Department of Fisheries
Government of Western Australia

Western Rock Lobster Environmental Management Strategy

July 2002 – June 2006

March 2005

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This document on the Environmental Management Strategy for the Western Rock Lobster Fishery describes the objectives and actions taken and planned to minimise adverse effects of the fishery on non-target species. A detailed explanation of the overall management system is outlined within the document '*Western Rock Lobster Management System'*. The contents of this EMS document will be reviewed, and updated as necessary, on an annual basis and in full every five years. Risks, and some of the strategies to manage them, are likely to roll over from one five-year period to the next.

An 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;
- 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.

In addition to these moderate risks is the risk that rock lobster fishing is having a significant and unacceptable impact on the ecosystem. The ERA process rated this as a low risk. However, because the levels of information surrounding this risk are relatively poor the risk is being treated in a way that is most closely aligned with a moderate risk rating.

This Environmental Management Strategy has been developed using the ERA document and comments thereon from five expert peer reviewers as a reference point from which continuous improvement of the fisheries management arrangements and a better understanding of related environmental processes can proceed.

This EMS has in place management objectives, operational objectives, management actions and targets to deal with risks already identified. Tables 1 - 4 outline the management action, who is responsible and the target delivery date for the first four moderate risks and Tables 5 - 9 for low risks dealt with in detail by this EMS.

Table 1. Sea lion interaction - Moderate Risk

Management Objectives

1. *To eliminate the capture of Australian sea lions pups by the commercial western rock lobster fishery and therefore eliminate the effects of rock lobster fishing related mortality on sea lion populations off the west coast*
2. *Build broad industry acceptance of the need for a zero impact.*
3. *To determine the effect of sea lion exclusion devices (SEDs) on catches of rock lobster.*
4. *Monitor trends in the abundance of sea lion breeding colonies off the west coast.*

Manage-ment objective	**Sea lion interaction - Moderate Risk** **Management Action**	**Who**	**Target**	**Achieved Y/N** **New target**
1	Public presentation to stakeholders that describes the SED trial and foreshadows the need for legislation to be implemented prior to the commencement of the 2004/05 season making the use of SEDs mandatory in certain areas of the fishery.	DOF	Oct 2003	Y Legislation for 2005/06 season
1, 2	Education on the importance of reporting interaction with protected species.	DOF / WAFIC/ WRLC	Throughout 2003/04	Y ongoing
1	Formal consultation points for SEDs legislation implementation and dissemination of research results.	RLIAC	Oct 2003 May 2004 Oct 2004	Y
1	SRG to comment on the outcomes of the SED trial (including rock lobster catchability) with reference to spatial, temporal and pot design elements of a legislated package that prevents the capture of sea lions.	DOF / SRG	Aug 2004	N Aug 2005
1, 2	SRG to comment on the outcomes of the reporting interaction with protected species education campaign.	DOF / SRG	Aug 2004	N Aug 2005
1, 2, 3	Presentation to stakeholders on the outcomes of the SED trial (including rock lobster catchability) and the details of the proposed legislative package to be implemented after consultation with the SRG.	DOF / WAFIC	Oct 2004	Y and ongoing
1	Monitor and report through the annual level identification process on both fishery dependent and independent data to identify fishing mortality of sea lions and ascertain all relevant spatial, temporal and biological details should an interaction be recorded.	DOF / CALM	Annual	Y
1 - 4	Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y
4	Report the results of pup counts exercises following each breeding event.	DOF / CALM	Annual	Y

Table 2. Leatherback Turtle Interaction – Moderate Risk

Management Objective

1. *To minimise interaction with leatherback turtles with commercial western rock lobster pots and therefore minimise the effects of rock lobster fishing related disruption to leatherback turtles on the west coast.*

Leatherback Turtle Interaction – Moderate Risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Paper to RLIAC reviewing known and relevant techniques to minimise interaction.	DOF	June 2005	On track
Education on the importance of reporting interaction with protected species.	DOF / WAFIC/ WRLC	Throughout 2003/04	Y Ongoing
Assess the outcomes of the reporting interaction with all protected species education process.	DOF	Aug 2004	N Draft report completed
Monitor and report through the annual level identification on both fishery dependent and independent data to identify fishing mortality of leatherback turtles and ascertain all relevant spatial, temporal and biological details, should an interaction be recorded.	DOF / CALM	Annual	Y
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y

Table 3. Physical Impact of Pots on Coral – Moderate Risk

Management Objective

1. *To understand the specific impacts of potting on corals and increase the awareness of rock lobster fishers, and the general community, of the impacts of potting in fragile coral habitats compared to natural perturbations.*

Physical impact of pots on coral – Moderate Risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Education process on the potential damage from pots.	DOF / WAFIC / WRLC	Throughout 2003/04	Y ongoing
Paper to RLIAC reviewing knowledge on impact of pots / traps in other tropical reef fisheries.	DOF	June 2005	On track
Commence a pilot study of specific impacts of pots on corals at the Abrolhos	DOF	Mar 2005	N Pending further analysis of desktop study and risk assessment
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y

Table 4. Waste Management at the Abrolhos Is - Moderate risk

Management Objective

1. *To minimise adverse effects of human waste activities on the aquatic habitats of the Abrolhos Islands.*

Waste Management at the Abrolhos Is- Moderate risk **Action**	**Who**	**Target**	**Achieved Y/N**
Undertake video and acoustic survey of waste dumping grounds	DOF	Oct 2005	On track
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y

Table 5. Effect of Fishing on the Ecosystem - Low risk

Management Objective

1. *To establish an operational plan of research that will test the hypothesis that: "Removal of lobsters in the deep water does not have a significant or irreversible effect on the ecosystem."*

Effect of Fishing on the Ecosystem –Low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Promote strategic research framework for assessing the effect of fishing on the ecosystem	DOF / WAFIC	Oct 2003 & ongoing	Y Ongoing (SRG to sign off at next mtg)
Promote deep-water ecology operational plan for gathering natural history information.	DOF / WAFIC	Oct 2003 & ongoing	Y & ongoing
Full project description for deep-water natural history ecology work	DOF / SRG	Nov 2003	Y & ongoing
Employ marine ecologist as PI of deep-water natural history ecology work	DOF	April 2004	Y
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y & ongoing
Report on ecosystem deep water research and other ecosystem research to SRG	DOF	Annual	Y & ongoing

Table 6. Whale and Dolphin interaction - Low risk

Management Objective

1. *That the trend in the number of logged observations, media reports or other recorded interactions with whales and dolphins remain stable or decline.*

Whale and Dolphin interaction – low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Education campaign on the importance of reporting interaction with protected species.	DOF / WAFIC / WRLC	Throughout 2003/04	Y ongoing
Assess the outcomes of the reporting interaction with all protected species education process.	DOF	Aug 2004	Y ongoing
Monitor and report through the annual level identification on both fishery dependent and independent data to identify interactions and ascertain all relevant spatial, temporal and biological details should an interaction be recorded.	DOF / CALM	Annual	Y ongoing
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y ongoing

TABLE 7. Octopus bycatch – Low risk

Deep sea crab bycatch – low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Management proposal to limit bycatch of deep sea crabs.	DOF / RLIAC	Sept 2003	Y Implementation Nov 2005
Monitor and report through the annual level identification on both fishery dependent and independent data to identify excessive catches and ascertain all relevant spatial, temporal and biological details should excessive catches be recorded.	DOF	Annual	Y ongoing
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y ongoing

Management Objective

1. *Minimise the risk of overfishing octopus populations as bycatch from rock lobster fishing.*

Octopus bycatch – low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Monitor and report through the annual level identification on both fishery dependent and independent data to identify large catches and ascertain all relevant spatial, temporal and biological details should this be recorded.	DOF	Annual	Y ongoing
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y ongoing

Table 8. Deep-sea crab bycatch – Low risk

Management Objective

1. *Limit bycatch of deep-sea crabs to acceptable levels*

TABLE 9. Other Low Risks (Appendix 1)

Management Objective

1. *Minimise harm to the environment from known low ranked risks.*

Other low risks (Appendix 1) **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Monitor and report through the annual level identification process.	DOF	Annual	Y ongoing

There is a commitment from the Department of Fisheries and the Western Rock Lobster Industry to meet the cost of:

- actions against each of the operational objectives;
- consultation and implementation of management outcomes; and
- the need to ensure there is adequate compliance with new and existing management initiatives.

PROCESSES UNDERLYING THE DEVELOPMENT OF THIS EMS

Function and development of the EMS

This document on the Environmental Management Strategy for the Western Rock Lobster Fishery (WRLF) describes the objectives and actions taken and planned to minimise adverse effects of the fishery on non-target species. The management of the WRLF is based around decisions made by the Minister for Fisheries who has appointed a committee, the Rock Lobster Industry Advisory Committee (RLIAC) as required by the Fish Resources Management Act 1995, to advise him. The Minister also seeks advice from the Department of Fisheries (DoF) and consults with stakeholders through public comment processes but particularly through peak representative bodies: the Conservation Council of Western Australia for the environment; the Western Rock Lobster Council (WRLC) for the WRL commercial fishery; Western Australian Fishing Industry Council (WAFIC), for the fishing industry generally and Recfishwest for recreational fishers.

The Western Australian Fishing Industry and DoF are proud of the management system of the WRLF which has been evolving since the early 1960s. In 2000, WAFIC sought and was granted certification of the WRLF by the Marine Stewardship Council (MSC) as a mark of independently assessed acknowledgement of good fisheries management.

There has always been an implicit regard for the marine environment that supports the productivity of the WRL stock, however the winning of MSC certification and the Australian government's Environmentally Sustainable Development initiative have required an explicit shift to managing the effects of the fishery on the environment compared with the previous focus on single species management. One of the benefits of this has been the requirement to develop an EMS which is seen by the DoF and industry as a necessary guide to planning for responsible management, which will be continued as a matter of policy, independently of whether MSC certification is sought in the future.

It is intended that there will be a major review of the EMS every five years. New Risks to the environment may be identified from time to time. Other risks will roll over from one five year period to the next and some risks may not be adequately resolved within one five year period and will need to be addressed in the next EMS. This particularly applies to issues where there is a large research requirement to provide the knowledge basis for management. On the other hand, if information becomes available earlier than expected, management action will also be taken earlier.

The EMS addresses issues identified in an Ecological Risk Assessment Process and takes into account the recommendations of expert working groups jointly convened by the DoF and WAFIC on major issues, currently there are Sea Lion Scientific Reference Group and Ecology Scientific Reference Group. The EMS is not a legislative requirement but is essentially an internal document developed by the DoF to identify, plan and keep track of actions considered necessary to manage the WRLF in an environmentally sound manner.

Public comment is sought on the EMS every time there is a version change, to broaden the range of input. While this input is appreciated, the DoF does not necessarily adopt all of the suggestions put forward in amending the EMS. A summary of the public submissions, and the DoF's responses, are included as appendices to the EMS.

Overview of the Ecological Risk Assessment Process

An 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) (Fletcher et al. in press). One outcome of the workshop was the development of the basic outline for this environmental management strategy. Specifically it identified and prioritised the main ecological risks that arise from the various activities carried out by the western rock lobster fishery.

Workshop participants were selected on the basis of their involvement with industry, the conservation movement and scientific expertise. It included representatives from the World Wide Fund for Nature, Western Australian Government Departments of Fisheries, Conservation and Land Management and Environmental Protection, Western Australian Fishing Industry Council, WA Museum, Curtin University, Conservation Council of Western Australia as well as rock lobster fishers.

In total 33 hazards were identified across the WRLF. No high risks were identified during the workshop. Risks associated with the identified hazards were ranked as either moderate (12%) or low (88%) (Appendix 1).

Within the risk category of moderate, four risks were identified:

- Sea lion pups may become entangled in pots with the potential for change to the population;
- Contact of pots with coral resulting in a potential change to coral abundance;
- Leatherback turtles becoming entangled in pot ropes 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.

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. In these instances a management strategy needs to be developed and implemented that quantifies the fishery impact more precisely and then minimises those impacts where appropriate.

The remaining risks identified were categorised as low in the ERA workshop. Despite this finding, the risk that rock lobster fishing is having a significant and unacceptable effect on the ecosystem is being treated in the EMS as if it was a moderate risk. This approach has been adopted after consideration of the specific comments made by expert peer reviewers of the ERA, the relative low level of empirical knowledge or data specific to the western rock lobster fishery and the obvious interest from stakeholders on this matter.

The ecological risk assessment workshop participants provided 13 recommendations to address the moderate risks to the WRL fishery. These recommendations (not in order of priority) are:

1. Investigate the spatial area of influence of sea lion pups feeding in pots;
2. Look at the South Australian efforts to keep out sea lion pups from pots to see how effective they were;

3. Determine whether sea lion pup mortality from pot capture is an issue by reviewing available data;
4. Investigate gear modification to keep out sea lion pups;
5. Recording interaction with gear and captures of sea lion pups;
6. Begin collecting data on turtle entanglement – species, time, location & a systematic study to understand how turtles are caught in ropes and placed in broader population context ie how important are the turtle mortalities in a local and regional context;
7. Ensure that if possible, dead turtles are brought back for analysis or photographs, description, location GPS/depth of turtle in water;
8. Better educate fishers to collect information on turtle sightings and captures;
9. Investigate through newsletters, magazines if other fishing activities regularly sight turtles;
10. Implement the outcomes and recommendations for studies/actions from the Abrolhos workshop which was held in July 2001;
11. Increase fisher awareness of the importance of coral habitats and environment;
12. Undertake an international review of pot damage to habitats; and
13. Examine the outcomes of the review by the Abrolhos Islands Management Advisory Committee (AIMAC) to implement appropriate waste management strategies.

The EMS is based on the Performance Report provided to the Commonwealth's Department of Environment and Heritage as part of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC) approval process. The Performance Report was appended to the ERA report. This EMS report should be read in conjunction with the ERA report (available from DoF).

The risk ranking of all risks, including the low risks, is shown in Appendix 1.

RISK 1 – SEA LION INTERACTION

Risk Rating

Moderate

Management Assessment underlying risk rating

The WRL fishery has the potential to interact negatively with the Australian sea lion, *Neophoca cinerea* in two ways. The first, and most significant 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.. The second interaction is the fisher's assertion that sea lions open bait-basket lids to steal the bait.

Sea lions are listed as a protected species within State legislation and have recently been nominated for listing as a threatened species under Commonwealth legislation and therefore all forms of fishery interaction with them needs to be eliminated where possible or minimised.

Interactions that result in mortality of sea lion pups in rock lobster pots are the focus of this objective. Therefore the behaviour of sea lions around rock lobster pots more generally (including opening bait baskets) is relevant. Any interactions that could result from discarding plastic bait bands have been addressed by the implementation of a industry Code of Practice for using and handling bait, bait packaging and rubbish. This Code was introduced in early 2001 and has reduced significantly the at-sea discard rate of the bands, plastics and other refuse with continued improvement being the aim.

The Western Rock Lobster / Sea Lion Interaction Scientific Reference Group (SLSRG), an independent and expertise based body, was tasked to provide advice on the sea lion interaction issue. The SL SRG summarised the current knowledge on sea lions as follows:

1. *Australian sea lions breed in a range from the Abrolhos Is. in WA to the Pages Islands in South Australia.*
2. *Australian sea lions are non-selective benthic predators with a comparatively good diving capability that is also present in pups.*
3. *Given the high abundance of undersize rock lobsters in shallow waters in the mid-west and Abrolhos region, there is a very low chance of any effect of lobster removal on the dietary requirements of sea lion populations.*
4. *At Kangaroo Island in South Australia, adult female sea lions dive to depths of up to 150m, but mostly dive in the 60-100m range. In Western Australia adult female sea lions have been recorded diving in 10-120m depths, and it is assumed that their foraging range includes continental shelf waters adjacent to where they live.*

5. *Recent research on the development of diving in sea lion pups has shown that pups of 6-18months of age (the study ages) can dive extensively, and in South Australia dive to depths of at least 60m.*
6. *The Australian sea lion's reproductive strategy is quite different from other pinnipeds.*
7. *The breeding cycle is about 17.5 months, but the timing of breeding differs significantly (by months) from one colony to the next, with an asynchronous pattern of breeding across their range.*
8. *Genetic analyses (female haplotype) indicated females display a strong breeding site fidelity ("house bound cow" phenomenon).*
9. *Males move relatively freely amongst regional colonies but probably do not migrate large distances, i.e. movements between WA and SA colonies would be very rare if at all.*
10. *There is a history of localised extinction in Australia, e.g. Bass Strait, Islands around Albany, Carnac Is and Garden Is.*
11. *The ability to re-establish breeding colonies where sea lions used to inhabit appears to be negligible because of female breeding site fidelity.*
12. *Four main breeding colonies on the west coast of WA described as being Abrolhos Is (Easter and Pelsaert Groups), Beagle Islands, North Fishermen Is and Buller Is.*
13. *Pup production at these sites is estimated to be a total of about 150 at the 3 mid-west islands and about 20 at the Abrolhos..*
14. *There is a documented history of a substantially more abundant population of sea lions at the Abrolhos Is. The reduction to today's very low levels appears to be linked to culling / harvesting events by early explorers and whalers and a likely low level of take until recent times.*
15. *There is no evidence to suggest colonies in the Jurien area were subject to as high a level of culling / harvesting as occurred at the Abrolhos and it is therefore likely that the mid-west coast colonies are closer in size to population sizes along the coast prior to human habitation.*

The following data sets provide information relevant to the assessment of the impact of commercial rock lobster fishing on Western Australia's sea lion populations.

1. Commercial monitoring data (collected by fisheries research observers aboard commercial vessels)
2. Voluntary logbook data (detailed catch and fishing effort data with increased spatial and temporal resolution provided voluntarily by 35-40% of commercial rock lobster fishers)
3. Annual Gear and Equipment Survey forms (recently upgraded to allow for bycatch of specially protected species data to be included)
4. Random telephone surveys of commercial fishers in areas of sea lion breeding activity.
5. Targeted telephone surveys of commercial fishers known to have caught sea lion pups.

6. Relevant data from CALM databases.

The SLSRG assessed the data sets alongside the current body of knowledge on sea lions and was able to determine that:

1. *Pups are vulnerable to capture in rock lobster pots from the age they enter the water and start diving (approximately 5 months) to a point when they are too large to enter into a pot and drown (possibly about 24 months of age).*
2. *Most accounts refer to pups caught being in the size range of 2.5 to 3 feet long, which is consistent with the estimated vulnerable age class.*
3. *All known catches are close to shore in less than 11 fathoms, but recent tracking studies of pups in South Australia demonstrate that these catches could occur further offshore.*
4. *The impact of recreational rock lobster pot fishing is unknown, but it is possible that it could contribute to some extent to pup mortality.*
5. *It is not possible to extrapolate from existing data to provide a useful or accurate estimate of total mortality from the commercial rock lobster fishery, however, the current estimate is regarded as being a minimum estimate.*
6. *As there are no data on age/sex specific survival data, and minimal data on other population parameters for Australian sea lions, any attempt to model the impact of fisheries accidental bycatch on sea lion populations would yield highly uncertain results that would be of little use to management.*
7. *Efforts to collect the necessary population dynamics data that could be used for such models requires intensive research within the sea lion communities, an activity that would cause significant disturbance (including increased pup mortality) to the sea lions themselves.*
8. *Given the statistically low reported incidence of sea lion interaction with rock lobster gear, it is not feasible, or cost effective, to adopt an independent observer program to collect data that could reliably estimate the level of interaction.*

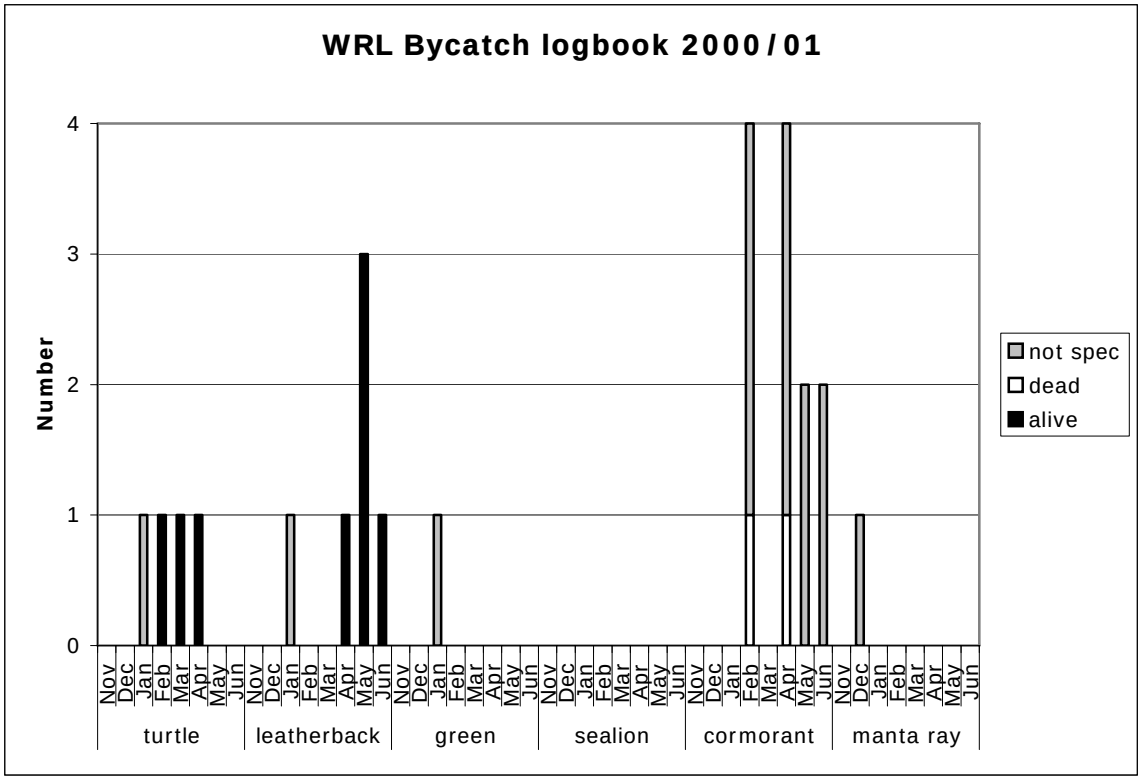


Figure 1 Bycatch recorded in WRL voluntary logbooks for the 2000/01 season.

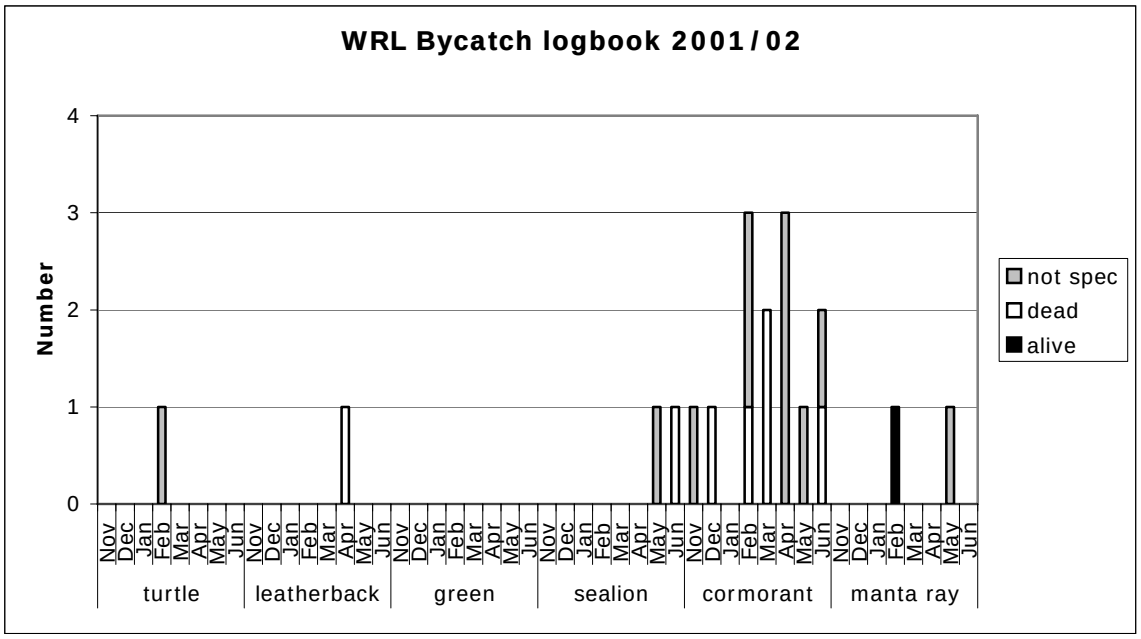


Figure 2 Bycatch recorded in WRL voluntary logbooks for the 2001/02 season.

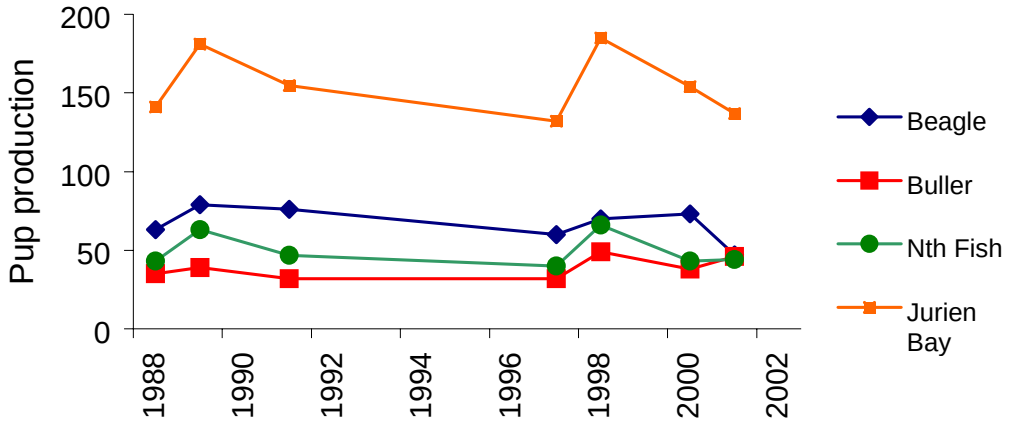


Figure 3. Pup production in the three WA coastal breeding colonies (Beagle, Buller and North Fishermen's Islands) and their combined total (Jurien Bay) between 1988 and 2001 (R. Campbell, 2003).

