1 L3 LOW)

- Reduction in the numbers of pots and limits to pot size should have reduced the impact.
- Pot presence is temporary (over night) and does not cause physical damage.

In ranking benthic biological community classes of the marine ecological units at the Abrolhos Islands according to their relative sensitivity to anthropogenic physical damage, Hatcher *et al.* (1990) ascribed seagrass a 'moderate' rank of 4 compared to 'high' rankings of 1 and 2 which were ascribed to coral assemblages. (Note this is not a comparable ranking of risk as used in the WRL risk assessment report as it was looking at all forms of human activity).

5.3.3 Impact of addition of biological material

5.3.2.1 Bait usage (impacts on ecosystem)

In the 1995-96 season, about 14,000 tonnes of bait was used to catch 9,900 tonnes of western rock lobsters (i.e. 1.4 kg of bait per kilogram of lobster) (Jones & Gibson 1997). This ratio of bait to catch is considered to be typical of trends in the western rock lobster fishery. Whilst approximately 14,000 tonnes of bait is used in the rock lobster fishery each year this amount only equates to the addition of 5 kg per hectare over the area of operation.

ERA Risk Rating: Addition of bait may introduce pathogens and disease (C4 L1 Low)

- Risk assessment has already been undertaken by WAFIC and Department of Fisheries (Jones & Gibson, 1997).

The conclusion of the bait import risk assessment undertaken by Jones and Gibson (1997) and modelled on the Office International des Epizooties (OIE) recommended methods, was that the risk of introducing an exotic disease capable of producing a large scale fish kill is either very low or does not exist at all.

5.3.2.2 Impact on bird and dolphin behaviour

ERA Risk Rating: Addition of bait may affect behaviour/population change of mutton birds (C4 L1 LOW)

- Bait is only available for part of the year.
- Additional food should enhance breeding success

⁷ Fisheries Research Report, Fisheries Dept. WA, No 82, 29pp

ERA Risk Rating: Specific feeding of dolphins using bait (C1 L1 LOW)

- Publicity has drawn attention to this practice being illegal.

5.3.3 General impacts on the environment

5.3.3.1 Camping at the Abrolhos Islands

Rationale for Inclusion

Licensed rock lobster fishermen with an A Zone endorsement for the Abrolhos Islands are allowed to establish permanent camps on the islands to assist them in fishing the adjoining waters. Only twenty two of the 122 islands in the Abrolhos have camps, the total number of camps on the islands is 140. Associated with these camps are jetties, moorings and pontoons. In addition there are three airstrips and 4 schools. The camps are occupied only during the Abrolhos season (15th March-30th June), and can only be used outside the Abrolhos rock lobster season for maintenance and repairs.

ERA Risk Rating: Dumping of domestic waste into ocean at Abrolhos Is. (C1 L6 MODERATE)

- Abrolhos Is. Management Advisory Committee is reviewing this practice and will phase it out within the next five years.

Operational Objective

To minimise adverse effects of human activities on the islands.

Justification

*The terrestrial flora and fauna of the islands have persisted since the larger islands were joined to the mainland and provide important reference areas on ecological interactions. Many of the islands, including those occupied by fishermen have bird nesting and breeding areas, and some species are of international significance. Other important fauna include the tammar wallaby (*Macropus eugenii*), Abrolhos pointed-button quail (*Turnix viaria scintillans*), brush bronzewing (*Phaps elegans*), Abrolhos dwarf bearded dragon (*Pogona minor minima*), and Houtman Abrolhos spiny-tailed skink (*Egernia stokesii stokesii*). The flora includes a number of communities which are of conservation interest, including the mangrove *Avicennia marina*, *Atriplex cinerea* dwarf shrubland, and saltbush flats.*

Indicator

There are several potential indicators for impacts of camps and associated infrastructure at the Abrolhos Islands. None of the issues they measure are major issues at this stage and therefore they are unlikely to have formal monitoring in the near future.

Possible Indicators identified include:

- Disturbance and clearing of vegetation (not a major issue –see Management Response)
- Disturbance of fauna (not a major issue - see Management Response)
- Presence of exotic flora and fauna (i.e pests) (not a major issue - see Management Response)
- Level of rubbish both on the islands and in the surrounding waters (New waste management arrangements to be introduced)
- Indicators of nutrient enrichment from toilets, sinks, and shower waters (has been assessed)

Performance measures

(if indicators above are monitored)

- Reduction in the abundance and diversity of flora and fauna.
- Presence of vermin and weeds.
- Increases in the accumulation of rubbish.
- Significant levels of nutrient enrichment of surrounding waters.

Data requirements for indicator

Data required	Availability
Disturbance and clearing of vegetation	Vegetation distribution and condition on the islands has not been established (Anon 1998).
Disturbance of fauna	Distribution and abundance of fauna on the islands has not been established (Anon 1998).
Presence of exotic flora and fauna	No survey data available but planned.
Presence of rubbish	Anecdotal Only
Nutrient Enrichment	A study has examined the effect of toilet wastes on nutrient levels at a reef nearby to an occupied island and found no indication of elevation (MSA 1998).

Evaluation

A study of one area in the Abrolhos Islands which is heavily populated by fishermen during the lobster fishing season (March-June), was undertaken in May 1998 to determine whether fishing camps were causing a perceptible elevation of nutrients (inorganic nitrate, organic nitrate, ortho-phosphate, organic phosphate). No pattern of elevation of nutrients was seen on the Rat Island home reef compared to a nearby control reef but some small elevation of nutrient levels occurred adjacent to Rat Island where domestic outfalls discharged.

A semi-quantitative evaluation of coral cover and algal abundance suggested that reefs at Rat Island within a few hundred metres of high-density fishing camps did not show any clear adverse impact of human activity.

This study (Marine Science Associates and Environmental Contracting Services, 1998) quotes Johannes et al. (1983) and Crossland et al. (1984) as stating that nutrient levels in the water column at the Abrolhos Islands are highest during autumn and spring. Those “studies addressed the source of nutrients in the lagoon and while pointing out that these values were above incident seawater, neither study made any suggestion that the nutrient values reported were anything but natural.”

Robustness

Medium-High

The ability to accurately measure nutrient levels is high.

Fisheries management response

Current:

Flora and Fauna

- The effects of camps on flora and fauna is minimised by restricting the number and size of camps.
- New buildings and major changes must be approved by the Department of Fisheries (FRMR 1995)
- No vehicles permitted on the islands without approval by the Department of Fisheries (FRMR 1995)
- Walkways and paths are established on the islands.
- The Abrolhos Islands Regulations are effective

Exotic Flora and Fauna

- A successful cat and rat eradication program has been conducted
- No domestic pets allowed on the islands.
- No flora or fauna to be introduced without Fisheries W.A and CALM approval (FRMR 1995)
- Rodents, cockroaches, mosquitoes and flies are controlled using preventive and control mechanisms (FRMR 1995).

Domestic Waste

- No waste is disposed on the islands (FRMR 1995).
- Food waste is to be disposed of at sea or by incineration (FRMR 1995).
- Paper, plastics, cardboard or bait bags are to be returned to the mainland or incinerated (FRMR 1995).
- Large and non-combustible items such as craypots, fishing gear, fridges etc are taken back to the mainland or dumped at official dumping sites (FRMR 1995).
- Oils, filters, fuel and batteries are returned to the mainland (FRMR 1995)

Nutrient Enrichment

- Sewage must be disposed by a saltwater flushing outfall pipe directly feeding into the sea, or through a septic tank disposal system or an approved system at an approved site (FRMR 1995).
- Composting or hybrid anaerobic toilets have been installed at the Beacon Island school, the research camp and at East Wallabi airstrip.

Future: The management plan identified the following new strategies:

- Develop a land-use plan which takes into account the natural and heritage values of the Abrolhos Islands.
- Develop a habitat map of the terrestrial environment of the Abrolhos Islands. Undertake additional surveys of the major islands to determine which flora and fauna are present and which species, if any are at potential risk.
- Survey exotic species of plants and animals on the islands to establish the species present and develop a plan for their removal or management.
- Prepare and implement a management plan for preventing the arrival of exotic species of flora and fauna, and managing or eradication such species which already may be present.

- Prepare and implement a fire management plan for the Abrolhos Islands, consistent with the conservation of the environment whilst protecting property and developments.
- Develop a waste management strategy that produces the most environmentally acceptable waste management procedure of the islands.
- Prepare policies, standards and guidelines for all marine structures, which meet acceptable standards and avoid environmental damage.

Issues for other Agencies: CALM may be involved with issues about the flora, fauna and fire on the islands. The DEP may be involved with waste management.

Comments and Actions

A review of waste management strategies is being undertaken by AIMAC and it is proposed that dumping at sea be phased out in 5 years.

5.3.3.2 Other impacts on the environment: Air quality

Whilst there are a relatively large number of rock lobster boats and the fleet does use a large amount of fuel, the boats and the engines are relatively new and therefore produce minimum emissions. At this stage this impact is not considered to have sufficient impact to warrant specific attention.

5.3.3.3 Other Impacts on the environment: Debris

Department of Fisheries receive ongoing complaints regarding rock lobster fishermen discarding bait bands (the synthetic band used to wrap cardboard bait boxes) and other fishing related debris into the marine environment. Investigations indicate that while fishermen's bait is banded, most fishermen are very responsible in properly disposing of bait bands and it seems likely that most of the bait bands found washed up on beaches and in the water come from other sources. It is acknowledged that, despite the best of care, it is possible that bands are occasionally lost overboard. Floats and other fishing gear is occasionally lost particularly as a result of vessels (usually not rock lobster vessels) running over pot lines.

In the context that much of the observed beach fishing debris is likely to be from other sources, no single indicator was identified that could be used as an auditable, quantifiable measure. Possible indicators that were considered included:

- a. A periodic survey count of bait bands and other fishing debris (floats etc) found on beaches between Augusta and Carnarvon.
- b. Reports from litter counts (beach sweep) by school groups.
- c. Reports on wildlife entrapped in bait bands and other fishing debris.
- d. The weight of rubbish removed council bins near rock lobster fishing jetties.
- e. The annual count of complaints about rock lobster fishing debris made to the Minister for Fisheries.
- f. Other fishermen's observations (in log books).
- g. Survey of boats returning without bait boxes etc.
- h. Random surveys of bait boxes taken aboard and material returned at the end of a day's fishing.

The industry has already done much to encourage behaviour that will minimise discarded bait bands and other fishing debris. It has ensured waste disposal bins are available at all points where commercial rock lobster boats tie up and ensured fishermen are aware of the related public perceptions and sensitivities. The Minister for Fisheries and Department of Fisheries has also continued to remind fishermen of their obligations in this regard.

The Agency will discuss with industry representatives the options for better management of the bait band issue.

5.8⁸ GOVERNANCE

Component tree for governance of the WRL fishery

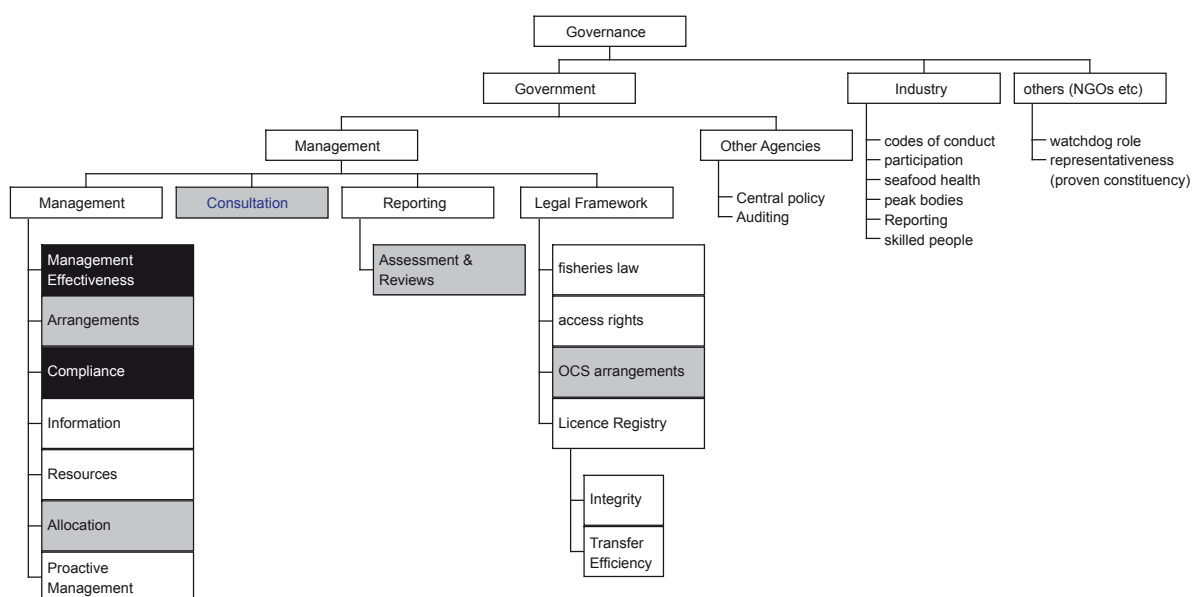


Figure 17. Component tree for governance.

