WESTERN ROCK LOBSTER ECOLOGICAL EFFECTS OF FISHING RESEARCH PLAN

Developed by the

Ecological Effects of Fishing Scientific Reference Group

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Western Rock Lobster Ecological Effects of Fishing Research Plan

Developed by the Ecological Effects of Fishing Scientific Reference Group[1]

Background and Context

The commercial West Coast Rock Lobster Fishery (WCRLF) targets the western rock lobster (WRL), *Panulirus cygnus*, averaging approximately 10,000 to 12,000 tonnes of lobsters each year. Currently there are 537 licensed boats operating in the Fishery in waters ranging from give metres to 200 metres om depth adjacent to the Western Australian coast stretching from Cape Leeuwin in the south to Shark Bay in the north. The Fishery is managed by the Department of Fisheries in Western Australia, using an input control management system designed to constrain exploitation/fishing effort and deliver sustainable catches. The annual value of the catch is estimated to be approximately between AUD $200 - $300 million.

In March 2000 the WCRLF became the first Fishery in the world to be certified by the Marine Stewardship Council (MSC) as a well-managed and sustainable Fishery. The Fishery is currently undergoing a five-year assessment for re-certification. The status of the rock lobster stocks, the Fishery's impact on the ecosystem and its management systems are being independently assessed by a team of experts contracted to Scientific Certifications Systems Inc (SCS) of Oakland California, an organisation which undertakes the certification on behalf of the MSC.

The process to obtain MSC certification involves a number of key components. Two major components involve the development and implementation of an Ecological Risk Assessment (ERA) and an Environmental Management Strategy (EMS). The development of these two documents involves a number of processes including public, stakeholder and expert consideration and comment.

The ERA report is based on a risk assessment workshop of stakeholders that produces a register of the main potential ecological risks that arise from the various activities carried out by the fishery. A subsequent workshop of scientific experts provides a risk ranking on all the risks identified. An ERA document provides the basis for the rankings. The EMS is developed using the ERA document and comments from the 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. The EMS has in place objectives, actions, targets and management actions to deal with risks identified.

This research plan has been developed to address knowledge gaps identified by the ERA process.

[1] A draft of the plan was circulated for final comment and agreement in March 2006, and was finalised in August 2006.

Establishment of Scientific Reference Group

In addition to its longstanding sub-committees[2], the Rock Lobster Industry Advisory Committee (RLIAC) established the Ecological Effects of Fishing Scientific Reference Group (Eco SRG). This group is responsible for ensuring that RLIAC is provided with independent ecological advice to ensure the western rock lobster resource is managed in a manner that is consistent with the national principles of Ecological Sustainable Development (ESD) and ecosystem-based management.

The Eco SRG has a composition and terms of reference (Appendix 1) that are set down by RLIAC and reports directly to RLIAC. The Eco SRG also operates in a manner that is consistent with *Fisheries Management Guide No. 3*[3].

Background to the Development of the Research Plan

The EcoSRG held the view that broadly there was a general lack of knowledge or information on the interaction of the WCRLF with the deepwater ecosystem and therefore it was necessary for initial work to be focussed on identifying and observing ecosystem patterns before attempting to research ecosystem processes. Without first undertaking this basic research there would be no scientific guidance on which to base the design of future studies comparing fished and unfished fished areas. For example what the size of the closed areas should be, the levels of replication required and what could be used as potential response variables.

The EcoSRG believed that targeted studies could determine relationships between fishing pressure, lobster population size structure and benthic structure, and hence provide a quick and cost-effective way of determining some of the impacts of fishing on benthic ecosystems.

EcoSRG members identified the need to develop a research plan to improve the information base to enable a more robust scientific assessment of the ecosystem effects of fishing. This would require completing the documentation of a Research Plan. The EcoSRG identified that there were already a number of projects underway and that it was important to have the fully documented Research Plan to provide co-ordination and an overview of those projects that would achieve the EcoSRG's objectives.