Overall the SLSRG summarised the status of Australian sea lions off the west coast as being:

> *"an isolated, small but stable population with low genetic variability that is segmented with little or no scope for migration from other populations. The SRG assessed that the impacts of what appear to be low levels of mortality from the fishery should be eliminated to avoid any negative impact on the populations.*
>
> *The SRG also concluded that given the generalist feeding behaviour of the sea lion, there was a very low risk of any effect of lobster removal on the sea lion populations.*"

This assessment by the SLSRG and their recommendations on action to be taken are accepted by the Department of Fisheries and WAFIC. The full report of the SLSRG is at Appendix 3 and is the basis for the strategy outlined in this EMS.

There are two obvious approaches to consider when dealing with the issue of sea lion interactions. The first is to attempt to model sea lion populations in Western Australia and assess what effect current estimated levels of fishing mortality have on the populations. This approach assumes there are accurate estimates of fishing mortality, natural mortality, other life history parameters, historical population sizes, and good measures of their uncertainty. Unfortunately there is no such information that could be used to model populations or the impact of fishing mortality. Furthermore, if programs were established to collect relevant data the risk of disturbance to sea lions is unacceptably high, probably inducing higher pup mortality, and it would be some 10-20 years before the data sets became useful from a modelling perspective. Substitution of data / knowledge from other species such as the Australian or New Zealand fur seal is also inappropriate given the significant differences between the species. See SLSRG report at Appendix 3 for full details.

The second approach is to implement strategies that prevent sea lions being caught in rock lobster pots and independently monitor abundance in such a manner that minimizes

disturbance. This is the strategy strongly recommended by the SLSRG and accordingly is the basis of management action adopted in this EMS. DOF and WAFIC have accepted in full the report of the SLSRG and the full list of resolutions from the SLSRG is as follows:

Resolution 1
The SRG summarised the status of Australian sea lions off the west coast as representing isolated and small populations with low genetic variability that is segmented with little or no scope for migration from other populations. The SRG assessed that the impacts of what appear to be low levels of mortality from the fishery can in fact be critical for west coast sea lion populations. The SRG also concluded that given the generalist feeding behaviour of the sea lion, that there was a very low probability of any effect of lobster removal on the sea lion population.

Resolution 2
The SRG do not believe there is sufficient, or appropriate, data available to conduct a modelling exercise designed to better understand the dynamics of Australian sea lion populations off the west coast, and the impact of fisheries on them. Furthermore, based on the SRG's understanding of sea lion behaviour, in particular their susceptibility to disturbance, the SRG recommends against collecting data that could potentially be used to model sea lion populations and the effect of fishing induced mortality because there is an unacceptably high risk of increasing pup mortality, or reducing sea lion production.

Resolution 3
The SRG advises that a trial of rock lobster pot sea lion exclusion devices, developed with the assistance of gear technologists from, but not limited to, existing designs, be undertaken as a matter of priority to determine the most effective means of eliminating sea lion mortality in rock lobster pots.

Resolution 4
Assuming the SEDs trial demonstrates that sea lions can be excluded from rock lobster pots the SRG recommends that it become compulsory from the commencement of the 2004/05 season to have a SED fitted to every rock lobster pot when fishing in waters from Lancelin to Dongara to a depth of 60m and for all waters of Zone A.

Resolution 5
Given that it is not feasible to have sufficient independent observer data to reliably estimate the level of interaction, the Department of Fisheries should continue with education process designed to improve industry's reporting of whether or not they have interacted with sea lions (and other specially protected species).

Resolution 6
The SRG recommends that the Environmental Management Strategy be revised to include a management trigger requiring a review of SED management rules should there be a sea lion mortality when the use of SEDs becomes mandatory.

Resolution 7
The SRG recommends that pup count data be collected for every breeding event to act as an indicator of abundance.

Management Objectives

1. *To eliminate the capture of Australian sea lions pups by the commercial western rock lobster fishery and therefore eliminate the effects of rock lobster fishing related mortality on sea lion populations off the west coast*

2. *Build broad industry acceptance of the need for a zero impact.*

3. *To determine the effect of sea lion exclusion devices (SEDs) on catches of rock lobster.*

4. *Monitor trends in the abundance of sea lion breeding colonies off the west coast.*

Operational Objectives and Action Plans

Sea Lion Operational Objective 1

To determine the most effective modification to a rock lobster pot that prevents sea lions entering the pot (including assessing the various sea lion exclusion devices used by some South Australian and Victorian rock lobster fishers).

Action Plan

1. In October 2003, DOF undertook a pilot project to assess the use of video equipment to observe the interaction of sea lions (in particular pups) with rock lobster pots, with and without sea lion exclusion device (bar within the neck). This trial occurred at North Fishermen Is. The purpose of this pilot study was to determine the most effective means of using video surveillance techniques to observe sea lion behaviour around rock lobster pots and to assess the effectiveness of pots with exclusion devices. The experiment showed that bar through the neck was effective in stopping sea lions from entering the pot while sea lions were able to enter and exit from the pot without a bar.

2. The fieldwork component of this study in 2004 enabled the assessment of the interactions with large and small sea lion pups and tested alternative exclusion devices.

Sea Lion Operational Objective 2

To determine the impact of the pot modifications (approved SEDs) on rock lobster catches by commercial vessels and to record details of any sea lion interactions.

Action Plan

For the 2003/04 rock lobster season, about 10 commercial fishers who operate in areas of sea lion interaction were asked to participate in testing SEDs.
They were asked to fit 10 of their pots with approved SEDs when fishing in areas where interactions may occur.

The area for testing the pots with and without SEDs is approximately 20 n. miles north and south of the islands where sea lion breeding is known to occur and to a depth of 40 m. This includes the Abrolhos Islands.
Fishers were asked to record the number of undersize and legal size rock lobsters from the 10 modified pots and ten control pots i.e. catch rates from 10 pots with and 10 pots without the SEDs.
Control pots are defined as the next pot pulled after the modified pot to ensure that catches from pots with SEDs can be compared with the standard pots.
Fishers were also asked to record any interactions with sea lions from the two types of gear.
Research monitoring staff also go onboard for a percentage of the trips each month to validate the fishery-dependent data and to investigate size frequency of the catch in the two types of gear.
Initially the SED tested in January 2004 was the bar across the neck and this was found to result in a loss of about 15% of catch. A second SED (a modified spike – a t- bar) was tested in March 2004 and a cup-head bolt in November 2004. The results are being analysed.

Sea Lion Operational Objective 3

To develop relative indices of interactions with sea lions via the established data collection methods

Action Plan

1. Continue to conduct the annual surveys sent to all commercial rock lobster fishers at the end of each season (a sample survey form is at Appendix 5). There are currently 30-40% of fishers providing information of sea lion interaction with the fishery. This has been operating since 1999/00 season and the data are recorded in an Access database. The spatial distribution of fishing effort of the fishers completing the survey will be compared with the overall effort spatial distribution of all fishers using the compulsory monthly catch and effort database to assess how representative the sample is. This comparison will be used to weigh up the sample data to the whole fishery and obtain an estimate of the level of interaction of the fishery with sea lion pups. The survey form will be reviewed annually to maximise information captured. Every effort will be made to encourage fishers to complete these survey forms (see Education campaign and phone interviews below).

2. Continue to monitor sea lion interactions via commercial monitoring surveys conducted at 6 locations (Fremantle, Lancelin, Jurien, Dongara, Kalbarri and the Abrolhos Islands) each month of the season and across all depths. The spatial range of monitoring at Jurien and the Abrolhos will be compared with the distribution of the sea lion pups to assess the usefulness of this monitoring in assessing the level of interaction of sea lion pups with the fishery.

3. Continue to collect information on sea lion interactions via the voluntary logbook programme completed by approximately 35% of the fishery on a daily basis. An education campaign has commenced with talks to the fishers, an article in WAFIC's ProWest magazine and letters to log-book participants to highlight the importance of collecting accurate statistics on the level of interaction with icon species. This has been supported strongly by fishing industry leaders. The logbook data provide accurate spatial and temporal distribution of the interaction with the sea lion pups. These data also can be used to weigh up the sample logbook data to the whole fishery

and obtain an estimate of the level of interaction. The log-books will be reviewed annually to improve the quality and quantity of data on icon species interactions.

4. DOF will conduct targeted phone interviews of all fishers who indicate an interaction with one or more of the icon species to thank them for their contribution and obtain more detailed information. As a separate exercise, random telephone interviews with fishers known to operate throughout regions having breeding sites/foraging areas also will be conducted to ascertain the level of interaction. These telephone surveys will be undertaken throughout each season to gather more accurate data on interactions with sea lions for data validation, and to promote the other forms of data collection (log-book and surveys). This phone survey of about 50 randomly chosen fishers will be conducted once per year and will focus on those operating on the mid-west coast and at the Abrolhos. It will collect spatial and temporal information on the level of interaction and sightings in the 2002/03 and later seasons as well as more general information on the level of interaction in previous seasons. Relevant CALM and Fisheries Officers in the region also will be interviewed.

Sea Lion Operational Objective 4

To examine the spatial and temporal distribution of pot deaths in relation to fishing effort

Action Plan

1. All existing and future data on pot deaths from all sources (including CALM) will be compiled and analysed by DOF to determine if there are any trends in spatial or temporal distribution of interactions. The spatial and temporal distribution of the sea lion interaction will be obtained from annual surveys, logbooks, commercial monitoring, phone interviews of fishers operating in the mid-west and at the Abrolhos. Information available for sea lion interaction to date indicates that interactions in the mid-west occur within 15 n. miles of the breeding colonies in waters less than 20 metres deep. These interactions will be compared with the spatial distribution of fishing effort from the voluntary log-book and the compulsory monthly returns. Time lines of known pupping periods will be compared with details of known recorded sea lion pup interactions to examine the hypothesis that younger juveniles are more susceptible to capture than older juveniles. Three years data are available for these comparisons at this time. This work will be ongoing and cumulative and will allow inter-annual variability to be assessed to take into account several cycles of pupping at different rookeries. This will enable the assessment of the level and spatial and temporal distribution of the interactions with sea lion pups during the age of 5-17 months when they are vulnerable to interaction with fishing gear.

Sea Lion Operational Objective 5

To increase certainty in the ability of fishery dependent data to provide a reliable estimate of interaction with sea lions and other protected species.

Ensure where an interaction is reported, spatial, temporal and biological factors are recorded for analysis.

Action Plan

1. DOF will conduct an education campaign focused on commercial fisheries that explains in clear terms the importance of accurately recording relevant data from interaction with sea lions and other protected species. This education campaign will include:
    i. Target articles in relevant DOF and fishing industry publications
    ii. Targeted letters to those in the voluntary logbook program
    iii. Presentations at professional fishermen's association meetings
    iv. Presentations at RLIAC open forum meetings (including annual Coastal Tour)
    v. Preparation and distribution of a water proof brochure explaining the importance of accurate reporting and information to assist in the accurate identification of protected species.

2. DOF will conduct follow up phone interviews with those who have recorded an interaction to thank them for doing so and extract any further relevant information

Sea Lion Operational Objective 6

To maintain a time-series of abundance indices for all breeding colonies by means of annual pup counts.

Action Plan

1. DOF will liaise with CALM Officers and Richard Campbell to determine the expected timing of pupping events for each colony.

2. DOF will facilitate the continuation of pup production estimates for every breeding event by Richard Campbell as an indicator of trends in sub-population abundance over time.

Sea Lion Operational Objective 7

Develop an understanding of the anthropogenic impacts on sea lion population(s) historically, currently and into the future.

Action Plan

1. DOF have contracted Richard Campbell to provide a documented history of anthropogenic impacts on the abundance of Australian sea lions off the mid-west coast of WA, including the Abrolhos, to provide an historical perspective to population changes over time in which current and future abundance and fishery mortality data may be considered.

Richard Campbell in consultation with Dr Nick Gales will review existing data and assess the feasibility of conducting a Potential Biological Removal (PBR) analysis on available information. Based on current knowledge this will require a number of important assumptions to be made and the value of this analysis should not be overstated.

Management Action and Targets

Manage-ment objective	Sea lion interaction - Moderate Risk Management Action	Who	Target	Achieved Y/N New target
1	Public presentation to stakeholders that describes the SED trial and foreshadows the need for legislation to be implemented prior to the commencement of the 2004/05 season making the use of SEDs mandatory in certain areas of the fishery.	DOF	Oct 2003	Y Legislation for 2005/06 season
1, 2	Education on the importance of reporting interaction with protected species.	DOF / WAFIC/ WRLC	Throughout 2003/04	Y ongoing
1	Formal consultation points for SEDs legislation implementation and dissemination of research results.	RLIAC	Oct 2003 May 2004 Oct 2004	Y
1	SRG to comment on the outcomes of the SED trial (including rock lobster catchability) with reference to spatial, temporal and pot design elements of a legislated package that prevents the capture of sea lions.	DOF / SRG	Aug 2004	N Aug 2005
1, 2	SRG to comment on the outcomes of the reporting interaction with protected species education campaign.	DOF / SRG	Aug 2004	N Aug 2005
1, 2, 3	Presentation to stakeholders on the outcomes of the SED trial (including rock lobster catchability) and the details of the proposed legislative package to be implemented after consultation with the SRG.	DOF / WAFIC	Oct 2004	Y and ongoing
1	Monitor and report through the annual level identification process on both fishery dependent and independent data to identify fishing mortality of sea lions and ascertain all relevant spatial, temporal and biological details should a mortality be recorded.	DOF / CALM	Annual	Y
1 - 4	Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y
4	Report the results of pup counts exercises following each breeding event.	DOF / CALM	Annual	Y

Fisheries Management Performance Measure

The number of deaths per year of sea lions through capture in lobster pots

RISK 2 – LEATHERBACK TURTLE INTERACTION

Risk Rating

Moderate

Management Assessment underlying risk rating

It is well known 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, if they continue, will lead to the extinction of these populations.

In the western Pacific, the collapse of the world's largest population of leatherbacks breeding on the Mexican Pacific coast was believed to be a combination of uncontrolled domestic harvest and the advent of the high seas drift net fishery in the 1980s (Wetherall *et al*. 1993, Sarti *et al*. 1996). Since then domestic harvest has been outlawed in Mexico and a United Nations moratorium closed the drift net fishery in the early 1990s. Nevertheless, it has been reported that leatherbacks move into the waters of South America following nesting in Mexico, and probably Costa Rica, and that the combined swordfish gillnet fleets of Peru and Chile are estimated to kill at least 2000 leatherbacks per year (Eckert 1997). This does not include incidental capture from the growing longline fleet which is known to inflict mortality on leatherbacks, eg 171 captures and 21 deaths of both juveniles and adults in the Hawaiian longline fleet in 1994/95 (Bolten *et al*. 1996 cited in Crouse 1997).

The once thriving leatherback population nesting in Terengganu, Malaysia is now severely depleted with nestings in 1995 representing less than 1% of levels recorded in the 1950s; eg from almost 11,000 landings in 1956 to 280 in 1990 (Chan and Liew 1996, Betz and Welch 2001). Major factors in this decline were the persistent collection of eggs and fisheries operations in both the high seas and in Malaysian waters (Chan and Liew 1996, Betz and Welch 2001). In other areas of south-east Asia, the poaching of eggs from nests continues unabated in the Irian Jaya region contributing to a decline in the numbers of leatherbacks nests on Jamursba-Medi beaches to about 25% of the 13,000 estimated in 1984 (Betz and Welch 2001). In another area of Indonesia, the Kai Islands, leatherbacks have been traditionally fished as part of Kai culture, however, the loss of traditional restraints on hunting for ritual and sustenance purposes, poses the greatest threat to this population of leatherback turtles (Suarez and Starbird 1996).

This places the occasional entanglement of marine turtles in pot ropes, which might result in one death per season on average, in context. Furthermore, it reinforces the statement that minimizing or completely removing all leatherback mortality attributable to the western rock lobster fishery is highly unlikely to impact the current status of the world's leatherback populations.

In Western Australia, there are consistent, but low frequency reports of leatherback turtles becoming entangled in lobster pot ropes. Evidence from interviews with fishers and CALM (R. Prince unpubl. data) suggests that where leatherback turtles have become entangled in

fishing ropes, they are usually alive and released unharmed if they are entangled at, or very near the surface. If leatherbacks entanglements are below the surface, they are invariably fatal. For the reported data within CALM records, between 1926 and 2001, 36 leatherback turtle interactions were noted with 22 deaths and 14 released alive, but these data may be biased towards only those interactions resulting in deaths because the main source of CALM data comes from dead turtles found washed ashore.

Rates of turtle entanglement are available from DOF data from annual bycatch survey forms completed by approximately 35% of fishers for the 1999/2000, 2000/01 and 2001/02 seasons. These data indicated that whilst up to 17 interactions with all species have occurred in one year, only five deaths (1 a leatherback and 4 unidentified) were noted over the three years for which data are available. There were 12 reported entanglements of turtles (all species) and 1 death for the 1999/2000 fishing season 17 entanglements and 3 deaths in 2000/01 and 5 entanglements and 1 death (leatherback) reported in 2001/02. Follow-up phone interviews with most of the fishers recording an interaction indicated that entangled turtles were greens or juvenile leatherbacks (because of their size), which supports the observation of Dr R. Prince (CALM, unpubl.) that only juvenile leatherbacks have been encountered in southern WA waters. Two fishers reported entanglements of green turtles. Fishers indicated that turtle entanglements occurred throughout the fishery from south of Mandurah to north of the Abrolhos Islands and at depths ranging from 14 to 60 fathoms.

The following data sets provide information relevant to the assessment of the impact of commercial rock lobster fishing with leatherback turtles.

- Commercial monitoring data (collected by fisheries research observers aboard commercial vessels)
- Voluntary logbook data (detailed catch and fishing effort data with increased spatial and temporal resolution provided voluntarily by approximately 35% of commercial rock lobster fishers)
- Annual Gear and Equipment Survey forms (recently upgraded to allow for bycatch of specially protected species data to be included)
- Random telephone surveys.
- Targeted telephone surveys of commercial fishers known to have caught sea lion pups.
- Relevant data from CALM databases.

Leatherback turtles are listed as a vulnerable or protected species within Commonwealth and State legislation and therefore all forms of interaction with them needs to be minimised.

With the historically low levels of interaction, there is no quantitative evidence to suggest that the rock lobster fishery has been having a major impact on leatherback turtle populations. However, given the status of leatherback populations, a precautionary approach of reviewing arrangements if there is any increase in mortality rates as a result of the fishery will be undertaken.

Management Objective

1. *To minimise interaction of leatherback turtles with commercial western rock lobster pots and therefore minimise the effects of rock lobster fishing related disruption to leatherback turtles on the west coast.*

Operational Objectives and Action Plans

Turtle Operational Objective 1

To determine if there are relevant techniques to minimise interactions between turtles and lobster pot ropes.

Action Plan

1. DOF will undertake a review of the international literature to investigate techniques for minimising the interaction between leatherback turtles and lobster pot ropes.

Turtle Operational Objective 2

To determine the level and the spatial and temporal distribution of interactions of leatherback turtles with the rock lobster fleet.

Action Plan

1. The level of information gained from log-books and Departmental observers will be improved and a reliable time series of data established.
2. DOF will assess the level of interactions with turtles via voluntary log-books, annual surveys and Department of Fisheries observers and report on these results annually.
    a. The survey forms/logbooks will be reviewed and validated annually by DOF.
    b. The spatial distribution of fishing effort from the annual surveys will be compared with the overall effort distribution of all fishers using the compulsory monthly catch and effort database to assess how representative the sample is.
    c. This data will be used to weigh up the sample data to the whole fishery and obtain an estimate of the level of interaction of the fishery with turtles.
3. DOF will monitor the spatial and temporal distribution of entanglements relative to fishing effort.
    d. All data from annual surveys, log-books, and commercial monitoring will be compiled and analysed annually to determine if there are any trends in the spatial or temporal distribution of entanglements.
    e. These interactions will be compared with the spatial distribution of fishing effort form the voluntary log book and the compulsory monthly returns.
    f. It is important to note that low level of interactions may require a number of years of data before any trends are apparent.
4. DOF and CALM will continually monitor the effectiveness of conservation measures implemented in breeding areas for leatherback turtles. Breeding areas are outside WA waters but the effectiveness of conservation measures will impact on the number of turtles passing through and hence the encounter rate.

Turtle Operational Objective 3

To increase certainty in the ability of fishery dependent data to provide a reliable estimate of interaction with leatherback turtles and other protected species, including spatial, temporal and biological factors.

Action Plan

1. DOF will conduct an education campaign focused on commercial fisheries that explains in clear terms the importance of accurately recording relevant data from interaction with leatherback turtles and other protected species. This education campaign will include:
    i. Target articles in relevant DOF and fishing industry publications and websites
    ii. Targeted letters to those in the voluntary logbook program
    iii. Presentations at professional fishermen's association meetings
    iv. Presentations at RLIAC open forum meetings (including annual Coastal Tour)
    v. Preparation and distribution of a water proof brochure explaining the importance of accurate reporting and information to assist in the accurate identification of protected species.
2. DOF will conduct follow up phone interviews with those who have recorded an interaction to thank them for doing so and extract any further relevant information.
3. All information on interactions will be copied to Dr R Prince, the scientist at CALM with responsibility for marine mammals and reptiles.

Management Action and Targets

Leatherback Turtle Interaction – Moderate Risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Paper to RLIAC reviewing known and relevant techniques to minimise interaction.	DOF	June 2005	On track
Education on the importance of reporting interaction with protected species.	DOF / WAFIC/ WRLC	Throughout 2003/04	Y Ongoing
Assess the outcomes of the reporting interaction with all protected species education process.	DOF	Aug 2004	N Draft report completed
Monitor and report through the annual level identification on both fishery dependent and independent data to identify fishing mortality of leatherback turtles and ascertain all relevant spatial, temporal and biological details, should an interaction be recorded.	DOF / CALM	Annual	Y
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y

Fisheries Management Performance Measure

The trend in the number of logged observations, media reports or other recorded negative interactions with leatherback turtles.

RISK 3 –PHYSICAL IMPACT OF POTS ON CORAL

Risk Rating

Moderate

Management Assessment underlying risk rating

The coral habitat in the Abrolhos Islands and northern part of the western rock lobster fishery is relatively unspoiled compared to many other areas in the world. There is a view that rock lobster fishing (and other anthropogenic activities), through the use of pots and anchoring of boats, could lead to coral damage, in this way impacting on the coral ecosystem. The moderate level of risk was conferred in the absence of current information. However, recent research has indicated that commercial fishing activities have a minimal impact overall on fragile coral communities with anthropogenic impacts of this nature apparently less disruptive than naturally generated disturbance (Webster *et al*. 2002).

It is important to note that the ERA process occurred prior to data being available from the FRDC-funded research investigating physical impacts from human activity and natural sources on the Abrolhos Islands. However, a workshop was held on the issue of anthropogenic physical impacts on the Abrolhos Islands in July 2001. A major report was compiled on these issues and the following is extracted information from this report that relates to rock lobster fishing.

"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. Unbaited pots are soaked for a week beforehand but are placed together in sandy sediments in areas defined and patrolled by DOF staff and so have little impact on fragile 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 defined as 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 fishing 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 eg 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."

Whilst rock lobster fishing has been carried out at the Abrolhos Islands for over 50 years and the rock lobster season lasts for only 3.5 months, there are some isolated physical impacts of potting on coral communities. This level of impact has not detracted from the overall appeal of the Abrolhos which has vast stands of pristine corals. Nevertheless, exactly what physical impact potting has on coral communities and how those communities respond, needs to be investigated. This understanding would apply to other areas of coral further north but it is notable that lobster fishing is very limited in coral communities north of Kalbarri.

Several other factors that have potentially reduced the fishery's impact on coral systems or contribute to minimising this impact include:

- The reductions in the numbers of pots and limits to pot size that have been introduced;
- It is appropriate to compare the relative impacts that may be caused by potting versus storms on this habitat. Observations by WA Museum and Department of Fisheries divers support that there is limited isolated physical damage to corals due to pots relative to storm damage;
- Setting of pots is generally adjacent to, rather than on, corals;
- Rock lobster fishers use permanent moorings rather than using anchors; and
- Most of the accidental "groundings" of vessels in this area occur on the tops of the western reefs which are flat, hard limestone, and because of consistent large wave activity do not support colonies of the sensitive branched corals.

Recent research suggests that potting impacts are insignificant but nevertheless in need of investigation.

Several data requirements have been identified in the need to determine the impact of the fishery on coral reef systems. These are outlined below:

Data Required	**Availability**
Distribution of fishing effort in shallow waters <20m	Data available from Voluntary log books and FRDC study. Some historical small-scale effort distribution data available from the 1980s.
Specific physical impacts of pots and vessels on fragile corals	Data presently unavailable. New research required.
Response of corals to physical impacts	Data presently unavailable. New research required.
Determination of the level of catch taken from fragile areas.	Data presently unavailable. New research required.

Management Objective

1. *To understand the specific impacts of potting on corals and increase the awareness of rock lobster fishers, and the general community, of the impacts of potting in fragile coral habitats compared to natural perturbations.*

Operational Objectives, Action Plans and Management Response

Coral Operational Objective 1

To determine the relative level of catch from fragile coral reef areas.

Action Plan

1. DOF will examine various strategies to determine the proportion of the catch taken from areas of the Abrolhos containing fragile corals and, if necessary, develop by March 2005, a research programme to assess it.

Coral Operational Objective 2

To educate fishers about the potential impacts of fishing activities on sensitive coral habitats.