Note: No generic components have been removed from the tree but only those boxes that are black or grey will be reported in this report.

5.8.1 Agency Level Management

5.8.1.1 Management effectiveness (outcomes)

The effectiveness of management activities should ultimately be reflected by the extent to which the fishery continues to produce expected outcomes. Thus, the annual average commercial catch of rock lobsters has been about 10,500,000 kg with the community's expectation that variations in annual catch only resulting from annual changes in environmental conditions, or planned changes to the management of the level of commercial and recreational exploitation. Any large unexplained variation in catch, particularly any significant and unexpected reduction in catch, is likely to be a reflection of a reduction in the management effectiveness and therefore reduce the community's confidence in the management of the resource and raise concerns about the ongoing sustainability of the fishery.

⁸ This is 5.8 to maintain numbering consistency with ESD report that has 4 more sections.

Operational Objective

The commercial catch of lobsters is maintained within an acceptable range as predicted on an annual basis using the known relationships with recruitment levels and Leeuwin Current strength.

Justification

If all management arrangements developed for this fishery, including the restrictions on effective effort levels, compliance with the regulations is being maintained effectively, combined with our understanding of the size of the exploitable stock - then the catch should be within the relatively small historical range of deviations from the predicted value. Any variation outside of this range would elicit the need to explain the cause of this deviation from the expected.

Indicator

The level of commercial catch and total catch compared to historical levels and the predicted level of catch for the season.

Performance measure

The extent to which the annual catch is within 10% of the predicted total catch value taking into account changes in the management arrangements for the year.

Justification

Historically, over the past 15 years the annual catch has been within 10% of the predicted value. Any significant variations outside of this range should be explained/explored given that nominal effort levels are now restricted to relatively constant levels and recruitment levels are estimated.

Data requirements for indicator

The following data is required for this indicator:

Data Requirement	Data Availability
Annual catch.	Yes - reliable estimates easily obtained.
Historical catch levels.	Yes - records available and accessible.
Annual puerulus settlement rates.	Yes – data collected regularly.
Historical puerulus settlement rates.	Yes – data available and accessible.
Annual catch prediction.	Yes – estimate prepared annually.
Historical catch predictions.	Yes – data available and accessible.
Level of fishing effort	Yes – number of pots used and days fished readily available.
Environmental indicators	Yes – key environmental indicators readily available.

Evaluation

Summary: The acceptable range of landings for the 1999/00 season were calculated as 13,500-14,500. Commercial catch figures for the WCRLMF for this season were 14,448 tonnes. Therefore, the

performance measure has not been triggered and current management strategies appear to be effective in achieving the overall objectives for the fishery (Figure 18).

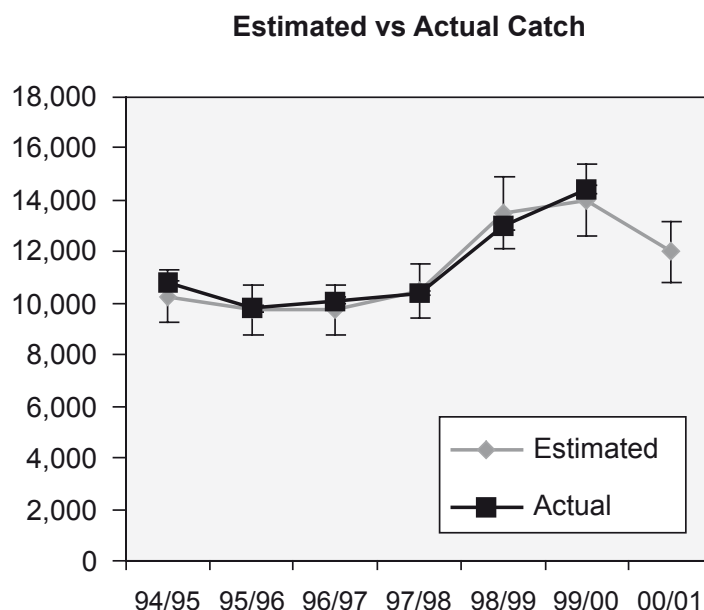


Figure 18. Comparison of estimated catch and the actual catch (+/- 10%).

Commercial Catch

Trends in the annual catches from the WRL are shown in Figure 4. The Australian Bureau of Statistics records of catch levels from 1944/45 to 1970/71 were replaced by processors' production figures in 1971/72. The 1998/99 catch in the WCRLMF was forecast from puerulus settlement to be 13,500-14,500 tonnes. Processors' figures show the catch from the WRL for the 1998/99 season was 14,448 tonnes (i.e. within the acceptable range of landings for this year). This value is, however, 33.2% greater than the long-term average catch of about 10,850 tonnes and 11.1% greater than the previous season's 13,009 tonnes. In 1999/00, the catches in A Zone, B Zone and C Zone were 1,970 tonnes and 4,165 tonnes and 6,874 tonnes respectively, 9.9%, 16.5% and 34.8% higher than the previous season.

In 1998/99, a survey of recreational rock lobster fishers estimated that that sector caught approximately 626 tonnes, which was a 29.1% increase on the catch estimate for 1997/98 of 485 tonnes. The increase again was due to larger catches in the southern sector, adjacent to the Perth metropolitan area. These estimates are considered to provide a reasonably reliable estimate of the total recreational catch (Melville-Smith & Anderton 2000) and there are now models to estimate the recreational catch prior to the season (Melville-Smith *et al.*, *in press*).

The total catch of western rock lobster from this fishery (commercial and recreational) was 13,635 tonnes, 24.5% higher than the previous season's catch of 10,948 tonnes.

Fishing effort

The nominal fishing effort for 1998/99 was 10.75 million pot lifts, 0.2% higher than the 10.73 million pot lifts for the previous season. The 1998/99 nominal effort for the A, B and C Zones of the WCRLMF was 1.22 million, 3.81 million and 5.72 million pot lifts respectively, 2.8% less, 0.8% less and 1.4% more than the previous season's 1.25, 3.84 and 5.64 million pot lifts. Effort, equivalent to 0.52 million commercial pot lifts, was used by the recreational fishery to land its catches. This was 4% higher than the 0.50 million pot lifts used in 1997/98 (see note above).

The total effort used in the WCRLMF during 1998/99 was 11.27 million pot lifts, 0.4% higher than the 11.23 million pot lifts made in 1997/98.

Stock Assessment

The stock remains fully exploited. The current management arrangements, introduced in 1993/94, have achieved their objective of rebuilding the breeding stock. The 18% pot reduction and minimum size increase to 77 mm carapace length (15 November to 31 January) have meant that a proportion of the 'whites' catch has been shifted through to the 'reds' fishery in each season since 1992/93. However, because of the geographic variation in the size distribution of lobsters (generally smaller lobsters in the north), this has had a greater impact in the northern regions than in the south. Greater overall survival meant that some lobsters grew to a larger size before contributing to the catches in each of those years, with greater recruitment to the breeding stock and a flow of product through to following seasons.

Pot usage under the management arrangements introduced in 1993/94 remained at 82%, or 56,816 pots allowed to be used during 1998/99. Industry continued to restructure and a further six vessels left the fishery, leaving 596 active commercial rock lobster boats in the fleet. Since latent effort has largely been removed from the fishery, pot reduction is now an effective tool with which to manage fishing effort in the WCRLMF. However, effort 'creep' has become evident, with nominal effort levels now 3.6% greater than the 10.38 million pot lifts of 1993/94 and 1994/95. Much of this has occurred in the C Zone where a 9% increase in nominal effort has been noted between 1993/94 and 1998/99. Therefore, effective fishing effort continues to increase, not only from effort 'creep' but also from the improved use of sophisticated fish-finding and navigational technology, resulting in an increase in efficiency. This will be factored into stock assessments and future management advice.

Acceptable Catch

Total catch predictions for the WRL fishery are made by summing the regional catch predictions based on puerulus settlement at the Abrolhos Islands (A Zone), Seven Mile Beach (Dongara) (B Zone) and Alkimos (C Zone) (Figure 18). Catch estimates for C Zone are also forecast from combined puerulus settlement figures from a number of C Zone puerulus collection sites. These additional forecasts are not dissimilar to the predictions based on Alkimos settlement alone. Seasons 1999/2000 and 2000/01 were expected to produce commercial catches of around 13,500-14,500 tonnes (revised estimate) and 11,000-12,000 tonnes respectively, the lower catch in 2000/01 resulting from declining puerulus settlement following large numbers of pueruli settling in 1995/96 and 1996/97 (Figure 19). Including the forecast recreational catches indicated that total rock lobster landings (commercial and recreational) would be in the range of 14,000-15,000 tonnes in 1999/2000 (Figure 18).

Robustness

High

The data required for the indicator in most cases are readily available and the estimates of catch and the methods for predicting future catches are based on peer reviewed statistical calculations.

The changes in fishing power and fleet efficiency through time need to be evaluated and considered in these analyses to ensure that the measures continue to be relevant.

Fisheries management response

Current: The management measures imposed to achieve the objective for the spawning stock (see above) also serve to achieve the objective related to the exploitable stock.

Historically, variations in catch outside of the range expected have been explained either in terms of increased fishing effort, increased fishing efficiency or seasonal environmental factors. The response to this has been to reduce fishing effort (e.g. pot reductions) or to develop the predictive model to take account of environmental factors such as sea surface temperature and ENSO and El Nino events.

Future: The Department is doing further work to both improve the measurement of fishing efficiency and understand the relationship between environmental factors and catch. The agency will continue to use input controls to adjust for variations in fishing efficiency and continue to develop the predictive models to improve the reliability of the predictions.

Research is currently being undertaken on developing techniques for large-scale harvesting of lobster pueruli and determining appropriate puerulus to legal size survival rates and potential harvesting ratios, that if implemented in the fishery, might result in 'biological neutrality' being achieved (FRDC Project 98/302). Current indications suggest that harvesting of pueruli in large numbers will be possible and legislation to allow this to occur is being developed (e.g. Anon 1998).

New work will be undertaken in 2001 (FRDC 2001/050) aimed at examining methods that might allow for enhancing the habitat so as to improve the survivorship of rock lobsters in the first years of their life, and in this way possibly improve the harvestable biomass of legal sized animals recruiting to the wild fishery.

Response if Performance Limit is Triggered: If the catch is outside of the range of expected values then a review of the causes would be undertaken. This review would examine if the likely cause was due to the environmental conditions known to affect catch rates such as water temperature and swell condition. It would also examine whether there had been significant changes to fishing operation both in terms of nominal effort levels and possible increases/decreases in fishing efficiency. Finally, there would be a determination of whether the measurements of recruitment levels were accurate.

Comments and action:

While the Department is able to accurately predict the annual catch and has been able to maintain it within acceptable levels, it continues to work on improving these systems.

The management package introduced in 1993/94 achieved its objectives of reducing the exploitation rate, increasing the breeding stock and allowing egg production to be maintained at or above the target levels. Catches are forecast to peak in 1999/2000, then decline to average or above average levels as result of recent lower puerulus settlements. It is noteworthy that fishing effort 'creep' has been occurring in the fishery, principally in C Zone, and that nominal effort was 3.6% higher in 1998/99 than it was in 1993/94, when an 18% temporary pot reduction came into effect as part of the new management package. The increased recreational catch in 1998/99 again was primarily due to a greater number of licences being issued (increase of 8.5% compared with 1997/98) and a high proportion of licensees actually undertaking some fishing activity. This response was probably partly due to the forecasts for a record catch for the 1998/99 season. In this season the rock lobster industry made application to the Marine Stewardship Council for the fishery to be assessed as an environmentally sustainable fishery and subsequently became the first fishery worldwide to receive such accreditation.

External driver check list

Environmental factors such as climatic changes, ocean currents, sea-surface temperatures and ENSO events are known to impact upon recruitment and hence the size of the exploitable biomass and consequent catch (see Fig. 19)

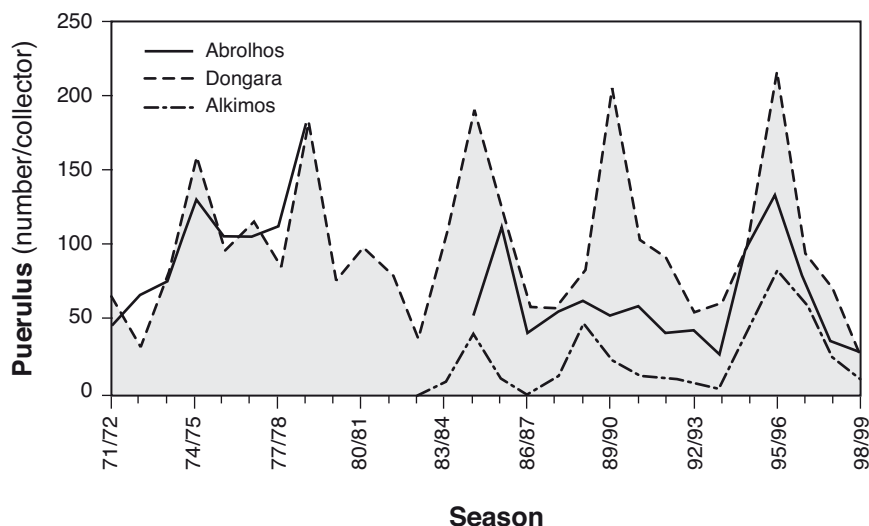


Figure 19. Annual indices of puerulus settlement for the Abrolhos (A Zone), Seven Mile Beach (Dongara) (B Zone) and Alkimos (C Zone) areas.