The EcoSRG noted that pattern-focussed studies assumed that gradients in effect could be found and that there was a need for such studies to be replicated in space and time. If this approach proved unviable then the EcoSRG considered that the only recourse would be to close an area(s) to conduct research on fished versus unfished areas. Observing ecosystem patterns was the important first step for all forms of ecosystem research whether based on gradients in fishing effort or fished versus unfished areas.

[2] Research and Development; Finance; Market Research; Compliance and Education; Finance Working Group; Sea Lion SRG; Eco SRG; Management Steering Committee; and ESD Steering Committee.
[3] A guide for Management and Ministerial Advisory Committees (MACs) and the conduct of meetings issued by the Minister for Fisheries.

The EcoSRG identified significant opportunities for increased collaboration and cooperation across the respective agencies and institutions undertaking ecological research to ensure that all efforts are complementary.

The EcoSRG noted that:

There is a paucity of data from the deep water such that, the EcoSRG 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 EcoSRG noted that there was significantly more data available on the shallow (< 30 m) water ecology of lobsters than for deep-water lobsters. However, this data was still limited in relation to determining the effects of lobster fishing on coastal ecosystems. The EcoSRG acknowledged that given the low percentage of lobsters taken in shallow waters (< 10%), that complementary studies on the effects of lobster fishing in shallow water waters were planned as part of the Jurien Bay Marine Park proposal; and at Rottnest Island, the initial focus of the EcoSRG study should be on the ecology of deep water. The EcoSRG expressed a desire to have some link to the shallow water study design to ensure the studies were complementary.

The EcoSRG welcomed the prospect of relevant studies in the Jurien Bay Marine Park and the SRFME Coastal Ecology project. The EcoSRG 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 developing skills and knowledge that is likely to be applicable in deep-water studies.

There are three key external drivers that have created the need to develop and implement a Research Plan for the WCRLF. These drivers are:

1. Marine Stewardship Council (MSC);
2. *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999); and
3. Jurien Bay Marine Park (JBMP).

It is important to note that the MSC and EPBC Act 1999 are the two external primary drivers for the development and implementation of the Research Plan in accordance with accreditation/certification, and to meet the requirements of the EMS developed as part of the process. These two primary drivers focus on what is the effect of rock lobster fishing on the ecosystem across the fishery's entire range, in particular the deep-water distribution.

The JBMP is a secondary driver that feeds into the two primary drivers by providing much needed information on what is the effect of rock lobster fishing on the ecosystem and biodiversity within a localised specific area (Jurien Bay Marine Park), focusing primarily on the shallow waters. These shallow water studies potentially represent the best opportunity to provide some outcomes directly related to the ongoing requirement for certification.

Objective

The goal of this research plan is to provide an overview of the research that may be required to test the null hypothesis that:

> *Removal of western rock lobsters on a scale experienced in Western Australia does not have a significant or irreversible effect on the ecosystem.*

This plan will also provide direction to organisations and institutions that are undertaking, or may undertake, research directly on or related to the effects of fishing for rock lobster on the ecosystem.

A more explicit description of the hazards that have been identified through the ERA[4] process is contained in the WCRLF EMS[5].

Purpose

By setting down what is required to better understand the effect of fishing for WRL on the ecosystem, the coordination of research resources can occur effectively and efficiently. The results of the research can then be used to address management issues.

