

**CERTIFICATION REPORT
ON
THE WESTERN ROCK LOBSTER FISHERY
IN
WESTERN AUSTRALIA**

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Status: Certification Recommended with Requirements for Continued Certification

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Accredited Certification Body:

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1.0 SUMMARY

1.1 Notable strengths of the fishery

The most notable strengths in the fishery are the management system, the research supporting management, and the stock assessments. Even in the face of becoming a full-cost recovery fishery, the WA Rock Lobster fishery has managed to continue its superlative management and research efforts toward sustainable management.

1.2 Main weaknesses of the fishery

Without doubt, the main weakness in the rock lobster fishery is the lack of information available about the potential and real risks that may accrue to the environment from fishing. In addition, the management and research decision making processes are too insular, not allowing for adequate input from interested stakeholders such as the environmental community.

1.3 Certification recommendation

It is the recommendation of the certification team that the WA Rock Lobster Fishery be awarded a certification. To maintain certification the fishery must agree to make required improvements within a specified time frame.

1.4 Justification of certification recommendation

Using the methodology prescribed by the Marine Stewardship Council, the assessment team found that the WA Rock Lobster Fishery met all three MSC Principles and Criteria. Given the potential for scores between 0 and 100, with a score of 80 being the minimum level to achieve certification, the assessment team found the fishery scored as follows:

- Principle 1 90,

- Principle 2 80,
- Principle 3 87.

1.5 Proposed requirements for continued certification (if any).

While the fishery significantly exceeded requirements for certification for Principles 1 and 3, it only minimally met the requirements set for Principle 2 on Ecosystem Management. In looking at the scores for each of the performance indicators under Principle 2, it can be seen that the fishery did not meet minimum expectations in several indicators. The deficiencies in these indicators formed the proposed requirements to maintain certification listed below:

2A Ecological Risk Assessment - Within 14 months of certification, a comprehensive and scientifically defensible assessment of the risks of the fishery and fishing operations to the ecosystem (ecological risk assessment) will be completed, based on existing knowledge, and taking into account points 2 to 5 in criterion 2C. The assessment should consider risks of all aspects of fishing (see intent in criterion 2B) on species (including protected and ecologically related species), habitats, and biotic communities (see criterion 2A). The risk assessment will identify and prioritize gaps in knowledge. The risk assessment will produce a set of prioritized risks, and strategies to address those risks, including research strategies that make maximum use of comparisons between fished and unfished areas. The risk assessment will be reviewed by independent and external expert reviewers, and be available for public comment.

2B Environmental Management Strategy - Within 24 months of certification, an Environmental Management Strategy for the fishery will be prepared and distributed for public comment and input. The EMS will address impacts of the fishery on the environment, and will include proposed objectives, strategies, indicators and performance measures. The EMS will specify an operational plan, including implementation actions and a supporting program of research. Future research should aim to provide information on the impacts of the fishery on the ecosystem that is at least as scientifically valid as that produced by studies of fished versus unfished areas.

2C Operation of the EMS - Within 36 months of certification, an Environmental Management Strategy will be effectively incorporated within the operational arrangements for the fishery

2D Transparency of Decision Making - Within 24 months of certification, there will be increased participation of the environmental community or their representatives in the decision-making processes in the fishery. This will include consultation on impending decisions, and involvement (full participation) in the decision-making processes at a range of levels in the fishery.

2E Data on By-catch of Icon Species - Within 12 months of certification, formal monitoring systems in the fishery will have improved arrangements for recording data on the by-catch of, or any other interactions of the fishery with, mammals, seabirds, manta rays, dolphins, or whales.

2.0 ADMINISTRATIVE CONTEXT

2.1 Summary of legislative, administrative and marine use contexts in the fishery

The primary government agency responsible for the management of the Western Australia Rock Lobster Fishery is Fisheries Western Australia. The only other government entity aside from Fisheries WA with a role in the management of the Fishery itself is the Commonwealth Government. The Offshore Constitutional Settlement 1995 (OCS) is a legal agreement between the Commonwealth and the State that assigns control for all fish, including rock lobster, inside 200 nautical miles to the State with the exception of:

- The Northern Prawn Fishery - Controlled by the Commonwealth
- Tuna and tuna-like fish - Controlled by the Commonwealth
- Deep Water Trawling in waters more than 200 metres deep (outside the 200 metre isobath) - controlled by the Commonwealth

- Shark Fishing east of Koolan Island - controlled jointly by the State and Commonwealth under State Law
- Demersal longlining and demersal gillnetting south of 33° South - controlled jointly by the State and Commonwealth under State Law

Part 5 of the Commonwealth's Fisheries Management Act 1991 provides for co-operation between the Commonwealth and the State in management of fisheries and is the basis for the OCS.

Numerous State and Commonwealth Agencies such as: the Department of Transport (vessel surveys) the Australian Quarantine Inspection Service (import of bait and export of fish), Conservation and Land Management (conservation and protection of marine mammals), the Department of Environmental Protection (conservation of the environment), the various State Port Authorities and Environment Australia all have some indirect impacts on the operation of fishermen and management of the fishery. However, while such agencies are regularly consulted and may influence development of policy and even day to day operational management, Fisheries WA is the only agency, under the existing legislative arrangements and the OCS agreement, with direct responsibility for management of the fishery.

Commonwealth/State liaison arrangements in Australia on natural resource management and environmental matters have been established; in part to facilitate consultation in relation to anticipated international agreements and ongoing implementation of existing international agreements. At the Ministerial level consultations might occur on fisheries/environmental/natural resource management matters through the Ministerial Council on Forestry, Fisheries and Aquaculture and the Australian and New Zealand Environment and Conservation Council. At officials level such consultations occur through the Standing Committee on Fisheries and Aquaculture, the Standing Committee on Conservation and the Standing Committee on Environmental Protection. These consultation processes are designed to ensure that all levels of Government are abreast of international developments and that Australia complies with its international obligations.

☰ *"Offshore Constitutional Settlement 1995"* Fisheries Management Paper 77 H G Brayford and G E Lyon Fisheries WA June 1996.

Fisheries Management Act 1991

http://www.austlii.edu.au/au/legis/cth/num_act/fma1991193/

3.0 FISHERY

3.1 A summary of basic information about the fishery

The commercial fishery for the Western Rock Lobster captures about 10,000 tonnes of lobsters each year. The rock lobster fishery is operated by 6276 licensed boats in waters from about 5 m depth to 200 m depth adjacent to the Western Australian coast stretching from about Cape Leeuwin in the south to about Shark Bay in the north. The fishery is managed by a set of input controls designed to deliver sustainable catches, and has an annual value of about AUD \$M200.

The commercial catches are made using baited traps (pots). In addition to rock lobsters, there is a small commercial bycatch of crabs and octopus. The fishery management system also includes recreational fishers, and they must comply with the same rules as commercial fishers. However, recreational fishers are restricted to a limit of two pots per licensed person with a maximum of four pots per boat, an individual daily bag limit of eight rock lobsters and a boat limit of 16. Recreational fishers (but not commercial fishers) may also dive and use their hands or a blunt crook or hand-held snare to assist in catching their bag limit.

3.1.1 EEZ/international waters

The Western Rock Lobster Fishery occurs within the Australian EEZ and does not occur in international waters

3.2 A summary of basic information about the management assessed

3.2.1 The total management area and its main divisions

The western rock lobster is found in commercial quantities from just east of Cape Leeuwin (34°24'S) in the south to Shark Bay (24°45'S) in the north. The fishery is divided into three zones;

- Below the 30° latitude (Zone C) to
- Above the 30°S latitude (Zone A and B)
- Zone A is the area of the Abrolhos islands

3.2.2 The fishery species composition

The fishery targets a single species of rock lobster, *Panulirus cygnus* George.

3.3 A summary of the fishery management system being implemented

3.3.1 Management objectives

The Western Australian *Fish Resources Management Act 1994* sets out the following objectives:

"The objects of this Act are to conserve, develop and share the fish resources of the State for the benefit of present and future generations."

In particular, this Act sets out the following objects: -

- (a) to conserve fish and to protect their environment;
- (b) to ensure that the exploitation of fish resources is carried out in a sustainable manner;
- (c) to enable the management of fishing, aquaculture and associated industries and aquatic eco-tourism;
- (d) to foster the development of commercial and recreational fishing and aquaculture;

- (e) to achieve the optimum economic, social and other benefits from the use of fish resources;
- (f) to enable the allocation of fish resources between users of those resources;
- (g) to provide for the control of foreign interests in fishing, aquaculture and associated industries;
- (h) to enable the management of fish habitat protection areas and the Abrolhos Islands reserve.”

These objects are taken as the legislative expression of Ecologically Sustainable Development (ESD) within the Western Australian fisheries context, including the Western Rock Lobster Fishery.

3.3.2 Management systems

The primary method of controlling access to western rock lobster in Western Australia is through licensing, empowered under the *Fish Resources Management Act 1994*.

To be able to take Western Rock Lobster on a commercial basis all the crew involved must have a Commercial Fishery License (CFL). In addition the boat must be a Licensed Fishery Boat (LFB). Finally, a Managed Fishery License (MFL) for the West Coast Rock Lobster Managed Fishery must be held.