Action Plan

1. An education program will be developed to ensure relevant information in appropriate formats is delivered prior to the commencement of the next Abrolhos season in March 2005.
2. Presentations at relevant professional fishermen's association meetings.
3. Presentations at RLIAC open forum meetings (including 2003 and 2004 Coastal Tours).

Coral Operational Objective 3

To gather relevant knowledge on the impact of pots /traps in other tropical reef fisheries.

Action Plan

1. A desk study will be undertaken before June 2005 to search for peer reviewed research results relating to the impacts of pot or trap fishing on corals in other tropical fisheries.

Coral Operational Objective 4

To determine the actual physical impacts of potting on Abrolhos sensitive coral reef habitats.

Action Plan

1. Develop and undertake a pilot study during the 2005 Abrolhos season to examine the direct impact of pots on Abrolhos corals.

Management Action and targets

Physical impact of pots on coral – Moderate Risk Action	Who	Target	Achieved Y/N New target
Education process on the potential damage from pots.	DOF / WAFIC / WRLC	Throughout 2003/04	Y ongoing
Paper to RLIAC reviewing knowledge on impact of pots / traps in other tropical reef fisheries.	DOF	June 2005	On track
Commence a pilot study of specific impacts of pots on corals at the Abrolhos	DOF	Mar 2005	N Pending further analysis of desktop study and risk assessment
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y

Fisheries Management Performance Measure

Management actions / outcomes delivered on time for use in future assessment and management decision processes.

RISK 4 –WASTE MANAGEMENT AT THE ABROLHOS ISLANDS

Risk Rating

Moderate

Management Assessment underlying risk rating

Licensed rock lobster fishers with an A Zone endorsement are allowed to establish permanent camps on the Abrolhos Islands to assist them in fishing the adjoining waters. Only twenty two of the 122 islands have camps; the total number of camps on the islands is 129. In addition there are three airstrips and four schools. The camps are occupied only during the Abrolhos season (15 March-30 June), and can only be used outside the lobster season for maintenance and repairs.

During fishing activities, most Abrolhos fishers take all rubbish material back to their camps where it is either burnt or sent to the mainland to be disposed of in an appropriate manner. Rubbish which cannot be burnt and is too large (eg corrugated iron water tanks, building material) to be taken back to the mainland, is dumped at sea at a designated “dumping ground”. The Abrolhos Islands Management Advisory Committee (AIMAC) is reviewing the dumping at sea practice and will phase it out within the next five years.

The State Territorial Waters surrounding the Abrolhos Islands are gazetted as a Fish Habitat Protection Area. Human waste activities on the islands present a risk to marine life around inhabited islands and at the "dumping grounds".

However, a study of one area in the Abrolhos Islands which is heavily populated by fishers 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) (Marine Science Associates and Environmental Contracting Services, 1998). 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.

Current management arrangements are in place; many of which are provided for within the Fish Resources Management Regulations 1995. *In summary they are:*

Domestic Waste

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

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.
- Composting or hybrid anaerobic toilets have been installed at the Beacon Island school, the research camp and at East Wallabi airstrip.
- Fishers are encouraged to install composting toilets as a replacement for direct outfall.

Management Objective

1. *To minimise adverse effects of human waste activities on the aquatic habitats of the Abrolhos Islands*.

Operational Objectives, Action Plans and Management Response

Waste Management Operational Objective 1

To conduct a baseline data survey of the Abrolhos waste dumping grounds.

Action Plan

1. DOF will use video and acoustic survey techniques to examine the extent and condition of waste dumping grounds at the Abrolhos.

a. As the dumping grounds lie in deep water 30-40m and so require the use of towed video cameras to document what is at the sites and what condition the items are in, colonization of organisms and so on.
b. Experienced divers will be used to visually inspect the sites if the videos reveal areas where more complete observation is required

2. DOF vessels will survey the dump sites using echo sounders and other equipment such as Roxann to provide three dimensional views of the sites.
3. Where possible all data will be integrated into a GIS data base.

Management Action and targets

Waste Management at the Abrolhos Is- Moderate risk Action	Who	Target	Achieved Y/N
Undertake video and acoustic survey of waste dumping grounds	DOF	Oct 2005	On track
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y

Fisheries Management Performance

Management actions / outcomes delivered on time for use in future assessment and management decision processes.

RISK 5 - IMPACT OF FISHERY ON THE ECOSYSTEM

Risk Rating

Low

Management Assessment underlying risk rating

The low risk rating for this objective is taken from the ERA process. However, it is relevant to note that despite this low rating, the certification team has repeated concerns about the appropriateness of a low rating when there are many unknowns with respect to the effects of removing lobster biomass on the ecosystem. Peer reviewers of the ERA process and outcomes also raised concerns about the rating for many of the same reasons, and it is on that basis that the treatment of this particular objective is more representative of action that would be taken to address a moderate risk. In addition much of this information relates to understanding rock lobster population dynamics, in particular catchability, and will be useful in the ongoing stock assessment.

Subsequent to peer review assessment of the ERA process and the resultant uncertainty around the risk rating, the Western Rock Lobster Fishery Effects of Fishing on the Ecosystem Scientific Reference Group (EcoSRG), an independent and expertise based body, was convened to provide advice on the issue of the effects of fishing on the ecosystem.

The EcoSRG accepted advice from DOF with respect to the following known life history and behavioural aspects of western rock lobsters:

1. The variation in total catch of rock lobsters in the last 30 years has been from 7200 tonnes to 14500 tonnes indicating a 50% fluctuation in annual abundance of exploitable section of the stock (Chubb, 2001).
2. The abundance of the breeding stock indicates that its current biomass is as high now as it has been over the last 20 years whilst juvenile levels are unaffected by fishing.
3. Examination of abundance from puerulus to legal-size rock lobsters near Dongara undertaken by FRDC project 98/302 Phillips *et al*. (2001) has provided an indication of the 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% - suggested as being much less than the impact of natural variations.
4. Increases to the minimum size during the migration phase of the lobsters (Nov-Jan) and reduction in the number of pots have significantly increased the number of lobsters surviving the migration to reach deep water each year.
5. 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.
6. The current estimates of the total biomass levels of lobsters suggest that they are at least 80% to 90% of the unfished levels (considering undersized and breeding females protected by law).
7. Lobsters in shallow water are known to be opportunistic omnivores feeding on a wide range of prey organisms, many highly productive with short life cycles.
8. In shallow water, lobsters have a home range of about 800 m and many individuals have their own foraging patterns returning to their own dens in the early morning.
9. Tracking of juveniles in shallow water suggested that lobsters are attracted to baited pots from a downstream odour plume but only lobsters upstream encountering the baited pot during their foraging could be caught. Only a proportion of lobsters that visted the baited pots were caught.
10. The total removals of lobsters are in the order of 5 kg/hectare/year.

The EcoSRG summarised the current important gaps in knowledge or areas of uncertainty as follows:

1. There is only a limited understanding of density dependent mortality;
2. There is a question about the relevance of studies from other parts of the world most of which have been conducted in rocky habitats while the habitat of the western rock lobster varies from sand to limestone to rocky areas and the breakdown of these habitat types (% of area) is largely unknown.
3. Much of the work published in the scientific literature is not of a scale sufficient to provide good levels of confidence when extrapolated to larger areas, i.e. they were often correlative or small-scale PhD studies.

4. There is uncertainty about the virgin status of the stock – what were the size distributions like inshore and offshore?
5. There was concern that the biomass argument discounted the role of large lobsters both in the deep and shallow water. The important issue here was the size of the lobsters and the impact or influence of these on the environment.
6. It was acknowledged that the level of information available for the inshore areas of the fishery was reasonably strong in comparison with knowledge of deep water, although it did suffer in a manner similar to that outlined in point 3 above.

Overall the EcoSRG assessed that:

There is a paucity of data from the deep water such that, the SRG was not able to determine the impact on the ecosystem of removing lobsters from deep-water habitats and that this should be a priority focus for research.

This assessment, the EcoSRG's statements regarding what is known, what can be inferred from the available data and recommendations on action to be taken are accepted by DOF and WAFIC. The full report of the EcoSRG is at Appendix 2 and is the basis for the strategy outlined in this EMS.

The EcoSRG assessment directs priority to deep-water studies because there is greater certainty with respect to knowledge of the shallow water natural history characteristics of the lobster related ecosystem. However, the EcoSRG recognised that there are considerable opportunities for collaborative studies as part of the Jurien Bay Marine Park Management Plan and the SRFME Coastal Ecosystem processes. This being the case the EcoSRG assessment should not be taken to mean that there is no need for further shallow water studies.

The particular ongoing requirement for certification that relates to the development and implementation of this EMS specifically refers to the need for studies that are able to produce information on the impacts of fishing on the ecosystem that are at least as scientifically valid as those produced by studies of fished versus unfished areas. As a result, the use of fished versus unfished experimental design (a form of manipulative study) to examine the effects of removing lobsters on the environment has been widely discussed.

With reference to the identified knowledge gaps, in particular the absence of any basic natural history knowledge of the deep-water lobster related ecosystem, the design of a manipulative study at this point in time would be fundamentally flawed

This being the case there is a clear need to address the identified knowledge gaps in a coordinated and strategic way so as to allow for ongoing assessment of risk, provide advice for management action and to enable the design of a manipulative study of significant scale that will produce credible results. This is the strategy strongly endorsed by the EcoSRG and accordingly is the basis of management action adopted in this EMS. The summary of the EcoSRG recommendations is as follows:

Resolution 1
There is a paucity of data from the deep water such that, the SRG was not able to determine the impact on the ecosystem of removing lobsters from deep-water habitats and that this should be a priority focus for research.

Resolution 2
The SRG accepted the evidence presented to justify the statement that there was a lower risk of an unacceptable effect on the ecosystem associated with the exploitation of lobsters in shallow water under the present management regime. Noting that there is not sufficient data for a prescriptive shallow water assessment the SRG recommended that opportunities to study the effects of lobster removal on the ecosystem in shallow water through collaborative studies in the Jurien Bay Marine Park and as part of the SRFME initiative should be vigorously pursued. The SRG also recommended that it be consulted during the development of any such projects.

Resolution 3
The SRG advises that at this point in time, and based on current available knowledge for the deep-water, it could not design an experimental approach equivalent to a fished versus unfished study with any certainty that the study would produce results that determine the effects of fishing on the ecosystem.

Resolution 4
The SRG recommends that the strategic framework illustrated in Appendix 4 be adopted.

Resolution 5
The SRG recommends that an operational plan of research be developed that, through its implementation, will establish the necessary understanding of the critical natural history elements. The key elements of this operational plan should include the following four points:

1. Habitat mapping

Focus questions to be addressed

- *What habitats do lobsters utilise?*
- *Is there a pattern in the habitat type that is related to lobster density and / or size structure?*

Action Plan

1. *Produce a broad scale habitat map by collating information from existing data bases eg fishers' GPS.*
2. *Review existing benthic habitat and seabed data for the shelf waters between Mandurah and Kalbarri.*
3. *Conduct broad large-scale rapid assessment protocols in waters between Mandurah and Kalbarri to determine areas of interest.*
4. *Choose a minimum of three representative transects with replicates at each location.*
5. *Conduct detailed habitat mapping of chosen sites that include*
    - *Acoustic survey of hard structure and associated ground truthing of epifauna and infauna 'habitat' using video techniques.*
    - *Limited grab sampling to later determine infaunal composition and sediment type*

Addressing these questions will provide information on the distribution and density of lobsters of different sizes relative to benthic habitats and prey resources.

The SRG defines the term "habitat" in this context to include the physical (e.g., rocks and sand waves) and biological (sponge gardens, emergent bivalves) features on the seafloor that provide structural complexity (on > 1m spatial scale) and are likely to act as surrogate variables enabling broad-scale rapid assessment of benthic communities).

2. Size structure and density of lobsters

Focus questions to be addressed

- *What is the current size structure and density of lobsters in the chosen sites?*
- *Is potting an appropriate measure of abundance and size structure of the population? (selectivity)*
- *What is/are the relationship(s) between pot catch rate and size composition?*
- *What is/are the impact(s) of habitat on catchability?*
- *What is the degree of movement (foraging/home range) of lobsters and is this size dependent?*

Action plan

1. *Use a range of methods to estimate selectivity and catchability (depletion experiments different gear options (e.g. pots with larger necks or tangle nets) and multiple tagging*
2. *Use video to observe localised lobster behaviour with habitat types and interaction with baited pots.*
3. *Using existing catch records and environmental data assess the influence of climate variation on catchability at sites.*
4. *Use existing length based fishery models to investigate possible size compositions for unfished stocks.*

This information will be used to relate lobster density (and size structure) to fisheries data to facilitate the scaling up of information from specific study sites to the fishery. It will also be combined with information collected in "1" above to determine relationships between habitat and lobster size and density.

3. Trophic Dynamics

Focus questions to be addressed

- *What is the size dependent diet of lobsters in the chosen sites*
- *What are the trophic dynamics of lobsters in these regions?*
- *Are there relationships between lobster size-structure compositions and prey density and composition?*

Action plan

1. *Conduct carbon and nitrogen isotope analysis of lobsters to provide information on diets, trophic relationship and whether the basis of lobster diets are plant, animal, detrital or a combination.*

2. *Conduct gut analysis studies to examine diets and compare with long-term trophic source both on a seasonal and inter-annual basis.*
3. *Conduct aquarium tests to investigate relationship(s) between lobster size and prey size*

This information will be used to assess whether large lobsters exploit a different range of food resources than smaller individuals

4. Lobster behaviour

Focus questions to be addressed

1. *What size and sex specific behaviours are relevant to the issue of sustainability of the resource*

Action plan

1. *Observe behaviour of small lobster in areas where there is an absence of large lobster, then seed some of those areas with large lobsters and observe any changes in behaviour / abundance of small lobsters.*
2. *Use video techniques to observe lobster behaviour*

This information will be used to assess interactions between different sized lobsters and determine the relevant space and time scales for manipulative studies

Resolution 6
The SRG recommends that the development of detailed projects for these four areas of study occur in liaison with the SRG.

Resolution 7
The SRG recommends that as results from the studies of basic ecology become available that they be used in further risk assessment and decision-making processes as provided for by the strategic framework.

Resolution 8
The SRG recommends that as results from the studies of basic ecology become available that they be used in the inference phase of the strategic framework to develop statistical, conceptual and ultimately mathematical ecological models that can be used in further assessment of risk and the decision making process.

Resolution 9
The SRG recommends that the increased understanding of natural history and the development of ecological modelling capacity should be used to assist in the design of manipulative study options such as fished versus unfished and linear correlative approaches to determine what the effect of fishing on the ecosystem is.

Management Objectives

To establish an operational plan of research that will test the hypothesis that:

> *"Removal of lobsters in the deep water does not have a significant or irreversible effect on the ecosystem."*

Operational Objectives, Action Plans and Management Response

Eco Operational Objective 1

Establish a strategic research framework for assessing the effect of commercial rock lobster fishing on the ecosystem facilitates the incorporation of results, when they become available, into further assessment of risk and the management decision-making process through RLIAC.

Action Plan

1. DOF and WAFIC will adopt, use and begin to promote the strategic framework recommended by the EcoSRG by September 2003. See Appendix 4.

Eco Operational Objective 2

Establish an operational plan of research to address the natural history characteristic knowledge gaps.

Action Plan

1. DOF developed a project description using the FRDC pre-proposal format in liaison with the EcoSRG in September 2003 with the following objectives:

    - To understand the deep-water habitat that rock lobsters utilize
    - To assess the catchability and the density and size structure of rock lobsters in deep-water
    - To understand the trophic dynamics of lobsters
    - To understand the impact of removal of large lobsters on the behaviour of the smaller lobsters

2. DOF developed a full project description for submission to FRDC in liaison with the EcoSRG in November 2003 with the above objectives.

3. The full project proposal by DOF to specify in full specifications and milestones for work to be undertaken.

4. The project proposal was reviewed and re-submitted to FRDC in May 2004 based on comments received from FRDC reviewers and comments from EcoSRG. FRDC agreed to fund the project

Eco Operational Objective 3

Ensure that appropriate expertise is associated with implementing the operational plan in a committed way and at a senior level.

Action Plan

1. DOF will employ a marine ecologist with relevant expertise as a member of the Research Division by April 2004.

Eco Operational Objective 3

Ensure there is good collaboration between DOF, CALM and SRFME to maximise study opportunities from Jurien Bay and SRFME initiatives.

Action Plan

1. DOF will discuss the establishment of a shallow water rock lobster ecosystem effects project with collaboration that includes relevant DOF, CALM and SRFME staff by September 2003.

Management Action and targets

Effect of Fishing on the Ecosystem –Low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Promote strategic research framework for assessing the effect of fishing on the ecosystem	DOF / WAFIC	Oct 2003 & ongoing	Y Ongoing (SRG to sign off at next mtg)
Promote deep-water ecology operational plan for gathering natural history information.	DOF / WAFIC	Oct 2003 & ongoing	Y & ongoing
Full project description for deep-water natural history ecology work	DOF / SRG	Nov 2003	Y & ongoing
Employ marine ecologist as PI of deep-water natural history ecology work	DOF	April 2005	Y
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y & ongoing
Report on ecosystem deep water research and other ecosystem research to SRG	DOF	Annual	Y & ongoing

Fisheries Management Performance Measure

The degree to which research progress is considered adequate by the funding bodies. Management actions and outcomes delivered on time for use in future assessment and management decision processes.

RISK 6 – WHALE AND DOLPHIN INTERACTION

Risk Rating

Low

Management Assessment underlying risk rating

There are rare reports of migrating whales being entangled in rock lobster pot ropes. Bottle nosed dolphins sometimes follow rock lobster vessels and may be fed by crew or possibly feed upon discarded bait.

CALM has encountered 17 whales entangled with rock lobster rope since 1985 (Doug Coughran, CALM, pers. comm.). All entangled whales were released alive.

Management Objective

1. *To minimise adverse effects of the fishery on whales and dolphins*

Operational Objectives, Action Plans and Management Response

Whales and Dolphins Operational Objective 1

To assess the level of direct interactions between dolphins and whales and the rock lobster fishery on the west coast.

Action Plan

1. DOF will continue to collect data from logbooks, independent monitoring and annual fisher surveys on whale and dolphin interactions and refine the collection techniques where necessary. The data will be analysed and reported publicly.

Whales and Dolphins Operational Objective 2

To increase certainty in the ability of fishery dependent data to provide a reliable estimate of interactions with whales, dolphins and other protected species including spatial, temporal and biological factors.

Action Plan

1. DOF will conduct an education campaign focused on commercial fisheries that explains in clear terms the importance of accurately recording relevant data from interaction with sea lions and other protected species. This education campaign will include:
    i. Target articles in relevant DOF and fishing industry publications and websites
    ii. Targeted letters to those in the voluntary logbook program
    iii. Presentations at professional fishermen's association meetings
    iv. Presentations at RLIAC open forum meetings (including annual Coastal Tour)
    v. Preparation and distribution of a water proof brochure explaining the importance of accurate reporting and information to assist in the accurate identification of protected species.
2. DOF will conduct follow up phone interviews with those who have recorded an interaction to thank them for doing so and extract any further relevant information.

Management Action and Targets

Whale and Dolphin interaction – low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Education campaign on the importance of reporting interaction with protected species.	DOF / WAFIC / WRLC	Throughout 2003/04	Y ongoing
Assess the outcomes of the reporting interaction with all protected species education process.	DOF	Aug 2004	Y ongoing
Monitor and report through the annual level identification on both fishery dependent and independent data to identify interactions and ascertain all relevant spatial, temporal and biological details should an interaction be recorded.	DOF / CALM	Annual	Y ongoing
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual *	Y ongoing

Fisheries Management Performance Measure

That the trend in the number of logged observations, media reports or other recorded interactions with whales and dolphins remain stable or decline.. Management actions / outcomes delivered on time for use in future assessment and management decision processes.

RISK 7 – OCTOPUS BYCATCH

Risk Rating

Low

Management Assessment underlying risk rating

Octopuses (principally *Octopus tetricus*) 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 for octopus in both overseas and local markets.

Octopus have a short (12 month) lifespan and their recruitment appears to be highly variable (Joll 1977a). Their habitat extends beyond the habitat utilised by the rock lobster fishery eg includes sea grass and weed beds, so that only a proportion of their population would be potential bycatch in the fishery.

This by-product was previously discarded or sold as bait, but now is 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.

Mitigation measures within the fishery include the increase in the number of escape gaps from one to 3 or 4 in the pots which has allowed more octopus to escape as did the 18% reduction of pots in the water in 1993/94.

As a lobster predator, the octopus is likely to be an important element in the rock lobster's ecosystem. Currently, despite the low risk rating, 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.

Management Objective

1. *To minimise the risk of overfishing octopus populations as bycatch from rock lobster fishing.*

Operational Objectives, Action Plans and Management Response

Octopus Operational Objective 1

To monitor the level of octopus bycatch from the rock lobster fishery on the west coast.

Action Plan

1. DOF will continue to closely monitor octopus catch rates using the existing independent commercial monitoring program and log book data. The data will be analysed and reported publicly.
2. Octopus caught during the monitoring program will be identified if different from the common species.
3. DOF will monitor 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.

Management Action and targets

Octopus bycatch – low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Monitor and report through the annual level identification on both fishery dependent and independent data to identify large catches and ascertain all relevant spatial, temporal and biological details should this be recorded.	DOF	Annual	Y ongoing
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y ongoing

Fisheries Management Performance Measure

Management actions / outcomes delivered on time for use in future assessment and management decision processes.

RISK 8 – BYCATCH DEEP SEA CRABS

Risk Rating

Low

Management Assessment underlying risk rating

Maintaining stock sustainability is critical for the future survival of the recently regulated West Coast Deep Sea Crab Fishery. There is potentially a large amount of latent effort from rock lobster fishers who inadvertently catch deep sea crabs within their rock lobster pots. To help diminish this risk and cap the potential bycatch, it is proposed to implement a possession limit of deep sea crabs on the west coast, applicable to all operators outside of the interim managed fishery, including rock lobster fishers.

RLIAC is currently considering a proposed amendment to the *Fish Resources Management Regulations 1995* to limit rock lobster operators to take a maximum of twelve deep sea crabs per boat per day within the rock lobster fishing season. The twelve crabs can be a mix of any three of the described deep sea crab species (these being Spiny, Snow and Giant crabs). The proposed possession limit has been set so that it is sufficient to cap the potential bycatch from the rock lobster fishery but to meet daily consumption desires of crew on board a rock lobster fishing boat.

Management Objectives

1. Limit bycatch of deep sea crabs to acceptable levels

Operational Objectives and Action Plans

Deep Sea Crab Operational Objective 1

To assess annually the level of deep sea crab bycatch from the rock lobster fishery on the west coast.

Action Plan

1. DOF will continue to closely monitor bycatch species and catch rates using the existing independent commercial monitoring program and log book data. The data will be analysed and reported publicly.

Deep Sea Crab Operational Objective 2

To develop a management proposal to limit (in legislation) the quantity of deep sea crab that can be retained by western rock lobster fishers.

1. DOF will put a proposal to RLIAC to limit rock lobster operators to take a maximum number of deep sea crabs per boat per day within the rock lobster fishing season.
2. As part of the proposal DOF will ensure adequate compliance checks are catered for.

Management Action and targets

Deep sea crab bycatch – low risk **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Management proposal to limit bycatch of deep sea crabs.	DOF / RLIAC	Sept 2003	Y Implementation Nov 2005
Monitor and report through the annual level identification on both fishery dependent and independent data to identify excessive catches and ascertain all relevant spatial, temporal and biological	DOF	Annual	Y ongoing

details should excessive catches be recorded.			
Monitor and report through the annual level identification process on all operational objectives.	DOF	Annual	Y ongoing

Fisheries Management performance measure

Management actions / outcomes delivered on time for use in future assessment and management decision processes.

RISK 9 – OTHER LOW RISKS

Risk Rating

Low

Management Assessment underlying risk rating

Appendix 6 displays all current known risks, those the have the highest risk rating or where there is a lack of knowledge associated with a low rating or interaction with protected species have been addressed in detail by Objectives 1 to 8.

It is important to ensure that the process described in this EMS to identify and assess issues, risk and hazard also apply to other known low risks. This will ensure that if there are changes in the status of risk they are identified early, and thereby provide the greatest opportunity for research or management action to be implemented to minimise the potential harm to the environment.

Management Objective

To minimise harm to the environment from known low ranked risks.

Management Action and targets

Other low risks (Appendix 1) **Action**	**Who**	**Target**	**Achieved Y/N** **New target**
Monitor and report through the annual level identification process.	DOF	Annual	Y ongoing

Fisheries Management performance measure

Management actions / outcomes delivered on time for use in future assessment and management decision processes.

KEY PERSONNEL AND FUNDING ARRANGEMENTS

There is a commitment from the Department of Fisheries and the Western Rock Lobster Industry to meet the cost of: actions against each of the operational objectives; consultation and implementation of management outcomes; and the need to ensure there is adequate compliance with new and existing management initiatives.

The full cost of fisheries management services provided by the Department of Fisheries is recovered from licensees in the Western Rock Lobster Fishery – cost recovery. Many of the actions in this EMS will be funded through the cost recovery process and there is a commitment from DOF, WAFIC and WRLC to this effect.

DOF does receive revenue from sources other than cost recovery that can be used to meet the cost of the western rock lobster fisheries research. In particular the Fisheries Research and Development Corporation (FRDC) is a significant source of funds for rock lobster research projects in Western Australia. Another potential source of funding is ARC linkage grants with a university partner.

It is hoped that a number of the actions to be undertaken in this EMS will be funded, at least to some extent, by the FRDC. For example, a significant proportion of the research required to gain greater knowledge on the natural history characteristics of the lobster related deep-water ecosystem will be part of a FRDC funding application. However, because it is not possible to commit the FRDC to funding the project at this early stage DOF, WAFIC and WRLC have reached an agreement that should alternate sources of revenue not be forthcoming, the cost of carrying out the implementation of this EMS will be met through funds recovered from the rock lobster industry.