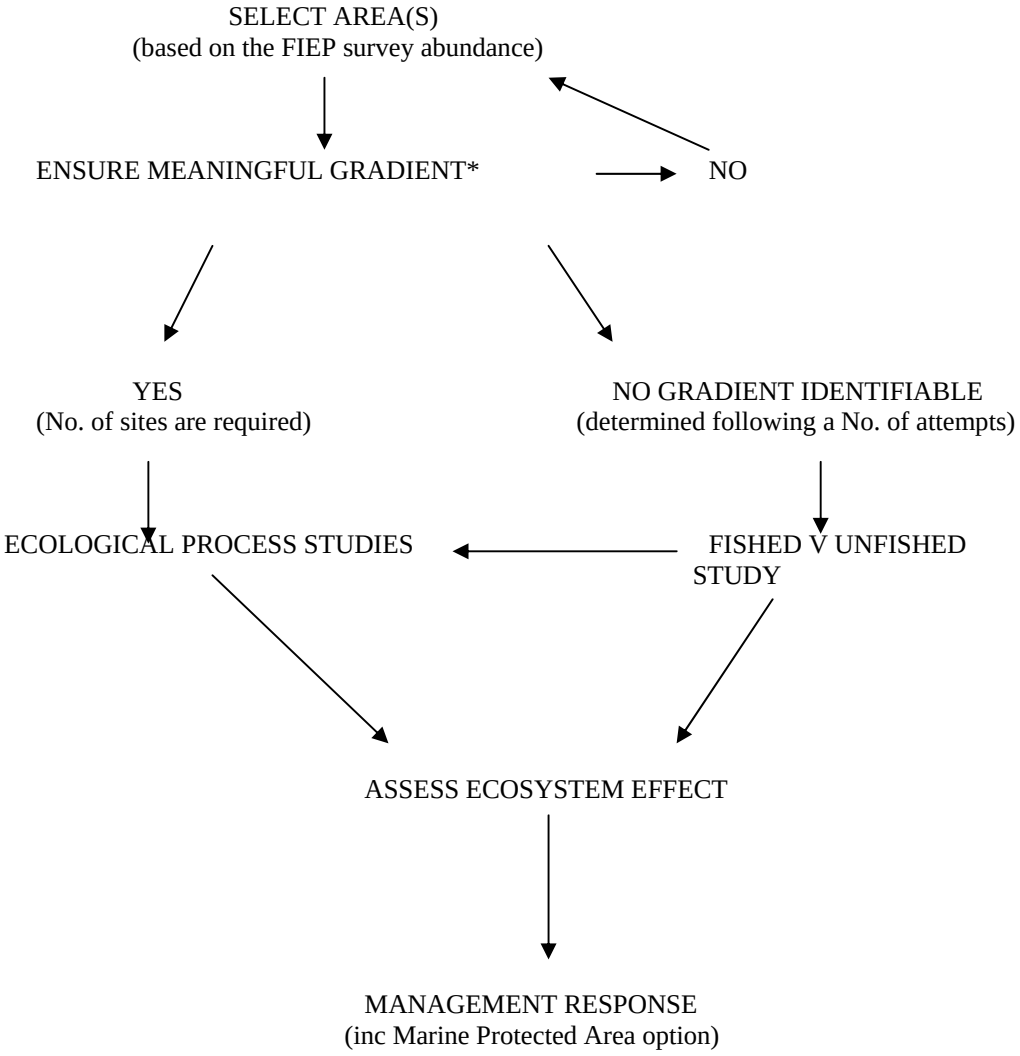
Guiding Principles

1. The objective of the Research Plan is to identify the effects of rock lobster fishing on the ecosystem.
2. The Research Plan is to be set out in such a way that identifies key elements of the plan and establishes clear milestones for reporting purposes.
3. It is essential that the Research Plan integrates efforts by different institutions and organisations undertaking relevant studies (e.g. Strategic Research Fund for the Marine Environment, Department of Fisheries, Department of Conservation and Land Management, Western Australian Marine Science Institution) to ensure that the plan is inclusive, adaptive and not isolated.
4. The Research Plan needs to employ a variety of methods so as to draw lines of inference relevant to the question at hand, rather than adopting a single methodology and pursuing it (perhaps erroneously) to an end point.
5. It is important that studies and the research methodology be based on a phased approach, i.e. choice of an appropriate study site => preliminary analysis => pilot study => full-scale study. This process then needs to be replicated both in time and space.
6. The initial focus of work should be to identify and observe pattern, which would lead to studies focused at understanding process.[6]
7. The determination of the magnitude of ecological effects needed to be done in a heuristic manner.