Increased levels of recreational fishing, boating and tourism and associated developments in the more geographically isolated parts of the fishery may also have an unforeseen impact on both the catchability of lobsters and the survival rates of juvenile settlement. The long term impact of conservation measures and possible population increases of turtles, sea lions, dolphins and whales may also have an impact on the catch available to commercial fishers. Other fisheries may also impact on available stock. In the case of octopus for example, increased commercial and recreational octopus fishing might either increase (through the introduction of new octopus habitat in lost pipe traps) or decrease octopus populations and thus the level of octopus predation on rock lobster.

Gradual refinements in fishing and fishing related technology (e.g. improved accuracy of Global Position Satellite navigation aids) may also lead to an increase in fishing efficiency.

5.8.1.2 Management arrangements

Rationale for Inclusion

In Western Australia, a number of instruments are used to articulate the management arrangements for fisheries. The FRMA has elements that affect all fisheries, in addition to this there are Management Plans, Orders, Regulations, Ministerial Guidelines and Policy Statements. In cases where current management arrangements were developed under the previous Act (as was the case for the WRL), whilst the terminology is different (see Table 9 for details), the powers from the old Act have been transferred under various sections of the Transitional Provisions of the FRMA (**S 266** Savings and transitional provisions - Schedule 3 parts 8-12, 15-19).

The “West Coast Rock Lobster Managed Fishery Management Plan” (the WRL Plan), which, in effect, is a set of rules as to how the fishery will operate, obtains its authority from the FRMA and, in conjunction with the FRMR and relevant Ministerial Policy Guidelines, is the vehicle through which the fishery is managed. The WRL Plan and the associated documentation (which includes the ESD report) should include all information expected to be in a “Best Practice” set of management arrangements (as defined in the Department’s ESD Policy - Fletcher 2001).

These arrangements should contain:

1. An explicit description of the management unit
2. The issues addressed by the plan
3. Descriptions of the stocks, their habitat and the fishing activities
4. Clear operational (measurable) objectives and their associated performance measures and indicators
5. Clearly defined rules, including what actions are to be taken if performance measures are triggered.
6. Economic and social characteristics of the groups involved in the fishery
7. Management and regulatory details for the implementation of the actual management plan
8. The reporting and assessment arrangements
9. How and when reviews of the plan will occur (including consultation mechanisms).
10. A synopsis of how each of the ESD issues are being addressed

These arrangements includes the criteria to operate in the fishery, the manner of fishing, the fishing season, fishing zones, licence renewals, transfers and cancellations, fishing pot entitlements, labelling of fishermen's containers, offences and major provisions, process for amending the plan and number of pots that fishermen may use.

Table 8. Comparison of Terminology.

Old Act	New Act (FRMA 1994)
Limited Entry Fishery	Managed Fishery
Notice	Order
Arrangement	Arrangement

Operational Objective

In consultation with the RLIAC and other stakeholders, periodically review the management plan, related legislation, regulations and arrangements to ensure it remains relevant and aligned with the fishery's management objectives and that collectively they cover the 10 main principles.

Justification

To have an effective and understandable plan for the management of this fishery with all of the 10 principles covered within the suite of arrangements developed for the fishery.

Indicator

The extent to which the management plan and supporting documentation addresses each of the issues and has appropriate objectives, indicators and performance measures, along with the planned management responses

Performance measure

This should be 100%.

Evaluation

As an over-arching sub-component the performance of the management arrangements is evaluated on two levels – the micro level, i.e. the relevance of individual clauses and the role they play and on the macro level, i.e. the relevance of the plan as a whole and the role that it plays.

Current Performance against each of the areas required within the “plan”⁹:

1. **An explicit description of the management unit** – The management unit is explicitly described within the “Declaration of the Fishery” section of the WRL Plan
2. **The issues addressed by the plan** – The issues that need to be addressed by the WRL plan have been examined thoroughly and are documented within the 8 ESD component trees and their reports.
3. **Descriptions of the stocks, their habitat and the fishing activities** – the WRL stock is well described in Section 2.1 and the fishing activities are described in Section 2.2.
4. **Clear operational (measurable) objectives and their associated performance measures and indicators** – These are now located in Section 5 for each of the major issues.
5. **Clearly defined rules, including what actions are to be taken if performance measures are triggered** – For each of these major issues, the management actions that are planned to be taken if performance limits were exceeded are now articulated in Section 5.
6. **Economic and social characteristics of the groups involved in the fishery** – A brief articulation of the economic and social characteristics is located in Section 3.3 and there is to be a greater level of detail accumulated during the process of completing the remainder of the ESD components.
7. **Management and regulatory details for the implementation of the actual management plan** – The regulations relating to the WRL fishery are located in both the WRL Plan and the FRMR and orders (A set of which has been provided to EA).
8. **The reporting and assessment arrangements** – These arrangements are documented in Section 5.8.4.1 and include annual reporting against current agreed performance limits and targets and a five yearly review of these arrangements and assumptions.
9. **How and when reviews of the plan will occur (including consultation mechanisms).** – The FRMA clearly sets out how the process for the review of any management plan must occur. A review of the WRL Plan has been conducted in a comprehensive fashion every 3 years but with annual updates on progress.
10. **A synopsis of how each of the ESD issues are being addressed** – A synopsis of ESD issues has been compiled within the Overview Table of this report.

In 1999/2000, as in the previous seven seasons, the policy objective for the West Coast Rock Lobster Managed Fishery was to maintain the breeding stock to provide future recruitment of young lobsters to the fishery. Although catches in 1991/92 and 1992/93 were high, a major concern was advice received from the Fisheries Research Division that the breeding stock of rock lobster had been fished down to about 15% of the unfished or virgin size. This was below the internationally accepted safe level of approximately 25% of the original breeding biomass.

⁹ “Plan” – includes all management arrangements.

A management package, attempting to address this problem by leaving more breeding stock in the water, was introduced for the 1992/93 season. The effect of the package in enhancing the breeding stock was not considered sufficient and a new package was developed during 1993 by the Rock Lobster Industry Advisory Committee (RLIAC). This new package for the 1993/94 season aimed at leaving an additional 1,000 tonnes (approximately 10% of the average catch) of lobsters in the water at the end of that season.

Management controls included:

- A temporary 18% reduction in the number of lobster pots allowed to be used by each boat since the 1992/93 season;
- a total ban on taking females in breeding condition (setose and tarspot);
- an increase in the legal minimum size of lobsters from 76 mm to 77 mm from 15 November to 31 January; and
- separate maximum sizes for female lobsters in the north and south of the fishery to reflect the latitudinal differences in both growth and maturation rates of the lobsters.

This 1993/94 package of management measures was originally intended to remain in place for two years while RLIAC developed options for the long-term management of the fishery. However, as the package appeared to be succeeding in its objective of rebuilding the breeding stock, and as most fishermen supported its retention, it was extended and has continued through to the 1999/2000 season.

A record catch of over 14,000 tonnes was recorded in 1999/2000, and with good export prices the season was one of the most economically successful, if not the most successful, ever recorded. The fishery also became the first international fishery to be awarded Marine Stewardship Council chain of custody certification on the basis of demonstrating the ecological sustainability of its fishing and management operations. As part of this ongoing certification process an Environmental Risk Assessment and Ecological Management Strategy will also be completed.

While the flow-on impact of the Asian economic crisis was still a factor in the worst-hit of the traditional Asian markets, demand from these areas improved considerably in 1999/2000. Through aggressive marketing the industry continued to develop new market opportunities in Europe, China and the United States. Exchange rate variations continued to favour export prices. The Marine Stewardship Council certification should also help support growth in the developing European markets where there is growing consumer interest in 'green' products.

An inquiry completed by the Legislative Council Standing Committee on Ecologically Sustainable Development (ESD) in May 2000 confirmed that '...the yield from the western rock lobster resource is currently sustainable and the infrastructure managing the fishery is operating along ESD principles...' (Western Australia, Legislative Council 2000). The report also supported the existing regulation of the State's rock lobster processing sector and raised a number of issues regarding the existing management consultative processes. An independent industry working group also examined and reported on options for industry consultative processes.

Since indications are that the management package has been very successful in achieving the objective of rebuilding the breeding stock, no major changes are contemplated for the 2000/01 season, although changes to administrative elements of the management plan, to better express the 18% pot reduction and increase the flexibility for licensees in a business operating context and to help remove barriers to entry, have already been agreed in principle. These include:

- Unitisation of the fishery to more explicitly incorporate the 18% pot reduction in the current pot entitlements,
- individual numbering of pot entitlements;
- the ability of those with access to 63 or more pot entitlements and a fishing boat licence to apply for a new managed fishery licence;
- the ability of fishermen to retain an inactive managed fishery licence by retaining an inactive fishing boat licence and one or more inactive pot entitlements; and
- provision for temporary pot transfers.

The majority of fishermen still appear to be committed to supporting the maintenance of most components of the existing management regime, and particularly those parts that protect breeding females. Nevertheless, some fishermen have questioned the need to maintain the 18% pot reduction and the protection of larger lobsters. The Department has completed research showing the relative impact of each of the measures designed to protect the breeding stock so that better-informed decisions can be made about possible changes to the management package in 2001/02 to help reduce the economic impact of an anticipated return to average catch levels. During 2000/01, licensees will be further advised on the options for the 2001/02 season .

Robustness

High

The management plan and related legislation represent a comprehensive set of fisheries management legislation that is performing well. The fact that the management arrangements are contained within legislation provides a high degree of stability with respect to how the fishery is managed. This said, the processes for achieving management plan changes are well understood by the majority of stakeholders and the system is flexible enough so that the management process can respond to change stimuli.

Fisheries Management response

Management has successfully administered the management plan and related legislation to achieve and pursue the stated objectives. Changes, such as the introduction of the current management package (introduced in 1993/94) have occurred from time to time to address key concerns or issues, and the management plan will continue to evolve over time through the established process.

Comments and Action

The fishery is managed in a dynamic and consultative way (i.e. responds readily to changed circumstances), but fishermen are often resistant to change; this means that before effort-reduction methods are accepted by fishermen, they require evidence of the need for such measures. While most fishermen have a very high level of confidence in the Department's research activities, sometimes members of the industry demand certain knowledge before accepting the need for change and can be sceptical of research findings no matter how statistically valid. Individual fishermen's views can understandably be greatly influenced by their own experiences and observations while fishing that sometimes may give them a contrary view of the state of the fishery. Nonetheless, there is generally a very good relationship between fishermen and the Departmental research scientists and most will accept the advice of the researchers (albeit after questioning it in the context of their own experiences).

The commercial success of the fishery also appears to have encouraged many fishermen to be somewhat risk averse and inclined to a very conservative approach to managing the fishery (particularly given

their level of investment). While this encourages an attitude of avoiding risks to the sustainability of the fishery, it can also sometimes make some fishers resistant to changes in fishing rules that are designed to ensure sustainability. There is also sometimes a failure to recognise that the success of the fishery is in part due to a history of adaptive management. Proposed changes are often questioned on the basis that: “as the fishery is operating successfully why, should any changes be necessary or contemplated?”

External Driver Check List

- Resistance of fishers to change
- Reluctance of Minister to exercise power

5.8.1.3 Compliance

Rationale for Inclusion

Effective compliance is vital to achieve the management objectives of any fishery. The Agency spends around \$2.5 million to have enforcement and compliance monitoring in the rock lobster fishery each year. This involves a mix of sea patrols, aerial surveillance, land patrols, processing factory inspections, covert surveillance and education programs.

Operational Objective

To have sufficiently high levels of compliance with the FRMA, FRMR and the managed fishery management plan.

Justification

The activities of the participants in the fishery need to be sufficiently consistent with the management framework and legislation to make it likely that the expected outcomes and objectives of the fishery will be achieved.

Indicators

The levels of compliance with the legislation, including the estimated level of illegal landings

Degree of understanding of rules governing operation of the fishery by licensees and the broader fishing community.

Performance Measure

These are under development as part of the FRDC project on Rock Lobster Compliance Risk Assessment.

Data Collection Requirements and Processes

Random Inspections of Processors.

Ongoing collection of data on illegal activities.

Comparative data on the relative effectiveness of certain compliance techniques.

Evaluation

Sea and land patrols along with factory inspections only detected a low level of non-compliance with the management of this fishery during the 1999/2000 season. Fisheries Officers carried out licence and gear inspections and provided advice to industry during the season. A compliance risk assessment involving industry, management and compliance representation was held for the first time prior to the commencement of the 1999/2000 season. As a result a review of operations led to a new field operations approach.