Key personnel to whom the responsibility of ensuring adequate funding is provided from financial year to year include:

- The Rock Lobster Program Manager
- The Supervising Scientist – Invertebrates
- The Rock Lobster Compliance sub-program Manager
- The Executive Director of the Western Rock Lobster Council
- The Chief Executive Officer of the WA Fishing Industry Council.

Resourcing details of specific objectives

Sea lion interaction

	2003/04		2004/05		2005/06	
Officer	%	$	%	$	%	$
Dr C Chubb	20	18,000				
Dr R Campbell	100	60,000	100	60,000	80	48,000
Tech support	100	50,000	50	25,000	50	25,000
Dr N Caputi	5	5,000	5	5,000	5	5,000
Operating expenses		30,000		10,000		10,000
Project cost		163,000		100,000		88,000

Dr Campbell's role will be to undertake the video work to assess the interaction of the sea lions with rock lobster pots and undertake the trial of the pots with SEDs with the fishing industry. Dr Chubb and Dr Campbell will supervise the data collection that assesses the level of interaction with icon species and its spatial distribution, and undertake the education role with the fishing industry. Dr Caputi will supervise the project and technical support is provided for all aspects of this project.

Ecosystem studies

	2003/04		2004/05		2005/06	
Officer	%	$$	%	$$	%	$$
Dr C Chubb/Dr Melville-Smith	20	18,000	20	18,000	20	18,000
Dr L Bellchambers	50	35,000	100	70,000	100	70,000
Tech support	50	25,000	100	50,000	100	50,000
Operating expenses (e.g. Research vessel)		25,000		50,000		100,000
Project cost		103,000		188,000		238,000

Dr Chubb is responsible for the initial development of the FRDC project on the effect of rock lobster fishing on the deep-water ecosystem. An ecologist, Dr Bellchambers, was appointed in April 2004 to undertake the work program. Technical support is provided for all aspects of the program developed. Co-investigators with experience in different aspects of this study will be utilised depending on the techniques required.

REFERENCES

Anon. (1998). Management of the Houtman Abrolhos System. *Fisheries Management Paper, Fisheries WA*, No. 117,

Anon. (1998). Opportunities for the holding/fattening/processing and aquaculture of western rock lobster (Panulirus cygnus). *Fisheries Management Paper, Fisheries WA* No. 122, 22 pp.

Anon. (2002). Application to Environment Australia on the western rock lobster fishery. Department of Fisheries (Western Australia).

Ayling, A.M. (1981) The role of biological disturbance in temperate subtidal encrusting communities. *Ecology* **62**:830-847

Barkai, A. (1986). Who eats whom on the sea-bed in Saldanha Bay. *African Wildlife* **40**: 178-185.

Barkai, A. and Barkai, R. (1985). Development of communities on hard substrata at Marcus and Malgas Islands: Coexistence and competition in the subtidal zone. *South African Journal of Science* **81**: 702 (abstract only).

Barkai, A. and Branch, G.M. (1988). Contrasts between the benthic communities of subtidal hard substrata at Marcus and Malgas Islands: A case of alternative stable states? *South African Journal of Marine Science* **7**: 117-137.

Betz, W. and Welch, M. (1992). Once thriving colony of leatherback sea turtles declining at Irian Jaya, Indonesia. *Marine Turtle Newsletter* **56**: 8-9.

Breen, P.A. and Mann, K.H. (1976). Changing lobster abundance and the destruction of kelp beds by sea urchins *Marine Biology* **34**:137-142

Chan, E.H. and Liew . H.C. (1996). Decline of the leatherback population in Terengganu, Malaysia, 1956-1995. *Chelonian Conservation and Biology* **2**: 196-203.

Chubb, C.F. (2000). Reproductive biology: Issues for management. In "*Spiny Lobsters: Fisheries and Culture*" (Ed. by Phillips, B.F. and Kittaka, J.), pp. 245-275. Fishing News Books, Blackwell Science Ltd., Oxford, U.K.

Chubb, C.F. (2002). Towards an assessment of the natural and human use impacts on the marine environment of the Abrolhos Islands. Volume 2. Strategic research and development plan. *Fisheries Research Report, Fisheries WA* No. 134(2), 31pp.

Cole, R.G., Ayling, T.M. and R.G. Creese (1990). Effects of marine reserve protection at Goat Island, northern New Zealand. *New Zealand Journal of Marine and Freshwater Research* **24**: 197-210.

Crossland, C.J., B.G. Hatcher, M.J. Atkinson and S.V. Smith (1984). Dissolved nutrients of a high latitude coral reef, Houtman Abrolhos Islands, Western Australia. *Marine Ecology: Progress Series* **14**: 159-163.

Crouse, D. (1997). Pacific leatherback postscript. *Marine Turtle Newsletter* **76**: 12-14.

Crowe, F., Lehre, W. and R. Lenanton (1999). A study into Western Australia's open access and wetline fisheries. *Fisheries Research Report, Fisheries WA* No. 118, 142pp.

Eckert, S.A. (1997). Distant fisheries implicated in the loss of the world's largest leatherback nesting population. *Marine Turtle Newsletter* **78**: 2-7.

Edgar, G.J. (1990a). Predator-prey interactions in seagrass beds. I. The influence of macrofaunal abundance and size-structure on the diet and growth of the western rock lobster *Panulirus cygnus* George. *Journal Experimental Marine Biology and Ecology*, **137**: 215-240.

Edgar, G.J. (1990b). Predator-prey interactions in seagrass beds. II. Distribution and diet of the blue manna crab *Portunus pelagicus* Linnaeus at Cliff Head, Western Australia. *Journal of Experimental Marine Biology and Ecology* **139**: 1-22.

Edgar, G.J. (1990c). Predator-prey interactions in seagrass beds. III. Impacts of the western rock lobster *Panulirus cygnus* George on epifaunal gastropod populations. *Journal of Experimental Marine Biology and Ecology* **139**: 33-42.

Edgar, G.J. and Barrett, N.S. (1997). Short term monitoring of biotic change in Tasmanian marine reserves. *Journal of Experimental Marine Biology and Ecology* **213**: 261-279.

Fletcher, W., J. Chesson, K Sainsbury, T. Hundloe, M. Fisher, T. Smith, and B. Whitworth (2002). The "How to Guide" for reposrting on ecological sustainable development for wild capture fisheries. FRDC Report 2000/145, Canberra, Australia.

Fletcher, W.J. et al. In press. ESD Report Series No 3 - Western Rock Lobster

FRDC 2000/166. Towards an assessment of natural and human use impacts on the marine environment of the Abrolhos Islands – Phase 1: Data consolidation and scoping. (Principal Investigator C Chubb)

FRDC 2001/050. Biological neutrality modelling and habitat improvement possibilities for the western rock lobster. (Principal Investigator B Phillips)

FRDC 99/154. Determining biological characteristics of the champagne crab *Hypothalassia armata* for management purposes.

FRDC 2000/145. Ecological Sustainable Development (ESD) Case study report: Western Rock Lobster. Prepared on behalf of the Fisheries Research and Development Corporation (Principal Investigator WJ Fletcher).

FRDC Project 98/302. Examining pueruli harvesting and the question of biological neutrality in the western rock lobster, and techniques for large-scale harvesting of lobster pueruli. (Principal Investigator B Phillips).

Hall, N.G and R.S. Brown (2000). Modelling for management: The western rock lobster fishery. In "*Spiny Lobsters: Fisheries and Culture*" (Ed. by Phillips, B.F. and Kittaka, J.), pp. 386-399. Fishing News Books, Blackwell Science Ltd., Oxford, U.K.

Hall, N.G. and Chubb, C.F. (2001) The status of the western rock lobster, *Panulirus cygnus*, fishery and the effectiveness of management controls in increasing the egg production of the stock. *Marine and Freshwater Research* **52**: 1657-1668.

Harriot, V.J. (1998). Growth of the staghorn coral *Acropora formosa* at Houtman Abrolhos, Western Australia. *Marine Biology* **132**: 319-325.

Hatcher, A., Hatcher, B. and G. Wright (1988). A preliminary report on the interaction between the major human activities and the marine environments at the Houtman Abrolhos Islands of Western Australia. Prepared for The Abrolhos Islands Task Force, Government of Western Australia.

Hatcher, A.J., Wright, G.D. and B.G. Hatcher (1990). Resolving the conflict between conservation values and extractive use of the Abrolhos coral reefs. *Proceeding of the Ecological Society of Australia* **16**: 55-70.

Holley, D. (2003). Australian sea-lion survey. *Marine Conservation Matters (CALM)* No 10, 7.

Howard, R.K. (1988). Fish predators of the western rock lobster (*Panulirus cygnus* George) in the nearshore nursery habitat. *Australian Journal of Marine and Freshwater Research* **39**: 307-316.

Jennings, S & Kaiser, M.J (1998). The effects of fishing on marine ecosystems. *Advances in Marine Biology* **34**: 201-352

Jernakoff, P., Phillips, B.F. and Fitzpatrick, J.J. (1993). The diet of post-puerulus western rock lobster, *Panulirus cygnus* George, at Seven Mile Beach, Western Australia. *Australian Journal of Marine and Freshwater Research* **44**: 649-655.

Johannes, R.E., W.J. Wiebe and C.J. Crossland (1983). Three patterns of nutrient flux in a coral reef community. *Marine Ecology Progress Series* **12**: 131-136.

Joll, L.M. (1977a). Growth and food intake of *Octopus tetricus* (Mollusca: Cepahalopoda) in aquaria. *Australian Journal of Marine and Freshwater Research* **28**:45-56

Joll, L.M. (1977b). The predation of pot-caught western rock lobster (*Panulirus longipes cygnus*) by octopus. *Department of Fisheries and Wildlife Report* No. 29, 58 pp.

Joll, L.M. and Phillips B.F. (1984). Natural diet and growth of juvenile rock lobsters *Panulirus cygnus* George. *Journal of Experimental Marine Biology and Ecology* **75**: 145-169.

Jones, B and A. Gibson (1997). "*Risk analysis for the practice of importing frozen fish as bait*." Western Australian Fishing Industry Council (Inc.), Perth, Australia. 188 pp.

Kailola, P.J., Williams, M.J., Stewart, P.C., Reichelt, R.E., McNee, A. and Grieve, C. (1993). "*Australian Fisheries Resources*." Bureau of Resource Sciences, Department of Primary Industries and Energy, and the Fisheries Research and Development Corporation, Canberra, Australia.

Mann, K.H. (1982). Kelp, sea urchins and predators: a review of strong interactions in a rocky subtidal system off eastern Canada. *Netherlands Journal of Sea Research* **16**:414-423

Marine Science Associates and Environmental Contracting Services (1998). An evaluation of the contribution of fishing camps to small-scale nutrient enrichment of reefs: nutrient status, coral growth and reef status at Rat Island, Easter Group, Abrolhos Islands. Consultancy Report for Fisheries WA., 16 pp.

Marine Science Associates and Environmental Contracting Services (1998). An evaluation of the contribution of fishing camps to small-scale nutrient enrichment of reefs: nutrient status, coral growth and reef stats at Rat Island, Easter Group, Abrolhos. Consultancy Report for Fisheries WA.

Mayfield, S. and Branch, G.M. (2000). Interrelations among rock lobsters, sea urchins, and juvenile abalone: implications for community management. *Canadian Journal of Fisheries and Aquatic Sciences* **57**: 2175-2185.

Miller, R.J. (1985) Seaweeds, sea urchins and lobsters: a reappraisal *Canadian Journal of Fisheries and Aquatic Sciences* **42**: 2061-2072

Penn, JW (2000) (Ed.) The State of the Fisheries 1999/2000. Fisheries Western Australia Report to Parliament.

Phillips, B.F., Chubb, C.F. and R. Melville-Smith (2000) The status of Australia's rock lobster fisheries. In "*Spiny Lobsters: Fisheries and Culture*." (Ed. by Phillips, B.F. and Kittaka, J.), pp. 45-77. Fishing News Books, Blackwell Science Ltd., Oxford, U.K.

Prince, R.I.T. (1993). Western Australian Marine Turtle Conservation Project: an outline of scope and an invitation to participate. *Marine Turtle Newsletter* **60**: 8-14.

Rainer, S.F. and V.A. Wadley (1991). Abundance, growth and production of the bivalve *Solemya sp*., a food source for juvenile rock lobsters in a seagrass community in Western Australia. *Journal of Experimental Marine Biology and Ecology* **152**: 201-223.

Sarti, L., Eckert, S.A., Garcia, N. and Barragan, A.R. (1996). Decline of the world's largest nesting assemblage of leatherback turtles. *Marine Turtle Newsletter* **74**: 2-5.

Shaughnessy, P.D. (1999). "*The Action Plan for Australian Seals*". Environment Australia, Canberra.

Spotila, J.R. *et al*. (1996). Worldwide population decline of *Dermochelys coriacea*: are leatherback turtles going extinct? *Chelonian Conservation and Biology* **2**: 209-222.

Spotila, J.R. *et al*. (2000). Pacific leatherbacks face extinction. *Nature* **405**: 529-530.

Suarez, A. and Starbird, C.H. (1996). Subsistence hunting of leatherback turtles, *Dermochelys coriacea*, in the Kai Islands, Indonesia. *Chelonian Conservation and Biology* **2**: 190-195.

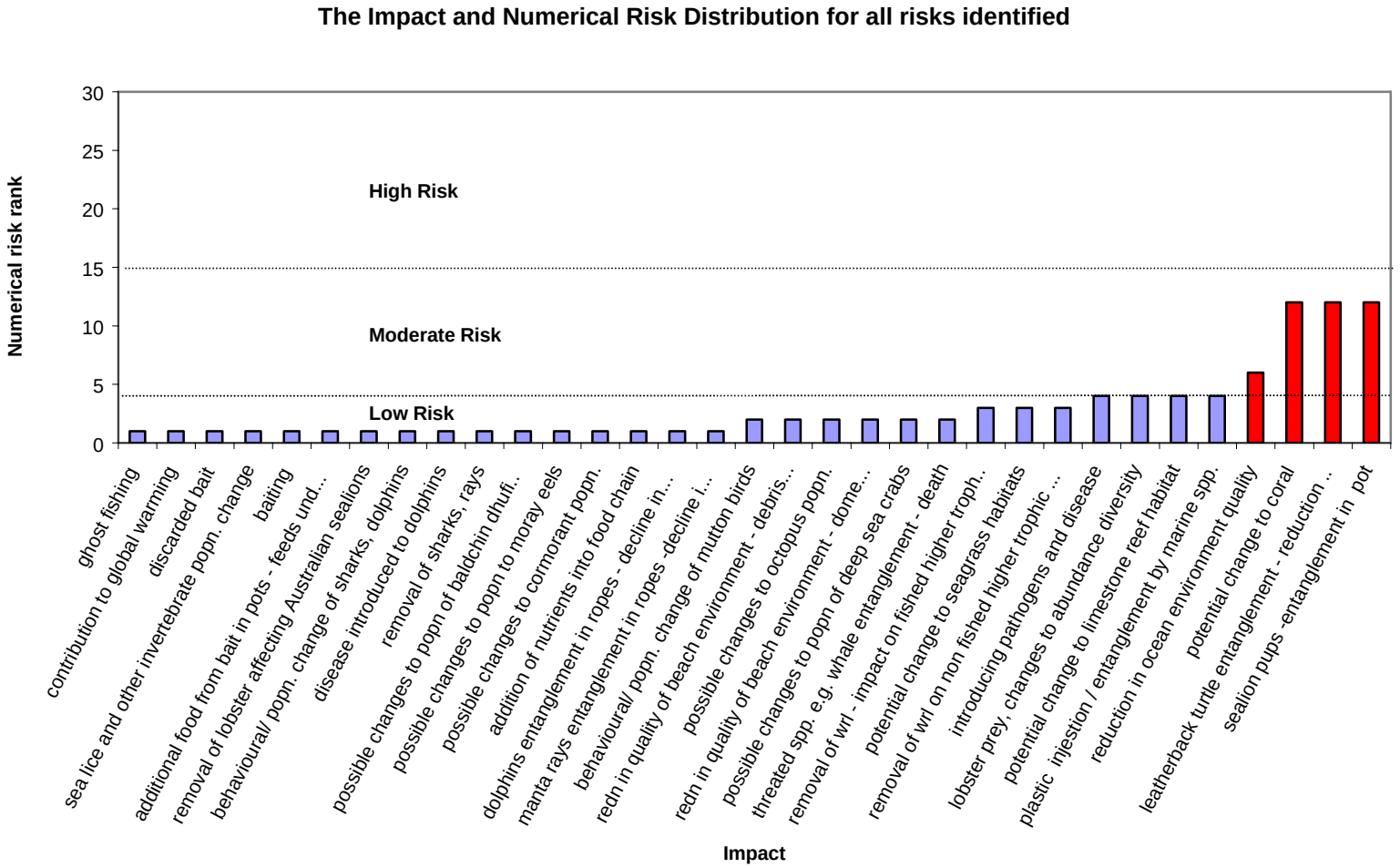
Tarr, R.J.Q., Williams, P.V.G. and MacKenzie, A.J. (1996). Abalone, sea urchins and rock lobster: A possible ecological shift that may affect traditional fisheries. *South African Journal of Marine Science* **17**: 319-323.

Walters, C.J., Hall, N., Brown, R. and C. Chubb (1993). Spatial model for the population dynamics and exploitation of the Western Australian rock lobster, *Panularis cygnus*. *Canadian Journal of Fisheries and Aquatic Sciences* **50**: 165-62

Wetherall, J.A., Balazs, G.H., Tokunga, R.A. and Yong, M.Y.Y. (1993). Bycatch of marine turtles in North Pacific high-seas driftnet fisheries and impacts on the stocks. *North Pacific Fisheries Commission, Bulletin* **53**: 519-538.

Wright, G., Hatcher, A.I. and B.G. Hatcher (1988). Clarifying the impact of fishing activity on the reefs of the Houtman Abrolhos: results of a tandem approach between anthropology and marine science. *Proceedings of the 6th International Coral Reef Symposium* **Vol. 2**: 433-437.

APPENDIX 1: IMPACT AND NUMERICAL RISK DISTRIBUTION



APPENDIX 2 - ECOSYSTEM SCIENTIFIC REFERENCE GROUP

Report of the Western Rock Lobster Fishery Effects of Fishing on the Ecosystem Scientific Reference Group to:

Peter Rogers, Executive Director Department of Fisheries
&
Ian Finlay, Chairman WA Fishing Industry Council

The Western Rock Lobster Effects of Fishing on the Ecosystem Scientific Reference Group (the SRG) was convened jointly by the Department of Fisheries and the WA Fishing Industry Council (WAFIC). The SRG met for the first time on Tuesday 5 and 7 August in Fremantle, and this document is the official report from that meeting.

SCIENTIFIC REFERENCE GROUP COMPOSITION

• Independent Chair	Ron Edwards (RLIAC Chairman)
• Executive Officer	Tim Bray (RLIAC Executive Officer)
• Alistair Robertson	Dean Faculty of Natural and Agricultural Sciences - UWA
• Simon Thrush	Principal Scientist Marine Benthic Ecology – NIWA
• Andrew Heyward	Australian Institute of Marine Science
• John Keesing	Strategic Research Fund for the Marine Environment
• Colin Buxton	Director – Tasmanian Aquaculture & Fisheries Institute, University of Tasmania
• Chris Simpson	Department of Conservation and Land Management
• Jim Penn	Director Research, Department of Fisheries

ADVISORS TO THE SCIENTIFIC REFERENCE GROUP

• Rick Fletcher	Principal Scientist Marine Policy, Dept of Fisheries
• Nick Caputi	Supervising Scientist Invertebrates, Department of Fisheries
• Chris Chubb	Principal Research Scientist, Department of Fisheries
• Roy Melville-Smith	Principal Research Scientist, Department of Fisheries
• Russel Babcock	Strategic Research Fund for the Marine Environment
• Guy Leyland	WAFIC

Prior to meeting the SRG was provided with the following documents:

- Meeting program for 5 and 7 August (Attachment 1);
- Establishment of the "Western Rock Lobster Fishery / Sea Lion Interaction Scientific Reference Groups" (Attachment 2);
- the Ecological Risk Assessment document including ESD report to Environment Australia (see MSC website);
- copies of peer review comments on the ERA (see MSC website);
- the most recent version of the EMS (see MSC website); and
- the assessment of the EMS by SCS (see MSC website.

All SRG members were advised that further reference material would be provided on request.

SUMMARY OF PROCEEDINGS

Day 1 – 5th August

Marine Stewardship Council Certification Overview

Following opening remarks by the Chairman the program for the day was adopted and Mr Tim Bray was asked to provide an overview of the MSC certification process and how the SRG fitted within it. Mr Bray provided an overview of the events leading up to the fishery being certified in March 2000 referring to the relative strengths and weaknesses of the fishery's case for certification. In particular reference was made to the relatively low score attained by the fishery under Principle 2 – that relating maintenance of ecosystem function and diversity. The link was then made to the ongoing requirements for certification that overwhelmingly focus attention on the need in improvement under Principle 2.

Mr Bray pointed out that the MSC certifier, Scientific Certification Systems (SCS), in its most recent review, had determined that the Ecological Risk Assessment (ERA) carried out for the fishery did meet the requirement for ongoing certification as supported by peer review comments. However, the resultant Environmental Management Strategy (EMS) submitted by the Department of Fisheries and WAFIC was not acceptable in two critical content areas, one being the manner in which the EMS dealt with the effects of lobster biomass removal on the ecosystem.

It was pointed out that the terms of reference for the SRG were, at least in the first instance, focused on this critical issue.

With respect to the desirable outcomes from this initial process, reference group members were informed that the SRG is an independent body given the task of developing the best strategies to address lack of knowledge relating to the effects of fishing on the ecosystem and that strategies should be based entirely on scientific merit. It was pointed out that the resolutions of the SRG would be contained within a report to the Department of Fisheries and WAFIC which would become a public document to ensure the process was transparent.

BIOLOGICAL UNDERSTANDING OF WESTERN ROCK LOBSTERS

Dr Chris Chubb presented to the reference group an overview of western rock lobster biology, life history patterns, stock structure and the nature in which commercial exploitation occurs, including reference to the general management framework.

Items of particular interest to the process were the description of the migratory behaviour of lobsters, the high recruitment variability and the environmental factors that influence this variability. Dr Chubb outlined the various data sets that are maintained and used to manage the fishery and made particular reference to analysis of: catch, effort, CPUE, exploitation rates, breeding stock indices, and the catch prediction capability.

CURRENT ECOLOGICAL UNDERSTANDING

Under the heading of current ecological understanding relevant to rock lobsters, presentations were given by Drs Fletcher, Chubb and Melville-Smith that covered studies from other parts of the world before concentrating on those studies conducted within Western Australia.

With respect to studies referred to from other parts of the world, Dr Fletcher pointed out the often-strong relationship observed between lobsters and large grazing urchins and the apparent lack of any such relationship in Western Australia. Studies from the North West Atlantic, North West Pacific, New Zealand, South Africa and Tasmania were cited.

Dr Melville-Smith gave an overview of published work on the potential to harvest puerulus. Key points from this presentation were:

- the further illustration of large inter-annual variations in the numbers of puerulus settling on the coast;
- the hypothesis that there is very high natural mortality in the first year of life and that this is at least in part due to habitat limitations; and
- that when considered on a biomass level the amount of lobster removed by the fishery in shallow water is approximately 2.5%.

The suggestion was that with such low percentage exploitation the ecosystem effects of fishing in the shallow water were likely to be negligible. The SRG raised the issue of the effect on the ecosystem of the removal of the larger lobsters that used to reside in the shallows as a discussion point for the second day.

Dr Chubb spoke further on local ecological studies of relevance and of note were studies that provided insight into predators of rock lobster, a body of work by CSIRO scientists in the 1980s on rock lobster in shallow water that covered diet, effect on the epibenthos and movement / foraging behaviour of lobsters. An overview of the current Department of Fisheries approach to the question of ecosystem effects of fishing as outlined in the EMS was provided to the reference group members. Dr Chubb drew attention to the fact that research to be undertaken should consider the time frame for experiments in relation to the dynamic nature of the ecosystem; the scope of the trophic relationships and need to understand the population dynamics of all predators and prey in the immediate trophic web; the environmental parameters to

measure; and the issue of uncertainty around any measure of biotic and physical elements.

FUTURE ECOLOGICAL STUDIES

Dr Chris Simpson provided an overview of the draft management plan for the impending Jurien Bay Marine Park. In particular Dr Simpson referred to the State Government's commitment as part of the marine park plan for a study designed to examine the role of lobsters in the ecosystem. He added that there had already been two years of baseline data collected by TAFI scientists under FRDC project (1999/162 Evaluating MPAs as a fisheries management tool), and that arrangements were being made for further surveys later this year. It is expected that there will be a component of this work that compares fished versus unfished areas.

Dr John Keesing, in conjunction with Dr Russel Babcock, made reference to monies assigned through the Strategic Research Fund for the Marine Environment (SRFME) that will be used to assess the natural variability in physical and biological characteristics of the central west coast shallow-water reef systems. Furthermore experimental studies sights will need to be chosen so as to avoid (where possible) disturbance to experimental treatments and protocols.

Having heard these reports the reference group was quick to recognise significant opportunities exist for increased collaboration and cooperation across the respective agencies and institutions to ensure that all efforts are complementary.

Throughout the presentations there were a number of questions and issues raised and following the last of the formal presentations the issues and questions still on the table at the end of the day's proceedings were summarised as follows:

1. There is only a limited understanding of density dependent mortality;
2. There is a question about the relevance of studies from other parts of the world most of which have been conducted in rocky habitats while the habitat of the western rock lobster varies from sand to limestone to rocky areas and the breakdown of these habitat types (% of area) is largely unknown.
3. Much of the work published in the scientific literature is not of a scale sufficient to provide good levels of confidence when extrapolated to larger areas, i.e. they were often correlative or small-scale PhD studies.
4. There is uncertainty about the virgin status of the stock – what were the size distributions like inshore and offshore?
5. There was concern that the biomass argument discounted the role of large lobsters both in the deep and shallow water. The important issue here was the size of the lobsters and the impact or influence of these on the environment.
6. It was acknowledged that the level of information available for the inshore areas of the fishery was reasonably strong in comparison with knowledge of deep water, although it did suffer in a manner similar to that outlined in point 3 above.