Although there is no limit on the number of CFLs on issue, the number of Fishing Boat Licenses (FBLs) has been falling since 1983, when the issue of new ones was frozen for all but special circumstances. The number of MFLs in the Western Rock Lobster fishery has been limited since 1963 as part of the suite of management measures for the fishery, which are expressed, in a type of subsidiary legislation called a “Management Plan”, together with various Regulations. These Regulations are generally used to stipulate biological controls (see below) and to control the recreational fishing sector generally.

The types of input controls used in the Western Rock Lobster fishery fall into a number of categories:

- Biological
- Gear and Season
- Social/Economic
- Compliance efficiency

- Other.

Biological controls are the foundation of good management in the Western Rock Lobster fishery. They are designed to ensure that as far as possible, immature animals are protected; through the setting of legal minimum sizes. Additional protection can be given to spawning females or even females with maximum reproductive potential through maximum sizes or the banning, of keeping females in breeding condition. These measures do not of themselves maximize production from the fish stock but do form the underlying “safety net” to protect the future of the stock for continued exploitation.

However, it is also considered important to ensure that there is a critical biomass of adult stock that enough eggs and young are produced each year to cope with both the vagaries of environmental fluctuations which can effect the settlement of young lobster, as well as the impact of commercial and recreational fishing.

The main aim of this management system is to introduce a suite of biological, social and economic controls that maximize the benefits for the economy.

In the Western Rock Lobster Fishery these controls include maximum trap holdings and the (now defunct) “7 to 10” rule which mandated the spread of trap numbers per length of boat. The aims of these controls were to ensure that the benefits from the fishery were relatively evenly and widely distributed across the fleet.

To this end in the Western Rock Lobster Fishery there are a series of gear and season controls. The total number of traps (pots) which can be deployed by the limited number of boats is tightly regulated and has been periodically reduced over time. Fortunately, given the knowledge gained of the Western Rock Lobster biological and population structure and dynamics over the last five decades, it is possible to manipulate the number of pots in use, together with associated controls, to produce a level of effort which in turn produces a relatively well predicted (and desired) total catch in any one year. This enables production to be maximized while maintaining a critical minimum adult breeding stock.

Such controls have recently come under review through the National Competition Policy process (see Fisheries WA 1999) and may be subject to more detailed review over the coming year (2000).

Some controls are necessary for compliance efficiency. Minimum pot holdings have been judged necessary to ensure that those participating in the fishery will, with a minimum level of competence, generate an income from the fishery and have sufficient investment in it to mitigate the chance of cheating. There are also a range of requirements to mark traps and floats, as well as the bags and crates containing the catch.

In effect, the Western Rock Lobster Managed Fishery is managed through a system of Individual Transferable Effort, which is a surrogate for a desired catch (output).

The principle method of consultation in the fishery is through the Rock Lobster Industry Advisory Committee (RLIAC), a statutory Ministerial Advisory Committee. A general guide to the operation of Ministerial Advisory Committees is provided in Attachment 1. Specifically, the functions of the RLIAC as set out in section 29 of the *Fish Resources Management Act 1994* are:

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

Since its establishment in 1965, RLIAC has had communication and consultation with industry as its first priority. RLIAC has been the forum in which issues (particularly those related to sustainability) have been debated and from which recommendations have flowed to the Minister. In summary, RLIAC's consultative process has involved taking problems that affect the fishery and the industry generally, for example prior to 1993/94 the dangerous decline in the level of the breeding stock, and initiating, by way of discussion/management papers and meetings with industry, ways to address them.

3.4 Estimates of maximum sustainable yield for fish and fish products

The estimated maximum sustainable yield for Western Rock Lobster is on the order of 12,000t (Hall, unpublished data). This is an equilibrium estimate based on current models of the stock, assuming a stock recruitment curve steepness of 0.95 (Francis, 1993). This is a reasonable assumption given observed recruitments to date.

3.5 A quantitative summary of current and projected harvesting

Landings over the past two decades have averaged 10,700t per year. Annual catches vary between about 8,000t and 12,000t (due to recruitment fluctuations not associated with spawning stock levels). The projected equilibrium catch at stock levels corresponding to the current reference point of 25% virgin egg production is approximately 11,500t per year.

4.0 OTHER FISHERIES ACTIVITIES IN THE AREA OF THE FISHERY

4.1 Summary of other activities being undertaken within the area evaluated

Currently, the basic commercial licensing element in Western Australian fisheries is an FBL, which is required for all commercial fishing vessels and allows such licensed vessels to line fish for scale fish or "wetline" within most commercial fisheries. For example all commercial rock lobster fishermen in the West Coast Rock Lobster fishery also hold an FBL. This method of managing scale fishing is under review but at the moment it means that commercial scale fishing operations can take place anywhere within the water of the fishery. Similarly, recreational and aboriginal fishing (including rock lobster fishing) can take place within the waters of this fishery.

- Specific managed fisheries that operate wholly or partially within the boundaries of the West Coast Rock Lobster Fishery include:
 - The Shark bay Prawn Managed Fishery
 - The Abalone Managed Fishery
 - The Shark Bay Scallop Managed Fishery
 - The Abrolhos Island Scallop Fishery

- Abrolhos Island and Mid West Trawl Managed Fishery
- South West Trawl Managed Fishery
- Shark bay Beach Seine and Mesh Net Managed Fishery
- Exmouth Gulf Beach Seine Fishery
- Western Australian Salmon Managed Fishery
- Australian Herring Fishery
- West Coast Purse Seine Managed Fishery
- Mid West Purse Seine Managed Fishery
- Sharp bay Snapper Managed Fishery
- West Coast Gillnet and Demersal Longline Interim Managed Fishery

Further details of the nature and location of these fisheries is contained in the *"State of the Fisheries Report 1997/98."*

 "State of the Fisheries Report 1997/98" Fisheries WA 1999

4.2 Evaluation of the impact, or potential impact, of such activities on the fishery

The only areas where significant issues of joint management or resource sharing has arisen in the context of fishing shared ground, are in the Abrolhos Island trawl fisheries and various commercial crab fishing operations. To accommodate the concerns of the rock lobster industry trawling operations have generally been restricted to areas of sandy bottom where there is little risk of damaging rock lobster habitat or entangling rock lobster pots. Similarly, the operations of commercial blue swimmer crab fishermen (managed through license requirements) have been restricted to times and areas where the incidental catches of rock lobster are likely to be minimal.

5.0 BACKGROUND TO THE EVALUATION

5.1 Evaluation team

To choose members of the assessment team, SCS spent 5 weeks interviewing prospective candidates by e-mail, phone, and fax. The determinants for choosing and contracting team members were technical expertise in fisheries management, stock assessment, or ecosystem management; specific knowledge of Australian fisheries, with special emphasis on Western Australia; scientific credibility; and the ability to provide an objective assessment.

Recommendations for potential team members were solicited from stakeholders in the fishery including but not limited to industry (WAFIC - Western Australian Fishing Industry Council and WRLDA - Western Rock Lobster Development Association), government agencies (i.e. Fisheries WA managers and researchers), academia, and members of the environmental/conservation community (see list of stakeholders for groups contacted). Curriculum Vitae were requested from all candidates and reviewed.

5.1.1 Names

Dr. Bruce Phillips
Adjunct Professor, School of Environmental Biology & Aquatic Science Research Unit
Curtin University
Perth, WA 6845
Australia

Dr. Tony Smith
Principle Research Scientist
CSIRO Marine Research
Hobart, Tasmania 7001
Australia

Dr. Trevor Ward
Director, Sustainable Ocean and Coastal Development Program
Institute for Regional Development
Department of Geography
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Nedlands, WA 6907
Australia

Dr. Chet Chaffee
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USA

5.2 Summary of previous certification evaluations and conclusions, with any recommendations and requirements.

No other officially sanctioned Marine Stewardship Council certifications have been completed on this or any other fishery. The Auditor General of Western Australia recently completed an audit of WA Fisheries, but the report was still in draft form and unavailable to the assessment team. A general description of the audit was provided by WA Fisheries Research noting that the conclusions are very favorable to the management of WA Rock Lobster.

6.0 STANDARDS FOR MSC CERTIFICATION

6.1 MSC Principles and Criteria

Recognizing that market incentives have the potential to improve fisheries management and to turn chronic over-fishing into recovery, sustainability and economic stability; the Marine Stewardship Council (MSC) was established in 1997. The goal of the MSC is to harness these incentives in such a way as to provide the fishers, processors and retailers with greater security of supply and employment than has been possible to date.

The MSC is an independent, charitable, not-for-profit, and non-governmental international organization working to achieve sustainable marine fisheries by promoting responsible, environmentally appropriate, socially beneficial and economically viable fisheries practices, while maintaining the biological diversity, productivity and ecological processes of the marine environment.

To accomplish its objectives, the MSC proposed a new approach to change the incentive structure so that benefits accrue to the fishers, fish processors, traders, retailers and consumers in adopting a more responsible and sustainable approach to fisheries exploitation. At the center of the MSC is a set of

Principles and Criteria for Sustainable Fishing which are used in an independent assessment as a standard by which an independent assessment team evaluates a fishery. In this project these standards were used in the evaluation of the Western Australian Rock Lobster Fishery.