These initiatives have been supported by a research project, with funding from the Fisheries Research and Development Corporation (FRDC), to examine compliance in the rock lobster industry. With over 95% of the total rock lobster catch currently processed through licensed factories, it has been possible to use random inspections of factory-consigned catch to estimate the total amount of “illegal” (i.e. undersize/oversize/setose) product removed from the fishery. The project has estimated that total level of “illegal” landings of between 33 and 50 tonnes¹⁰ were consigned during the 1999/2000 fishing season, which equates to an average infringement rate of less than half a percent, or approximately 3 illegal lobsters in every 1000 animals consigned. The vast majority of these infractions result from under-size animals (Table 10).

The infringement notice system, in its fifth year of operation, was also used to maximum effect. There were 155 infringement warnings given, 41 infringement notices issued and 38 breach reports filed in the 1999/2000 season (Table 10).

Table 9. Summary of commercial rock lobster breaches, warnings and infringements for the years 1998/99 and 1999/2000.

Offence Type	1998/99			1999/2000		
	Breaches	Warnings	Infringements	Breaches	Warnings	Infringements
Closed season	0	0	0	0	0	0
Illegal gear	2	1	1	1	3	2
Obstruction	0	0	0	0	0	0
Processing	1	0	2	7	2	2
Records/Returns	0	0	0	0	0	0
Spawners	0	114	9	2	48	3
Under-size	3	190	34	11	96	33
Excess gear	0	0	0	4	0	0
No licence	0	0	0	1	0	0
Over-size	0	0	0	0	2	1
Closed waters	2	0	0	10	0	0
Other	2	1	0	2	4	0
Total	8	305	46	38	155	41

¹⁰ This estimate is provided as a “best-case” and “worst-case” scenario after incorporating the estimated variability in several parameters used to calculate the total illegal catch consigned to licensed processing factories.

Robustness

Medium

The difficulties in identifying all types of illegal activities will remain particularly when concentrating effort on the factory inspections.

Fisheries Management response

The Regional Services division of the Department continues to gather intelligence on suspected and known illegal activity within the fishery and does so by using state of the art technology and sound procedures. In addition to this dedicated work close working relationships with other enforcement agencies, the Police in particular, are of great value.

Comments and Action

The Department will continue to provide high standard compliance service to the rock lobster fishery. With the completion of the FRDC compliance study, there will be a review of the activities that are undertaken, the indicators that should be measured and the performance measures that will be used to gauge success.

External Driver Check List

Changes to technology that may facilitate an increase the level of non-compliance.

Changes to non-fisheries legislation (National Competition Policy) may impact upon the Department's ability to restrict activities in a way that assists compliance (e.g. processor licence restrictions)

5.8.1.4 Allocation among users

Rationale for inclusion

In addition to the commercial fishery there is also a significantly large recreational fishery for rock lobsters in Western Australia. Regardless of the motivation for extractive fishing it has to be said that the sustainability parameters of the resource remain the same. It is therefore important that all extractive users are considered when implementing arrangements designed to secure the resource and ecological sustainability.

Furthermore there are other non-extractive interests in the resource and its related ecosystem that also need to be considered within the management process.

Operational Objective

To ensure that adequate management processes are in place that allow for the inclusive management of the rock lobster fishery as a means of facilitating debate on management arrangements that will achieve an equitable allocation of the resource amongst the various extractive and non-extractive stakeholders.

Indicator

The percentage of catch taken by each sector (recreational and commercial).

The level of resource sharing conflict amongst user groups.

The level of participation of interested groups/parties in any focused resource sharing process.

The willingness of the various interest groups to participate in the resource sharing process.

Performance Measure

To be determined as part of the Toohey Committee (see below) deliberations on resource sharing

Data Requirements

Information on the catch by the recreational sector.

Projected growth of recreational fishing for rock lobster.

The cost associated with various management options and the identification of potential funding sources – particularly relevant for those measures targeted at the recreational sector.

Appropriate advice and framework from the Toohey Committee on the question of resource allocation mechanisms across user groups.

Evaluation

There are now reliable estimates of the total annual recreational catch (Melville-Smith & Anderton 2000) and models to forecast the recreational catch prior to the season (Melville-Smith *et al.*, *in press*).

The current estimates of annual catch by the recreational sector over the past 8 years have been between 400-800 t depending on the year. The level of recreational catch varies amongst years in line with the changes in the relative abundance of lobsters in a similar fashion to the variations in the commercial catch in Zone C (Figure 20). Thus, the recreational take comprises a relatively similar proportion of the total catch.

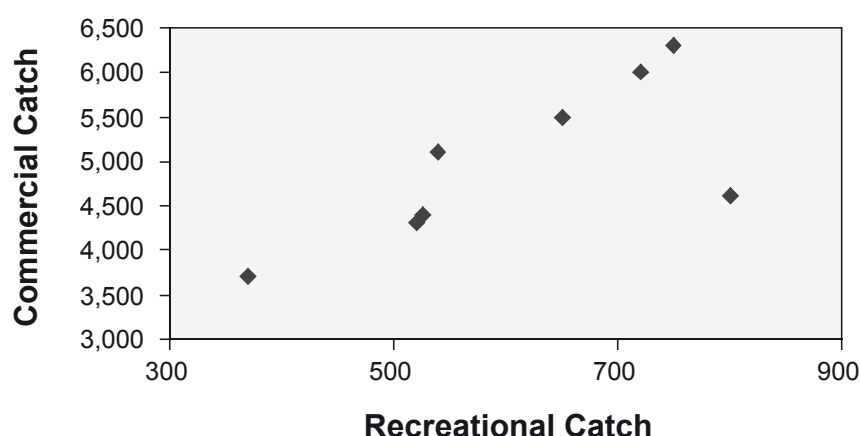


Figure 20. Relationship between the commercial catch in Zone C and the recreational catch from 1990-1998.

The rock lobster fishery is likely to move into a more explicit process to address resource sharing issues, including resource allocation across user groups. These deliberations are being progress by a committee being chaired by Justice Toohey which is due to report in mid 2002.

Robustness

Medium

Presently, whilst there is no specific allocation made to either the commercial or recreational sectors, both the overall catch and percentage take by each sector is monitored annually. The level of catch by the recreational sector has taken about 30 years to increase from 2% up to the current levels of

about 5% and the current management arrangements make it unlikely that this percentage will increase considerably before the Toohey committee findings have been finalised.

If there was a significant increase in the percentage of catch from the recreational sector, this would prompt a reassessment of the current management arrangements, possibly for both sectors in line with the normal dynamic management approach that is used.

Fisheries Management Response

Current: A Resource Sharing Sub-Committee has been established by the RLIAC that has equal representation from commercial and recreational fishers. While this sub-committee is in its infancy, it has recognised that others in the community have valid interests in the fishery. Processes such as “Issues Identification” workshops are part of the initial steps being taken.

The extensive consultative processes involved in managing both sectors of the fishery also ensure that the rights of commercial and recreational fishers are considered.

Recreational fishers interests are also catered for through the Recreational Fishing Advisory Committee that advises the Minister for Fisheries on matters relating to recreational fishing, including recreational rock lobster fishing.

Future: It should also be noted that an inquiry into the agency’s proposed approach for the implementation of Integrated Fisheries Management is currently underway and being headed by Justice Toohey. This process is charged with determining a more explicit process of allocation amongst the sectors.

Comments and Action

Through the processes already established and underway, the Department will continue to promote the integration of fisheries management across user groups. To this end the Department has a number of initiatives related to improving the governance of allocation and reallocation. An Integrated Fisheries Management policy was released in early 2000. This has been followed up by the formation of the “Toohey Committee” which will report to the Minister on the most appropriate framework to try and achieve these objectives.

External Driver Check list

Resource sharing issues being raised with the Minister independently of the RLIAC or the Toohey Committee.

5.8.2 Legal arrangements

5.8.2.1 OCS arrangements

Rationale for Inclusion

The Offshore Constitutional Settlement (OCS) arrangements between Western Australia and the Commonwealth Government of 1995 (originally developed in 1988) established that it is the sole responsibility of the State of Western Australia to manage the rock lobster fishery. OSC arrangement “*was developed to simplify legal arrangement for the management of fisheries operating in both State and Commonwealth waters*”. (Anon., 1988).

This OCS agreement, jointly signed by Ministers Beddall, for the Commonwealth Government, and House for Western Australia, prescribes that all rock lobster fishing (amongst other species) in Western Australia (which includes the WRL fishery) out to the limit of the AFZ is under the jurisdiction of WA. This further simplified the management of the fishery from system prior to any OCS arrangements where jurisdiction was split between WA within 3 nm of the coast and the Commonwealth, outside of this area.

These arrangements are supported using Part 3 of the FRMA relating to the Commonwealth State management of fisheries and *Commonwealth Fisheries Management Act (1991)*.

Operational Objective

To uphold the existing jurisdictional arrangements for the management of this fishery.

Indicators

Approaches from the Commonwealth Government to alter the existing OCS.

Performance Measure

Maintenance of the existing responsibility of the State for the management of the fishery.

Data Requirements

None specific

Evaluation

The current jurisdictional arrangements are appropriate given the distribution of the western rock lobster and the good track record that exists under these arrangements for the management of the rock lobster fishery.

Robustness

Very high

Fisheries Management response

The Department has successfully managed the rock lobster fishery for many years and sees no reason to alter the jurisdictional arrangements that currently exist as they relate to rock lobster.

Comments and Action

The original arrangement as specified in the 1988 agreement has now been captured as part of the more general 1995 agreement (see Brayford & Lyon, 1995 for more details).

External Driver Check List

Pressure to change any of the OCS arrangements.

5.8.3 Consultation

5.8.3.1 Consultation (including communication)

Rationale for Inclusion

The FRMA has certain requirements with regard to consultation that must be undertaken in the course of managing fisheries. The management of the rock lobster fishery is based around a very extensive consultation and communication process.

There are sections in the FRMA that relate to the development of a management plan (Section 64) and to the amendment of a management plan (Section 65). Given that the WRL already has a management plan, Section 65 is the most relevant.

This states that:

S 65. Procedure before amending management plan

- (1) A management plan must specify an advisory committee or advisory committees or a person or persons who are to be consulted before the plan is amended or revoked.*
- (2) Before amending or revoking a management plan the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan.*
- (3) Despite subsection (2), the Minister may amend a management plan without consulting in accordance with that subsection if, in the Ministers opinion, the amendment is –*
 - (a) required urgently; or*
 - (b) of a minor nature*
- (4) If –*
 - (a) the Minister amends a management plan; and*
 - (b) the amendment is made without consultation because it is, in the Minister's opinion , required urgently,**the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan as soon as practicable after the plan has been amended.*

The particular committee which must be consulted for the WRL fishery is designated in the management plan as the Rock lobster Industry Advisory Committee (RLIAC). Section 29 of the FRMA stipulates the composition of the Rock Lobster Industry Advisory Committee whilst Sections 30-32 describe its function and operations.

Operational Objective

To administer a consultation process that is in accordance with the requirements of the FRMA and allows for the best possible advice from all relevant stakeholders to be provided to the decision maker (Minister/ED) in a timely manner.

Indicators

- The Minister (or the Department on his behalf), conforms to the consultation requirements of the FRMA
- The level to which licencees consider that they are adequately and appropriately consulted.

Performance measures

Advice provided to the Minister following each RLIAC meeting.

Production and circulation of Chairman's reports to all stakeholders.

Adherence to annual planning cycle.

Proper consultation procedures have been followed in any amendment of the management plan.

Coastal tour held annually.

Data requirements

Views on the RLIAC and related consultation processes collected from stakeholders at each annual coastal tour

Documentation of the formal consultation procedures followed when an amendment is made.

Evaluation

Consultation on management of the rock lobster fishery is conducted in an open, accountable and inclusive environment where all sectors of the industry and the Departments managers collectively identify and discuss appropriate courses of action.

Decision makers take due note of advice provided on the basis of this consultation and give reasons for decisions which vary from consultation-based advice.

Robustness

High

The consultation process is extremely well understood with relatively high levels of participation from the various stakeholder groups.

Fisheries Management Response

The Department has strong links to the rock lobster industry through a formal statutory process. The Rock Lobster Industry Advisory Committee (RLIAC) has certain functions under section 30 of the FRMA which are:-

- to identify issues that affect rock lobster fishing;
- to advise the Minister on matters relating to the management, protection and development of rock lobster fisheries; and
- to advise the Minister on matters relating to rock lobster fisheries on which advice of the Advisory Committee is sought by the Minister.

To that end, they play an integral part in guiding the service delivery of the Department and setting priorities for management, research, enforcement and development.

The Department does, however, also provide independent advice to the Minister on the implications of any proposal from RLIAC, or other body.

Membership of the RLIAC comprises; an independent Chairperson; Executive Director the Department of Fisheries; an officer from the Department; two rock lobster processors; eight commercial rock lobster fishermen; and one recreational rock lobster fisherman and a representative of the Conservation Council of WA. Terms of appointment are usually for two years however members can seek to be reappointed for additional terms.

RLIAC has a number of sub-committees which are chaired by RLIAC members but nominations are sought from industry groups to make up the sub-committees.