[4] The ERA handbook, detailing the risk identification process including risk assessment scales, is available from the Department of Fisheries head office, Perth.
[5] The EMS is available from the Department of Fisheries website at www.fish.wa.gov.au
[6] The development of models to synthesise knowledge, promote communication across disciplines and enhance understanding of the ecosystem can take place in parallel with either the descriptive or process studies. This type of work has been proposed in the recently funded FRDC project FRDC 2006/038 – "Evaluating how food webs and the fisheries they support are affected by fishing closures in Jurien Bay, temperate Western Australia"

Conceptual model for the research plan

To assist in establishing a collective understanding of the approach that is to be at the heart of the Research Plan, the EcoSRG developed a conceptual model as to how the process would evolve and develop knowledge that is directly applicable to testing the hypothesis. The results of the research will be used to answer the threshold question contained within the ongoing requirements of the Department of Environment and Heritage and MSC certification. This model is illustrated in Figure 1.



*The task of finding a meaningful gradient is encapsulated here in a single component of the conceptual model, but is actually a complex iterative task. Ideally, or ultimately, a "meaningful gradient" will be defined as a meaningful gradient in biological assemblage structure across sites that are otherwise undistinguishable based on physical attributes. Thus the examination of gradients will need to be structured in such a way that it takes into account both physical and biological habitat structure. It is recognised that fully meeting these criteria will only be possible by the ongoing incorporation of data from initial examinations of sites identified by FIEP and more detailed habitat mapping studies.

Figure 1. Eco SRG conceptual model of research plan to determine the effect of rock lobster fishing on the ecosystem. Note that management responses can occur throughout the process as information is fed into the risk assessment and evaluation process through the SRG.

Research approach

With regard to previous research on the WRL, the EcoSRG previously recognised that:

1. There is only a limited understanding of density dependent mortality in lobsters.
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 (e.g. what the unfished size distributions were 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 was the size of the lobsters and the impact or influence they had 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.

Proposed Research Priorities and Operational plan to establish the ecology of rock lobsters in deep-waters

In a manner that is consistent with the conceptual model the SRG has effectively prioritised work that targets the following:

1. habitat description;
2. relationship between habitat type and lobster size; and
3. identification of lobster habitat in a geological sense.

Within the research framework the EcoSRG 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 EcoSRG 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, oil companies) - ***Yr 1;***
    - reviewing existing benthic habitat and seabed data for the shelf waters between Mandurah and Kalbarri - ***Yr 1;*** and
    - conducting broad-scale rapid assessment in waters between Mandurah and Kalbarri to determine areas of interest (eg. Swath mapping) - ***Yr 2.***

2. Choose a minimum of three representative transects with replicates at each location - ***Yr2.***
3. Conduct detailed habitat mapping of chosen sites that included:

    - acoustic survey of hard structure and associated groundtruthing of epifauna and infauna 'habitat' using video techniques - ***Yrs3-5;*** and
    - limited grab sampling to later determine infaunal composition and sediment type - ***Yrs 3-5.***

    The SRG defines the term "habitat" in this context to include the physical (e.g. rocks and sand waves) and biological (e.g. sponge gardens and 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.

Habitat mapping will provide a framework upon which our analysis of the relationships between seafloor community structure and lobster size/density will be based. It will provide the basis for an assessment of the ecosystem effects of lobster fishing.

2. Habitat based size structure and density of lobsters

Focus questions to be addressed

- Is potting an appropriate measure of abundance and size structure of the population? (selectivity) - ***Yr 1***
    - What are the relationship(s) between pot catch rate and size composition? - ***Yr 1 - 2***
    - What are the impact(s) of habitat on catchability? - ***Yr 1-2***
- Are there any **patterns** in the size structure and density of lobsters in the chosen sites? - ***Yr 3-5***

- What are the movement dynamics of the lobsters in the chosen sites (foraging/home range), and are there any key movement relationships (size; sex; reproductive state) or other intrinsic biological reason for the movement dynamic? - ***Yr 5 out***[7]

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 - ***Yr 2-3***
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 environmental 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 on habitat to determine relationships between habitat and lobster size and density.

3. Trophic Dynamics

An examination of the trophodynamics of rock lobster populations in deep water will be used to understand the observable **patterns** in the community structure of the **chosen sites**. This type of process study is required to parameterise models of the ecological effects of rock lobster fishing.