The MSC Principles and Criteria (P&Cs) have been developed by means of an extensive, international consultative process through which the views of stakeholders in fisheries have been gathered from around the world. Further international consultations will take place through 2001 at which time the MSC will revise the P&Cs as necessary. The P&Cs reflect a recognition that a sustainable fishery should be based upon:

- The maintenance and re-establishment of healthy populations of targeted species;
- The maintenance of the integrity of ecosystems;
- The development and maintenance of effective fisheries management systems, taking into account all relevant biological, technological, economic, social, environmental and commercial aspects; and
- Compliance with relevant local and national local laws and standards and international understandings and agreements

The Principles and Criteria are further designed to recognize and emphasize that management efforts are most likely to be successful in accomplishing the goals of conservation and sustainable use of marine resources when there is full co-operation among the full range of fisheries stakeholders, including those who are dependent on fishing for their food and livelihood.

The scope of the MSC Principles and Criteria relates to marine fisheries activities up to but not beyond the point at which the fish are landed. The MSC Principles and Criteria apply at this stage only to marine fishes and invertebrates (including, but not limited to shellfish, crustaceans and cephalopods). Aquaculture, freshwater fisheries, and the harvest of other species are not currently included. Issues involving allocation of quotas and access to marine resources are considered to be beyond the scope of these Principles and Criteria.

For further information about the MSC Principles and Criteria, or about other aspects of the Marine Stewardship Council, information can be found at the MSC website (www.msc.org).

PRINCIPLE 1

A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

Intent:

The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favor of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Criteria:

1. The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.
2. Where the exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.
3. Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.

PRINCIPLE 2:

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Intent:

The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Criteria:

1. The fishery is conducted in a way that maintains natural functional relationships among species and should not lead to trophic cascades or ecosystem state changes.
2. The fishery is conducted in a manner that does not threaten biological diversity at the genetic, species or population levels and avoids or minimizes mortality of, or injuries to endangered, threatened or protected species.
3. Where exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.

PRINCIPLE 3:

The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Intent:

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

A. Management System Criteria:

The fishery shall not be conducted under a controversial unilateral exemption to an international agreement.

The management system shall:

1. demonstrate clear long-term objectives consistent with MSC Principles and Criteria and contain a consultative process that is transparent and involves all interested and affected parties so as to consider all relevant information, including local knowledge. The impact of fishery management decisions on all those who depend on the fishery for their livelihoods, including, but not confined to subsistence, artisanal, and fishing-dependent communities shall be addressed as part of this process;
2. be appropriate to the cultural context, scale and intensity of the fishery – reflecting specific objectives, incorporating operational criteria, containing procedures for implementation and a process for monitoring and evaluating performance and acting on findings;
3. observe the legal and customary rights and long term interests of people dependent on fishing for food and livelihood, in a manner consistent with ecological sustainability;
4. incorporates an appropriate mechanism for the resolution of disputes arising within the system;
5. provide economic and social incentives that contribute to sustainable fishing and shall not operate with subsidies that contribute to unsustainable fishing;
6. act in a timely and adaptive fashion on the basis of the best available information using a precautionary approach particularly when dealing with scientific uncertainty;
7. incorporate a research plan – appropriate to the scale and intensity of the fishery – that addresses the information needs of management and provides for the dissemination of research results to all interested parties in a timely fashion;
8. require that assessments of the biological status of the resource and impacts of the fishery have been and are periodically conducted;
9. specify measures and strategies that demonstrably control the degree of exploitation of the resource, including, but not limited to:
10. setting catch levels that will maintain the target population and ecological community's high productivity relative to its potential productivity, and account for the non-target species (or size, age, sex) captured and landed in association with, or as a consequence of, fishing for target species;
11. identifying appropriate fishing methods that minimize adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
12. providing for the recovery and rebuilding of depleted fish populations to specified levels within specified time frames;

13. mechanisms in place to limit or close fisheries when designated catch limits are reached;
14. establishing no-take zones where appropriate;
15. contains appropriate procedures for effective compliance, monitoring, control, surveillance and enforcement which ensure that established limits to exploitation are not exceeded and specifies corrective actions to be taken in the event that they are.

B. Operational Criteria

Fishing operations shall:

16. make use of fishing gear and practices designed to avoid the capture of non-target species (and non-target size, age, and/or sex of the target species); minimize mortality of this catch where it cannot be avoided, and reduce discards of what cannot be released alive;
17. implement appropriate fishing methods designed to minimize adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
18. not use destructive fishing practices such as fishing with poisons or explosives;
19. minimize operational waste such as lost fishing gear, oil spills, on-board spoilage of catch, etc.;
20. be conducted in compliance with the fishery management system and all legal and administrative requirements; and
21. assist and co-operate with management authorities in the collection of catch, discard, and other information of importance to effective management of the resources and the fishery.

6.2 Interpretation of MSC Principles for Performance Evaluations

The MSC Principles and Criteria are general statements describing what aspects need to be present in a fishery to indicate that it is moving toward sustainable management. The certification approach or methodology adopted by the MSC requires that the assessment move beyond a management verification program that simply provides third-party assurances that a company's stated management policies are being implemented. The MSC's approach, detailed in its 'Certification Methodology' document (see www.msc.org), is designed to be an evaluation of a fishery's performance to determine if the fishery is being managed consistent with emerging international standards of sustainable fisheries. In particular, the requirements of the MSC are to bring to bear evaluation criteria or

performance indicators that are consistent with emerging international standards of environmentally responsible fisheries management.

Using its expertise in fisheries management, fisheries biology and ecology, ecosystem monitoring, and stock assessments, the assessment team developed a set of performance indicators (see section 6.2.2) to be consistent with the intent and extent of the MSC Principles and Criteria. Specifically, each MSC Principle and its associated Criteria were translated into a specific set of performance indicators that could be measured either quantitatively or qualitatively by the assessment team.

To the extent possible, the assessment team endeavored to avoid overlap in performance indicators between the three principles. This was accomplished by recognizing that the three principles set forth by the MSC for use in certification can be broadly classified in the following manner:

- Principle 1 is concerned with maintaining the target species at productive levels and is therefore concerned with outcomes of a management system that provide documentation that the resource is being maintained at the appropriate levels.
- Principle 2 is concerned with restraining the impact of the fishery on ecological systems, and therefore is also concerned with documented outcomes of a management system showing that the fishery has or is moving toward an understanding of its impact on the environment.
- Principle 3 is concerned with sound management systems, and is therefore focused on processes. The intent is to show that all the processes necessary for moving toward and attaining a sustainable fishery are in place.

6.2.1 Developing numerical performance scores

The MSC methodology for fishery evaluations (see MSC Certification Methodology Document at the MSC website www.msc.org) utilizes a decision making process known as AHP (Analytical Hierarchical Process) to prioritize, weight, and score sets of performance indicators for a given Principle. This allows the expert team of fisheries professionals to identify which performance indicators - also termed Scoring Criteria - are most important for achieving the performance required

by the MSC and to weight them accordingly on a scale of 0 to 1. Once weighted, a separate step is taken where each scoring criteria is scored on a scale of 1 to 100 indicating how well the fishery performed for that given indicator. The weighting of each indicator or criteria is multiplied by its score to obtain a weighted score. All weighted scores for the performance indicators in a given Principle are then summed to provide a final normalized, weighted measure of performance, again on a scale of 0 to 100.

The final normalized, weighted average score for each Principle represents the team's judgment as to the extent to which management systems in a given fishery fully attain the goal of the Principle. In other words, "performance" is measured relative to full attainment of sustainable fisheries management as defined by the MSC's three Principles, not relative to the performance of other fisheries. Of course, consistent application of the evaluation standards to a number of different fisheries will generate scores that can be compared to those received by individual fisheries.

A normalized performance scale of 0 to 100 has been arbitrarily chosen for measuring performance. It is required that the fishery obtain a normalized, weighted score of 80 (arbitrarily chosen) for each of the 3 Principles in order to be certified. However, a fishery may score less than 80 (unweighted score) on individual performance indicators. Where the fishery fails to achieve an unweighted score of 80 on individual indicators, it indicates the performance of the fishery is significantly deficient. The result is that the fishery, if meeting all other aspects for certification, will be required to meet certain specified requirements to be awarded a certificate. If the requirements are adopted by the client, thus agreeing to bring the score for that indicator to at least the benchmark level, the fishery would then be awarded a conditional certification.

The assignment of numerical performance scores is aided by written "Scoring Guideposts" that describe what constitutes an ideal fishery (score = 100) and what constitutes the minimum requirements for certification (the benchmark level; score =80). Scores are assigned based on team member's expert judgement of how the fishery performs in relation to the scoring guides. The benchmark of 80 is chosen so that only the world's best fisheries would pass on an individual Principle.

This aspect of the methodology has been applied to ensure that an effective MSC certification process can be developed and implemented for global fisheries.