Day 2 –7th August

After the Chair's welcome the second day of the SRG process began with a statement from Tim Bray in which the task of the SRG was defined. With reference to the words used in the EMS ongoing requirement for certification, Mr Bray explained that is was necessary for the SRG to develop a detailed operational plan of research that would provide information on the effects of lobster biomass removal on the ecosystem. It was also stated that there was a materiality test that needed to be satisfied, i.e. any information from the operational research plan must be at least as scientifically valid as those produced by a fished versus unfished analysis.

This statement led to a round table discussion amongst the members of the SRG that helped to further clarify the SRG's purpose and the way in which it would develop the necessary operational plan.

The SRG's view was that the problem should be tackled by developing a testable hypothesis, given that it was generally accepted that the question "What are the impacts of the fishery on the environment?" is a very broad question that needed to be broken down into scientifically tractable questions. Reflecting on day 1 discussions, the SRG posed such questions as:

> *"What is the effect of lobster biomass removal on the ecosystem?"*
>
> *"What is the effect of lobster size structure changes that have resulted from fishing pressure with reference to spatial, temporal, seasonal and ecosystem type effects?"*
>
> *"Is there sufficient information to justify a focus on the deep water issues?"*
>
> If yes then a testable hypothesis could be -
>
> *"Removal of lobsters in the deep water does not have a significant or irreversible effect on the ecosystem."*

These questions and initial discussion on what data / information would be required to test the hypothesis, which is similar to the assertions made in the EMS, lead the SRG to its first resolution.

Resolution 1

There is a paucity of data from the deep water such that, the SRG was not able to determine the impact on the ecosystem of removing lobsters from deep-water habitats and that this should be a priority focus for research.

The SRG acknowledged that although there was significantly more data available on the shallow (< 30 m) water ecology of lobsters than for deep-water lobsters, this was still very limited in relation to determining the effects of lobster fishing on coastal ecosystems. However, the SRG acknowledged that given the low percentage of lobsters taken in shallow waters (< 10%) and that complementary studies on the

effects of lobster fishing in shallow water waters were planned as part of the marine park proposal, it was reasonable that the initial focus of the SRG study should be on the deep water effects. The SRG expressed a desire to have some link to the shallow water study design to ensure the studies were complementary.

Despite the relatively lower risk in shallow water, the SRG welcomed the prospect of relevant studies in the Jurien Bay Marine Park and the SRFME Coastal Ecology project. The SRG believed such studies could be used to assess the uncertainty surrounding the role large lobsters might have had in shallow water ecosystems. In addition, the shallow water studies also provide an excellent opportunity for skills and knowledge development that is likely to be applicable in deep-water studies.

Resolution 2

The SRG accepted the evidence presented to justify the statement that there was a lower risk of an unacceptable effect on the ecosystem associated with the exploitation of lobsters in shallow water under the present management regime. Noting that there is not sufficient data for a prescriptive shallow water assessment the SRG recommended that opportunities to study the effects of lobster removal on the ecosystem in shallow water through collaborative studies in the Jurien Bay Marine Park and as part of the SRFME initiative should be vigorously pursued. The SRG also recommended that it be consulted during the development of any such projects.

Focus on the effects of lobster biomass removal on the deep-water ecosystem

When referring to the deep-water ecosystem the SRG was describing those waters inhabited by western rock lobster greater than 30 metres deep, between Mandurah and Kalbarri.

To test the hypothesis that *"Removal of lobsters in the deep water does not have a significant or irreversible effect on the ecosystem"* the SRG noted it was vital for there to be a habitat assessment that included:

- a habitat description;
- the relationship between habitat types and lobster size; and
- the identification of lobster habitat in the geological sense.

The importance of appropriately detailed habitat maps could not be overstated. Such maps would form the basis upon which a manipulative study of the effects of lobster fishing on the ecosystem could be appropriately designed. Currently no such habitat map exists, although the detail to produce one resides on a variety of data bases including fishers' GPS, and could reasonably readily be collated. No significant natural history knowledge of deep-water ecology off the west coast exists either.

The SRG discussed at length the likely success or otherwise of a variety of manipulative study approaches (e.g. linear, longitudinal, gradient and fished versus unfished) and found that in the absence of any basic natural history knowledge the design of a manipulative study could be fundamentally flawed. In particular the absence of baseline natural history knowledge means that choices in project design that relate to an area of study, identification of indicators and what would represent a

measurable change in the chosen indicators largely would be guess work. It is the opinion of the SRG that the resultant uncertainty and inability to extrapolate results from a manipulative study at this point means that such an approach would be premature and put at risk the opportunity to develop a solid plan of research that has a far better chance of producing valid results about a complicated issue.

When appropriate designs are employed and appropriate data can be collected this basic ecological information can be analysed to determine relationships between changes in lobster density, size-structure, habitat structure and benthic community composition and this information can be used to improve the assessments of risk to the ecosystem and focus further research to address the key questions.

Importantly, the SRG did not dismiss the value of manipulative studies in this process and is not unnecessarily delaying the prospect of such a study going forward. Rather, the SRG wants to ensure the advice its provides is based on scientific merit. Therefore the SRG believes it is important to assign immediate priority to observing and developing a better understanding of the natural history characteristics of lobster related deep-water ecology.

Resolution 3

The SRG advises that at this point in time, and based on current available knowledge for the deep-water, it could not design an experimental approach equivalent to a fished versus unfished study with any certainty that the study would produce results that determine the effects of fishing on the ecosystem.

The SRG recognised that the MSC certification team and stakeholders need to be aware of how the development of a better understanding of natural history characteristics of the deep-water ecology will work towards understanding the effects of fishing on the ecosystem and address the hypothesis *"Removal of lobsters in the deep water does not have a significant or irreversible effect on the ecosystem."*

Thus, the SRG developed a strategic research framework for assessing the effect of commercial rock lobster fishing on the ecosystem that guides how the development of an operational research plan should occur.

Resolution 4

The SRG recommends that the strategic framework illustrated in Appendix 4 be adopted.

Operational plan to establish the ecology of rock lobsters in deep-waters

Within the research framework the SRG provided an operational plan that identified four primary areas of interest, questions to be addressed by studies established in these areas of interest and an action list to answer the specific questions that collectively and comprehensively target the ecological knowledge gaps.

Resolution 5

The SRG recommends that an operational plan of research be developed that, through its implementation, will establish the necessary understanding of the critical natural history elements. The key elements of this operational plan should include the following four points:

1. Habitat mapping

Focus questions to be addressed

- What habitats do lobsters utilise?
- Is there a pattern in the habitat type that is related to lobster density and / or size structure?

Action Plan

1. Produce a broad scale habitat map by collating information from existing data bases eg fishers' GPS.
2. Review existing benthic habitat and seabed data for the shelf waters between Mandurah and Kalbarri.
3. Conduct broad large-scale rapid assessment protocols in waters between Mandurah and Kalbarri to determine areas of interest.
4. Choose a minimum of three representative transects with replicates at each location.
5. Conduct detailed habitat mapping of chosen sites that included
    a. Accoustic survey of hard structure and associated ground-truthing of epifauna and infauna 'habitat' using video techniques.
    b. Limited grab sampling to later determine infaunal composition and sediment type

Addressing these questions will provide information on the distribution and density of lobsters of different sizes relative to benthic habitats and prey resources.

The SRG defines the term "habitat" in this context to include the physical (e.g., rocks and sand waves) and biological (sponge gardens, emergent bivalves) features on the seafloor that provide structural complexity (on > 1m spatial scale) and are likely to act as surrogate variables enabling broad-scale rapid assessment of benthic communities).

2. Size structure and density of lobsters

Focus questions to be addressed

- What is the current size structure and density of lobsters in the chosen sites?
- Is potting an appropriate measure of abundance and size structure of the population? (selectivity)
- What is/are the relationship(s) between pot catch rate and size composition?
- What is/are the impact(s) of habitat on catchability?
- What is the degree of movement (foraging/home range) of lobsters and is this size dependent?

Action plan

1. Use a range of methods to estimate selectivity and catchability (depletion experiments different gear options (e.g. pots with larger necks or tangle nets) and multiple tagging
2. Use video to observe localised lobster behaviour with habitat types and interaction with baited pots.
3. Using existing catch records and environmental data assess the influence of climate variation on catchability at sites.
4. Use existing length based fishery models to investigate possible size compositions for unfished stocks.

This information will be used to relate lobster density (and size structure) to fisheries data to facilitate the scaling up of information from specific study sites to the fishery. It will also be combined with information collected in "1" above to determine relationships between habitat and lobster size and density.

3. Trophic Dynamics

Focus questions to be addressed

- What is the size dependent diet of lobsters in the chosen sites
- What are the trophic dynamics of lobsters in these regions?
- Are there relationships between lobster size-structure compositions and prey density and composition?

Action plan

1. Conduct carbon and nitrogen isotope analysis of lobsters to provide information on diets, trophic relationship and whether the basis of lobster diets are plant, animal, detrital or a combination.
2. Conduct gut analysis studies to examine diets and compare with long-term trophic source both on a seasonal and inter-annual basis.
3. Conduct aquarium tests to investigate relationship(s) between lobster size and prey size

This information will be used to assess whether large lobsters exploit a different range of food resources than smaller individuals

4. Lobster behaviour

Focus questions to be addressed

What size and sex specific behaviours are relevant to the issue of sustainability of the resource

Action plan

Observe behaviour of small lobster in areas where there is an absence of large lobster, then seed some of those areas with large lobsters and observe any changes in behaviour / abundance of small lobsters.

Use video techniques to observe lobster behaviour

This information will be used to assess interactions between different sized lobsters and determine the relevant space and time scales for manipulative studies

Resolution 6

The SRG recommends that the development of detailed projects for these four areas of study occur in liaison with the SRG.

The SRG estimates that if priority is given to this operational plan then results from most areas of study should be available in approximately a two to three year time frame. This may need to be revised once detailed project descriptions are available. Results from some studies will be available before others and there is a logical sequence for some of the actions, whilst other elements can run concurrently. The SRG agreed that the design of the strategic framework (Appendix 4) facilitates the incorporation of results, when they become available, into further assessment of risk and the management decision-making process through RLIAC.

In this way, the strategic framework provides for a progression into new and more advanced areas of study, such as ecosystem modelling and manipulative research, but does not necessarily have defined start and end points for the natural history, inference and manipulation phases of the progression. The SRG is in agreement that this is an important element of the strategic framework because it will actively encourage thinking and action to occur in the inference and manipulative phases earlier then would be the case if assessment of natural history information waited until all elements of the recommended operational plan were complete. It also provides a logical framework for an adaptive management approach to the fishery.

Early in the meeting the SRG discussed the value of taking advantage of studies that can be performed in the Jurien Bay Marine Park. The SRG agreed that the Marine Park is a good example of how a study that would sit in the manipulative phase of the strategic framework could be occurring in parallel to other work going on in both the natural history and inference phases.

Resolution 7

The SRG recommends that as results from the studies of basic ecology become available that they be used in further risk assessment and decision-making processes as provided for by the strategic framework.

Resolution 8

The SRG recommends that as results from the studies of basic ecology become available that they be used in the inference phase of the strategic framework to develop statistical, conceptual and ultimately mathematical ecological models that can be used in further assessment of risk and the decision making process.

Resolution 9

The SRG recommends that the increased understanding of natural history and the development of ecological modelling capacity should be used to assist in the design of manipulative study options such as fished versus unfished and linear correlative approaches to determine what the effect of fishing on the ecosystem is.

Concluding Remarks

On behalf of the SRG members I would like to thank both the Department of Fisheries and WAFIC for coordinating this process. All SRG members agree that the process was well designed and provided the opportunity for meaningful and constructive discussion of the issue at hand.

As provided in the terms of reference the SRG looks forward to monitoring progress on this issue and having further constructive input.

It is with pleasure that I present this inaugural report of the Western Rock Lobster Effects of Fishing on the Ecosystem Scientific Reference Group to both the Department of Fisheries and WAFIC for your consideration in the broader context of the Environmental Management Strategy.

Should you require further advice or clarification please do not hesitate to contact me.

Yours sincerely

Ron Edwards
Chairman
Western Rock Lobster / Effects of Fishing on the Ecosystem Scientific Reference Group

APPENDIX 3 - SEA LION INTERACTION SCIENTIFIC REFERENCE GROUP

Report of the Western Rock Lobster Fishery / Sea lion Interaction Scientific Reference Group to:

Peter Rogers, Executive Director Department of Fisheries
&
Ian Finlay, Chairman WA Fishing Industry Council

The Western Rock Lobster Fishery / Sea Lion Interaction Scientific Reference Group (the SRG) has been convened jointly by the Department of Fisheries and the WA Fishing Industry Council (WAFIC). The SRG (with all members present) met for the first time on Monday 28 July in Perth, and this document is the official report from that meeting.

The composition (also those who were in attendance) of the SRG is:

- Ron Edwards — Independent Chair
- Nick Gales — Australian Antarctic Division
- Peter Mawson — Department of Conservation and Land Management
- Richard Campbell — University of Western Australia
- Jim Penn — Department of Fisheries Research Division
- Tim Bray — Executive Officer (non-member)

In addition to members of the SRG a number of advisors / observers were also present to observe the process and assist the SRG where required. These people were:

- Guy Leyland — WAFIC
- Nick Caputi — Department of Fisheries
- Chris Chubb — Department of Fisheries
- Katie Weir — Department of Fisheries

Prior to meeting the SRG was provided with the following documents:

- Meeting program for 28 July (Attachment 1)
- Establishment of the "Western Rock Lobster Fishery / Sea Lion Interaction Scientific Reference Groups" (Attachment 2)
- The Environmental Management Strategy of 28 February 2003 (see MSC website)
- Scientific Certification System's Addendum 1 Surveillance Report No. 5 (see MSC website).

All SRG members were advised that should they require any further reference material that it would be provided on request.

SUMMARY OF PROCEEDINGS

Marine Stewardship Council Certification Overview

Following opening remarks by the Chairman the program for the day was adopted and Mr Tim Bray was asked to provide an overview of the MSC certification process and how the SRG fitted within it. Mr Bray emphasised that the SRG is an independent body provided with the task of developing the best strategies to address the bycatch of Australian sea lions in western rock lobster pots and that these strategies should be based entirely on scientific merit. It was pointed out that the resolutions of the SRG would be contained within a report to the Department of Fisheries and WAFIC and that this would be a public document to ensure the process is transparent.

Sea lion population structure and history of human induced mortality

Richard Campbell presented to the SRG his PhD research on sea lion population structure in Australia with a particular focus on Western Australian populations. He also provided a summary of the work he has been undertaking for the Department of Fisheries Research Division and on the history of known human induced mortality in Western Australia dating back to survivors of shipwrecks in the 17th century. This presentation allowed for a high degree of interaction discussion with many questions and clarifications throughout with and input from all reference group members.

SRG key points agreed under this item:

1. Australian sea lions breed in a range from Abrolhos Is. in WA to the Pages Islands in South Australia.
2. Australian sea lions are non-selective benthic predators with a comparatively good diving capability that is also present in pups.
3. Given the high abundance of undersize rock lobsters in shallow waters in the mid-west and Abrolhos region there is a very low chance of any effect of lobster removal on the sea lion population.
4. At Kangaroo Island in South Australia, adult female sea lions dive to depths of up to 150m, but mostly dive in the 60-100m range. In Western Australia adult female sea lions have been recorded diving in 10-120m depths, and it is assumed that their foraging range includes continental shelf waters adjacent to where they live.
5. Recent research on the development of diving in sea lion pups has shown that pups of 6-18months of age (the study ages) can dive extensively, and in South Australia dive to depths of at least 60m.
6. The Australian sea lion's reproductive strategy is quite different from other pinnipeds.
7. The breeding cycle is about 17.5 months, but the timing of breeding differs significantly (by months) from one colony to the next, with an asynchronous pattern of breeding across their range.
8. Genetic analyses (female haplotype) indicated females display a strong breeding site fidelity ("house bound cow" phenomenon).

9. Males move relatively freely amongst regional colonies but probably do not migrate large distances, i.e. movements between WA and SA colonies would be very rare if at all.
10. There is a history of localised extinction in Australia, e.g. Bass Strait, Islands around Albany, Carnac Is, Garden Is.
11. The ability to repopulate areas where sea lions used to inhabit appears to be negligible because of female breeding site fidelity.
12. Four main breeding colonies on the west coast of WA described as being Abrolhos Is (several islands), Beagle Islands, North Fishermen Is and Buller Is.
13. Pup production at these sites is estimated to be a total of about 150 at the 3 mid-west islands and about 20 at the Abrolhos..
14. There is a documented history of a substantially more abundant population of sea lions at the Abrolhos Is. The reduction to today's very low levels appears to be linked to culling / harvesting events by early explorers and whalers, and a likely low level of take until recent times.
15. There is no evidence to suggest colonies in the Jurien area were subject to as high a level of culling / harvesting as occurred at the Abrolhos and it is therefore likely that the Jurien colonies are closer in size to population sizes along the coast prior to human induced mortality.

Resolution 1

The SRG summarised the status of Australian sea lions off the west coast as representing isolated and small populations with low genetic variability that is segmented with little or no scope for migration from other populations. The SRG assessed that the impacts of what appear to be low levels of mortality from the fishery can in fact be critical for west coast sea lion populations. The SRG also concluded that given the generalist feeding behaviour of the sea lion, that there was a very low probability of any effect of lobster removal on the sea lion population.

Current data collection

A description of the relevant data currently being gathered by the Department of Fisheries was provided and is summarised as follows:

1. Commercial monitoring data (collected by fisheries research observers aboard commercial vessels)
2. Voluntary logbook data (detailed catch and fishing effort data with increased spatial and temporal resolution provided voluntarily by almost 40% of commercial rock lobster fishers)
3. Annual Gear and Equipment Survey forms (recently upgraded to allow for bycatch of specially protected species data to be included)
4. Random telephone surveys.
5. Targeted telephone surveys of commercial fishers known to have caught sea lion pups.
6. Relevant data from CALM data bases.

From these data sets and the collective knowledge of the SRG the following points were agreed by the SRG members:

1. Pups are vulnerable to capture in rock lobster pots from the age they enter the water and start diving (approximately five months) to a point when they are too large to enter into a pot and drown (possibly about 24 months of age).
2. Most accounts refer to pups caught being in the size range of 2.5 to 3 feet long, which is consistent with the estimated vulnerable age class.
3. All known catches are close to shore, but recent tracking studies of pups in South Australia demonstrate that these catches could occur further offshore.
4. The impact of recreational rock lobster pot fishing is unknown, but is likely to contribute to some extent to pup mortality.
5. It is not possible to extrapolate from existing data to provide a useful or accurate estimate of total mortality from the commercial rock lobster fishery, however, the current estimate is regarded as being a minimum estimate.
6. As there are no data on age/sex specific survival data, and minimal data on production for Australian sea lions, any attempt to model the impact of fisheries take on sea lions population would yield highly uncertain results that would be of little use to management.
7. Efforts to collect the necessary survival and production data that could be used for such models requires intensive research within the sea lion communities, and activity that would cause significant disturbance to the sea lions themselves, and would take a great deal of time.
8. Given the statistically low reported incidence of sea lion interaction with rock lobster gear, it is not feasible or cost effective to adopt a sufficiently independent observer program to collect data that could reliably estimate the level of interaction.

Points 6 and 7 were the subject of considerable discussion. In particular the SRG identified that there is no data for this species upon which estimations of age / sex specific survival could be made and there is only a very small amount of data on reproductive output.

This being the case, any modelling exercise would have to be based on information from other species. The SRG believes this would be inappropriate because of the significant differences in life history patterns between the Australian sea lion and other pinniped species, i.e. 17.5 month breeding cycle as opposed to regular 12-month cycles displayed in other species.

The SRG also discussed in detail the advantages and disadvantages of programs to collect data from sea lion populations off the west coast designed to address the knowledge gaps. Collection of relevant data would be dependent upon the ability to permanently mark pups for subsequent re-sighting and identification. Methods of doing this include flipper tags, microchip tags, paint branding and hot or cold iron branding.

Flipper tags are notoriously unreliable for this species because they will invariably lose them, paint branding is not effective due to moulting and hot / cold iron branding is regarded as being unethical and has been outlawed in Australia. Microchip tags would be a more reliable technique. However, the process of tagging and subsequent

animal identification would be dangerous to researchers and cause great disturbance to what are understood to be vulnerable populations.

To elaborate further on the disturbance issue, the SRG understands that the type of data collection envisaged would require a regular and frequent human presence on colonies for a period of 10-20 years. Data collection would require physical handling of animals. Due to the aggressive behaviour of sea lions (particularly when pups are present) such data collection has an unacceptably high risk of causing stress to adults and exposing pups or juveniles to increased rates of mortality from larger adult seals.

The aggressive and elusive behaviour of sea lions would also confound the efforts of researchers to locate all (or at least the majority) of tagged animals; this would introduce a significant error into any modelled results.

Finally, any model of impacts would require accurate and precise estimates of fishery take. Experience in other fisheries has shown that this can only be achieved through the use of independent observers, a program that is logistically entirely impractical in this fishery.

Resolution 2

The SRG do not believe there is sufficient, or appropriate, data available to conduct a modelling exercise designed to better understand the dynamics of Australian sea lion populations off the west coast, and the impact of fisheries on them. Furthermore, based on the SRG's understanding of sea lion behaviour, in particular their susceptibility to disturbance, the SRG recommends against collecting data that could potentially be used to model sea lion populations and the effect of fishing induced mortality because there is an unacceptably high risk of increasing pup mortality, or reducing sea lion production.

Strategies to address interaction with sea lions

Eliminate capture of sea lions

The SRG believes that the development of an effective sea lion exclusion device (SED) is a critical and essential component of any strategy to address the mortality of sea lions in rock lobster pots. Furthermore, with reference to the SRG's assessment of sea lions populations in Western Australia, the objective of any process to develop a SED should be the elimination of sea lion bycatch and mortality from rock lobster fishing.

Resolution 3

The SRG advises that a trial of rock lobster pot sea lion exclusion devices, developed with the assistance of gear technologists from, but not limited to, existing designs, be undertaken as a matter of priority to determine the most effective means of eliminating sea lion mortality in rock lobster pots.

The SRG gave consideration to how, when and where such a trial should be conducted. Key elements of the trial should be based on the following:

- Conducting a pilot project to assess the use of video equipment to observe the interaction of sea lion pups/juveniles with rock lobster pots. This should occur as soon as possible (August 2003) and it is recommended that the colony at North Fishermen's Is. be the study site.

- The design of SEDs should be undertaken by fishing gear technologists, and can be based on, but not limited to, existing designs. The SRG considered that a successful design will be inexpensive to produce, easily fitted and removed from existing pot designs, completely exclude sea lions from entering and drowning in pots, and should not affect the rock lobster catching characteristics of the pot.

- If the pilot project is successful this approach should be expanded and used to examine the interaction of sea lion pups with pots with and without SEDs to enable a preliminary assessment of the likely success of using the SEDs. This study should occur in October 2003 and July 2004 to enable the assessment of the interactions with large and small sea lion pups.

- It is important the pots used in the SEDs video trial are modified so as to allow for the quick release of any sea lion that may be captured during the trial.

- To assist in the uptake of SEDs by the rock lobster industry a study to examine the impact of the pot modifications on rock lobster catches should occur. Such a study should be conducted from willing commercial vessels. 50% of the gear would be modified to include a SED the other 50% unchanged. The study area should include waters 20nm north and south of known sea lion colonies to a depth of 40m. Researchers / observers should be onboard participating vessels to record relevant data including any interaction with sea lions.

- The duration of this at sea trial should be for the entire 2003/04 season.

The SRG expects to be provided with a detailed description of the trial study to review and comment on.

Without wanting to pre-empt the outcome of a SEDs trial, the SRG contemplated the mandatory use of SEDs for the 2004/05 season.

The spatial and temporal extent of where the SEDs should be used can be finally determined at the end of the research proposed by the SRG.

Resolution 4

Assuming the SEDs trial demonstrates that sea lions can be excluded from rock lobster pots the SRG recommends that it become compulsory from the commencement of the 2004/05 season to have a SED fitted to every rock lobster pot when fishing in waters from Lancelin to Dongara to a depth of 60m and for all waters of Zone A.

Measuring the effectiveness and review of a bycatch elimination strategy

To assess the effectiveness of using SEDs it is important to ensure that reports of any captures are received and that an index of abundance for the respective sea lions colonies is available.

With the data on sea lion bycatch it is difficult to say more than current fishing operations do result in some level of sea lion mortality. The SRG would like to be informed in 12 months time as to the success, or otherwise, of initiatives by the Department of Fisheries to educate industry through public meetings, the coastal tour process, information brochures, posters and other mediums of the importance of reporting any interactions. At that point the SRG should be given the opportunity to examine if there are under-reporting or misreporting issues that would undermine the bycatch elimination strategy.

Resolution 5

Given that it is not feasible to have sufficient independent observer data to reliably estimate the level of interaction, the Department of Fisheries should continue with education process designed to improve industry's reporting of whether or not they have interacted with sea lions (and other specially protected species).

To give credibility to the target of eliminating mortality it is important that if there were a mortality event from gear with an approved SED that such an event would trigger a review of the effectiveness of the SED in use. Such a review may or may not result in further modifications to approved pot design depending upon the circumstances surrounding the mortality event or events.

Resolution 6

The SRG recommends that the Environmental Management Strategy by revised to include a management trigger requiring a review of SED management rules should there be a sea lion mortality when the use of SEDs becomes mandatory.