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 **chosen sites**?
- Are there relationships between lobster size-structure compositions and prey density and composition? (possible PhD study)

Action plan

1. Conduct carbon and nitrogen isotope analysis of lobsters to provide information on diets, trophic relationships and whether the basis of lobster diets is plant, animal, detrital or a combination. (PhD study) potentially ***Yr 2-5***
2. Conduct gut analysis studies to examine diets and compare with long-term trophic source both on a seasonal and inter-annual basis. (PhD study) potentially ***Yr 2-5***
3. Conduct aquarium tests to investigate relationship(s) between lobster size and prey size (PhD study) potentially ***Yr 2-5***
4. Points 1 and 2 should be done at the **chosen sites.**

[7] Yr 5 analysis of data to evaluate the lobster density gradient approach.

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

4. Lobster behaviour

What aspects of lobster demographics (e.g. size and sex) are important or play a role in shaping the environment in which they live?

Focus questions to be addressed

1. Does the absence of large lobsters influence the demographics of lobster populations?
2. What are the implications of altering the sex ratio through fishing?

Action plan

1. Through a series of manipulative experiments examine whether the presence or absence of large lobsters has a measurable impact on key parameters such as habitat utilisation and population structure mediated through competitive or facilitatory interactions - ***Yr 5+***
2. Similarly, through the experimental procedure examine the effect of the above on the habitat in which they liv - ***Yr 5+***
3. As with 1 and 2 examine the effect of sex ratio on intra and inter specific interactions and habitat relationships - ***Yr 5+***

In the latter phases of this research program this information will be used to understand how long-term changes in lobster demographics could affect the ecosystem. This could be especially useful in understanding the long-term effects of fishing in shallower water where large lobsters are no longer abundant.

Current research program

FRDC Project 2004/049: The effect of western rock lobster fishing on the deepwater ecosystems off the west coast of Western Australia.
Department of Fisheries Western Australia
Principal Investigator: Dr Lynda Bell-Chambers

There is a need to collect basic ecological information to determine if changes in lobster density and size structure due to fishing have caused significant changes in habitat structure and benthic community composition in deep water. This research will provide information on the level of ecosystem impact of removing lobsters from deep-water habitats to improve the assessment of risk to the ecosystem to ensure that the western rock lobster fishery maintains MSC certification and complies with DEH requirements for export permits. However, the SRG recognised that research needs to occur in a structured manner and has highlighted the need for research proposals which sit within the strategic framework which they have devised.

The SRG recognises that the provision of a strategic framework and related scientific research will ultimately allow management of deep-water stocks in a more sophisticated ecosystem-based manner.

If removal of western rock lobster biomass, by the deepwater fishery, has resulted in detectable changes in the ecosystem, management options such as reduction in the fishing effort, minimum size changes and area closures, will be considered by RLIAC to reduce the removal of biomass from areas of the deepwater fishery. This FRDC funded research project is focused primary on the question " what is the effect of lobster biomass removal on the ecosystem?"

The objectives of the project are:

1. To identify gradients in the density/size distribution of western rock lobster to enable selection of representative areas.

The focus of this objective is to use existing data, from both the Department of Fisheries and other sources, to compile a comprehensive database on the abundance and distribution of rock lobsters and the associated habitat types. This objective is primarily a desktop study to use existing data to identify areas, within the scope of the rock lobster fishery, where gradients in lobster density and/or size structure can be investigated.

2. To assess the deep-water catchability of western rock lobsters and its relationship with population abundance and size structure.

The focus of this objective is to be able to calibrate commercial and research catch rates and determine the actual size structure and density of lobsters in selected locations, examine the influence of gear type on providing an accurate representation of the population.

3. 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.

The focus of this objective is to investigate the pattern in the relationship between gradients in the abundance and size distribution of lobsters and their corresponding deep-water habitat. The aim is to collect additional biological data to identify if habitat characteristics, physical or biological, are correlated with high or low lobster abundance.

Complementary Research

This section describes key projects already funded or planned and relevant milestones that the SRG regards as important for the research plan to deliver against its objective and purpose.