In applying this methodology, the assessment team for Western Rock Lobster had little difficulty in developing suitable scoring guideposts for Principles 1 and 3 (resource sustainability and management) at the 80 and 100 levels. In fact, it is the opinion of the assessment team that a score of '80' on Principle 1 or Principle 3 does represent a fishery that is 80% of the way toward achieving an ideal sustainable fishery. However, complications arose when trying to set scoring guides for Principle 2. The assessment team found that a realistic benchmark for Principle 2, even in the case of the world's leading fisheries, had to be set well below a "real" score of 80 on a linear scale of 0 to 100. It is the opinion of the assessment team that a realistic scoring guide for achieving an '80' under Principle 2 is well below what is really required to give absolute effect to the intent of the criteria as they are currently stated under the MSC Principle 2. The Criteria under Principle 2 state emphatically that a fishery a) maintains natural functional relationships among species and should not lead to trophic cascades or ecosystem state changes, and b) does not threaten biological diversity at the genetic, species or population levels. These are important objectives; however, these criteria are difficult to measure and evaluate in any ecosystem making it difficult to do so for even the best-managed fisheries. This is not because fisheries necessarily fail, but because there is insufficient information to evaluate these criteria. There may be nothing at all wrong in a fishery, but insufficient evidence may be available to prove the absence of any impacts. Principle 2 and its associated criteria define goals that fisheries have only recently now been asked to work toward, and so the scoring guides for Principle 2 reflect this fact. Throughout the coming years, the performance indicators chosen and the scoring guides used by evaluation teams will need to evolve to reflect the fact that fisheries should be achieving these goals rather than just working toward them.

The MSC methodology currently requires that all the scoring benchmarks for individual Criteria indicating that a fishery meets the minimum requirements for certification be labeled as 80. Similarly, the methodology also requires that the normalized score for each Principle be above 80 for the fishery to achieve certification. Such an approach has the potential to be very misleading. Some may read the criteria and the scoring guides and get a picture that a fishery scoring 80 in Principle 2 is achieving the

same level of performance along the path to an ideal fishery (a score of 100) as it is in Principles 1 and 3. This runs the risk of opening the whole approach to criticism, and falsely inferring that a fishery is more closely approaching ecological sustainability than the scoring guides intend.

A further problem with setting the relative benchmark lower in Principle 2 than in Principles 1 and 3, but calling it the same name (80), is that it could work to decrease the incentive for fisheries to improve over time. This would be an undesirable consequence in an area (ecosystem management) where major improvements are certainly required worldwide, and where relatively modest improvements in practice could lead to dramatic improvements in outcome. In short, it will be incumbent on the MSC to constantly raise the performance requirements for certification under Principle 2 if the MSC initiative is to be successful in encouraging the management of fisheries from an ecosystem perspective. It is also important that the MSC ensure that all certifiers understand the differences in performance inherent in evaluating the management of fisheries from an ecosystem perspective so that fisheries do not pass with low expectations or without guaranteed requirements for improvement.

6.2.2 Performance Indicators and Scoring Guideposts for the Western Rock Lobster Fishery

Principle 1

Indicator 1A: There is adequate knowledge about the target species being fished.

The intent of this performance indicator is to evaluate the extent to which there is sufficient knowledge of the life history, distribution and abundance of the target species to allow an adequate evaluation of the effects of the fishery on the target species.

Elements considered in scoring include that:

1. There is adequate knowledge of the identity of the target species, and its range and stock structure.
2. There is adequate knowledge of the life history (fecundity, growth, natural mortality) and behavior of the target species.

3. There is adequate information on trends in abundance of spawning stock, larval recruitment, and fishery recruitment over time.

100% Scoring Guidepost

- There is comprehensive knowledge of the taxonomy of the species, its range, and of any genetic sub-structuring of fished populations based on state-of-the-art techniques.
- There is comprehensive knowledge of key life history parameters, and of the behavior and ecology of key life history stages.
- Fishery independent surveys of spawning stock size and recruitment are available over a substantial period of the history of the fishery.

80% Scoring Guidepost

- The target species is unlikely to be confused with any other species. Research data are adequate to assess whether multiple stocks are being fished.
- Estimates are available of fecundity at size, growth rates, and natural mortality. There is some knowledge of seasonal patterns of movement or availability.
- Some fishery independent estimates of abundance are available (or fishery dependent estimates have been shown to be reliable).

Indicator 1B: There is adequate knowledge about the fishery

The intent of this performance indicator is to evaluate the extent to which there is sufficient knowledge of the fishery, including spatial and temporal patterns in catch and effort by all fishing methods, to allow an effective evaluation of the effects of the fishery on the target species.

Elements considered in scoring include that:

1. There is adequate monitoring of catch and effort.
2. There is adequate information on fishing methods and fishing patterns.
3. There is adequate information on gear selectivity and on changes in catchability over time.

100% Scoring Guidepost

- There are comprehensive data available at fine spatial and temporal resolution on fishing effort in all sectors and on catches and discards (by size and sex) from all fishing methods.
- There is an at-sea observation program to measure discarding and fishing practices.
- Research programs have established gear selectivity, discard mortality, and key determinants of catchability including, where relevant, environmental influences and changes in fishing technology and practices.

80% Scoring Guidepost

- Total annual catch and effort by major fishing methods are known for the major spatial zones of the fishery. Data are available to estimate levels of discards. Data on size composition of the catch are available on a regular basis.
- Gear selectivity of major fishing methods is known.
- Standardized catch rates are available for assessments, if required.

Indicator 1C: There is a well-defined and effective harvest strategy to manage the target populations

The intent of this performance indicator is to evaluate the extent to which there is a well-defined and effective harvest strategy in place that will maintain the target species at productive levels, or recover the target species to productive levels if already below such levels.

Elements considered in scoring include that:

1. Fishing effort is contained.
2. Management tools (input and/or output controls) are specified and appropriate.
3. The relationship between assessment advice and subsequent decisions is clear, and action is timely.

100% Scoring Guidepost

- There is an explicit and precautionary harvest strategy in place for management of the target species at sustainable levels.
- The harvest strategy specifies monitoring and stock assessment methods, and agreed rules for setting management measures on the basis of assessments.

- Effort levels are commensurate with the productive potential of the resource.

80% Scoring Guidepost

- There is an implicit harvest strategy in place that constrains harvest rates to sustainable levels.
- The harvest strategy is adaptive, and management measures are set on the basis of best scientific information, taking account of uncertainty.
- Effort levels are contained, and if excessive, measures are in place that are reducing overall levels of effort.

Indicator 1D: There is a robust assessment of the impacts of fishing on the target species.

The intent of this performance indicator is to evaluate the extent to which the methods used to assess the current and future impacts of the fishery on the target species are robust and rigorous.

Elements considered in scoring include that:

1. The assessment models used are appropriate to the biology of the species and the nature of the fishery.
2. The methods used to fit the models to data are statistically rigorous.
3. The sensitivity of the assessment to major uncertainties in data and assumptions has been evaluated and is reflected in management advice.
4. The assessment evaluates current stock status relative to prescribed reference points, and the future consequences of current harvest strategies.

100% Scoring Guidepost

- Assessment models and methods have been developed specifically for, and are appropriate to, the species and fishery in question and take account of all known and significant impacts of the fishery on the target species.
- Agreed harvest strategies are in place that specify monitoring strategies, assessment methods and decision rules for determining management response to assessment results. These harvest strategies have been formally evaluated using Monte Carlo simulation methods that take account of a wide range of uncertainties.

80% Scoring Guidepost

- Assessment models and methods are appropriate to the species and fishery and meet internationally accepted standards of rigor.
- Current stock size and harvest rates have been estimated and evaluated against appropriate limit reference points.
- The assessment takes account of key uncertainties and these are reflected in the management advice.

Indicator 1E: Stocks are not depleted and harvest rates are sustainable

The intent of this performance indicator is to evaluate whether the target species is currently overfished, and whether current harvest levels are sustainable.

Elements considered in scoring include that:

1. The assessment indicates that stocks are above specified limit reference levels.
2. The assessment indicates that harvest rates are below specified limit reference levels.
3. The limit reference points used meet acceptable international standards.

100% Scoring Guidepost

- The limit reference point selected for the stock is at least as precautionary as B_{MSY} .
- Weighted across all major uncertainties, there is better than a 90% chance that the stock is above the limit reference point.
- The limit reference point selected for the exploitation rate is at least as precautionary as F_{MSY} .
- Weighted across all major uncertainties, there is better than a 90% chance that the current exploitation rates are below the limit reference point.

80% Scoring Guidepost

- A biomass limit reference point has been chosen that is appropriate for the species and is above levels for which major declines in recruitment have been observed or are expected.
- The stock is assessed to have a better than 70% chance of being above the limit reference point.

- A limit reference point has been chosen for the exploitation rate that is appropriate for the species.
- There is greater than a 70% chance that the current exploitation rate is below the limit reference level.

Principle 2

Indicator 2A: There is adequate knowledge of the ecosystem and its values where the fishery operates

The intent of this performance indicator is to enable an evaluation of the extent to which there is sufficient knowledge of the ecosystem and its values so that the fisheries management system can determine the nature of the effects of fishing on the ecosystem. This includes the extent to which there is a sufficient and appropriate process that operates to gather such knowledge.

Elements considered in scoring include that:

1. Knowledge of the distribution of habitats and major assemblage types in relation to the distribution of the fishery is adequate.
2. Knowledge of the species diversity, population structures and the natural trophic relationships among species throughout the fished areas is adequate.
3. The types and distribution of functional feeding guilds of hard and soft substrates in the fished areas is well known.
4. The distributions of protected species are well known, together with the nature and distributions of their critical habitats.
5. Knowledge of the natural variability in the ecosystem is adequate, including the natural physical forcing factors such as dominant currents, seasonal patterns in oceanographic conditions, and river or coastal runoff.

100% Scoring Guidepost

- The major habitat types have been determined and mapped across the areas where the fishery operates, using a comprehensive biophysical habitat classification.
- There is comprehensive comparative data with non-fished but otherwise comparable ecosystems on species diversity, population structures and the natural trophic relationships among species.