There are a number of avenues through which RLIAC communicates to industry, such as the RLIAC newsletter, industry meetings, management papers, individual correspondence, attendance at association meetings, surveys, and discussions with their peers.

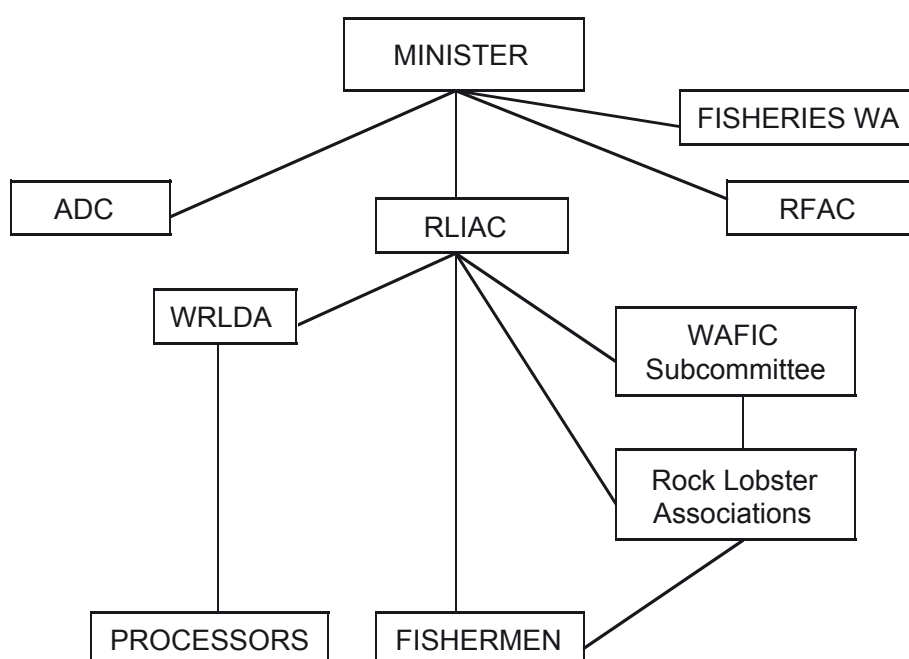


Figure 21. Various Fishing Bodies involved in the management process for the Western Rock Lobster Fishery.

Abbreviations:

ADC - Aquaculture Development Council

RFAC – Recreational Fishing Advisory Committee

WRLDA – Western Rock Lobster Development Association

WAFIC – Western Australian Fishing Industry Council

Comments and Action

The Department will continue to provide a dedicated executive officer whose primary role to service the consultation process for the rock lobster industry.

External Driver Check List

Despite the robustness of the RLIAC and other consultation processes used, disaffected parties may still seek to use political avenues to further their cause.

5.8.3.2 Reporting

Rationale for Inclusion

It is important that the outcomes of the fisheries management processes administered by the Department for the WRL fishery are available for review by external parties. It is also important that the community is sufficiently informed on the status of this fishery, given that it is utilising a community resource. The reports that are currently provided annually are: the State of the Fisheries Report, the Annual report to the Auditor General; more irregular reports include the Parliamentary Inquiry, this ESD report, and the application to EA. There is a longer term plan to have the entire system of management audited by the WA EPA.

Operational Objective

Current: To report annually to the Parliament and community on the status of the fishery.

Future: To develop an independent audit process for the fishery at appropriate intervals.

Indicators

- The extent to which external bodies with knowledge on the management of fisheries resources have access to relevant material.
- Level of acceptance within the community.

Performance Measure

General acceptance of the management system by the community

Data Requirements

The majority of data required to generate reports is already collected in the course of pursuing resource management objectives. The Department conducts an annual survey of the community with respect to its opinion on the status of the State's fisheries and their attitudes to the performance of the Department.

Evaluation

The Department has implemented more than one process to report on the performance of this fishery and in doing so has ensured that the community has access to this information.

In addition to this base level reporting the development of a new process that will see the fishery undergo regular independent audits ensures this sub-component is well in hand.

The Department has been the recipient of a number of awards for excellence for its standard of reporting - Premiers Awards in 1998, 1999 for Public Service excellence, Category Awards in Annual Reporting in 1998, 1999, 2000; Lonnie Awards in 2000, 2001.

Current Reporting Arrangements for this fishery include:

State of Fisheries

Annual reporting on the performance of the fishery against the agreed objectives within the *State Of The Fisheries Report*. This document is available in hard copy format but is also available from the Department's web site in PDF format.

Annual Report

A summary of this report is presented within the Department's Annual Report and is used in some of the Performance Indicators that are reviewed annually by the Office of the Auditor General (OAG). It is also available from the Departmental Website.

The OAG also periodically audits that the information (both the data and processes) used to generate these reports.

ESD

This ESD Report (of which the material in the application was a subset), not only covers the environmental aspects of the fishery but the full social and economic issues. It is now available from the website.

Reports to Industry

Each year, the status of the resource, effectiveness of current management, predictions for future years catches and any proposals for alterations to arrangements are presented to fishers and other interested parties in a series of public meetings along the coast. This is termed the Rock Lobster Tour. This includes the production of a summary report which is provided to the audience.

Robustness

High

Fisheries Management response

Current: For many years the Department has produced substantial and high quality documents that report on the operation of the Department and the status of its fisheries (including the WRL fishery)—these reports are the Annual Report and the State of the Fisheries

The ongoing accreditation by the Marine Stewardship Council demands regular reports on the status of the fishery in terms of its ecological sustainability – this is an external review process.

Future: In line with the new Commonwealth Government requirements the Department of Fisheries is in the process of developing a tri-partite memorandum with the Western Australian Environmental Protection Authority and the Office of the Auditor General to conduct a regular audit of the fishery.

Comments and Action

The processes already established and those new external review processes that are all but established ensure that there will be many opportunities for appropriateness of the management regime and the importantly the results it produces to be reviewed.

External Driver Check List

The assessments provided by independent review bodies and the community.

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7.0 Appendices

APPENDIX 1. ATTENDEES LISTS

A1.1 SCFA Meeting

Attendees:

SCFA Project Team (Dr Rick Fletcher, Dr Jean Chesson, Dr Tony Smith, Prof Tor Hundloe, Kate Brooks)

Peter Millington, Director Programs, Department of Fisheries

Dr Chris Chubb, Research Officer, Department of Fisheries

Dr Roy Melville-Smith. Research Officer, Department of Fisheries

Dr Lindsay Joll, Program Manager Commercial Fisheries, Department of Fisheries

Mal Millard, Industry Rep

John Looby, Manager Regional Services, Department of Fisheries

Neil Hughes, Environment Australia

Dr Jim Penn, Director Research, Department of Fisheries

Dr Nic Dunlop, Conservation Council of WA

Prof Bruce Phillips, Curtin University

Emma Hopkins, Department of Environment Protection

Ross Gould, Program Officer Rock Lobster Fishery, Department of Fisheries

Jo Bunting, Policy Officer, Department of Fisheries

Les Rochester/Frank Prokop, Recfishwest

Tony Gibson, West Coast Rock Lobster Development Association

Brett McCallum. Western Australian Fishing Industry Council

Norm Hall, Stock Assessment/Data Analysis, Department of Fisheries

A1.2 Risk Assessment Meeting

Brett McCallum, Pearl Producers Association (ex WAFIC CEO)

Bruce Phillips, Adjunct Professor Curtin University

Colin Chalmers, Department of Fisheries

Edwina Ward-Davies, Marine & Coastal Community Network

Eric Barker, Department of Fisheries

Fred Wells, Snr Curator WA Museum

Guy Leyland, WAFIC

Jim Penn, Department of Fisheries

Jo Bunting, Department of Fisheries

Katherine Short, WWF

Kevin Donohue, RILIAC

Lindsay Joll, Department of Fisheries

Neil Dorington, Rock Lobster Commercial Fisher

Nic Caputi, Department of Fisheries

Nick D'Adamo, CALM

Nic Dunlop, Conservation Council of WA

Peter Auguston, Rock Lobster Commercial Fisher

Peter Jernakoff, IRC Environment

Rick Fletcher, Department of Fisheries – FRDC Project

Rob Rippingale, Curtin University

Ross Gould, Department of Fisheries

Roy Melville-Smith, Department of Fisheries

Sarah Brown, IRC

APPENDIX 2. MATERIALS SUPPLIED TO ENVIRONMENT AUSTRALIA AGAINST THEIR SPECIFIC GUIDELINES

SECTION 4. Assessment of the SBS Management Regime against the Commonwealth (EA) Guidelines for assessing the Ecologically Sustainable Management of fisheries

GENERAL REQUIREMENTS OF THE EA GUIDELINES

The management arrangements must be:

Documented, publicly available and transparent

As per the FRMA, “the Executive Director is to cause a copy of every order, regulation and management plan in force under this Act –

- *To be kept at the head office of the Department; and*
- *To be available for inspection free of charge by members of the public at that office during normal office hours.”*

In addition to these legislative requirements the current management regime, as documented in the formal set of management regulations, can be purchased by interested parties from the State Law Publisher.

Of more relevance is that any discussion papers and proposals for modifications to these management arrangements are distributed widely to stakeholder groups automatically and other interested individuals by request in hard copy format. They are now also available from the Departmental web site www.fish.wa.gov.au. (e.g. Donohue, 2000 –FMP 143)

Finally, once completed, the full National ESD Report on the WRL fishery will be publicly available on the Departmental website which will provide increased transparency through explicitly stating objectives, indicators, performance measures, management arrangements for each issue and how the fishery is currently performing against these criteria.

Developed through a consultative process providing opportunity to all interested and affected parties, including the general public

S64 and S65 of the FRMA define the requirement for procedures that must be undertaken before determining or amending all management plans. More specifically, the management arrangements for the WRL fishery have been developed through formal consultation with industry and the general public which includes the Rock Lobster Industry Advisory Committee (RLIAC), which is a statutory committee under legislation (S29 and S30 of the FRMA), and also from requested submissions from industry groups (e.g. WAFIC), other stakeholder groups (e.g. Recfishwest, Conservation Council of WA) and the general public.

Specific public meetings are held during periods when major changes to arrangements are proposed with discussion documents and draft proposals sent to any interested parties. In addition, RLIAC undertakes an annual coastal tour whereby issues related to the WRL fishery, including any proposed changes, are presented at open forums. These meetings are held at a number of relevant coastal towns along the southern west coast of WA. A full description of consultation mechanisms used in this fishery is located in Section 5.8.3.1

The National ESD Report for the WRL fishery was developed through a consultative process that included a wide variety of stakeholders including members of the rock lobster industry, government (Fisheries, Conservation and Environment Departments), recreational groups, non-government environmental groups (Conservation Council of WA) and Environment Australia. Details of the methodology used to generate this report including how the issues were identified, how these identified issues were subjected to a risk assessment, and how the objectives etc were developed are described in Section 3.5. Attendees at each of the meetings are listed in Appendix A1.

Ensure that a range of expertise and community interests are involved in individual fishery management committees and during the stock assessment process.

The level of involvement and the range of expertise and community interests that are involved, and have been involved, in the process of determining management and reviewing stock assessments is extensive. The groups that have been involved in the generation of the information contained in this report include:

- Department of Fisheries, WA;
- Department of Environment, WA,
- Department of Conservation (formerly known as CALM),
- The Rock Lobster industry,
- Western Australian Fishing Industry Council (WAFIC)
- Recfishwest
- Conservation Council of WA
- WWF
- Museum of WA
- Marine Stewardship Council (MSC – including the three international experts on their review panel).

The general consultation methods used for this fishery are summarised in the Governance Section 5.8.3.1. The attendee lists for the 2 meetings are listed in Appendix A1.

Be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements are measured.

The National ESD Component Reports (see Section 5) contains the available objectives, indicators and performance measures for measuring the effectiveness of the management arrangements for the WRL fishery. For some components, the objectives, indicators and performance measures are well established and the data are available to demonstrate levels of performance over time. For other components, the objectives, indicators and performance measures have only just been developed and/or the necessary data collection is only just being initiated. The status of this information is documented within each of the individual component reports within the National ESD Report in Section 5.1-5.8.

Be capable of controlling the level of harvest in the fishery using input and/or output controls

The FRMA, and specifically the management plan for the WRL fishery provides the legislative ability to control the level of harvest within this fishery. This is achieved through the use of a sophisticated and effective combination of input control measures based upon limiting the number of vessels allowed to operate in the fishery, the amount (and type) of gear each of these boats may use, the seasons and areas they are allowed to fish, along with a variety biological controls which restrict the types of lobsters allowed to be landed.

These arrangements have been varied during the past 40 years to ensure that management remains appropriate to achieve the sustainability objectives for the fishery. Thus there have been both permanent and temporary reductions in the numbers of pots that can be used, changes to the fishing seasons at both the coastal and Abrolhos Islands sites; changes to the size limits (minimum and maximum sizes) to protect a greater proportion of breeding lobsters; changes to the reproductive stages permitted to be landed (berried, tar spot and setose etc), changes to permitted pot designs (e.g. introduction of escape gaps).