Project Title	Milestones		Linkages to conceptual model
Description of the set of Jurien projects looking at linkages between organisms and habitats Funded by SRFME and ECU $AUD446,609 over 3 years	31/05/05	Postdoctoral Fellow and Research Assistant appointed. Sampling protocol and locations finalised. Collection of stable isotope samples for first season completed.	
	30/11/05	Processing and analyses of stable isotope samples for first season completed. Preliminary studies on isotope enrichment completed. Collection of stable isotope samples for second season completed	
	31/05/06	Processing and analyses of stable isotope samples for second season completed. Sampling design and methods finalised for second phase of the stable isotope study.	
	30/11/06	Processing of stable isotope samples for the second phase of the stable isotope study completed. Survey of wrack in different habitats completed.	
	30/05/07	Analyses of s Analyses of stable isotope samples for the second phase of the stable isotope study completed.	
	30/11/07	If acoustic tagging studies of wrack are possible, collection of movement patterns of wrack through acoustic tagging will be completed. Final analyses of stable isotope and wrack data completed. Draft report completed.	
Biodiversity of marine fauna on the central west coast Funded by SRFME and Museum $AUD223,902 over 2	Autumn 2005	Completion of first field survey in April 2005, of two areas Jurien Bay and Cervantes. Field identifications will be made where possible. Material brought to the Museum will be identified, voucher material databased and entered into the permanent collections.	
	Sept 2005	Report on results of second survey will be completed, including biodiversity information on molluscs, corals, echinoderms, fishes, sponges, and decapod crustaceans.	

Project Title	Milestones		Linkages to conceptual model
years	Autumn 2006	Completion of second survey in April 2005, of two areas (probably Green Head and Dongara). Field identifications will be made where possible. Material brought to the Museum will be identified, voucher material databased and entered into the permanent collections.	
	Sept 2006	Report on results of second survey will be completed, including biodiversity information on molluscs, corals, echinoderms, fishes, sponges and decapod crustaceans. Individual papers will be written by the participants, or there may be a supplement of the *Records of the Western Australian Museum* describing the results.	
Ecological interactions in coastal marine ecosystems. The fish communities and main fish populations of the Jurien Bay Marine Park Project funded by Murdoch and SRFME $AUD286,456 over three years	30/9/2005	Sampling sites will have been identified during an initial exploratory trip. The first three seasonal sampling trips will have been conducted. Data on species composition, abundance and size structure in different zones will have been collected and subjected to preliminary analyses. The otolith, reproductive and dietary material collected during the first two trips will have been processed in the laboratory and preliminary studies will have been conducted on ageing, reproductive and dietary aspects. Acoustic tagging and tracking will have commenced and the data from the first two trips will have been stored on computer and subjected to preliminary analysis.	
	30/9/2006	Sampling will have been conducted seasonally between spring 2005 and winter 2006 and the data on species composition and the abundance, age and size structure, reproductive biology and diets of selected species in the first of those seasons and all of those in the first year will have been analysed. Acoustic tagging and tracking will have been completed and analysis of the data collected will be underway.	
	30/9/2007	The eighth and final of the main sampling trips will have been completed. All of the data on the fish communities and the abundance, age and size structures, reproductive biology and diets of the main species will have been completed and analysed. A final report will have been written in which conclusions will be drawn as to the extent of any influences of closure to fishing on the fish community and main fish populations in the Jurien Bay Marine Park.	

Project Title	Milestones		Linkages to conceptual model
The effects of western rock lobster fishing on the deepwater ecosystems off the west coast of Western Australia Funded by FRDC $AUD1,026,000 over 3 years	31/12/04	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.	
	30/06/05	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.	
	31/12/05	Habitat characterisation using ROV will be completed 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 catchibility studies will be underway. Review of data will be conduct to determine priorities for phase 2.	
	30/06/06	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.	
	31/12/06	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.	
	30/06/07	Statistical analysis will be underway to assess the impact of lobster biomass removal from the ecosystem. All fieldwork will be complete and data will be in the process of being analysed. Final report preparation underway.	
Evaluating how food webs and the fisheries they support are affected by fishing closures in Jurien Bay, temperate Western Australia	December 06	Appointment of postdoctoral fellow to lead development of InVitro/Atlantis and coordinate other modelling activities.	
	June 07	Construct and balance a preliminary Ecopath model for the most recent time period.	
	December 07	Conduct preliminary policy optimisation explorations that optimize economic, social, and ecological values.	
	June 08	Conduct simulations that reconstruct observed ecosystem change by integrating all existing information	