- There is comprehensive comparative data with non-fished but otherwise comparable ecosystems on the types and distribution of functional feeding guilds of hard and soft substrates.
- The distributions of protected species and the habitats upon which they depend have been identified and mapped, including an assessment of temporal variability.
- The dominant natural large-scale factors responsible for structuring the coastal ecosystems and their composition are known, and the nature, spatial and temporal extent of the dominant ecological effects of the major ocean currents and river inputs have been defined.

80% Scoring Guidepost

- There is knowledge of the major types of habitat in the area of the fishery, and aspects of their distribution.
- Research has been or is being undertaken on the predators and prey of the lobster.
- The presence and distribution of protected species in the area of the fishery is known.
- There is knowledge of the natural variability in the ecosystem, including natural physical forcing factors such as dominant currents and seasonal patterns in oceanographic conditions.

Indicator 2B There is adequate knowledge of the fishery-based risk factors for the ecosystems

The intent of this performance indicator is to evaluate the extent to which knowledge of the operations of the fishery is sufficient for the fisheries management system to be able to identify the nature and importance of potential risks that the fishery may pose to the ecosystem. This includes the use of specific gear types, fishing deployment techniques, mooring and channel creation in fishing areas, and ancillary factors such as ropes, anchors, buoys, bait, discarded consumables, gear lost at sea, potential introductions of pest species, the impact of discards, the nature and extent of bycatch, and the disturbance to normal behavior of icon species.

Elements considered in scoring include that:

1. There is adequate knowledge of the potential for effects of the type of gear used in the fishery on the ecosystems, habitats and species that occur within the fished areas.
2. There is adequate knowledge of the potential for effects of the fishery operations on the ecosystems, habitats and species that occur within the fished areas.

3. There is adequate knowledge of the potential for ecosystems, habitats and species that occur within the fished areas to recover after fishing (or the fishery activity) has been removed.

100% Scoring Guidepost

- The extent of potential risks from fishing gear on the ecosystems, habitats and species that occur in the fished areas have been studied in detail and quantified, including the nature of any irreversible changes.
- The extent of potential risks from fishing operations on the ecosystems, habitats and species that occur in the fished areas have been studied in detail and the risks are quantified, including the nature of any irreversible changes.

80% Scoring Guidepost

- There is adequate knowledge of the types of fishing gear used, and the extent and location of their use.
- There is adequate knowledge of fishing practices, including levels and types of bycatch and discards, and amount and type of bait.
- There is adequate knowledge of lost gear and disposable wastes.

Indicator 2C: A scientifically defensible ecological risk assessment has been conducted to determine the potential impacts of the fishery on the environment.

The intent of this performance indicator is to evaluate the extent to which there are robust assessments or predictions of impacts of the fishery, and if they are based on reliable methods for estimating risks, inferring or detecting ecological changes, use data derived from robust sampling designs, and could infer important ecological changes if they were occurring.

Elements considered in scoring include that:

1. There have been adequate studies of, or assessments of, the impacts in space and time of the fishery on the ecosystem.

2. Impact detection and assessment is based on appropriate ecological understanding, on assumptions, sampling designs and inferential models that are appropriate, and uses space and time scales that are ecologically important.
3. The cause-effect models used in experimental studies to evaluate the nature of fishery impacts are appropriate, including their ecological, toxicological and statistical basis.
4. The natural dynamics of the ecosystem is adequately accounted for in determining the fishery-based impacts.
5. Factors outside the fishery management system that can have an impact on the fishery or the ecosystem are adequately considered in determining fishery-based impacts.

100% Scoring Guidepost

- The effects of the fishery have been determined by detailed comparative studies between fished and non-fished but otherwise comparable ecosystems, across large space and time scales and using a broad range of ecological attributes.
- Studies of causes and effects in the fishery are comprehensive across habitats, functional guilds, and protected species, and use ecologically important attributes and statistically robust designs.
- The impact-detection designs include space and time across a range of scales.
- The impact-detection designs include and control for the effects of factors outside the fishery in determining fishery impacts.

80% Scoring Guidepost

- There has been a comprehensive and peer-reviewed evaluation of the risks posed by the fishery to the environment (ecological risk analysis), based on existing information.
- Such an evaluation is based, at least in part, on information from fished versus unfished areas.
- There have been studies to address specific identified impact issues, and these have evaluated ecological risks using scientifically robust methods.

Indicator 2D: The fishery does not have unacceptable impacts on the ecosystem structure or function, on habitats, or on the populations of dependent or otherwise associated species.

The intent of this criterion is to evaluate the extent to which the fishery has unacceptable impacts on important aspects of the ecosystems, habitats or associated species where it operates.

Elements considered in scoring include the following, with reference to acceptable limits:

1. The effects of the removal of target species biomass on species that depend on it as a food source.
2. The effects of the removal of target species biomass on species that it consumes as food.
3. The effects of the fishery on the habitat structure, productivity and species diversity in fished areas.
4. The effects of by-catch, discarded species, including the target species, and bait on trophic structure and dynamics, species diversity, and productivity in fished areas.

100% Scoring Guidepost

- In the major fishing areas, the impacts of fishing on the distributions or abundance of the populations of the main prey and the predators of the target species are within acceptable limits, which have been defined.
- In the main habitats, the impacts of fishing on the structure, primary and secondary productivity and species diversity are within acceptable limits, which have been defined.

80% Scoring Guidepost

- No unacceptable impacts of the fishery on ecological systems have been demonstrated.
- Where specific impacts have been studied, the impacts are contained within acceptable limits.
- Research programs are investigating the impacts of the fishery on the main habitats and the main predators and prey of the target species.
- Attempts have been made to identify acceptable limits to change for ecological impacts on key habitats and species.

Indicator 2E: The fishery is conducted in a manner that does not have important impacts on protected, endangered, or threatened species.

The intent of this performance indicator is to evaluate the extent to which the fishery has important impacts on highly valued icon species, and particularly those identified in National or State legislation and regulations.

Elements considered in scoring include that:

1. There is adequate knowledge of the direct interactions of the fishery on protected, threatened and endangered species, such as through by-catch, entrainment, effects on behavior, or physical disruption of seabird colonies and populations.
2. There is adequate knowledge of the extent of interruptions, removals, mortalities of protected, threatened or endangered species caused by the fishery.

100% Scoring Guidepost

- Research data show that the effects of the fishery or its operation on the populations, distribution and abundance of any protected, endangered, or threatened species (identified under any State or Commonwealth legislation or regulation) that occur in the areas where the fishery operates, and adjacent to shore-based installations, are within acceptable limits.

80% Scoring Guidepost

- The occurrences of any protected, endangered, or threatened species (identified under any State or Commonwealth legislation or regulation) in the areas where the fishery operates have been identified.
- Any formally implemented species management or recovery plans do not identify the fishery as a threatening, or potentially threatening, process.

Indicator 2F: The impacts of lost fishing gear or lost consumables such as plastic bait-box bands on target and non-target species are minimal.

The intent of this criterion is to evaluate the extent to which fishing gear and waste materials (such as bait bands, bait boxes, or other consumables) that are lost at sea have an impact on the target or non-target species

Elements considered in scoring include that:

1. There is adequate knowledge of the extent of lost fishing gear and its ghost fishing effects on target and non-target species, and any physical habitat damage.
2. There is adequate knowledge of the loss of consumable wastes, including bait-box bands, and their effects on target and non-target species, and any physical habitat damage.

100% Scoring Guidepost

- The nature of gear and consumables loss has been measured and assessed across the fishery, and the extent of impacts has been measured and shown to be a negligible threat to habitats, coastal ecosystems or species of concern that may be susceptible (e.g. seabirds, sharks, mammals, turtles, hard corals).

80% Scoring Guidepost

- The extent of gear and consumable loss from the fishery has been estimated in at least one area, and gear or consumable loss from the fishery is not cited as a threatening, or potentially threatening, process in any formally implemented species management or recovery plans.

Indicator 2G: Strategies are employed in the fisheries management system to address and restrain the impacts of the fishery on the ecosystem

The intent of this criterion is to evaluate the extent to which the fisheries management system includes an appropriate set of strategies designed to restrain and reduce any important impacts that may be detected.

Elements considered in scoring include that:

1. Regional ecological objectives for habitats and populations have been developed and promulgated.
2. The levels of acceptable change have been developed for a range of habitats and non-target species in the fished areas.
3. Monitoring programs designed to assess fishery impacts are operational.
4. Fishery management measures are in place to enable adjustment of fishery practices where unacceptable impacts have been identified.

100% Scoring Guidepost

- Regional management objectives and strategies designed to adequately protect ecosystems, habitats and populations from degradation are included as environmental objectives in the fisheries management plan.
- Fisheries operations use the objectives and limits for environmental change to guide operational practices.
- Variables related to ecosystems, habitats and populations of non-target species are included within the fisheries monitoring program and in the management plan, and these data are used to guide and revise fishery management practices.

80% Scoring Guidepost

- The fisheries management plan includes management objectives and strategies for key aspects of the ecosystem, including habitats, protected species, and species diversity where potential impacts of the fishery have been identified.
- The fisheries management plan has the appropriate arrangements to adjust fishery operations if adverse ecological impacts of the fishery are detected.

Principle 3

Indicator 3A: A comprehensive and effective management plan or management system is in place

The intent of this performance indicator is to evaluate the extent to which there is a comprehensive and effective management plan or management system in place for the fishery.