With respect to the need for an index of abundance, the SRG advises that regular pups counts timed to coincide with each breeding event is the best approach. The SRG acknowledges that this method still has issues with respect to the potential injury of researchers and disturbance to the colonies. However, these risks are much less and therefore far more acceptable then approaches required to collect data for modelling purposes. There is already a time series of data, and as this time series is extended the SRG expects that the value of pup count data as an indicator of abundance will improve.

Resolution 7

The SRG recommends that pup count data be collected for every breeding event to act as an indicator of abundance.

In addition to pup counts, the SRG would like to see the results of a Potential Biomass Removal (PBR) analysis conducted on available information. The SRG expects that a number of significant assumptions will have to be made for this to occur and therefore does not want to overstate the value of such an analysis. However, the SRG believes it is appropriate to conduct the exercise. In this light conducting a PBR analysis is a suggestion rather than a recommendation.

Other Research Initiatives

Clearly the SRG has recommended an approach that focuses on eliminating mortality caused by the rock lobster fishery and chooses a measure of abundance, pup count data, that is reliable and minimises the risk of disturbance. However, the SRG believes that there is scope for further advancement of our understanding of sea lions.

In particular the SRG identified the following as relevant options for further consideration:

1. A non-archival satellite telemetry tagging program of animals 6 – 18 months old designed to gather data on the foraging range and behaviour of juvenile sea lions at a time they are vulnerable to fishery interaction. This would improve the knowledge base with regard to this species while assisting in the longer-term refinement of measures to eliminate mortality, and inform spatial and temporal limits of where SEDs should be used.

2. A SCAT analysis, or studies of sea lion faeces, to better understand the diets of sea lions. Benefits could include knowledge on what attracts sea lions to rock lobster pots and whether food supply is a factor limiting the recovery of sea lion populations. The SRG noted that these generalist feeders were unlikely to be food-limited as a result of rock lobster fishing.

3. Further genetic studies using existing tissue samples to better understand the population sub-structure on the west coast.

4. Investigate the potential to provide hides for pups on known colonies to reduce mortality from large adults.

Other threats to sea lion populations

In addition to mortality from the commercial rock lobster fishery the SRG identified additional unquantified threats to sea lion populations in Western Australia. In particular:

- Recreational rock lobster fishing
- Net fishing – both commercial and recreational
- Tourism – private and tourist operators

Summary

On behalf of the SRG members I would like to thank both the Department of Fisheries and WAFIC for coordinating this process. All SRG members agree that the process was well designed and provided the opportunity for meaningful and constructive engagement on the issue at hand.

As provided in the terms of reference the SRG looks forward to monitoring progress on this issue and having further constructive input.

It is with pleasure that I present this inaugural report of the Western Rock Lobster / Sea Lion Interaction Scientific Reference Group to both the Department of Fisheries and WAFIC for your consideration in the broader context of the Environmental Management Strategy.

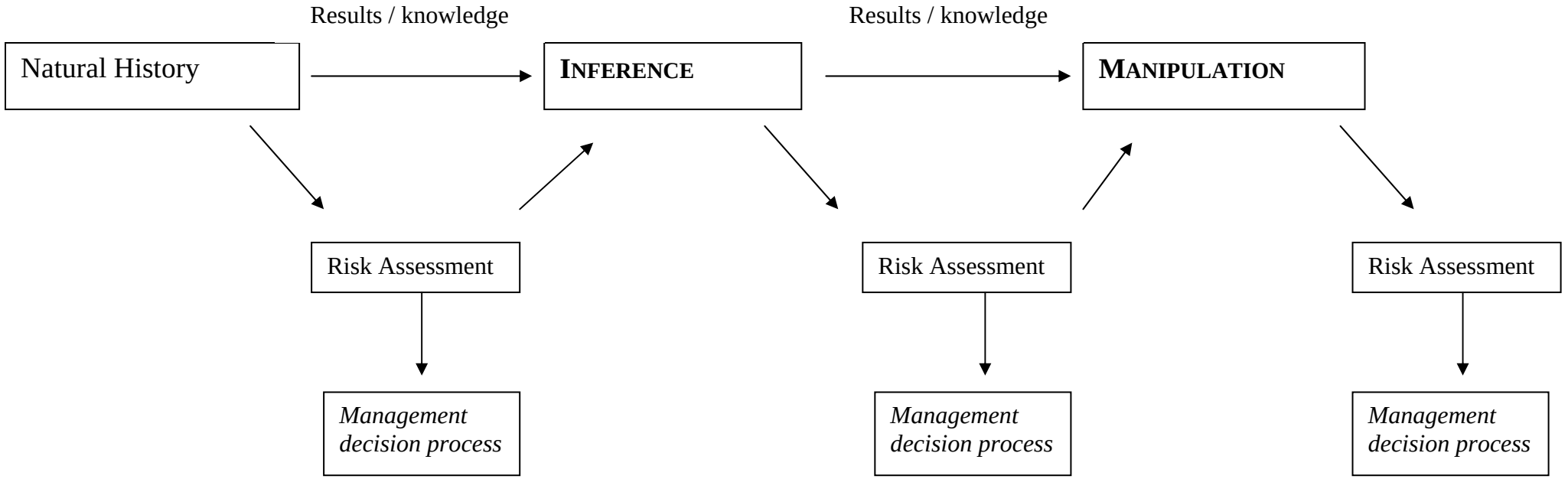
Should you require further advice or clarification please do not hesitate to contact me.

Yours sincerely

Ron Edwards
Chairman
Western Rock Lobster / Sea Lion Interaction Scientific Reference Group

12 August 2003

APPENDIX 4: STRATEGIC RESEARCH FRAMEWORK FOR ASSESSING THE EFFECT OF COMMERCIAL ROCK LOBSTER FISHING ON THE ECOSYSTEM.



APPENDIX 5: BYCATCH SURVEY FORM

For continued MSC (Marine Stewardship Council) accreditation of the Western Rock Lobster Fishery, it is necessary on a seasonal basis to monitor the accidental "catch" of the fishing gear with various species, e.g. turtles, sea lion pups and seabirds (cormorants), etc.

Please indicate below, in the boxes provided, if any of the above species were caught or tangled with fishing gear during the previous season (2000/2001).

Species	Number released live **(Record "0" if none)**	Number found dead **(Record "0" if none)**	**In Pots (tick)**	**Entangled in pot ropes (tick)**
Turtles			☐	☐
Sea lion pups			☐	☐
Sea birds			☐	☐
Other -<u>not</u> carpet (Wobbygongs) or Port Jackson sharks			☐	☐

Please describe the circumstances under which the above species were "caught" (eg where and when it occurred, whether it was released alive /dead, etc).

Comments: ----------

Please record the number of pots lost during the 2000/2001 season:

Number of batten pots lost: ----------

Number of stick pots lost: ----------

APPENDIX 6: BACKGROUND FOR LOW RISKS

Risk 6: Whale and Dolphin Interaction

The results of the annual bycatch survey forms which were introduced after the 1999/2000 season suggest that, understandably, there is very little accidental entanglement of whales or dolphins. Follow up interviews were conducted with those indicating rope entanglements had occurred (1 dolphin and 3 whale interactions in total). A humpback calf was entangled due west of Leeman in 20 fathoms on 4 June 2001. It was released unharmed while its mother was watching. An adult humpback was found entangled in Good Friday Bay, north of Rat Island in about 20 fathoms in early June 2000. It was released unharmed with slight rope burn. A third humpback was found entangled about 23 miles out to sea just south of Geraldton in early June 2000 and released unharmed. The only recorded interaction with a dolphin was one entangled inside African Reef in late April 2000. This, and the lack of documented media coverage (an interaction with a whale which occurred in June 2002 attracted significant media attention), suggests such interactions are very uncommon.

Risk 7: Octopus Bycatch

The biology and ecology of the species of octopus caught by the western rock lobster fishery suggests that they should be very resilient to overfishing. The main species, *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 fishers, ensuring biological sustainability will not be at risk

Pot designs now have 3 or 4 escape gaps which reduces octopus catchability. Furthermore, octopus catch rates (whole fishery) 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 available from four locations for over 30 years indicates that there has not been a decline in their abundance. Data from voluntary research log books also support that view.

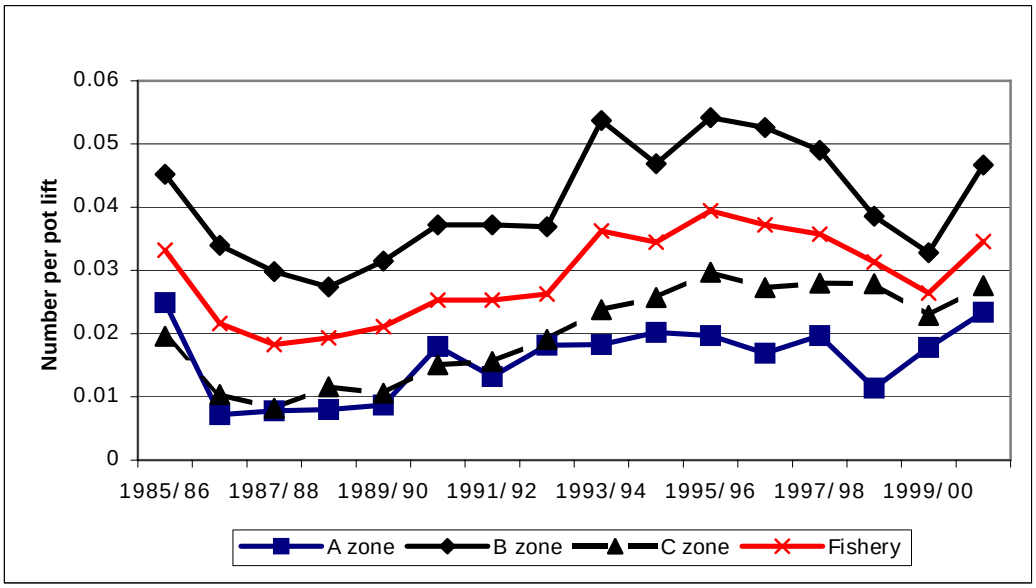


Figure 4 Average number of octopus found per pot lift per season per zone as recorded in research logbooks.

Octopus are caught in the pots generally in shallow water (0-20 fathoms; 0-37m) and catch rates of about 0.02–0.04 octopus per pot lift were recorded in voluntary research log-book data between 1985/86 and 1999/2000 (Figure 4). This led to an estimated 220,000 to 300,000 octopus caught in all zones in each of the past fifteen 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.

Risk 8: Monitoring Bycatch

Scalefish and Sharks

Scalefish and sharks are taken by rock lobster fishers both in pots and by wetlining. As the wetlining activity is a legitimate part of another fishery only pot caught fish are considered as bycatch in this context. As rock lobster fishers only take 7% of the total wetfish catch (Figure 5) 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 through an integrated management process, at which time all catches by the rock lobster fishers of these species will be incorporated within the assessment. However, it is not feasible to manage the very small numbers of scalefish and sharks captured in the pots and highly unlikely they will affect the sustainability of any species.

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.

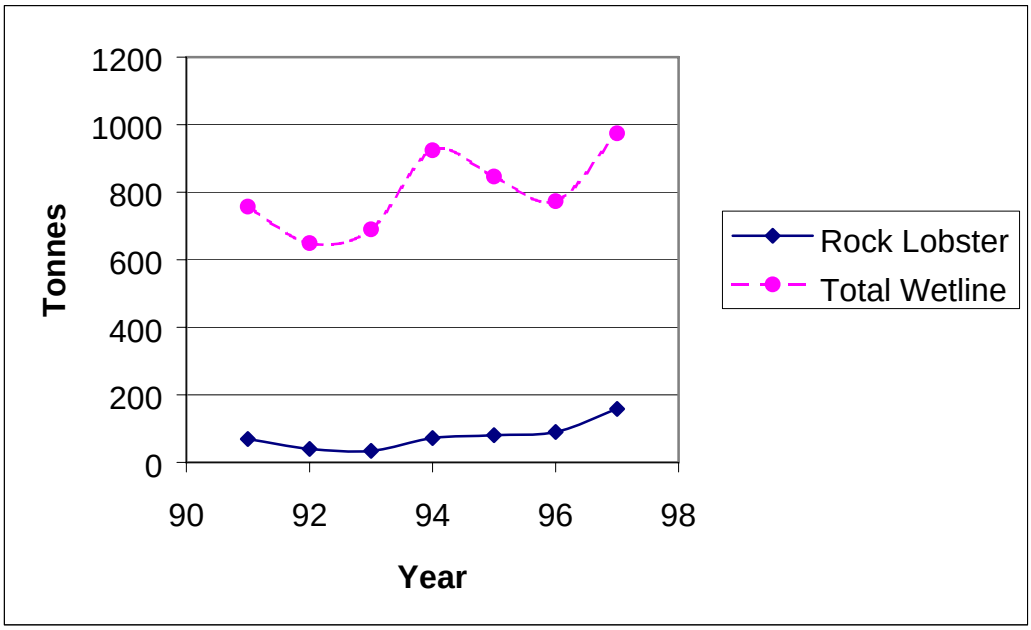


Figure 5 Catch of scalefish by lobster fishers (all methods –majority by line not pot) compared to total amounts caught (Crowe et al., 1999).

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.

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. The accuracy of return for incidental catch has not been assessed by independent surveys, however, the commercial monitoring data can be used as an indication of the level of scalefish and shark caught in pots.

The independent monitoring surveys have collected bycatch data since 1971 at four sites along the coast: Jurien, Dongara, Fremantle and Lancelin. This data represents a very small proportion of total effort and, at least in the earlier decades, may not have been recorded rigorously. In any event, the data provides an indication of the composition of scalefish caught in pots. Over the four sites approximately 25% of the catch by number rather than weight was eel. Eels are generally returned to the water quickly because of the danger presented to deckhands. The rest of the catch comprised of 15% baldchin groper (Choerodon rubescens), 10% blackarse cod (Epinephilides armatus), 10% leatherjacket (Monacanthidae) (and approximately 5% each of wrasse (Labridae), dhufish (Glaucosoma hebraicum), snapper (Chrysophrys auratus) and cod (Epinephelus spp) with the remaining 20% representing all other species which were individually not caught in significant numbers. The relative catch (numbers) of scalefish to sharks was 62:38 with port jacksons (Heterodontus portusjacksoni) and wobbegongs (Orectolobus spp) making up most of the shark bycatch (51% and 44% respectively).

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 fishers from targeting scalefish by pot fishing.

Given that scalefish are always going to be attracted by rock lobster bait and that rock lobster fishers 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 weight of pot caught scalefish and shark (not that caught by line from lobster vessels) is relatively insignificant.

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.

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

Deep Sea Crabs (including spiny crabs)

Deep-Sea crabs, particularly spiny (champagne) crabs but also king and snow crabs, are taken in small numbers in rock lobster 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 it has been three to four times that figure but this is still less than half the total amount of crabs taken in WA.

The data from the independent monitoring surveys mentioned above show that 149 deep sea crabs were caught in over 300,000 pots surveyed, most of which were caught off Fremantle and Jurien.

Rock lobster fishers 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 fishers from retaining any deep sea crabs altogether or alternatively imposing a daily catch limit (50 kg/boat) is being incorporated into the West Coast Deep Sea Crab Fishery Management Plan which is currently being developed and will be subject to Ministerial approval. 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 fishers will depend on both the willingness of the Minister to support the proposal and the willingness of rock lobster fishers to accept such restrictions. Nevertheless, the rock lobster fleet is in the deep water only in late December and early January for a short period.

Specialised fishers 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 Wildlife Protection (Regulation of Exports and Imports) Act 1982. 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.

Objective 9: Ecosystem Effects

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 at-sea commercial 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 region[1] each year during a 30-year period (1968-1998). Relationships were developed to estimate the number of animals surviving from each cohort through time using catch and effort data to estimate the required parameters, including natural mortality, density-dependent mortality and fishing mortality. The model used the age-weight key determined by Morgan (1977) to estimate total biomass. This was 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

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

showing that the majority of total lobster biomass is composed of juveniles, even under unfished conditions (Fig. 6, Table 10).

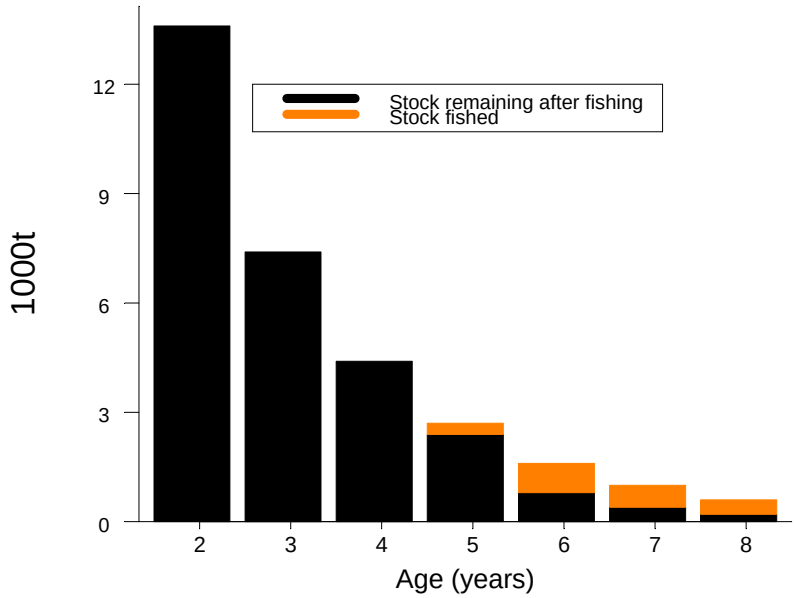


Figure 6. Plot of the biomass remaining of each year class at the end of the fishing season in comparison to that biomass that would have been there in the absence of any fishing. (This scenario is calculated for average annual puerulus settlement of 338 million. The level of fishing used is that experienced in 1991/92 (2.55 million pot lifts) and ignores the effect of the extra 93/94 management arrangements. E.g. 18% pot reduction.)

Table 10. 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	Biomass remaining (1000t)	Biomass fished (1000t)	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 11). 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 11. 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 is 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 7 and 8 show the length frequency distributions of lobsters in fishing areas A and C. Whilst these distributions have been adjusted for 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 (Fig. 9).

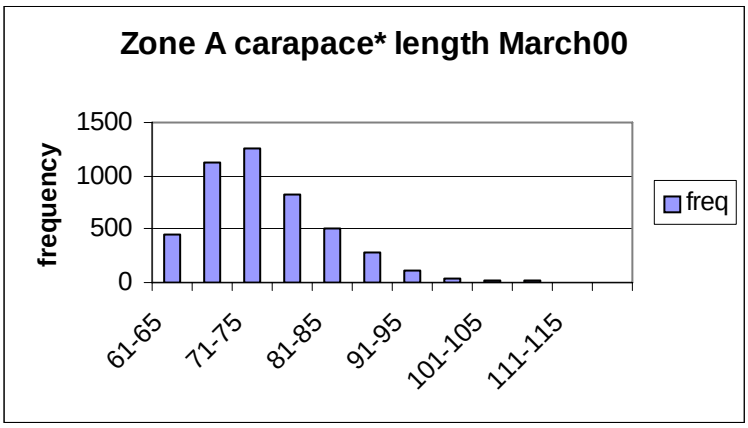


Figure 7. Length frequency of lobsters within Zone A developed from monitoring data and modified for escape gap retention rates

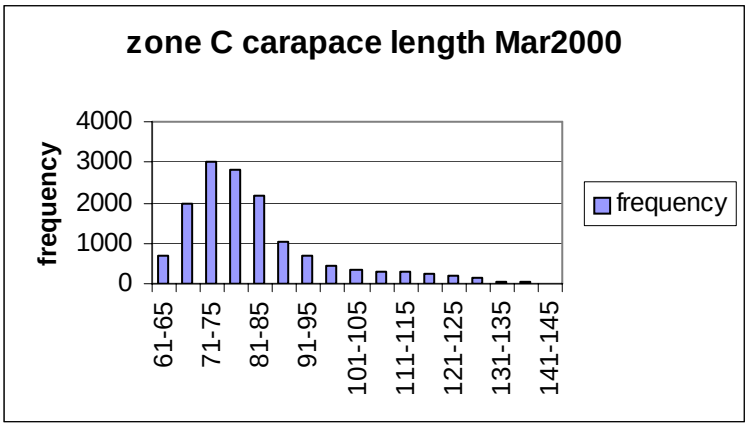


Figure 8. Length frequency of lobsters within Zone C developed from monitoring data and modified for escape gap retention rates.

Table 12. Biomass of lobsters modelled using the 4 recruitment scenarios in Zone B

	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**
Recruitment	Average (338)	High (1200)	Median (600)	Low (60)
Age	Biomass	Biomass	Biomass	Biomass
2	16.7	4.7	13.6	19.6
3	8.5	3.0	7.4	9.5

4	5.0	2.0	4.4	5.5
5	2.6	1.1	2.3	2.9
6	0.9	0.4	0.8	1.0
7	0.4	0.2	0.4	0.4
8	0.2	0.1	0.2	0.2
yr2&3	25.2	7.7	21.0	29.1
yr4on (B*)	8.9	3.7	7.9	9.8
all ages	34.1	11.4	28.9	38.9
B*/ Total	0.261	0.325	0.273	0.252

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. Table 12 summarises the calculations*

Averaging the ratios in the last line over all four scenarios indicates that the biomass vulnerable to this fishery (B) was 27.7% of the total biomass in March 2000 (Table 12). Thus, the total biomass will be 3.6 times B*. For Zone B, the total rock lobster biomass is 21234 tonnes, and the catch of 1888 t therefore only represents about 9% of the total biomass (Table 12). This percentage is very similar to the values calculated above (which were 6-9%).*

Allowing for levels of error in 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 decline in abundance 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 occur primarily in shallow inshore areas where the fishery has very little impact (see above). Howard (1988) recorded a number of small fish such as sand bass, sea trumpeters, brown-spotted wrasse and gold-spotted sweetlips as being predators of puerulus and post-puerulus. 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 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 9).

Western rock lobsters are generalist feeders, consuming a range of different plant and animal material. The major components are coralline algae, molluscs and crustaceans (Jernakoff et al. 1993, Joll and Phillips 1984), which are also eaten by other predators (Edgar, 1990c). Small bivalve species, such as Solemya sp., are known to be consumed by juvenile western rock lobsters in areas where the bivalves occur in large numbers (Joll and Phillips 1984). 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). 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 trophic levels is not known, particularly in deep water, 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 considered 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 methods 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 demonstrated 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 comprised dense mussel beds, sea urchins, sea cucumbers 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 apparent populations of subtidal sea urchins even capable of creating "barren grounds".

In Canada, Breen & Mann (1976) and Mann (1982) suggested that the "barren grounds" off Nova Scotia were due to a lack of predation by the lobsters on the sea urchin Strongylocentrotus droebachiensis caused from the overfishing of Homarus americanus 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 along the west coast of Western Australia, 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

the trophic interaction is covered by the maintenance of lobster biomass at their current high levels. This is outlined above.

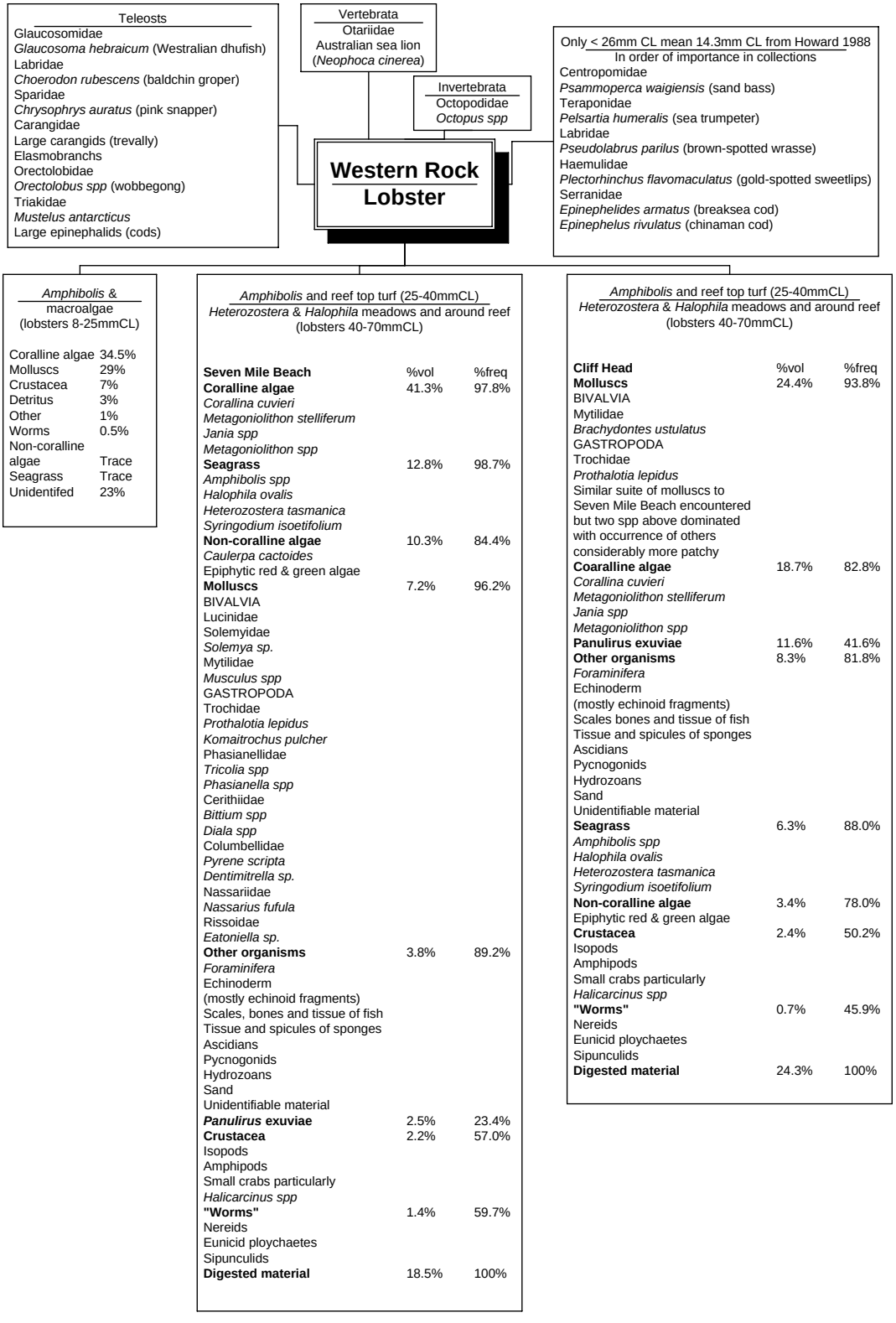


Figure 9 Predators and prey of the western rock lobster, *Panulirus cygnus*. Data collated from Joll and Phillips (1984), Edgar (1990a), Howard (1988) and unpublished Department of Fisheries records.