Project Title	Milestones		Linkages to conceptual model
Murdoch University, CSIRO Funded by FRDC $344,865 (2006/038) over 3 year	Dec 08	Conduct final round of Ecosim analyses: policy optimisation, alternative management strategies, time-series fitting, and spatial simulations.	
	June 09	Completion of final simulations from all models. Discussion of simulation results with Project Advisory Group and key stakeholders. Draft Final Report.	
	Sept 09	Completion of Final Report	

Research Gaps

- Design of Jurien Bay Marine Park zoning scheme inconsistent with addressing the requirements.

- Ability of listed projects to address their objectives – what alternate methods are being contemplated?

- Gap analysis to continue.

GLOSSARY

CSIRO – **Commonwealth Scientific Industrial Research Organisation**
DoF – **Department of Fisheries**
EcoSRG – **Ecological Scientific Reference Group**
EMS – **Environmental Management Strategy**
EPBC Act – ***Environmental Protection and Biodiversity Conservation Act 1999***
ERA – **Ecological Risk Assessment**
FIEP – **Fishery Independent Egg Production**
FRDC – **Fisheries Research Development Corporation**
JBMP – **Jurien Bay Marine Park**
MSC – **Marine Stewardship Council**
PATTERN – **the change in size structure or abundance of rock lobsters, which may be related to fishing pressure or habitat characteristics**
RLIAC – **Rock Lobster Industry Advisory Committee**
SCS – **Scientific Certification Systems**
SRFME – **Scientific Research Fund for Marine Environment**
WCRLF – **West Coast Rock Lobster Fishery**
WRL – **Western Rock Lobster**

APPENDIX 1

Terms of reference and composition of SRG

Terms of Reference

The Eco SRG as required, annually and in a strategic way every five years, to provide advice on:

- the ecological effects of removing lobster biomass;
- how to improve our measurement and assessment of the risk to the environment from the removal lobster biomass; and
- the experimental designs / techniques that are necessary to gather data for analysis to address these questions.

The Eco SRG as required, annually and in a strategic way every five years, will perform the following functions:

- an assessment of known and recently identified risks and review established projects against milestones and objectives;
- seek formal input from the ESD steering committee with regard to the status of existing risks and the identification of new risks;
- provide the ESD Steering Committee with its justification for risk ratings for a new risk or an already identified risk; and
- be a source of advice when changed circumstances may influence risk ratings.

Composition

• Independent Chair	Ron Edwards (RLIAC Chairman)
• Executive Officer	Tim Bray (RLIAC Executive Officer)
• Simon Thrush	Principal Scientist Marine Benthic Ecology – New Zealand National Institute of Water & Atmospheric Research
• Andrew Heyward	Australian Institute of Marine Science
• Russ Babcock	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
• TBA	Director Research, Department of Fisheries
• Neil Loneragan	Chair in Fisheries Science, Biological Sciences, Murdoch University

Operational requirements

- The Eco SRG reports directly to RLIAC with a copy of its report sent to the ESD Steering Committee.
- Eco SRG reports are to be made available to the Minister for Fisheries as part of RLIAC advice.
- Eco SRG members are to formally sign off (signature or email confirmation) on every report before it is forwarded to RLIAC and the Chairman to ensure any dissenting views are explicitly recorded in the report.
- In all other matters the Eco SRG is to operate in a manner that is consistent with *Fisheries Management Guide No. 3*.

Process for amending terms of reference or composition

Responsibility for amending the Eco SRG's terms of reference or composition rests with RLIAC. Should RLIAC decide to alter either the terms of reference or composition then it should document the justification in its advice to the Minister for Fisheries.

RLIAC should seek input from rock lobster stakeholders and the Department of Fisheries prior to amending the terms of reference or composition.