Elements considered in scoring include that the management plan or system includes:

1. Clear short and long term sustainability (resource and environment) objectives.
2. Operational criteria and performance measures related to the objectives.
3. Strategies and procedures for implementing the plan.
4. Processes for monitoring and performance evaluation.

5. Guidelines for acting on evaluations.
6. An effective consultative process.
7. Consideration of legal and customary rights of indigenous or subsistence fishers.
8. Dispute resolution mechanisms for processes arising within the plan.
9. A process for periodical external review of the management plan or system.

100% Scoring Guidepost

- The management system includes all of the above elements.
- An evaluation has been undertaken which shows that the management system fully complies with relevant international and national agreements.
- The management system includes comprehensive strategies and procedures for implementation.
- Performance evaluation is frequent and thorough.
- The consultative process is transparent and includes all substantial stakeholders.
- Management plans and/or arrangements are subject to independent external audit.
- There are no subsidies supporting fishing operations.

80% Scoring Guidepost

- The management system comprises at least elements 1 to 5 of criterion 3A.
- Fishing appears to comply with international and national agreements (including agreed catch limits).
- A set of general arrangements operate to see that the management plan is implemented.
- The consultative process is inclusive.
- Management plans and arrangements are open to public scrutiny.
- There are no unusual or unique subsidies supporting fishing operations.

Indicator 3B: There is a harvest strategy to achieve the management objectives for the target species

The intent of this performance indicator is to evaluate the extent to which there is an effective harvest strategy in place for management of the target species.

Elements considered in scoring include that:

1. The harvest strategy should include monitoring of the resource and fishery, a periodic assessment of the status of the resource, and the way in which harvest levels will be altered on the basis of assessments.
2. Actions should be taken in a timely and adaptive fashion on the basis of the best available information, using a precautionary approach to deal with scientific uncertainty.
3. Harvest strategies should maintain stocks at productive levels (specified by appropriate target and limit reference points), and should provide for the recovery of depleted stocks to specified levels within specified time frames.
4. Harvest strategies should be evaluated using robust assessment methods that consider the use of a range of management tools.
5. Stock assessments and harvest strategy evaluation should be undertaken in an open process and the methods and results made available in published reports.
6. There should be periodic external review of stock assessments and harvest strategy evaluations.

100% Scoring Guidepost

- Stock assessments are published documents subject to periodical external review.
- Harvest strategies are explicit and have been formally evaluated and externally reviewed.

80% Scoring Guidepost

- Stock assessments are written documents available for public examination.
- Harvest strategies are implicit but are designed to achieve a sustainable resource.

Indicator 3C: There is a strategy to manage the environmental impacts of fishing

The intent of this performance indicator is to evaluate the extent to which there is an effective strategy in place to manage the environmental impacts of fishing.

Elements considered in scoring include that:

1. Strategies have been put in place to address significant environmental impacts of fishing.
2. The effectiveness of such strategies has been assessed.

100% Scoring Guidepost

- Effective strategies are in place to address and reduce significant impacts; such strategies have been demonstrated to be feasible and achievable in this or other similar fisheries and ecosystems.

80% Scoring Guidepost

- Potential environmental impacts of fishing have been considered.
- Strategies are implemented or being developed to address publicly identified concerns about environmental impacts of fishing.

Indicator 3D: There is a research and monitoring strategy designed to support the management plan for the fishery

The intent of this performance indicator is to evaluate the extent to which there is an effective research and monitoring strategy that supports and is closely linked to the overall management of the fishery.

Elements considered in scoring include that:

1. There is a strategic plan for monitoring and research linked to the management plan.
2. The plan balances consideration of needs across resource and environmental management objectives.

100% Scoring Guidepost

- The plan is comprehensive and balanced.
- There is wide stakeholder input in development of the plan, and the plan is subject to external review.

80% Scoring Guidepost

- The plan puts greatest emphasis on resource sustainability but addresses high priority environmental concerns.
- The plan is a publicly available document.
- The fraction of the value of the fishery spent on research and monitoring is appropriate.

Indicator 3 E: There are compliance and enforcement strategies designed to support the management plan for the fishery

The intent of this performance indicator is to evaluate the extent to which there is an effective compliance and monitoring strategy in place to support the management of the fishery.

Elements considered in scoring include that:

1. There is an effective process for development and implementation of cost-effective compliance and enforcement strategies.
2. The effectiveness of such strategies is measured.
3. There are periodical external reviews of strategies.

100% Scoring Guidepost

- There is a very high level of compliance with agreed management arrangements and measures.
- Fishers are significantly involved in the collection of catch, discard and other information.
- Strategies are judged to be effective by external reviewers.

80% Scoring Guidepost

- There is an adequate level of compliance with agreed management arrangements and measures.
- Fishers are involved in the collection of catch and other information.

Indicator 3F: Fishing operations are carried out in a manner that minimizes unintended impacts on the resource and the ecosystem

The intent of this performance indicator is to evaluate the extent to which fishing operations are carried out in a manner that minimizes unintended impacts on the resource and ecosystem.

1. The fishery does not use destructive fishing practices such as use of explosives or poisons.
2. There are strategies and measures to minimize inadvertent impacts of fishing on target species. These could include altering the selectivity of gear, and improving handling and discarding practices.

3. There are strategies and measures to minimize inadvertent impacts of fishing on ecological systems. These could include altering the deployment of gear, use of by-catch exclusion devices, and minimizing operational wastes such as loss of fishing gear, oil spills and disposal of bait box bands.

100% Scoring Guidepost

- There is an effective code of conduct for responsible fishing that is fully supported by fishers.
- Fishing gear and operations are designed for minimum impact on non-target species and the ecosystem.
- Release procedures for target species ensure maximum survival at release.
- There is no operational waste from fishing operations.

80% Scoring Guidepost

- There is an education and awareness program for fishers concerning responsible fishing practices.
- Fishing is conducted in a way that attempts to reduce impacts on non-target species and the ecosystem.
- Release procedures for target species attempt to minimize mortality at release.
- Operational waste is at low levels, and plans to minimize it are supported by fishers.

6.3 Comments of stakeholders

Stakeholders comments were minimal as they concerned the actual Principles and Criteria drafted by the MSC. The most significant comments came from the environmental community stakeholders with regard to Principle 2. The concern expressed in a letter to the MSC was that no fishery could meet the expectations of Principle 2 as currently drafted, and that to make more realistic claims in the marketplace, Principle 2 should be redrafted to indicate that certification is based on identifying progress towards ecosystem management in a significant and fruitful manner.

There were no stakeholder comments regarding the drafted performance indicators or the scoring guideposts as these were not readily available to stakeholders for comment. The lack of availability

was due to the amount of time required to develop and update the indicators and guideposts prior to the issuance of this report.

6.4 List of relevant legislation and applicable national regulations

The legislative basis for management of the Western Rock Lobster Fishery consists of Western Australia legislation:

1. The West Coast Rock lobster Management Plan 1993
2. Ministerial Policy Guidelines
3. The Fish Resources Management Act 1994 (*the Act*)
4. Fish Resources Management Regulations 1995

Binding documents to which Australia is a party and might conceivably apply to the Western Rock Lobster Fishery are:

1. The United Nations Convention on Biological Diversity
2. The United Nations Convention on the Law of the Sea

7.0 Assessment Team Site Visits

7.1 Itinerary of main organizations/people visited

All visits, interviews, and inspections were conducted between July 1, 1999 and October 15, 1999. The assessment team identified the following organizations and or people to contact and meet in order to properly evaluate the management activities associated with the Western Australian Rock Lobster Fishery:

- WA Fisheries Perth, Australia
 - Management
 - Research

- WA Fishing Industry Council, Perth, Western Australia
- Professional Fisher's Associations, Perth, Western Australia
 - Geraldton PFA
 - Central West Coast PFA
 - Leeman PFA
 - Kalbarri PFA
 - Seabird & Ledge Point PFA
 - Zone C PFA
 - Western Australian Rock Lobster Fishers Federation
 - United Mid-West PFA
- Environmental Protection Authority (EPA), Perth, Western Australia
- Conservation and Land Management (CALM)
 - Perth, Western Australia
 - Geraldton, Western Australia
- Western Australia Rock Lobster Processors
 - Lobster Australia Rock Lobster Processing Plant, Perth, Western Australia
 - Vinci Seafoods Rock Lobster Processing Plant, Perth, Western Australia
 - Kalis Bros. Rock Lobster Processing Plant, Perth, Western Australia

7.2 Justification for selection of items and places/vessels inspected.

The sites and people chosen for visits and interviews were based on the assessment team's need to acquire information about the management operations of the fishery under evaluation. As all fishery resources are a public resource, they are managed by government agencies. Using the expertise of the team, agencies and their respective personnel responsible for fishery management, fisheries research, fisheries compliance, and habitat protection were identified. In addition, professional fisher's associations and industry associations were identified and contacted. Likewise, other government agencies with any probable input into the management or operations of the fishery or management of the general environment in which the fishery operates were contacted.

Fisheries WA Management provided the bulk of all the documentation required in understanding the management system, including the management plan and all its affiliated documents. Fisheries WA also provided information on compliance measures required in the fishery to ensure legal fishing within the bounds of the effort controls (licenses and catch statistics) in place in the fishery.