APPENDIX 7 - OBJECTIVES AND MILESTONE REPORT FOR RESEARCH PROJECT ON EFFECT OF ROCK LOBSTER FISHING ON THE DEEP WATER ECOSYSTEM.

Objectives:

- To identify gradients in the density/size distribution of western rock lobster to enable selection of representative areas;
- To assess the catchability of western rock lobster and its relationship with population abundance and size structure;
- To identify the relationship between the deep-water habitat and the density/size distribution of western rock lobster to enable a preliminary evaluation of the impact of lobster biomass removal in the deep water.

Milestone Dates and Descriptions

31-December-2004
Staff recruitment and appointment. Review of existing physical and biological information will be complete. GPS data from Fishermen and other sources will be collected and entered into database. IBSS survey at Jurien for validation of abundance and size distribution of lobsters will be complete. Analysis of existing data sources (IBSS) will be complete and appropriate sites for habitat assessment will be selected

30-June-2005
Habitat analysis using underwater video equipment and ROV will be complete at Jurien Bay sites. Depletion experiment will be complete at Jurien. Preliminary diet and catchability work will be underway.

31-December-2005
Habitat characterisation using ROV will be complete at Jurien Bay. All lobsters will have been collected for diet analysis and processing will be underway. Analysis of sediment samples will also be underway. Desktop catchability studies will be underway. Review of data will be conducted to determine priorities for phase 2

30-June-2006
Habitat characterisation using ROV at Lancelin will have commenced. Collection of lobsters for diet analysis and sediment samples will have commenced. Seasonal replicate of depletion survey at Jurien will be complete. Catchability experiments at Jurien will be complete

31-December-2006
Habitat assessment at Lancelin will be complete and habitat assessment at Dongara will have commenced. Diet analysis at Lancelin and Dongara will be underway. Prey of Rock Lobster and sediment samples will have been processed.

30-June-2007
Statistical analysis will be underway to assess the impact of lobster biomass removal from the ecosystem. All field work will be complete and data will be in the process of being analysed. Final report preparation underway

MILESTONE PROGRESS REPORT **December 2004**

FRDC PROJECT NUMBER:	2004/049
NAME OF RESEARCH PROVIDER:	Department of Fisheries
PROJECT TITLE:	The effect of western rock lobster on the deepwater ecosystems off the west coast of Western Australia
PRINCIPAL INVESTIGATOR:	Dr Lynda Bellchambers
ORIGINAL MILESTONE DATE AND TITLE:	December 2004 1. Staff recruitment and appointment. 2. Review of existing physical and biological information will be complete. 3. GPS data from fishermen and other sources will be collected and entered into database. 3.IBSS survey at Jurien for validation of abundance and size distribution of lobsters will be complete. 4. Analysis of existing data sources IBSS will be complete and appropriate sites for habitat assessment will be selected.
REVISED MILESTONE DATE AND TITLE:	None

PROGRESS AGAINST MILESTONE:

1. All staff associated with this project have been recruited. Dr Lynda Bellchambers, an invertebrate ecologist who has been with the Department of Fisheries for 4 years, has been appointed as Rock Lobster Ecologist (Research Scientist). While Mr Scott Evans, who has also been with the Department for four years, has been appointed as Technician Officer. Mr Kris Waddington is commencing his PhD at UWA in 2005 on the diet and trophic status of western rock lobsters in deep water ecosystems. Kris' project has been designed in conjunction with FRDC project 2004/049 to allow the project to draw on expertise of personnel at both UWA and CSIRO.

2. Review of existing physical and biological information is complete. All Departments and companies that have conducted seabed mapping or bathymetry along the coast of WA have been contacted and data from previous studies has, where available, been obtained (Table 1). There have been difficulties obtaining some of the data due to intellectual property however the negotiation process of obtaining data is on going. Talks have been undertaken with Curtin University (Dr John Penrose) to obtain the GIS expertise required to transfer the data obtained into a GIS acceptable format to produce seabed maps.

Table 1: Habitat mapping and bathymetry data for the West Australian coast from Fremantle to Kalbarri, Departments/companies contacted and data available or received.

Company and contact details	**Data available**
CALM Marine Conservation Branch	Have detailed bathymetry, Landsat data and habitat mapping of areas to around 30m deep
DOLA	Have some Landsat Imagery to maximum of 40m deep
DPI	Have supplied Naval bathymetry
Fugro Survey	Currently searching databases
Rok Oil	Have supplied limited mapping of area North of Freshwater Bay and some bathymetry of the Perth Basin
Other companies contacted	"No Data Available"
Apache Oil, BBG, Des Lord and Associates, URS Environmental	

3. Collecting GPS data from fishermen has been trialed but was not successful due to the unwillingness of fishermen to release GPS co ordinates. Therefore, collecting data using digital photos of the GPS screens on lobster vessels was trialed (Figure 1). However, the level of resolution was poor and as a result only broad areas could be used to identify the areas of rock lobster fishing. These areas were not on a spatial scale suitable for the identification of physical seafloor attributes. Further attempts to collect this type of data from fishermen are ongoing.

4. The Jurien IBSS (Independent Breeding Stock Survey) for validation of abundance and size distribution of lobsters was conducted from the 10 to 21 October 2004 (for location of breeding stock sites, see figure 2). The survey is conducted on 5 sites or sub regions in Jurien Bay with each sub region containing 10 lines of 16 pots that are sampled over the course of the IBBS. All data from the survey has been entered into the database and validated. Detailed analysis of the 2004 season data is currently being conducted. However, the annual estimates of egg production from the

2004 IBSS indicate that egg production has increased slightly from the 2001 estimate (Figure 3).

5. The Jurien Bay IBSS data (from previous surveys) was validated outliners and anomalies in the data sets were checked. When the IBSS was established a range of sub regions were selected to represent areas of high and low lobster density. These sub regions were then analysed on a line-by-line basis to compare mean catch rates within and between sub regions (Figure 4 A-D). Sites for the habitat assessment via underwater video transects were chosen to represent the range of density combinations (between and within sub regions) within the lobster grounds surveyed by the IBSS. The number of sites selected and density combinations are listed in Table 2. Subregions were also analysed to examine patterns in the mean carapace length of both females and males on a line by line basis

Table 2: Number and density rankings of sites for lines of pots selected for underwater video analysis.

Sub region density	Line density	No. of sites
High	High	3
High	Low	3
Low	Low	3
Low	High	1

APPENDIX 8: SUMMARY REPORT ON THE PUBLIC CONSULTATION SUBMISSIONS FOR THE DRAFT WESTERN ROCK LOBSTER ENVIRONMENTAL MANAGEMENT STRATEGY AND MANAGEMENT SYSTEM

(November 2004)

INTRODUCTION

In August 2004, the Department released two draft documents, which were part of a four document series developed for certification by the Marine Stewardship Council (MSC), for a 30-day public consultation period.

The public consultation period was extended from Thursday 30 September to conclude on Friday 29 October 2004, during which time four submissions in total were received.

Document one (*Draft Western Rock Lobster Management System*) released for public consultation described the Western Rock Lobster Management Systems. This document with its supporting documentation in the appendicis provided a detailed explanation of the management system and governance for the fishery. It provided the basis for implementing the detailed management strategies in place to respond to all risks identified and those contained within document two (*Draft Western Rock Lobster Environmental Management Strategy*(EMS)).

The EMS document specifies the objectives, actions, targets and management actions to deal with risks identified through an Environmental Risk Assessment workshop process conducted in 2001.

This report provides a dot point summary of each of the four submissions received during the public consultation period, for consideration and comment of the Western Australian Fishing Industry Council (the Marine Stewardship Certification client) (WAFIC), the Rock Lobster Industry Advisory Committee (RLIAC), and the Government.

SUMMARY

Comments from the four submissions received, primarily focused on four major areas contained within the EMS and MS documents as well as one significant area that forms the basis of the EMS. The five main areas were;

1. Specified timelines;
2. Management objectives and Performance Measures;
3. Committee structures and 'terms of reference';
4. Consultation process and stakeholder involvement; and
5. Scientific basis (i.e. process, methods, statistical analysis) and risk ranking.

Apart from the five main areas highlighted, the submissions also provided constructive criticisms regarding the content of the EMS and the MS documents to allow for easily readable text for all stakeholder levels.

Some submissions indicated that the two documents were very disjointed in content, context and style of writing, which inhibited the flow of information to the reader. It has been suggested that the writing style of the document be amended to cater for all stakeholders, in particular the fishing industry participants themselves.

SPECIFIED TIMELINES

Several of the submissions raised concerns and confusion in relation to the timeframes or their lack of in the EMS document. The concerns and confusion with timelines, broadly involved the lack of updates on progress made to date, no indication of any annual review amendments to the EMS, and very unclear whether the management objectives are linked to the life of the EMS or the overall long-term management objectives. Also there was some doubt raised with what could be realistically achieved within the two years left in the life of the EMS.

For more detail concerning submission comments on timelines, please refer to all four Submissions.

MANAGEMENT OBJECTIVES AND PERFORMANCE MEASURES

Some submissions illustrated the need to re-word some of the objectives contained within the EMS document to make them less ambiguous and depict management actions as opposed to management objective being pursued. While other submissions believed that the management objectives needed to be amended to reflect the possible sliding baseline over the life of the fishery.

For more detailed submission comments in relation to management objectives contained within the EMS document, please refer to all four Submissions received.

Committee structures and 'terms of reference'

Submissions 2 and 4, highlighted several issues related to the structure and function of the committees and their 'terms of reference' detailed in the EMS and MS documents.

These submissions indicate a need for the EMS and MS documents to state clearly that each of the committee's structure and 'terms of reference' have not been finalised and are more for information. Another issue raised involved the question of how the committee's are prompted to convene and what process is in place for this to happen?

Submission 4 provided comments to argue for the expansion of the committees membership and also amend their 'terms of reference' to take into account certain marine park issues.

Please refer to Submissions 2 and 4 for further details.

Consultation process and stakeholder involvement

Submission 3 focused heavily on past and future consultation process and the need for greater stakeholder involvement during all processes regarding the development and fossilisation of the EMS and MS documents. Please refer to Submission 2 and 3 for further details concerning comments raised regarding the consultation process and stakeholder involvement.

Scientific basis (i.e. process, methods, statistical analysis) and risk ranking

All four submissions in one way or another questioned some of the scientific basis, methods, statistical analysis, and level of risk ranking for some of the moderate risks identified in the EMS. However, the scientific basis and risk ranking for sea lions in the EMS document raised the majority of issues from the submissions.

Submission 3 in particular was very critical of the moderate risk ranking assigned to the sea lions issue and the whole scientific basis used to justify the ranking as well as for achieving future management objectives.

Please refer to Submission 3 for more detail.

SUBMISSION 1

Dr Nic Dunlop, Conservation Council of WA.

- To reflect the possible sliding baseline over the life of the fishery, Objective 5 of the EMS document should read;

Establish an operational plan of research to test the hypothesis that: "Removal of lobsters from the deep water has not had a significant or irreversible effect on the ecosystem"

- Concerned that;
    - there are no timelines for research milestones in terms of answering the various 'natural history' questions;
    - not start up date for an adaptive management (closed areas) experiment

- if commitment is subject to FRDC funding then it is not a commitment (fishery has no control over third parties);
- industry code of conduct for bait and waste management, and discarding protocol. There is no mention of it in the EMS, although used rhetorically to reduce the claimed level of risk to wildlife and sharks, bait bands and introduction of exotic fish diseases;
- these codes have relevance to lobster boats potentially attracting sharks to populated areas (Capes);
- very few fishers appear to adhere to such codes, at least the bait discarding protocol.

SUBMISSION 2

Ms Lorraine Hitch, Project Leader Sustainable Fisheries, Worldwide Fund for Nature

General:-

- welcomes progress towards a decision rules framework for the fishery;
- both documents are difficult to read, need to be accessible and easily understood, particularly by the fishing industry, WWF recommend the need for a explanation or diagram that accurately describes the links between the various reports and systems to be included in both documents;
- not clear when the documents will be finalised, nor how they will be published (i.e. are they stand alone documents or will they be published together as a series);
- WWF believes that the EMS should be a stand alone document that can be read and interrupted without referencing any other documents;
- language used needs to be readily understood by broader stakeholders;
- a comprehensive glossary should be provided.

Draft Western Rock Lobster Environmental Management Strategy

Timelines:-

- no indication if the target dates for actions that have already passed have been met;
- only two years left in the life of the strategy, constraining how much can realistically be achieved;
- has the current EMS document been actively applied in the WRL since 2002? If not, the dates should be altered in the EMS to reflect appropriate timelines and outcomes;
- document states that it will be reviewed annually, it is unclear if this document has been updated since 2002 in regard to timelines, actions;
- not clear if the management objectives specified in the EMS are linked explicitly to the life of the EMS rather than the overall, long-term management objectives;

Management objectives:-

- number of the objectives are ambiguous or more properly depict management actions as opposed to the management objective being pursued, this leads to confusion when reading the text, potentially presenting issues relating to performance measurements at a later stage. Specific comments regarding the management objectives are included in the EMS (Appendix 1).
- If the management objective is linked to the five-year time frame of the EMS, then maybe it is considered feasible only to gain an understanding of the issues in five years. Actions to address the issues would then be undertaken upon the basis of that understanding in the next iteration of the Strategy. However, as the EMS is subject to annual review, there appears little reason why appropriate actions could not be undertaken earlier if the information became available. This example illustrates the need for clarification regarding management objectives and timeframes.
- WWF questions if the approach of delaying actions to address the problem until adequate information and understanding is achieved, is consistent with a precautionary approach;

Performance Measures (PM):-

- PM's need to be linked clearly to each of the management objectives to provide an effective means of determining whether the management objectives are being met by the actions specified in the EMS;
- WWF believes that the PM's proposed in the draft EMS will not allow the performance of the EMS to be assessed, as many of the measures proposed appear to confuse management responses with performance measures;
- Many of the PM's proposed in the draft EMS are inconsistent with the ESD reporting framework and do not clearly address this question (a more comprehensive review regarding claruty and specificity of PM's in included in Appendix 1);

Management Actions:-

- While great emphasis is placed on management actions for data collection and monitoring activities, WWF believes that the draft EMS does not give sufficient emphasis to the management response in its stated actions after such activities;

Stakeholder Involvement:-

- WWF acknowledges that there is increasing scope for stakeholder participation in the management processes of the Western Rock Lobster Fishery. WWF welcomes moves to include a conservation member on RLIAC;
- WWF believes that there is a need for further clarification in the EMS, regarding the nature and extent of engagement with stakeholders;
- 'stakeholder' needs to be defined as the meaning may vary through out the document, if so this needs to be addressed so that it is clear who will be consulted about what;
- Where the intention is to seek broader public input it is not clear how this will be achieved;

- WWF believes that simply posting material on a web site does not constitute consultation, as it relies on the public having access to, identifying and regularly checking the web site. In effect, this transfers the onus of consultation from the management agency to the public;
- The mechanisms for incorporating stakeholder comments and concerns are not clearly defined in the document. While a number of committees exist, a process is not identified that suggests how this function would occur;
- WWF recommends that a consultative framework is established that clearly identifies how and when during implementation of the EMS that stakeholder input will be sought, and how stakeholder views will then be assessed and incorporated into the ongoing management of the fishery.

Presentation:-

- The presentation of the Management Objectives, Operational Objectives, Actions and Targets and Performance Measure could be improved, using a logframe[2] format or something similar;
- WWF believes that the presentation of these core elements in a single table would facilitate the reader's understanding, while providing more discipline to link objectives with performance measures and operational objectives with actions;
- Given the inclusion of the reports of the Scientific Reference Groups as appendices to the EMS, WWF suggests that consideration be given to removing some of the details about the findings of these groups from the body of the document. There is considerable repetition of material;
- WWF believes that provided the rationale for the details of the actions proposed under the EMS are provided in the appendices, the body of the EMS should focus on the objectives, actions and performance measures;
- The Executive Summary should attempt to provide a concise summary of the background to, and objectives of the EMS. This could also include revised tables in accordance with the suggestions provided above. It should ensure that references to other documents are clear. For example, references to *Documents 1 and 3* in the current draft provide no indication of the nature of these documents and where to access them.

Overall comment on the Environmental Management System:-

- WWF believes that the EMS attempts to address the key priorities in the WRL Fishery;
- WWF has reservations if the current draft of the EMS can ensure that the issues identified in the fishery can and will be dealt wirth effectively and in a timely manner;

[2] A description of a logframe and components can be found at http://www.viva.org/tellme/events/cuttingedge/resources/1999/evaluation.html#logframes, or http://www.frp.uk.com/sub_page.cfm/title/Logframes%20+%20Notes/section/previous_call/editID/39

- WWF has concerns that it will be very difficult to monitor progress and hold the responsible agencies accountable against the actions in the EMS on the basis of the current performance measures;
- WWF believes that the concerns raised regarding the management objectives, performance measures, management actions and stakeholder input must be addressed if the EMS is to provide a sound basis for effective management and resolution of the ecological issues identified in the WRL Fishery.

Draft Western Rock Lobster Management System

Stakeholder Involvement:-

- Comments provided for EMS document regarding stakeholder involvement, also apply to the Management System document;
- there is a need to be explicit about whether stakeholder involvement refers simply to proving opportunities for consultation or whether it provides opportunities for direct stakeholder involvement in the development of management advice.

ESD Steering Committee:-

- Appendix 7 to the Management System indicates that the ESD Steering Committee will, in addition to annually and every five years, undertake its responsibilities 'as needed'. It is unclear how it is determined when the ESD Committee's involvement is 'needed'. What prompts the convening of the Committee? Who decides when it should convene? Do stakeholders have any influence over this and, if so, what process is in place to provide for this? WWF recommends that these issues be clarified.

Data Validation:-

- WWF is concerned about the use of telephone surveys for validation purposes. It is unclear to WWF why the results of such surveys should be regarded as 'more accurate' than the data provided in voluntary logs or collected through the observer programme;
- WWF does not view the use of telephone surveys as a rigorous or effective method of validating fishing data;
- the extent to which the observer program provides for the collection of data on bycatch and interactions with icon species is unclear. If the amount of data collected on these issues is not adequate to validate that collected in voluntary logbooks, WWF believes that the observer programme should be extended in order to fulfil this role.

Ecosystem-based management:-

- On p.4 it is stated that the ESD Steering Committee is '*responsible for ensuring that RLIAC is provided with advice on how to ensure the western rock lobster resource is managed in a manner that is consistent with the principles of ecosystem based management'*. On p.81 the documents asserts that the ecological objective of management arrangements for the fishery is to

ensure that those arrangements '*are consistent with the principles of ecosystem-based management.'* Ecosystem-based management is not referred to in the Terms of Reference of the ESD Steering Committee. The document does not provide a definition of the principles of ecosystem-based management. There is a need for clarification on this point if the Steering Committee and the Department of Fisheries are to be held accountable for progress against their objectives.

It is important to note that the WWF submission also contained detailed comments specific to the individual documents or particular sections within either of the reports. These comments have been provided directly in the two documents and are at Appendix 1 and 2. The below tables provide a summary of where WWF comments can be found in relation to the two documents.

Draft Western Rock Lobster Environmental Management Strategy		
PAGE	**SECTION**	**PARAGRAPH**
4	Executive summary	6
11	Overview of the ERA process	5 & 6
12	Overview of the ERA process	1 & 2
27	Management Action and Targets	Table
28	Management Action and Targets	Table
29	Management Action and Targets	4

Draft Western Rock Lobster Management System		
PAGE	***SECTION***	**PARAGRAPH**
3	Source of Ministerial advice and process through which it is provided	3
4	Source of Ministerial advice and process through which it is provided	2

SUBMISSION 3

Mr David R Offord, South Australia

Australian Sea Lions:-

- Strategies outlined do not give a sufficiently holistic sense that real planning and proper direction was available at the beginning of the period of the EMS;
- The lack of continuing progress places in doubt the plan as a whole;

Ecosystem Impacts:-

- A real plan to establish fished and unfished reference areas ought to be well advanced, this is not the case;

Transparency of Decision Making:-

- Inherent problems with the transparency of the decision making process;

- Appears to be a exclusion of ordinary environmental stakeholders from the whole process that places in doubt the strategy as a whole.

Relationship to the precursor Risk Assessment:-

- Lack of any real progress in analysis and risk assessment from the time of the workshop in 2001, makes the strategy look very unrealistic and lacking in a real foundation;
- The risk weighted consequences of various actions are not properly discussed in any real manner, either in a preliminary or in a continuing fashion.

Performance Measures:-

- With the first half of the strategy already completed, performance measures essential for planning should have been placed before stakeholders as a whole, this has not occurred.

Underlying Management System:-

- The underlying management system does not include stakeholders in any real way;
- Is set up for a three year, not an annual, consultancy cycle;
- There is no real intention that environmental goals will be met within the period of the EMS, let alone before the completion of the MSC certification.

General Intent of the EMS:-

EPBC Act requirements

- The DEH Sustainability Fisheries Assessment of the Western Rock Lobster Fishery is essentially the only summary we have of the Ecological Risk Assessment published in one document;
- There is an assumption in the assessment, encouraged by a lack of investigation by DOF, that sea lion interactions are insignificant;

MSC requirements

- The MSC certifier has said that this ERA is not up to a satisfactory standard;
- The idea that a new ERA can be brought forward a year can be no excuse for a lack of common sense in the logical discussion of critical issues in this EMS;
- It would be fair to say that all written submissions from environmental stakeholders, in 2003, were of the opinion that sea lions should have been given a high risk rating rather than a moderate risk rating;
- The sea lion SRG supported that view when it said in August 2003: "*The SRG assessed that the impacts of what appear to be low levels of mortality from the fishery can in fact be critical for west coast sea lion populations"*;
- This EMS predicated upon the idea that sea lions remain a moderate risk;

- DOF should have reported upon this high risk level in some wholesome manner, as well as acting upon it;
- a full examination of the risk weighted consequences of various management actions should have occurred in the first following six months, with fishers and stakeholders. This discussion should have been placed in the EMS;
- the MSC certifier has clearly stated that the sensitivities to research should be available to stakeholders "at every level" of research programmes, if they are not happy with the direction of the research. A 20 minute presentation followed by a 10 minute question time period on the RLIAC coastal tour 2003, was not a means of being transparent or reporting in any way sufficiently to stakeholders;
- nothing in writing on the 2003 coastal tour presentations were ever given out;
- while it was illegal for RLIAC to show anybody any repoprts from its meetings until after a certain timeframe, there was nothing stopping DOF or WAFIC from preparing reports as were needed for a new high risk to be brought to public notice;
- the early version of the EMS clearly described the need for such reports. A desk top survey on mitigation was noted in late 2002 and promised release in 2003, at the beginning of 2003, reports were promised for October and December that year which would have provided important background information that is still not available;
- if the EMS were to mean anything in MSC terms, then the sense of continual improvement needs to be real and not nominal;
- one might suppose that a written summary of the progress made to date on the five sea lion ERA recommendations might have been released within three years, but that has certainly not been the case;
- this EMS remains dated from July 2002. the first "annual level identification process" has to be at least the draft EMS dated 15 August 2003 and the expectations that arose from it;
- the SLSRG meeting that proceeded that draft is supposed to be an independent view, and if we are to believe it should be taken, whollus bolus as the Departmental viewpoint without further ado, then it could in fact hardly be independent;
- the Department should not take a year working privately, before releasing any information to the wider public;
- there is little evidence that a basic principles of performance measures are inherent to the EMS are being met;
- the timing of pupping, and temporal and spatial overlap of the fishery with high risk overlap the weaning juvenile sea lions would have become a thing of public notice and awareness;
- if the Precautionary Principle needed to be applied against a "newly" identified high risk, then it has to be a thing of public notice, because it must be practical and cost effective. The EMS gives no indication that this is possible. Only that the Minister has the potential to legislatively act to enforce mitigation once RLIAC has gone through a yearly consultancy cycle of closed session meetings;
- the annual level identification process would appear now to be a matter of correspondence between the SLSRG and the ESD Committee in a manner that is entirely at the discretion of the DOF;

- DOF has refused to release any information or reports on sea lions to stakeholders;
- Stakeholders will not have the opportunity to comment on these reports until after the start of the fishing season;
- Stakeholders have been excluded for the last 2 years;

Sea Lions Performance Measures in the EMS

Data Published in the EMS itself

- Why isn't the data on the take of sea lions simply summarize existing known data on the temporal and spatial take of sea lions?
- The bar graphs supplied in the document provide an entirely different impression from the data Richard Campbell has available to him;
- Why has the data of the take from 1999/2000 not been mentioned;
- Is there any reason why consolidated information is not included in the EMS as we now have it, or at any time in the furutre?

Sea Lion Objective 1 & 2 – Development of mitigation

- The apparent deterrence may not be as ideal as is assumed;
- The mitigation is not perfect in South Australia;
- There is not the flexibility to consider using mitigation that could be installed and removed in use;

Sea Lion Objective 3 – Level of interactions

- There is no real attempt to try and consider what the actual baseline level of interaction is likely to be;
- Telephone surveys have not been conducted;
- Performance measures mean very little if delayed – as they have been;
- There should be a simpler means that the annual surveys give us some real indication of the actual level at least as a rule of thumb but with some real statistical nouce behind the procedure;
- The commercial monitoring surveys are completely irrelevant;
- There is of course no consideration of robust monitoring.