Contain the means of enforcing critical aspects of the management arrangements

The Department of Fisheries, WA employs a large number of operational staff to ensure compliance with the critical aspects of the management arrangements for the WRL fishery (both the commercial and recreational components). This includes at sea patrols to ensure the closed seasons and closed areas, number of pots and other operational rules are being adhered to. These compliance activities also include factory inspections to ensure that the landed lobsters conform to legal size and reproductive status requirements. Various on-shore patrols, along with covert activities, are also used to minimise the level of illegal take of lobsters.

Given the value of the licences and pot holdings, fishers themselves are also a source of information on illegal activities. A full summary of these compliance activities and their effectiveness is provided in Section 5.8.1.3.

Provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria

There is an annual review of the performance of the major aspects of the WRL fishery through the completion of the “State of the Fisheries” report. This is updated and published each year following review by the Office of the Auditor General. It forms an essential supplement to the Department’s Annual Report to the WA Parliament.

The National ESD Component Report contains a comprehensive performance evaluation of the WRL fishery based upon the framework described in the Fisheries WA ESD policy (Fletcher, 2001). This includes the development of objectives, indicators and performance measures for all aspects of this fishery (including social and economic issues) and includes status reports for those components that are not subject to annual assessment. This full assessment, including an examination of the validity of the objectives and performance measures, is planned to be completed and reviewed externally every five years.

The WRL fishery has recently been reviewed and awarded the Marine Stewardship Council’s certification as a Sustainable Fishery. To maintain this certification requires periodic assessment by an independent review team at intervals not exceeding five years.

Be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates

Capabilities for the assessment, monitoring and avoidance, remedying or mitigating any adverse impacts on the wider marine ecosystem are documented in “Other effects on the environment” Section 5.3. This has been completed through a formal risk assessment analysis of the issues and, where necessary, the development of suitable monitoring programs.

Require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy

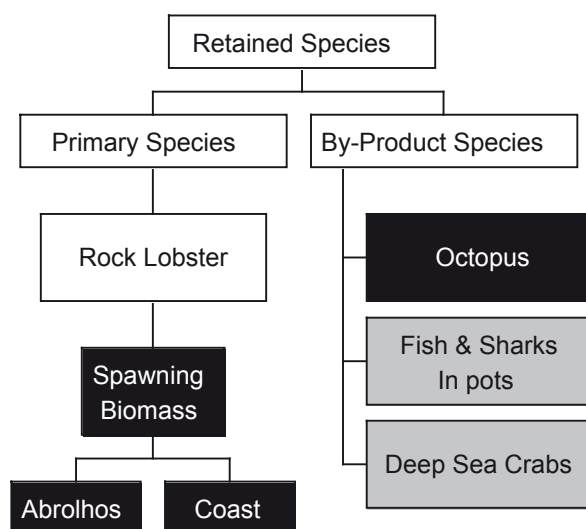
The management regime complies with all relevant threat abatement plans for species where there is an interaction. Details are provided in the ‘non-retained species’ Section of the National ESD Report (Section 5.2.).

Principle 1 of the Commonwealth Guidelines

Objective 1 Maintain Viable Stock Levels of Target Species

A fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability

The component tree detailing the retained species within the WRL fishery is shown below. Each of the target species/groups retained by this fishery has been assessed with appropriately detailed reports having been completed. The full reports are located in Section 5.1. Only the WRL and octopus were caught in sufficient quantities by this fishery to warrant detailed attention (5.1.1.1 and 5.1.2.1). Full justifications for not specifically assessing the other two components (Fish & Sharks, Deep Sea Crabs) are located in 5.1.2.2 and 5.1.2.3 - largely related to the relatively small amounts taken by the WRL fishery, and these groups will be dealt with in detail in other fishery assessments.



Assessments of current performance demonstrate that both the WRL and Octopus are being maintained above levels necessary to maintain ecological viable stock levels. Thus, in summary:

- The breeding stock levels of the WRL across all regions are currently estimated to be above 22% - which is the performance limit for these stocks.
- The current catch rate of octopus is within the acceptable range of the long-term (10 year) average.

Consequently this fishery is meeting the requirements of Principle 1. The information relevant to this principle for these species is detailed below.

Information Requirements

1.1.1 There is a reliable data collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate degree of fishery independent as well as fishery dependent research and monitoring.

A substantial level of information is collected for the WRL fishery. Data are collected through a combination of fishery dependent and fishery independent systems, many of which have been in place for decades. These ongoing monitoring programs are supported by a long history of research programs on the biology, ecology and interactions of lobsters along the west coast of WA.

The specific data requirements (and justifications) needed to assess the ongoing performance for each of the relevant objectives are detailed in the relevant sections of the SCFA- ESD reports in Section 5.1 Retained Species but can be summarised as including –

Monitoring Program	Information Collected	Robustness ¹¹
Monthly return data from all fishers*	Monthly Catch, Days Fished, Traps Pulled per day	Moderate
Processor Returns	Weights of lobsters purchased by processors by grade category	High
Factory size class and quantity figures for WRL	Length Frequency sample of lobster from factories in each Zone of the fishery	High
A voluntary daily log book completed by a large percentage of fishers*	Daily Catch, Traps Pulled, Days fished, Swell Height, Number of undersized returned, Number of Breeding Lobsters returned	High
On-board observer program covering all zones, times and depth ranges *	Pot by pot catch details size structure, reproductive condition; and other species information – e.g. octopus numbers, interactions with other fauna (e.g. seals turtles dolphins)	High
Compliance data on breaches of regulations	Records of breaches and infringements of fishers and processors.	Moderate
Fishery independent spawning stock surveys	Numbers of spawning individuals per pot lift on standardised surveys in 3-5 regions of the fishery	High
Puerulus settlement data	Monthly numbers of puerulus from collectors at five standard sites along the lower west coast	High
Climatic data	Monthly Fremantle Sea Level data – used to estimate strength of Leeuwin Current; Rainfall data, Wind data and Swell Height Conditions.	High
Surveys of recreational fishers	Annual phone survey of licensed recreational lobster fishers including levels of effort, and catch	Moderate

* indicates monitoring programs that also relate to species other than the WRL

¹¹ The level of robustness of these measures is discussed in full within each of the relevant component reports in Section 5.

Assessments

1.1.2 There is a robust assessment of the dynamics and status of the stock dynamics and status for the target species. Review should ideally take place every year, and no greater than three years should elapse between reviews.

The status of the breeding stock of the WRL is assessed annually using a synthesis of information obtained in coastal waters and the Abrolhos Islands, using both fishery independent surveys and onboard monitoring of the commercial fishery. Full details of the current evaluation and a discussion of the robustness of the analyses used are located in 5.1.1.1. These assessments are reported annually within the State of the Fisheries Report.

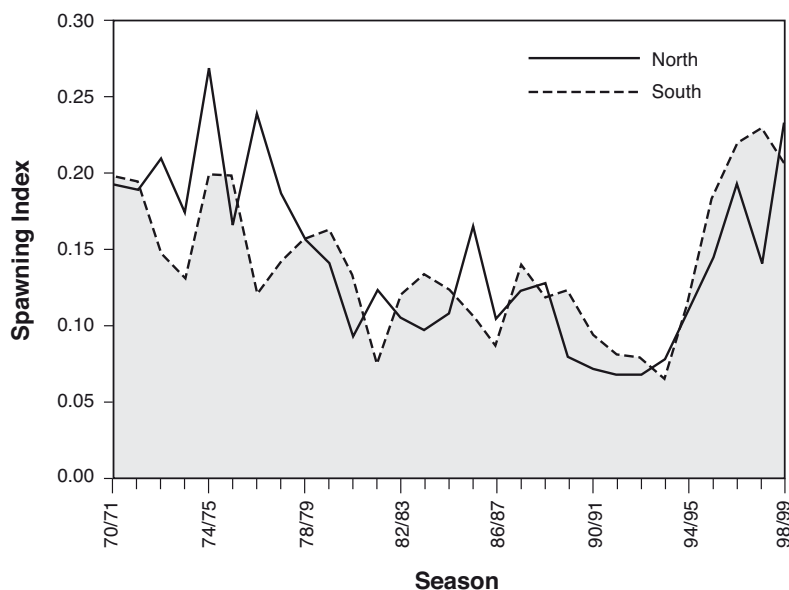


Figure 5. Time series of the monitoring spawning stock index (an index of the numbers of eggs/pot lift integrated over the whole season) for the north (Jurian and Dongara) and south (Fremantle and Lancelin) coastal regions.

In summary, all analyses (including the monitoring of coastal sites shown above in Figure 5) show that since the 1993/94 management arrangements were implemented, the breeding stock levels of the WRL have recovered from the 15% unfished level present at that time, to be currently greater than the 22% performance target (Fig. 5). All analyses, including the independent breeding stock surveys, are displayed in section 5.1.1.1

1.1.3 The distribution and spatial structure of the stock(s) has been established.

The distribution of the WRL has been well documented as occurring along the lower west coast region from Shark Bay in the north to Cape Leeuwin in the south. (see also Figure 1).

1.1.4 There are reliable estimates of all removals, including commercial (including discards), recreational and indigenous, from the fished stock. These estimates have been factored into stock assessments and target species catch levels.

Within the list of monitoring programs outlined above for the WRL fishery, data covering each of these sources of removal are outlined. In most cases, these data are collected annually or at least on a sufficiently frequent basis to ensure robust estimates are available. The stock assessment modelling that is conducted includes estimates of each of these categories in determining the current and likely future status of the WRL stock.

Sector	Catch Data Collected	Frequency
Commercial	Fishers Monthly Returns, Processor Returns, Voluntary Daily Log books, On-board observer data	Daily or Monthly during season
Recreational	Phone survey of Licensed Recreational Fishers	Annually
Indigenous	Included in recreational data	Annually
Illegal	Estimated from compliance data.	Annually

1.1.5 There is a sound estimate of the potential productivity (maximum safe long term yield) of the fished stock/s

The population dynamics and potential yield of the WRL stock are well understood. The annual catch has varied between 8-14 thousand tonnes over the past 20 years with an average of approximately 10 thousand tonnes, which is consistent with the MEY estimates from a number of published stock assessments (see Hall & Brown, 2000 for review).

The ability to accurately predict the level of catch, with high precision, up to four years in advance based upon environmentally driven fluctuations in recruitment is strong evidence of the high level of understanding in the dynamics and productivity of this stock. Moreover, the level of concordance between estimates of the catch one year in advance and what was subsequently caught forms a major performance measure for the governance for the fishery as to effectiveness of the current management arrangements (see Figure 6 below).

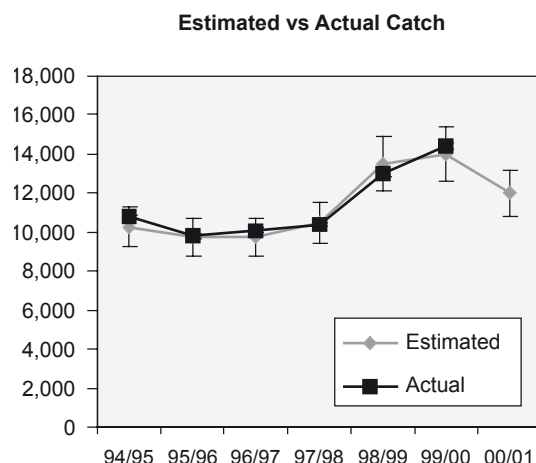


Figure 6. Comparison of the estimated catch and the actual (+/- 10%).

Management Responses

1.1.6 There is a limit reference point, which is the biological and/or effort bottomline beyond which the stock should not be taken.

The limit reference point for the WRL breeding stock is 22% of the unfished level. The appropriateness of this level has been determined from direct observations on recruitment to this stock during a period when the breeding stock was at 15% (Walters *et al.*, 1993; Hall & Brown, 2000, Hall & Chubb, 2001), and also from the general experiences of decapod crustacean fisheries where levels greater than 20%

are recommended. The full justification for selecting this level and current performance against this measure are described in Section 5.1.1.1.

1.1.7 There are management strategies in place capable of controlling the level of take.

A full description of the management arrangements for the commercial fishery are located in the attached management plan. A full discussion of these regulations and their justification are located in Section 2.2. In summary, these arrangements include:

- Closed season July 1 to November 14 (Coastal Zones), March 14 (Abrolhos Is.).
- Maximum Number of pot entitlements for fishery (currently 56906 pots distributed amongst 594 boats).
- The licensee can only operate in the zone for which he/she is licensed.
- Minimum size of carapace is 76 mm, except for a period of 2.5 months at the start of the season when the minimum size is 77 mm.
- It is illegal to take setose females or those carrying eggs, or tarspot.
- A maximum size of 115 mm for lobsters landed south of 30°S and 105 mm for landed north of 30°S. (except for the 2001/02 season).
- The configuration of pots and size and number of escape gaps (54 mm) are regulated.
- Pots may only be pulled during specified daylight hours.
- To operate (actually go fishing), the managed fishery licence must have between 63 and 150 units of pot entitlement.