Fisheries WA Research Laboratories were chosen for audits and interviews as the group charged with all research and data collection necessary for proper understanding and management of the fishery, including ecosystem impacts. Fisheries research responsibilities include but are not limited to stock assessments; ecological monitoring; data collection on catch and effort; bycatch data collection (including independent at-sea observers programs, voluntary fishing vessel observer programs, and mandatory vessel operator data collection programs); observations about on-board lobster handling procedures; and observations and data collection on interactions with protected, threatened, and endangered species.

CALM was identified for interviews as the management authority charged with conservation measures in the coastal zone. If significant impacts had been or were currently occurring in the rock lobster fishery, CALM would be one of the lead agencies in identifying and addressing the problems.

The EPA was identified for interviews as the lead agency in WA in charge of general environmental protection. In addition, the Chairman Mr. Bernard Bowen, has in-depth knowledge of the rock lobster fishery as a former scientist in charge of managing the fishery.

WAFIC was consulted for the overall views of the industry and for data/information on industry-based programs to limit environmental impacts. WAFIC provided direct information on risk assessments for imported bait, a code of practice for on-board lobster handling procedures, and the Rock Lobster Industry Advisory Committee (RLIAC) process for recommending management and research programs for the lobster fishery.

The professional fisher's associations were identified as important to interview not only because they are stakeholders in the fishery, but as resources for information/data pertinent to fishing operations

(gear development, gear deployment), on-board lobster handling practices, and mandatory and voluntary data collection programs on-board fishing vessels. To ensure that the assessment team fully understood how these issues were handled throughout the fishery, we met with a group representing all the major lobster fishers throughout WA.

The rock lobster processors were identified as an important contingent to interview and audit as they are integral to two important aspects in the fishery: a) the effort to monitor the catch taken from the fishery, and b) the chain of custody for all landed WA rock lobster. As part of the compliance program in WA, all processors are regularly checked by compliance officers for illegal landings of lobsters (illegal size limits, or breeding females). In addition, processors also readily identify boats where landed lobsters look stressed from improper handling. At that time, processors will provide feedback to ensure the boat can identify the problem and rectify it so as to maintain compliance with the industry code of conduct for proper on-board handling procedures. All licensed boats are signatories to the industry code of practice for on-board handling practices. The industry code of practice not only ensures that landed lobster are delivered in excellent condition, but provide for the proper and careful return of breeding females and undersized individuals to the fishery. Information was gathered on data collection and compliance systems for all processors in WA. Random inspections were also carried out at 3 facilities as a check on the information provided. Aspects of the chain of custody were also inspected to see that all processors could ensure a) that supplied lobsters were from legal catches, and b) that all lobsters were identifiable at the point of sale.

8.0 STAKEHOLDER CONSULTATION

8.1 Identification of significant stakeholders influenced by the fishery

The significant stakeholders in the Western Australia rock lobster fishery are:

- Commercial Fishers
- Recreational Fishers
- Non-governmental environmental groups
- Government Agencies (non-fisheries)

- Fish processing businesses

8.2 Summary of use-rights (both legal and customary), which relate to the fishery

The only existing established rights are in those granted through recreational and commercial fishing licenses granted under the Fish Resources Management Act 1994 and the rights of aboriginal people to fish on a recreational basis.

Section 6 of the Fish Resources Management Act 1994 exempts an aboriginal person from having a recreational fishing license for the purposes of recreational fishing. Accordingly, *the Act*, gives aboriginal persons an ongoing right to take rock lobster in accordance with the regulations for recreational rock lobster fishing.

Recreational licenses are provided for under Part 13 of *the Act* and, in accordance with section 258 (b) of *the Act*, the nature of a recreational fishing license is further prescribed in regulations 123 and 124 of the Fish Resources Management Regulations 1995. In practice a recreational fishing license provides annual access to the fishery for the purposes of recreational rock lobster fishing.

Part 6 of *the Act* provides for licensing of commercial fishermen by a managed fishery license (MFL) in managed fisheries such as the West Coast Rock Lobster Fishery. Section 68 and 143 of the Act implies an expectation that, subject to satisfactory compliance licenses will be renewed on an annual basis. The nature of the rights to fish with a Managed Fishery License are detailed in both *the regulations* and *the Management Plan*. *The Management Plan* (Regulation 15) also provides for transfer rights in respect of licenses and pot entitlements.

The West Coast Rock Lobster Fishery operates as a unitised fishery with transferable pot entitlements. Commercial fishermen hold a fishing boat license (FBL) for their vessels, a Managed Fishery License (MFL) giving them access to the managed West Coast Rock Lobster fishery and rock lobster pot entitlements that regulates the number of rock lobster pots they may use in their fishing operations.

Commercial fishermen hold a reasonable expectation that, provided they comply with fisheries and related legislation, remain "fit and proper" to hold a license and pay the required license fees when due, they will have their licenses renewed on an annual basis. Similarly, they hold an expectation that they may be able to sell or transfer their licenses without undue restriction by the Government. Therefore, while the existing legislation does not provide any explicit property rights to fishermen, the industry perceives an implicit right, albeit if only an ongoing right of variable access to the fishery. This is reflected both in the market value of licenses and pot entitlements and the willingness of the banking and finance sectors to accept licenses and pot entitlements as prime security to support industry borrowings.

The nature and extent of both explicit and implicit rights provided to all fishermen under the existing State legislation, is subject to occasional debate. Understandably, many fishermen would like the nature of these rights to be more explicit and secure while Governments have generally been reluctant to transfer, or be perceived to transfer, the property of community resources to individual fishermen. These issues have been further discussed in two Fisheries Management Papers "*Use of Market Mechanisms for the Allocation of Commercial Fishing Access Entitlements in Western Australia*" and "*A Pricing Policy for Fisheries Agencies*."

"Use of Market Mechanisms for the Allocation of Commercial Fishing Access Entitlements in Western Australia" Fisheries Management Report Number 2 Economic Consulting Services April 1998

"A Pricing Policy for Fisheries Agencies" Fisheries Management Paper 98 Fisheries WA March 1997.

8.3 Names and affiliations of people formally consulted by the Assessment Team

8.3.1 Endorsed MSC Contact Persons

At the time of the assessment and report, there were no endorsed MSC contact persons in Australia or surrounding areas.

8.3.2 Government organizations involved in fishery management

1. Fisheries WA

- Jim Penn
- Norm Hall
- Nick Caputi
- Ross Gould
- Peter Rogers
- Paul Fitzpatrick
- Kim Nardi
- Wayne Godenzie
- Richard Sellers
- Kevin Donahue
- Colin Chalmers

2. Department of Agriculture, Fisheries, and Forestry

- Matthew Kinross-Smith, Fisheries and Aquaculture Branch

3. CALM (Department of Conservation and Land Management)

- Chris Simpson
- Mike Meinema
- Keirnan Macnamara
- Barry Wilson

4. WA Parliamentary Inquiry Panel on Ecologically Sustainable Development

- Christine Sharp

5. The Abrolhos Islands Management Advisory Committee (AIMAC)

- Michael Hardy

6. The WA Marine Parks and Reserves Authority (MPRA) responsible for marine reserves in WA.
 - Michael Hardy

7. Environmental Protection Authority
 - Bernard Bowen

8.3.3 Non-government organizations

1. Australian Conservation Foundation
 - David Sutton
 - Margi Prideaux
2. Conservation Council of Western Australia
 - Rachel Siewart
3. Marine and Coastal Community Network
 - Denis Bereos
4. Australian Marine Conservation Society
 - Edwina Davies Ward
5. World Wildlife Fund
 - Margaret Moore
 - Katherine Short
 - Denise True
6. Wilderness Society
 - Nic Dunlop

8.3.4 Other stakeholders, including employees and local people

1. Western Australian Fishing Industry Council (Inc.)
 - Brett McCallum
 - Guy Leyland

- John Cole
- Ian Finlay
- 2. Western Rock Lobster Development Association
 - Tony Gibson
- 3. Central West Coast Professional Fishers Assoc. (PFA)
 - Graham Eaton
- 4. Leeman PFA
 - Harold Waas
- 5. Kalbarri PFA
 - Ralph Blundell
- 6. Seabird & Ledge Point PFA
 - Guy Edgar
- 7. Geraldton PFA
 - John Fitzhardinge
- 8. Zone C PFA
 - Chris Bisse
 - Keith Pearce
- 9. Western Australian Rock Lobster Fishers Federation
 - Dan McDaniel
- 10. United Mid-West PFA
 - Terry Ash
- 11. RECFISHWEST
 - Frank Prokop
- WA Coastal Tour

8.4 Information obtained and conclusions drawn.

Each group identified above met with members of the assessment team to share specific views on the fishery as well as any concerns they had with the idea of certification. A general description of the information provided by organization is listed below.

Fisheries WA

As the management authority in charge of all aspects of the fishery, the bulk of the information obtained by the assessment team on all aspects of the fishery (i.e. the management system, management plan, compliance, research, etc.) was provided by this organization. In general, Fisheries WA felt they complied with the MSC Principles and Criteria.

The FWA personnel were able to recall observations of turtles carried out some years ago in response to accusations that lobster fishers cut the heads off turtles that became entangled in fishing gear. The cited observations were during years when turtles were found in the district (not often). The citations were about turtles with missing heads, the cause of which were rumored to be entanglement with lobster gear. In FWA's view, these incidences were mostly from predation by sharks (teeth marks evident). No turtles were found with clean knife-type cuts.