Sea Lion Objective 4 – Temporal and spatial distribution

- To take insufficient data and find there is no statistical power, in what is a rare event, is really inappropriate especially when you are going to try and exclude rare events to a certain level, but that is essentially what the DOF has been doing;

Sea Lion Objective 5 – Education programs

- Fishers need to be involved in the real examination of the risk weighted consequences of different management actions, if they are to be expected to be

actually enthusiastic for the process and if this then going to lead to the sort of data the Department needs;

Sea Lion Objective 6 – pup counts

- Is there any reason whatsoever to believe that pup counts can give any indication at all of "trends in sub-population abundance" over time of the EMS?

Sea Lion Objective 7 – Anthropogenic impacts

- What are we trying to measure, it would seem that by stealth the implication is being brought in that Type II risks of a dcline are overestimated as if by definition;
- This report was expected in December 2003, it would have had some meaning then;
- How the performance measure here relates to other things at issue needs to be clearly outlined – if it is important.
-

Other Sea Lion Objectives – PBR limit points

- There should be great discussion in the EMS regarding the Leeuwin Current and its effects on crustaceans and sea lions, the exclusion to date is an extreme lack;
- If there is no quantitative analysis of the bycatch and no actual realistic limit points set, then the Precautionary Principle must be applied. This is a requirement of the National Policy for Fisheries Bycatch, but it applies just as much to FAO Guidelines. And one should do so consciously and carefully. This has not been done in the EMS;
- The use of temporal and spatial closures needs proper discussion;

Recommendations

1. all outstanding environmental reports should be released;
2. a full range of management actions should be discussed in a way that is clearly cost effective and practical and based on a new spirit of cooperation; and
3. needless to say, the EMS must be rewritten based on real outcomes rather than nominal action.

SUBMISSION 4

Dr Chris Simpson, Manager, Marine Conservation Branch (Department of Conservation and Land Management)

General comments:-

- the EMS and MS have been prepared in response to MSC audit requirements for ongoing certification of the WRL Fishery. This point should be made

explicitly in the EMS and MS reports, along with related background in respect of the fisheries MSC certification and associated conditions of certification.

Specific comments on Risk 1: Sea lion interaction

- CALM believes that the work currently underway to exclude sea lions from pots is an appropriate course of action and has the potential to reduce the risk of drowning pups in pots;
- Effective assessment of exclusion devices will rely on accurate reporting (logbooks), emphasis on reporting compliance will be required;
- Exclusion technology will be better facilitated if greater lobster catches can be demonstrated by using this device;
- Important to ensure monitoring programs are designed so as to be able to decouple the influence of this variable (exclusion devices) from other factors that may be inhibiting recruitment into the breeding population;

Specific comments on Risk 5: Impact of fishery on the ecosystem

- Concerned that the management approach in the EMS, focuses on the deep water ecosystem and then only the deep water areas of the central west coast. However, the audit team specified that it considered manipulative approaches and the use of existing contrasts and comprehensive studies to be required;
- CALM believes that the issue of geographical scope as proposed is inadequately addressed;
- Evidence so far marshalled on shallow water lobster, and reported upon in the EMS, is not sufficient to suggest we have an understanding of the ecosystem impacts (Specific comments in relation to this matter are listed in the table at Appendix three);
- CALM has the strong view that studies on the deep water ecosystem impacts need to be expanded, as a matter of priority, to also include shallow water and waters that cover the fishery's extent from north to south;
- The need for controlled studies is a high priority;
- CALM believes that the figure quoted by DOF of <10% as the amount of lobsters removed by the industry relative to total biomass requires clarification in respect of age class;
- The isotope work should not be done solely on lobsters but also on other components of the food web to quantify material flows throughout the trophic network;
- Given that fishing has a significant effect on lobster size structure, studies on differential foraging are recommended;

- It is premature for the EMS and associated MS to refer to the structure and terms of reference of each committee as being finalised rather than in a state of information;
- In respect of the proposed MS expanded steering committee and associated EcoSRG, CALM understands that the intent is to alter membership to address the governments JBMP research commitments. However, in view of these changes not being finalised it would be prudent at this point in time to refer to the current membership rather than the proposed memberships. Furthermore, the SRG has yet to address the issue of its proposed expanded role.

APPENDIX 9: DEPARTMENT OF FISHERIES RESPONSES TO PUBLIC COMMENTS RECEIVED ON THE DRAFT WRL ENVIRONMENTAL MANAGEMENT STRATEGY RELEASED IN AUGUST 2004

Section	From	Recommendations/comments	Response
Specified timelines	Cons Council	There are no timelines for research milestones in terms of answering the various 'natural history' questions;	Objectives and milestones for the FRDC project on deepwater ecology including natural history questions now included as appendix 7.
	Cons Council, David Offord	No start up date for an adaptive management (closed areas) experiment	The ERA process identified filling some knowledge gaps as an essential precursor to the design of a closed areas experiment
	WWF,	No indication if the target dates for actions that have already passed have been met; Has the current EMS document been actively applied in the WRL since 2002? If not, the dates should be altered in the EMS to reflect appropriate timelines and outcomes. Document states that it will be reviewed annually, it is unclear if this document has been updated since 2002 in regard to timelines, actions	Target dates now annotated with whether they have been met or an altered date has been set
	WWF, David Offord	Only two years left in the life of the strategy, constraining how much can realistically be achieved; Not clear if the management objectives specified in the EMS are linked explicitly to the life of the EMS rather than the overall, long-term management objectives; There is no real intention that environmental goals will be met within the period of the EMS, let alone before the completion of the MSC certification.	This EMS, with only a short time to run, will be succeeded by another EMS which will pick up any objectives and actions that are not completed within the life of the current EMS. Introduction now modified to clarify this.
	WWF	If the management objective is linked to the five-year time frame of the EMS, then maybe it is considered feasible only to gain an understanding of the issues in five years. Actions to address the issues would then be undertaken upon the basis of that understanding in the next iteration of the Strategy. However, as the EMS is subject to annual review, there appears little reason why appropriate actions could not be undertaken earlier if the information became available. This example illustrates the need for clarification regarding management objectives and timeframes.	This EMS will be succeeded and is subject to annual review, appropriate actions will be undertaken earlier if the required information becomes available. Introduction now amended to reflect this.
Management objectives and performance measures	WWF	A number of the objectives are ambiguous or more properly depict management actions as opposed to the management objective being pursued, this leads to confusion when reading the text, potentially presenting issues relating to performance measurements at a later	These criticisms are noted. Objectives have been re-worded where necessary and performance measures re-worded, related to management objectives

		stage. PM's need to be linked clearly to each of the management objectives to provide an effective means of determining whether the management objectives are being met by the actions specified in the EMS; WWF believes that the PM's proposed in the draft EMS will not allow the performance of the EMS to be assessed, as many of the measures proposed appear to confuse management responses with performance measures; Many of the PM's proposed in the draft EMS are inconsistent with the ESD reporting framework and do not clearly address this question	
	WWF	WWF questions if the approach of delaying actions to address the problem until adequate information and understanding is achieved, is consistent with a precautionary approach	This is not the approach of the EMS. The action to mitigate the effect of the fishery on sea-lions is being implemented as soon as effective mitigation measures can be identified, action is not being delayed until an understanding of the effect on sea-lion populations is achieved. November 2005 is target date now in "actions" table for legislated mitigation requirements.
	WWF	While great emphasis is placed on management actions for data collection and monitoring activities, WWF believes that the draft EMS does not give sufficient emphasis to the management response in its stated actions after such activities	The nature of the management response is often dependent on the results of data collection and monitoring. The management system for this fishery has a good history of responding to research findings. The ESD and ERA processes assess and guide management responses.
Stakeholder involvement	David Offord	With the first half of the strategy already completed, performance measures essential for planning should have been placed before stakeholders as a whole, this has not occurred	Stakeholders were invited to comment on the first draft EMS document in 2002. The amended document has been available to stakeholders since 2003. This latest version of the EMS was put out for public comment in August 2004.
	WWF	WWF acknowledges that there is increasing scope for stakeholder participation in the management processes of the Western Rock Lobster Fishery. WWF welcomes moves to include a conservation member on RLIAC;	Stakeholders are everybody with an interest in the fishery, including but not limited to commercial and recreational fishers, other industries affected by the fishery, consumers, environmentalists, scientists, and government departments.

		WWF believes that there is a need for further clarification in the EMS, regarding the nature and extent of engagement with stakeholders; 'stakeholder' needs to be defined as the meaning may vary through out the document, if so this needs to be addressed so that it is clear who will be consulted about what; Where the intention is to seek broader public input it is not clear how this will be achieved; WWF believes that simply posting material on a web site does not constitute consultation, as it relies on the public having access to, identifying and regularly checking the web site. In effect, this transfers the onus of consultation from the management agency to the public; The mechanisms for incorporating stakeholder comments and concerns are not clearly defined in the document. While a number of committees exist, a process is not identified that suggests how this function would occur; WWF recommends that a consultative framework is established that clearly identifies how and when during implementation of the EMS that stakeholder input will be sought, and how stakeholder views will then be assessed and incorporated into the ongoing management of the fishery.	Advertisements were placed in popular media seeking public comment on the draft EMS which was available either on the website or in hard copy by contacting the DoF. The consultative framework and role of committees in the process leading to the EMS is now outlined in the introduction.
	David Offord	Inherent problems with the transparency of the decision making process; Appears to be a exclusion of ordinary environmental stakeholders from the whole process that places in doubt the strategy as a whole The underlying management system does not include stakeholders in any real way; Is set up for a three year, not an annual, consultancy cycle	For the management of fisheries as a whole, and the ERA which led to this EMS, consultation with stakeholders is mandatory in Western Australia. The main groups of stakeholders known to the DoF and some individuals with relevant expertise are included in working groups and the wider community is invited to comment on the draft document before it is finalised through the public submissions process.
Overall comments on the EMS	WWF	WWF believes that the EMS attempts to address the key priorities in the WRL Fishery; welcomes progress towards a decision rules framework for the fishery WWF has reservations if the current draft of the EMS can	The EMS is a strategy, developed by DoF with invited input from experts, to help it to address actual or potential environmental effects of the fishery. It is an aid to planning, not a commitment against which the department can be held accountable.

		ensure that the issues identified in the fishery can and will be dealt with effectively and in a timely manner; WWF has concerns that it will be very difficult to monitor progress and hold the responsible agencies accountable against the actions in the EMS on the basis of the current performance measures; WWF believes that the concerns raised regarding the management objectives, performance measures, management actions and stakeholder input must be addressed if the EMS is to provide a sound basis for effective management and resolution of the ecological issues identified in the WRL Fishery.	The DoF values stakeholder input, including criticism, to give a wider perspective than the small committees which are the only feasible way to conduct an ERA or develop an EMS. The DoF will do the best it can, with the resources it can obtain, to achieve the performance measures it has set for itself.
	CALM	The EMS and MS have been prepared in response to MSC audit requirements for ongoing certification of the WRL Fishery. This point should be made explicitly in the EMS and MS reports, along with related background in respect of the fisheries MSC certification and associated conditions of certification	The EMS and MS are valuable in their own right, independently of the MSC certification and will be continued even if the industry decided not to seek continued MSC certification. This is now stated clearly in the introduction.
	Cons Council	If the commitment is subject to FRDC funding then it is not a commitment	Research can also be funded under cost-recovery from industry.
	Cons Council	Industry code of conduct for bait and waste management, and discarding protocol. There is no mention of it in the EMS, although used rhetorically to reduce the claimed level of risk to wildlife and sharks, bait bands and introduction of exotic fish diseases; These codes have relevance to lobster boats potentially attracting sharks to populated areas (Capes); Very few fishers appear to adhere to such codes, at least the bait discarding protocol	The code of conduct is mentioned under Sea lion interaction: Management assessment underlying risk rating. Shoreline surveys have found reduced numbers of bait bands indicating the code of practice is successful.
	David Offord	EPBC Act requirements The DEH Sustainability Fisheries Assessment of the Western Rock Lobster Fishery is essentially the only summary we have of the Ecological Risk Assessment	Many of these points are criticisms of the DoF's performance or the transparency of its processes, rather than the EMS,.

		published in one document; MSC requirements The MSC certifier has said that this ERA is not up to a satisfactory standard; The idea that a new ERA can be brought forward a year can be no excuse for a lack of common sense in the logical discussion of critical issues in this EMS; This discussion should have been placed in the EMS; the MSC certifier has clearly stated that the sensitivities to research should be available to stakeholders "at every level" of research programmes, if they are not happy with the direction of the research. A 20 minute presentation followed by a 10 minute question time period on the RLIAC coastal tour 2003, was not a means of being transparent or reporting in any way sufficiently to stakeholders; nothing in writing on the 2003 coastal tour presentations were ever given out; while it was illegal for RLIAC to show anybody any reports from its meetings until after a certain timeframe, there was nothing stopping DOF or WAFIC from preparing reports as were needed for a new high risk to be brought to public notice; the early version of the EMS clearly described the need for such reports. A desk top survey on mitigation was noted in late 2002 and promised release in 2003, at the beginning of 2003, reports were promised for October and December that year which would have provided important background information that is still not available; if the EMS were to mean anything in MSC terms, then the sense of continual improvement needs to be real and not nominal; one might suppose that a written summary of the progress	

		made to date on the five sea lion ERA recommendations might have been released within three years, but that has certainly not been the case; this EMS remains dated from July 2002. the first "annual level identification process" has to be at least the draft EMS dated 15 August 2003 and the expectations that arose from it; the Department should not take a year working privately, before releasing any information to the wider public; there is little evidence that basic principles of performance measures are inherent to the EMS are being met; the timing of pupping, and temporal and spatial overlap of the fishery with high risk overlap the weaning juvenile sea lions would have become a thing of public notice and awareness; if the Precautionary Principle needed to be applied against a "newly" identified high risk, then it has to be a thing of public notice, because it must be practical and cost effective. The EMS gives no indication that this is possible. Only that the Minister has the potential to legislatively act to enforce mitigation once RLIAC has gone through a yearly consultancy cycle of closed session meetings; the annual level identification process would appear now to be a matter of correspondence between the SLSRG and the ESD Committee in a manner that is entirely at the discretion of the DOF; DOF has refused to release any information or reports on sea lions to stakeholders; Stakeholders will not have the opportunity to comment on these reports until after the start of the fishing season; Stakeholders have been excluded for the last 2 years;	

	David Offord	There is an assumption in the assessment, encouraged by a lack of investigation by DOF, that sea lion interactions are insignificant It would be fair to say that all written submissions from environmental stakeholders, in 2003, were of the opinion that sea lions should have been given a high risk rating rather than a moderate risk rating; The sea lion SRG supported that view when it said in August 2003: "*The SRG assessed that the impacts of what appear to be low levels of mortality from the fishery can in fact be critical for west coast sea lion populations"*; This EMS predicated upon the idea that sea lions remain a moderate risk; DOF should have reported upon this high risk level in some wholesome manner, as well as acting upon it; a full examination of the risk weighted consequences of various management actions should have occurred in the first following six months, with fishers and stakeholders	The ERA process had a membership with wide expertise mainly from outside of the DoF, it rated the sea lion interactions as a moderate risk. This rating is used in the EMS and the actions proposed are intended to quickly and substantially mitigate that risk.
	David Offord	The SLSRG meeting that proceeded the draft EMS is supposed to be an independent view, and if we are to believe it should be taken, whollus bolus as the Departmental viewpoint without further ado, then it could in fact hardly be independent;	The Sea Lion SRG was convened by DoF as a group of independent scientists and others with expertise relating to sea lions, to advise it on sea lion issues. It is not surprising that the DoF accepted the group's view.
Presentation/ legibility	WWF	EMS difficult to read, need to be accessible and easily understood, particularly by the fishing industry, WWF recommend the need for a explanation or diagram that accurately describes the links between the various reports and systems to be included in both EMS and MS documents; It is not clear when the documents will be finalised, nor how they will be published (i.e. are they stand alone documents or will they be published together as a series); WWF believes that the EMS should be a stand alone document that can be read and interpreted without	The WWF suggestions are appreciated and implemented where possible.

		referencing any other documents; language used needs to be readily understood by broader stakeholders; a comprehensive glossary should be provided. The presentation of the Management Objectives, Operational Objectives, Actions and Targets and Performance Measure could be improved, using a logframe format or something similar; WWF believes that the presentation of these core elements in a single table would facilitate the reader's understanding, while providing more discipline to link objectives with performance measures and operational objectives with actions; Given the inclusion of the reports of the Scientific Reference Groups as appendices to the EMS, WWF suggests that consideration be given to removing some of the details about the findings of these groups from the body of the document. There is considerable repetition of material; WWF believes that provided the rationale for the details of the actions proposed under the EMS are provided in the appendices, the body of the EMS should focus on the objectives, actions and performance measures; The Executive Summary should attempt to provide a concise summary of the background to, and objectives of the EMS. This could also include revised tables in accordance with the suggestions provided above. It should ensure that references to other documents are clear. For example, references to Documents 1 and 3 in the current draft provide no indication of the nature of these documents and where to access them.	
Sea lion interactions	David Offord	Strategies outlined do not give a sufficiently holistic sense that real planning and proper direction was available at the beginning of the period of the EMS; The lack of continuing progress places in doubt the plan as a whole	These views are noted. DoF believes that the EMS is being and will continue to be effective in addressing environmental issues in the WRL fishery.

	David Offord	*Data Published in the EMS itself* Why isn't the data on the take of sea lions simply summarize existing known data on the temporal and spatial take of sea lions? The bar graphs supplied in the document provide an entirely different impression from the data Richard Campbell has available to him;Why has the data of the take from 1999/2000 not been mentioned; Is there any reason why consolidated information is not included in the EMS as we now have it, or at any time in the future?	All available data have been utilised by the sea-lion SRG. The EMS is consistent with the scientific information contained in Richard Campbell's most recent report to this group. The EMS is not the appropriate document to display all the data.
	David Offord	Sea Lion Objective 3 – Level of interactions There is no real attempt to try and consider what the actual baseline level of interaction is likely to be; Telephone surveys have not been conducted; Performance measures mean very little if delayed – as they have been; There should be a simpler means that the annual surveys give us some real indication of the actual level at least as a rule of thumb but with some real statistical nouce behind the procedure; The commercial monitoring surveys are completely irrelevant; There is of course no consideration of robust monitoring. To take insufficient data and find there is no statistical power, in what is a rare event, is really inappropriate especially when you are going to try and exclude rare events to a certain level, but that is essentially what the DOF has been doing;	Baseline interaction levels have been estimated by the SRG Telephone surveys are part of this strategy It is important to use the performance measures, even if delayed The actual level of a very rare event is difficult to measure statistically. The existing strategy is that recommended by the scientists of the SRG. The commercial monitoring surveys occur anyway, for other reasons. They at least confirm that the interactions are very rare. The DoF has followed advice of the SRG that action to mitigate the interactions is more important and effective than putting a lot of resources into more precisely determining the level of the interaction through monitoring.
	David Offord	Sea Lion Objective 5 – Education programs Fishers need to be involved in the real examination of the risk weighted consequences of different management actions, if they are to be expected to be actually enthusiastic for the process and if this then going to lead to the sort of data the Department needs;	Suggestion noted.

	David Offord	Sea Lion Objective 6 – pup counts Is there any reason whatsoever to believe that pup counts can give any indication at all of "trends in sub-population abundance" over time of the EMS?	Clearly there would have to be a very large and unlikely trend in abundance to be detectable within the duration of this EMS. However, it is an important measure for the longer term so it is appropriate to continue the pup counts.
	David Offord	Sea Lion Objective 7 – Anthropogenic impacts What are we trying to measure, it would seem that by stealth the implication is being brought in that Type II risks of a decline are overestimated as if by definition; This report was expected in December 2003, it would have had some meaning then; How the performance measure here relates to other things at issue needs to be clearly outlined – if it is important.	DoF have contracted Dr Richard Campbell to provide a documented history of anthropogenic impacts on the mid-west sea lion populations based on a review of existing data. This will not affect assessment by the SRG of risks of a decline. The report will be of value whenever it is completed
	David Offord	*Other Sea Lion Objectives – PBR limit points* There should be great discussion in the EMS regarding the Leeuwin Current and its affects on crustaceans and sea lions, the exclusion to date is an extreme lack; If there is no quantitative analysis of the bycatch and no actual realistic limit points set, then the Precautionary Principle must be applied. This is a requirement of the National Policy for Fisheries Bycatch, but it applies just as much to FAO Guidelines. And one should do so consciously and carefully. This has not been done in the EMS; The use of temporal and spatial closures needs proper discussion;	This scientific opinion regarding the Leeuwin current has been passed to the SRG Though there is no evidence that the fishery is causing a decline in sea lion populations, the precautionary approach of mitigating the interaction through legislated gear modifications is being followed. The use of closures has been discussed. Seasonal closures are unlikely to be useful as the vulnerable time of the pups' lives is approximately a year in length. It is expected that gear modifications will be effective and that spatial closures will not be necessary.
	CALM	CALM believes that the work currently underway to exclude sea lions from pots is an appropriate course of action and has the potential to reduce the risk of drowning pups in pots; Effective assessment of exclusion devices will rely on accurate reporting (logbooks), emphasis on reporting compliance will be required;	DoF has found that information supplied voluntarily is the most valuable. Assessment of the effectiveness of exclusion devices will be possible even though only around one third of fishers complete the voluntary logbooks. An education campaign is part of the EMS

		Exclusion technology will be better facilitated if greater lobster catches can be demonstrated by using this device;	True. Though the information to date indicates that catches of legal sized lobsters are neither increased nor decreased by the sea lion exclusion device.
	CALM	Important to ensure monitoring programs are designed so as to be able to decouple the influence of this variable (exclusion devices) from other factors that may be inhibiting recruitment into the breeding population;	While this would be ideal in terms of understanding the population dynamics of sea lions, it would require contrast experiments eg, exclusion devices fitted in only some of the pupping populations. The DoF is following the strategy of trying to eliminate the risk, as a higher priority than better understanding of the populations
Impact of fishery on the ecosystem	CALM	Concerned that the management approach in the EMS, focuses on the deep water ecosystem and then only the deep water areas of the central west coast. However, the audit team specified that it considered manipulative approaches and the use of existing contrasts and comprehensive studies to be required; The need for controlled studies is a high priority	The deep water ecosystem was seen by the SRG to be the greatest gap in knowledge. The area of most intensive fishing has been targeted for research. It is intended that manipulative approaches, with controls, will be used when the initial work has been done to enable them to be designed properly. Work using existing contrasts has begun.
	CALM	CALM believes that the issue of geographical scope as proposed is inadequately addressed;	With limited resources, the decision has to be made on trade-offs between more intensive work in a smaller region and less intensive work in a larger region. Though it is a value judgement, the decision has been made to research the most heavily fished regions of the fishery rather than to include the lightly fished northern and southern extremities.
	CALM	Evidence so far marshalled on shallow water lobster, and reported upon in the EMS, is not sufficient to suggest we have an understanding of the ecosystem impacts (Specific comments in relation to this matter are listed in the table at Appendix three); CALM has the strong view that studies on the deep water ecosystem impacts need to be expanded, as a matter of priority, to also include shallow water and waters that cover the fishery's extent from north to south	Comment acknowledged.
	CALM	CALM believes that the figure quoted by DOF of <10% as the amount of lobsters removed by the industry relative to total biomass requires clarification in respect of age class;	The minimum legal length gives protection to the younger age groups, which dominate the shallow waters. The older the age class, the more depleted it is compared to the unfished state. The older lobsters tend to live in the deeper waters, which is part of the reason for the focus of the FRDC project in deep water.

	CALM	The isotope work should not be done solely on lobsters but also on other components of the food web to quantify material flows throughout the trophic network;	Agreed
	CALM	Given that fishing has a significant effect on lobster size structure, studies on differential foraging are recommended	Agreed
	CALM	It is premature for the EMS and associated MS to refer to the structure and terms of reference of each committee as being finalised rather than in a state of formation; In respect of the proposed MS expanded steering committee and associated EcoSRG, CALM understands that the intent is to alter membership to address the governments JBMP research commitments. However, in view of these changes not being finalised it would be prudent at this point in time to refer to the current membership rather than the proposed memberships. Furthermore, the SRG has yet to address the issue of its proposed expanded role	The EMS and appendices give the composition of the ERA workshop participants and SRGs at the time their reports were made. The EMS is not the appropriate document to discuss future changes in committee structure.

APPENDIX 10: TABLE OF ACRONYMS

ACRONYM	MEANING
CALM	(WA) Department of Conservation and Land Management
DoF	(WA) Department of Fisheries
DOLA	(WA) Department of Land Administration
EMS	(Western Rock Lobster Environmental Management Strategy
ERA	Ecological Risk Assessment
ESD	Ecologically Sustainable Development
FAO	Food and Agriculture Organisation (of the United Nations)
FRDC	Fisheries Research and Development Corporation
GIS	Geographic Information System
IBSS	Independent Breeding Stock Survey (for western rock lobster)
JBMP	Jurien Bay Marine Park
MS	(The Western Rock Lobster) Management System
MSC	Marine Stewardship Council
PBR	Potential Biological Removal
RLIAC	Rock Lobster Industry Advisory Committee
ROV	Remotely Operated Vehicle (usually for underwater video filming)
SCS	Scientific Certification Systems (auditors for MSC certification)
SED or SLED	Sea-lion Exclusion Device
SRG	Scientific Reference Group
WAFIC	WA Fishing Industry Council
WRL	Western Rock Lobster
WRLC	Western Rock Lobster Council
WRLF	Western Rock Lobster Fishery
WWF	World Wide Fund for Nature (formerly World Wildlife Fund)