There are also controls on the take of lobster by the recreational fishery:

- A recreational rock lobster licence is required to take lobsters.
- Each licence holder is only allowed to use two recreational pots, or four per boat.
- There is a daily bag limit of 8 lobsters per person or 16 per boat.
- All the closed seasons, size limits and reproductive stage prohibitions that apply to the commercial fishery also apply to the recreational fishery.
- Pots can't be pulled at night.
- All recreationally caught lobsters must be tail clipped.
- Divers may not use spears to capture lobsters.

(More details on the recreational fishery are located in the Allocation section 5.8.1.4)

Significant effort is put into ensuring adequate compliance with these regulations. This includes at sea patrols to ensure the closed seasons and closed areas, number of pots and other operational rules are being adhered to. These compliance activities also include factory inspections to ensure that the landed lobsters conform with legal size and reproductive status requirements. Various on-shore patrols, along with covert activities, are also used to minimise the level of illegal take of lobsters.

(Full details on Compliance activities and their effectiveness are located in Section 5.8.1.3)

1.1.8 Fishing is conducted in a manner that does not threaten stocks of by-product species.

Full descriptions of the information available and the levels of risk of impact on the by-product species (octopus, scalefish and sharks) by the WRL fishery are located in sections 5.1.2.1, 5.1.2.2 and 5.1.2.3 but only octopus was rated as being of sufficient risk to require specific ongoing monitoring. The WRL fishery catches only minor amounts of the other groups and their management will be covered fully (including the take by the WRL) within other fisheries environmental assessments.

In summary, (relating to objectives 1.1-1.6), a number of the monitoring programs that are in place for the WRL fishery also provide relevant information on octopus and the other retained species. An assessment of the status of the octopus stock will now be completed annually from this year using an analysis of catch rates calculated from data collected by the fishery independent observer program plus research log book program. Because few recreational fishers target this group, only these commercial data will be used in the assessment. The reference point at which extra management arrangements for Octopus stocks would be introduced is based on there being a significant decline in catch rate. Full justification for this approach is located in Section 5.1.2.1 .

1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The management responses that are currently in place for the WRL are very detailed, both for current actions, future actions and if the performance limits are reached/approached (see Section 5.1.1.1). Management actions taken over the past 40 years have been extremely effective and there is, therefore, an extremely high probability that they will continue to achieve the main objective of maintaining the spawning biomass of the WRL.

The ability to directly monitor recruitment levels and hence predict catches up to four years in advance would provide advance warning if the patterns were outside of normal variation limits and enable responses to be implemented in a timely fashion. Thus, continued direct monitoring of the level of spawning biomass will be undertaken and if there were a chance that the performance limit will be reached, increased management arrangements, similar to those implemented in the early 1990s would be imposed:

Strategies available to offer further protection to the breeding stock if required include:

- a. Further reductions in the total number of pots that may be used in the fishery.
- b. A reduction in the length of the fishing season or within season closures.
- c. Changes to minimum and maximum size gauges to protect juvenile and large breeding female rock lobsters.
- d. Area closures.

Objective 2. Recovery of Stocks

Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes

There are no stocks within the WRL fishery that are currently below defined reference points/limits.

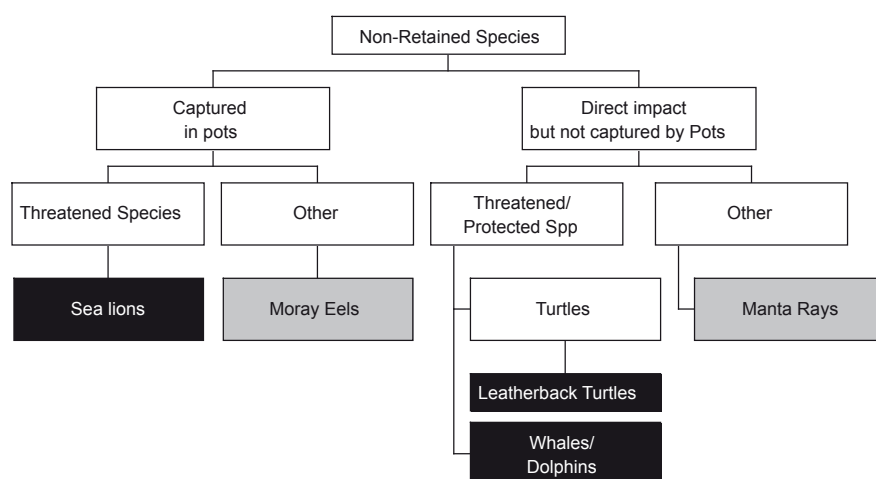
PRINCIPLE 2 OF THE COMMONWEALTH GUIDELINES

Objective 1. Bycatch

The fishery is conducted in a manner that does not threaten bycatch species

There are relatively few non-retained species caught by the WRL fishery. As a potting fishery with pots designed to catch lobsters of a certain size (including numerous escape gaps), it is a very selective method of fishing. Only a few non-retained species were identified of significance in this fishery. These are shown in the component tree below and three of these are not actually captured in the pots but on rare occasions interact with the ropes. The threatened and protected species (e.g. sea-lions, turtles) are covered in objective 2.2, the remaining non-retained (bycatch) species are covered under objective 2.1.

Comprehensive reports on each of these bycatch (non-retained) species are presented in Section 5.2. NON-RETAINED SPECIES. These assessments indicate that the performance of the WRL fishery is currently adequate in not threatening any of the bycatch (non-retained) species and is therefore meeting the objectives 1 and 2 of Principle 2.



Information requirements

2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.

The level of interaction of the WRL with the bycatch species that are not on the threatened species list or the protected species list (which are covered in section 2.2) is too small to warrant ongoing monitoring.

Assessments

2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing.

A formal risk assessment for each of the identified bycatch/non retained species (including those caught by the pots and entangled within ropes) was completed (see Section 3.4 Risk Assessment/Prioritisation Process for details of how this was completed and Appendix 1 for the list of stakeholders and experts involved and Attachment 1 for the full IRC report). This assessment concluded that the WRL fishery formed a low risk to Moray eels and Manta Rays.

Moray Eels – Summary

ERA Risk Rating (C1 L1- LOW)

Moray eels whilst captured on a relatively frequent basis are generally returned to the water in a live state. There is no evidence of any decline in abundance and the current pot design probably results in most escaping capture. For full details see 5.2.1.2

Manta Rays - Summary

ERA Risk Rating: Manta Rays caught in Pot Ropes (C1 L1 LOW)

Only infrequent interactions occur between the WRL fishery with this group and these rarely result in death or even injury. The full rationale for the low risk ratings for Manta Rays is documented in section 5.2.2.2.

Management responses

2.1.3 Measures are in place to avoid capture and mortality of bycatch species unless it is determined that the level of catch is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.

Current pot designs, particularly with the current number and size of escape gaps that are required, minimise the capture of most bycatch species.

2.1.4 An indicator group of by-catch species is monitored.

The minimal risks associated with this group of non-retained species, results in it not being necessary to monitor any of these species.

2.1.5 There are decision rules that trigger additional management measures when there are significant perturbations in the indicator species numbers.

The risks associated with this group of species will be reassessed at the next major review of this fishery. This will occur within five years, both as a requirement to maintain MSC accreditation, and as a requirement of the WA ESD policy.

2.1.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Given the relatively low levels of interactions of the WRL fishery with non-retained species and the relatively stable nature of this fishery (including constancy of methodology – and a general trend for a decrease in pot lifts over the past 8 years), makes it unlikely that there will be increases in the level of impact on these group of species.

Objective 2. The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities.

Information requirements

2.2.1 Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities.

Monitoring programs, based upon the information collected by the on-board observers, are now in place for sea lions, turtles and whales/dolphins. The log books also contain the ability to record interactions with each of these species/groups. Previously the only information available was from the sparse data collected by the Dept. of Conservation and Land Management who has the legislative responsibility for these species within WA waters.

Assessments

2.2.2 There is an assessment of the impact of the fishery on endangered, threatened or protected species.

A formal risk assessment for each of the identified bycatch/non retained species (including those caught by the pots and entangled within ropes) was completed (see Section 3.4 Risk Assessment/Prioritisation Process for details of how this was completed and Appendix 1 for the list of stakeholders and experts involved). This assessment concluded that the WRL fishery formed a low risk to whales/dolphins and a moderate risk to sea lions and leatherback turtles.

Sea Lion – Summary

ERA Risk Rating (C3 L4 MODERATE)

Interactions with seals, sea lions and their pups are recorded in many fisheries around the world and there have been occasional reports of sea-lion pups being caught and drowning in rock lobster pots. The mortality rate from lobster potting is expected to be very small and perhaps insignificant when compared to the reported highly variable mortality suffered by pups up to 5 months old in Western Australia. There is now, nonetheless, an ongoing monitoring program to better assess the interactions of the WRL fishery with sea lions. For full details see 5.2.1.1.

Leatherback Turtles – Summary

ERA Risk Rating (C3 L4 MODERATE)

The moderate risk to leatherback turtles (where about one individual per year may get entangled in the pot ropes and possibly drown) was rated at this level because of the low stock levels of this species caused by the active harvesting of both the adults and eggs in other countries, not because the WRL fishery was seen to be having the major impact. There is now an ongoing monitoring program to more accurately assess the level of interactions of the WRL with leatherback turtles. For full details see 5.2.2.1.

Whales/Dolphins - Summary

ERA Risk Rating: Rope entanglement of threatened spp. e.g. whales (C1 L2 LOW)

Only infrequent interactions occur between the WRL fishery with these groups, and these rarely result in death or even injury. The full rationale for the low risk ratings for whales/dolphins is documented in section 5.2.1.2.

2.2.3 There is an assessment of the impact of the fishery on threatened ecological communities.

There are no threatened communities associated with the WRL fishery.

Management responses

2.2.4 There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.

Current pot designs, particularly since the introduction of the escape gaps, minimise the capture of most bycatch species. The rate of capture of sea lion juveniles is to be monitored more closely to ascertain if it is really a moderate risk to the population. In addition, tests on the use of changes to gear, such as spikes in the necks of the pots to discourage foraging (as used elsewhere) may be trialed if necessary.

If there is evidence of increasing levels of interactions with turtles, trials of weighted pot-ropes may be done to ascertain if this is likely to reduce interactions with large pelagic species (e.g. whale turtles etc).

2.2.5 There are measures in place to avoid impact on threatened ecological communities.

Not applicable.

2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

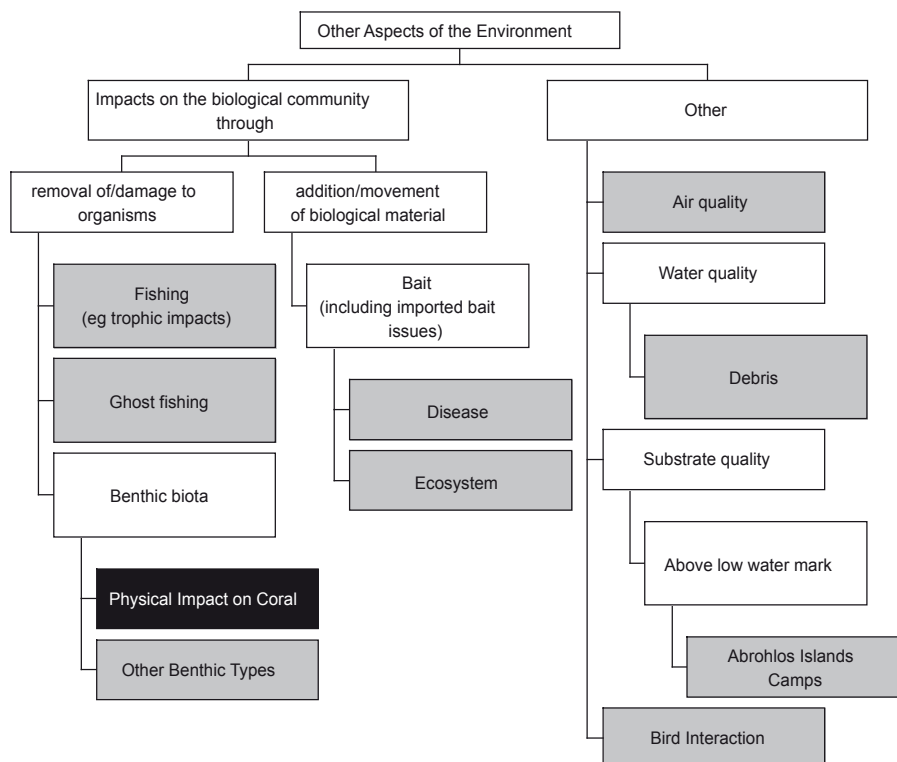
Given the relatively low levels of interactions of the WRL fishery with non-retained species (including those on the threatened or protected lists) and the relatively stable nature of this fishery (including constancy of methodology – and a general trend for a decrease in pot lifts over the past 8 years), makes it unlikely that there will be increases in the level of impact on either the threatened or protected species by the WRL fishery. Nonetheless, as monitoring data become more available, the suitability of these current performance limits may need to be reviewed. If they are inappropriate and/or the level of interactions increases, appropriate alterations to practices will be taken.

Objective 3. General Ecosystem

The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally

The issues that relate to the broader ecosystem which were identified for the WRL fishery are shown in the following component tree. A formal risk assessment process subsequently assessed each of these issues with the information relating to each issue detailed in Section 5.3.

Of the ten identified issues, only one (impacts on coral reef) was rated as a moderate risk, all others were rated as a low risk. Consequently, the current performance of the WRL fishery is meeting objective 3 and this acceptable performance is likely to continue or improve in the future.



Information requirements

2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.

The information available to assess potential ecosystem impacts includes data directly related to the WRL fishery – such as the total biomass of lobsters, the levels and distribution of effort, design of gear and an understanding of the method and area of deployment. There are also a number of research publications on the prey species of lobsters and lobster predators, along with other scientific reports that have investigated the impacts of bait and reviews of fishing impacts in the Abrolhos Is. In cases where the level of information was insufficient, processes are already in place to remedy this situation to enable a more informed decision to be made (e.g. impacts on corals). Consequently, the levels of information available for most issues identified allowed a sensible assessment of the level of risk to be determined.

Assessment

2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.

A formal risk assessment was completed (see Section 3.3 for details) on each of the identified issues relevant to the WRL fishery (see component tree for issues). The identified issues that were assessed and a summary of outcomes are located in Table 4 with complete justifications located in Section 5.3.

Table 10 . Summary of Risk Assessment Outcomes for Environmental Issues Related to the WRL fishery.

ISSUE	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Trophic structure (both higher and lower) affects	LOW	The total biomass of lobsters remains at > 90% of unfished levels. There are no identified, nor suspected, strong trophic interactions associated with rock lobsters in WA. Hence there is likely to be only minimal trophic level impacts resulting from lobster fishing	5.3.1.1
Ghost Fishing	LOW	Pots have escape gaps, designed to disintegrate if left for long periods Surveys have found no lobsters in lost pots	5.3.1.2
Impacts on benthic communities types:			
Coral reefs	MOD	Assessment of potting activities indicates only a low level of potting in highly sensitive areas. More work is needed to assess recovery rates.	5.3.1.3
Limestone reefs	LOW	Less than 1 in 10000 chance of an area of reef even being hit by any pot per year.	5.3.1.4
Seagrass	LOW	Pots will not impact seagrass using overnight sets.	5.3.1.4
Impacts of Bait Usage	LOW	Previous assessment (Jones and Gibson 1997) found this risk to be low.	5.3.2.1
Impacts on Bird and Dolphin Behaviour	LOW	Dolphin feeding is now illegal, birds are only present part of season	5.3.2.2
General impacts on air and water quality	LOW	Fuel-efficient boats are used, code of conduct re handling of waste in use.	5.3.3.2
Impacts from Camping in Abrolhos Is	LOW	New plan for this region will eliminate most waste issues.	5.3.3.1

Thus, all of these issues were rated as low risk except for the potential for pots impacting upon the coral reef structure at the Abrolhos Is. This issue was rated as a medium risk, largely because of a lack of knowledge of the real scale of the interactions. Following the workshop held in August 2001 on this issue, a report has been compiled an extract related to rock lobster fishing is located in section 5.3.1.3.

Management responses

2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1.

The most important management methods employed to ensure minimal impact on the broader ecosystem are associated with ensuring significant biomass levels of lobsters remains. The total biomass of lobsters is currently estimated to be still at least 80% and probably > 90% of the unfished levels (see Section 5.3.1.1 for details). Furthermore, lobsters are generalist feeders, feeding on a wide variety of algae and invertebrates (i.e. they are not a keystone predator) and they do not form the sole prey of any other species. Consequently, keeping a high biomass of lobsters serves to achieve both objectives -ensure a sustainable fishery and minimise any potential impacts on trophic interactions. Other management measures such as the designs of the pots, allowable fishing methods and ancillary legislation further minimises the potential for impacts.

The only moderate rating for the potential impacts generated from the risk assessment workshop was for the corals within the Abrolhos Is. and this was largely associated with a lack of available data. The more recent workshop on Human Impacts (including lobster fishing) at the Abrolhos Islands collated all the information available on this issue and concluded that the risk from lobster fishing was low. This review did, however, develop a series of recommendations that will be carried out over the coming years (see Section 5.3.1.3 for details).

Finally, whilst studies have found no discernable impacts on the ecosystem from camping within the Abrolhos Islands, revised regulations will make this even less likely given that new waste disposal policies are being introduced (see Section 5.3.3.1 for details).

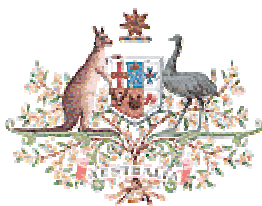
2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is indicated by application of the precautionary approach.

All ecosystem issues, except for the impact on coral reefs, were not of sufficient risk to require specific target levels as they are effectively covered by the other management arrangements and trigger points (e.g. – biomass of lobsters). For the potential impacts on corals, future work will determine if precise limits and practices (including trigger points) need to be introduced.

2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The risk assessments identified that under current management arrangements there have been minimal or negligible impacts of the WRL fishery on the broader ecosystem even after 40 years of fishing. In summary, during this period the ecosystem has continued to produce an average catch of 10 thousand tonnes of lobsters per year (but it must be highlighted that this still results in 90% of the unfished biomass remaining), there have been no discernable changes to bycatch composition, there have been no unexplained changes in the catch of other species in these areas, the coral reefs at the Abrolhos Islands are still regarded as some of the most pristine in the world. Consequently, it is highly likely that the fishery will continue to meet the objectives of having only minor and acceptable levels of impact.

APPENDIX 3. APPROVAL AND RECOMMENDATIONS FROM EA



THE HON. DR. DAVID KEMP MP MINISTER FOR THE ENVIRONMENT AND HERITAGE

The Hon Kim Chance MLC
Minister for Agriculture, Forestry and Fisheries
11th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005

Dear Minister

In November 2001 the Western Australian Department of Fisheries (WADF) submitted the document Application to Environment Australia on the Western Rock Lobster Fishery Against the Guidelines for the Ecologically Sustainable Management of Fisheries for Continued Listing on Section 303DB of the Environmental Protection and Biodiversity Conservation Act 1999 for assessment under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The submission has been assessed in accordance with the protected species provisions of Part 13 and the wildlife trade provisions of Part 13A of the EPBC Act.

I am pleased to advise that assessment of the fishery is now complete. The assessment report will be available on the EA website at: <http://www.ea.gov.au/coasts/fisheries/index.html>.

I am satisfied that it is unlikely that fishing operations conducted in accordance with the management arrangements will adversely affect the conservation status of protected species, or affect the survival and recovery of threatened species. The Western Rock Lobster Limited Entry Notice 1993 requires that all reasonable steps are taken to ensure that protected species are not injured or killed and the level of interactions with such species in the fishery is not likely to adversely affect the conservation status of protected species or the survival and recovery of listed threatened species. Hence, the management arrangements for the WRL fishery meet the requirements of Part 13 of the Act and I will accredit the Notice accordingly. Accreditation will ensure that individual fishers operating in accordance with the Notice are not required to seek permits in relation to interactions with protected species.

I am satisfied that for the purposes of the wildlife trade provisions in part 13A of the EPBC Act, the Notice provides the basis for the fishery to be managed in an ecologically sustainable way. I shall therefore amend the list of exempt native specimens to include all products taken in accordance with the Western Rock Lobster Limited Entry Notice 1993, including western rock lobster (*Panulirus Cygnus*), octopus (*Octopus* species), snow crab (*Chacean bicolor*), spiny (champagne) crab (*Hypothalassia acerba*) and giant crab (*Pseudocarcinus gigas*), for a period of five years. Such listing will serve to exempt the fishery from other export controls of the Act and exempt exporters from requiring export permits under the Act.

The Western Rock Lobster Limited Entry Notice 1993 meets the Commonwealth's Guidelines for the Ecologically Sustainable Management of Fisheries. The fishery is managed under a comprehensive, adaptable, precautionary and ecologically based regime capable of controlling, monitoring and enforcing the level of take from the fishery. The combination of management arrangements, data gathering and proposed research provides confidence in the fishery's ability to maintain relatively low bycatch levels, minimise interaction with protected species and manage impacts on the wider ecosystem.

While there are some environmental risks associated with this fishery, I believe that WADF is addressing them adequately. Officers from our two departments have discussed some key areas requiring ongoing attention. I understand that they have agreed to a number of recommended actions, focussed on ensuring the continuation of good management practices.

I would like to draw your attention to three recommendations in particular. Recommendation 1 seeks the formal incorporation into the management arrangements of the detailed and explicit management triggers, decision rules and performance measures that are included in the submission but which to date have not been included in the formal management regime. The objective in seeking this is to ensure that the strength of the management arrangements is given adequate legislative backing.

Recommendation 4, while recognising that consideration of issues relating to the impact of the fishery on the marine environment is currently undertaken as an implicit part of the development of the advice of the Rock Lobster Industry Advisory Committee, seeks to ensure these issues are an explicit and integral part of the business of that body. The intention behind this is to raise the importance of ecological interactions as a integral component of fisheries management.

Recommendation 11 seeks to ensure, among other things, the continuation of monitoring of interactions with sea lions, and in light of recent interactions with humpback whales, cetaceans. It also requires that WADF to implement appropriate mitigation measures in a timely fashion, should interactions with these species increase. The objective in seeking this is to minimise risks to protected species in the short, medium and long term.

I would like to thank you for the constructive way in which your officials have approached this task and I look forward to reviewing the remainder of the Western Australian managed fisheries.

Yours sincerely

Signed on 20 August 2002

DAVID KEMP

Recommendations to the Western Australian Department of Fisheries on the ecologically sustainable management of the Western Rock Lobster Fishery

1. The Western Rock Lobster Fishery submission contains a number of detailed and explicit management triggers, decision rules and performance measures which are not included in the management plan. The Western Australian Department of Fisheries (WADF) and the Rock Lobster Industry Advisory Committee should formally incorporate these into the management regime and decision making process with clear timelines for implementation. These measures must ensure the total effort in the fishery from all sectors is controlled and within sustainable limits. Serious consideration should be given to a cap on total effort including both the recreational and commercial sectors.
2. WADF should undertake contingency planning to deal with breaches in the existing management triggers. In the event that a review is triggered by a breach of the performance measures and that review establishes that the management regime is under-performing, the management plan should require that action must be taken to return the fishery to a stage where it will satisfy the management objectives.
3. The compliance and enforcement strategy should continue to be periodically reviewed to ensure emerging compliance risks are identified and addressed. WADF should conduct an annual assessment of the risks to ensure that the current compliance and enforcement regime is as effective for the recreational as for the commercial sector.
4. Recognising that consideration of issues relating to the impact of the fishery on the marine environment is currently undertaken as an implicit part of the development of the advice of the Rock Lobster Industry Advisory Committee, consideration should be given to including an explicit requirement to consider such impacts in the terms of reference for the Committee.
5. WADF should continue active encouragement of broad public notification of the potential to input into the environmental impact assessment processes. Furthermore WADF should ensure the external peer review of the existing stock assessment process is maintained.
6. WADF should continue to monitor the situation with respect to the harvest of immature animals to ensure any reductions in egg production or puerulus settlement are detected in a timely manner, and develop a management response for implementation in the event that a major issue develops.
7. WADF should continue to implement annual estimation of recreational and indigenous harvest of lobsters which is factored into management, including ongoing improvement of data collection and analysis.
8. Research into changes in fishing efficiency should be undertaken on a five yearly basis, and contingency plans and management strategies be developed to compensate for potential increases.
9. Monitoring should be undertaken to evaluate whether the impact of the fishery on octopus is increasing, and if so the impacts that harvest is having on the stock and ecosystem. A management response should be developed by WADF as a contingency.
10. The retention of deep sea crabs in the western rock lobster fishery should be actively managed by WADF to ensure the sustainability of the developing deep sea crab fishery.
11. WADF should undertake to develop appropriate triggers for endangered, threatened, protected or bycatch species and appropriate management strategies should the levels or sensitivity of interactions are shown to be greater than currently estimated. To facilitate this process it is important that:

- WADF continue the recording of byproduct and bycatch taken by the fishery (using both fishery dependent and fishery independent methods). WADF analyse whether byproduct and bycatch recording by the fishery dependent methods are an effective mechanism for obtaining these data;
 - WADF continue the ongoing monitoring of sea lion and cetacean interactions. In the event that these interactions significantly increase, WADF should implement appropriate mitigation measures in a timely fashion.
12. WADF should assess options for system-based management objectives and associated biological reference, target and limit levels, and implement system-based performance measures in the fishery. This should include a determination of the appropriate levels of protection for larger lobsters. WADF therefore are encouraged to undertake the proposed additional work on the issue of the role of large western rock lobsters in the system, including work on the catchability of larger lobsters.
 13. WADF should examine mechanisms for monitoring ecosystem impacts of the fishery, including the appropriateness of reference areas that would allow comparison of fished and unfished areas.