In further discussions, the team received comments on the potential threat to protected, threatened, or endangered species. In general, it was noted that the observer program in place in the fishery would not normally be expected to systematically document any interactions of the fishery with protected species. While they may document some interactions, the system could be improved to guarantee that any interactions are noted and reported in annual bycatch summaries. FWA considered that the Abrolhos Island Management Plan and the vesting of the Islands with Fisheries (the FHPA) were the key factors that empowered FWA to move their focus for management of the Abrolhos Fishery towards including more ecosystem-based management approaches. The only example FWA was able to put forward of how this was being implemented was the existence of an FRDC grant application on reef health and monitoring at the Abrolhos. An outline of the proposed project was provided to the assessment team.

Department of Agriculture, Fisheries, and Forestry

This organization provided the assessment team with a brief letter outlining the pertinent national and international laws/regulations that pertain to Australian Fisheries. In general, there are few binding international arrangements making the majority of the regulations pertinent to the fishery at national and local levels.

CALM

As the WA organization in charge of managing the land and coastal areas and providing habitat protection, we sought from CALM any information and concerns it may have with regard to the rock lobster fishery. In so doing, the team met with CALM managers from the head office in Perth, and with the regional managers in Geraldton. No major concerns about the rock lobster fishery were voiced. In their opinion, there were no significant interactions from fishers or fishing gear that were causing problems either with the habitat or with protected, threatened, or endangered species. While over the years there have been some reported interactions with sea lions, turtles, and whales, most of these were limited to few incidences and appeared to be of no real consequence to the overall management of the fishery.

CALM provided information on the process and implementation of a strategy to identify and put in place marine parks through Western Australia. This became important due to the fact that a marine park had been proposed and was under consideration in Jurien Bay during the tenure of this assessment. One of the concerns expressed by CALM is that it did not want to make recommendations that were contradicted by the MSC evaluation. We assured CALM that the MSC assessment was independent of the actions being taken to establish a marine park and would be performed in an objective manner. To that end, we would consider whether the fishery was considering necessary actions to minimize environmental effects of fishing, noting that marine parks were just one method of addressing the problem.

In further discussions with a CALM scientist, it was observed that populations of Australia Sea Lions were not increasing as expected, and although there was little or no data, it was considered possible that there may be a detrimental interaction between the lobster fishery and the Sea Lion population. This was based on observations mainly from other Australian rock lobster fisheries, and the assessment team considered the issue remained very uncertain.

In general, CALM had no significant data or information suggesting severe habitat impacts or negative interactions with protected species by the WRL.

WA Parliamentary Inquiry Panel on ESD

Contact was made via an introduction by WAFIC to a parliamentary committee formed in WA to conduct an inquiry into the Ecologically Sustainable Development of the rock lobster fishery. The inquiry was requested by the Western Australian Rock Lobster Fishers Federation because of its concerns that the management of the fishery was not equitable. The concerns of the federation were mostly associated with allocation of resources within the fishery (see below). The inquiry panel chose not to talk with the assessment team at this time unless the team wanted to make a formal submission to the committee. The team did not make a formal submission.

The Abrolhos Islands Management Advisory Committee and The WA Marine Parks and Reserves Authority (MPRA)

The information provided by these organizations was in relation to the overall management of the Abrolhos Islands. As the Abrolhos Islands represent an important area of coral reef habitat in the fishery, are a significant seabird habitat, have important national biodiversity values, and are considered in need of specific management. The information we obtained indicates that the Abrolhos Islands Management Committee is strictly advisory in nature. It appears that the committee is still in its infancy and is slowly making progress with regard to specific management or monitoring activities.

Environmental Protection Authority

The assessment team met with Mr. Bernard Bowen, Chairman, and formerly the person who set up and ran the management system for the rock lobster industry. Mr. Bowen was asked to comment specifically on the role that the EPA did or could have with regard to the fishery and any views he had on issues of concern, especially with regard to habitat management. Mr. Bowen pointed out that at this time the EPA did not play a role in managing or advising management on the rock lobster fishery. He did point out that if asked by the fishery managers, the EPA could provide some support on issues of habitat and ecosystem management.

Australian Conservation Foundation, Conservation Council of Western Australia, Marine and Coastal Community Network, Australian Marine Conservation Society, and Wilderness Society

These groups met jointly with the assessment team on 2 occasions. During the second meeting, the NGOs provided a 2-page summary of their concerns about potential negative interactions with protected, threatened, or endangered species; habitat destruction from fishing gear; and lack of knowledge about the impacts of removing a large number of lobsters from the ecosystem. In addition, the NGOs expressed concern about the MSC Principles and Criteria (especially Principle 2 on Ecosystem Management) and about the transparency of the MSC certification process. The specific concerns were:

- Mechanical damage caused by pots - mainly to coral reefs but limited knowledge about effects in limestone reefs and seagrass beds.
- Bycatch types and extent - Seabirds, seal pups, and sea lion pups killed by getting caught in lobster pots. Also, no proper reporting of bycatch.
- Behavior changes of other marine animals - lack of knowledge about the effects of spent bait and the entrainment of some species on lobster fishing activities.
- Ghost fishing from lost and damaged pots
- Threats from imported bait
- Negative impacts on sea lions from reduction in a known food source
- Negative impacts from marine debris.

The additional concerns regarding the MSC Principles and Criteria and the certification process focused on the fact that it is difficult to know much about marine ecosystems and therefore difficult to say that any fishery in the world would be able to make an outright claim to thorough and proper ecosystem management. The NGOs provided thoughtful comments regarding the way in which the MSC should consider changing its requirements and its public statements about sustainability. The assessment team urged the NGOs to take these matters up with the MSC directly.

World Wildlife Fund

The team met with members of WWF on a couple of occasions. WWF provided no specific comments regarding problems in the fishery, only noting that it was concerned about being kept abreast of the process and the findings.

WAFIC

Considering WAFIC is the client, it was made clear that the industry believed it had one of the best managed fisheries in the world and could prove that through the MSC certification process.

WRLDA

This organization represents the processors in Western Australia and echoed the same sentiment as WAFIC.

Central West Coast PFA, Leeman PFA, Kalbarri PFA, Seabird & Ledge Point PFA, Geraldton PFA, Zone C PFA, Western Australian Rock Lobster Fishers Federation, United Mid-West PFA

These fishing organizations met with the assessment team as a group. In general, the fishers thought the fishery was well managed. There were no real concerns about bycatch, negative interactions with non-target species, or with large scale habitat damage. The group provided insights into habitat damage from pots, which they deemed minimal, and rare sightings of negative interactions with seabirds, seals, sea lions, turtles, manta rays, or whales. They also provided information on ghost fishing and use of different baits in lobster traps. The group also indicated as fishers they would not be opposed to reasonable steps to improve recordings about bycatch or about interactions with seabirds and marine mammals.

The representative from the federation of rock lobster fishers (the same federation sponsoring the parliamentary inquiry) was asked if the federation was interested in speaking separately with the assessment team. We repeated the fact that we were specifically interested in developments that the federation felt impacted negatively on the proper management of the resource or on the ecosystem. We were told that while the federation had some issues with internal allocation within the fishery, and with equitable distribution of management decision making, they did not have issues with the management of the resource or the ecosystem. The team followed up with a letter asking the federation for a formal written submission about their concerns or lack of concerns; however, the federation did not respond.

RECFISHWEST

Frank Prokop provided the assessment team with a thorough overview of the interactions between commercial and recreational lobster fishers. In general, Frank considered that the consensus was that the recreational lobster fishers did not have any issues with regard to the overall management of the resource or of the habitat. While there were some issues regarding license fees and allocation, they were not of consequence to the proper management of fishery resources and habitat.

WA Coastal Tour

Two members of the assessment team attended a Coastal Tour Meeting in Geraldton. These Coastal Tours form an important part of the consultation process with the fishing industry and regional communities, and are an annual event. Here they were able to hear concerns from the local community as expressed to the tour organizers. The team did not participate in the process except to sit in the audience and listen. After the presentations, the 2-team members were able to visit individually with a variety of people from management authorities and from the local community. No significant issues of concern to the certification assessment were found in the public discussions.

9.0 OBSERVATIONS AND PERFORMANCE EVALUATIONS

PRINCIPLE 1 - RESOURCE MANAGEMENT

Performance Indicator 1A: There is adequate knowledge about the target species being fished.

Score: 95

The intent of this scoring indicator is to evaluate the extent to which there is sufficient knowledge of the life history, distribution and abundance of the target species to allow an adequate evaluation of the effects of the fishery on the target species.

Elements considered in scoring include that:

1. There is adequate knowledge of the identity of the target species, and its range and stock structure.
2. There is adequate knowledge of the life history (fecundity, growth, natural mortality) and behavior of the target species.

3. There is adequate information on trends in abundance of spawning stock, larval recruitment, and fishery recruitment over time.

100% Scoring Guidepost

- There is comprehensive knowledge of the taxonomy of the species, its range, and of any genetic sub-structuring of fished populations based on state-of-the-art techniques.
- There is comprehensive knowledge of key life history parameters, and of the behavior and ecology of key life history stages.
- Fishery independent surveys of spawning stock size and recruitment are available over a substantial period of the history of the fishery.

80% Scoring Guidepost

- The target species is unlikely to be confused with any other species. Research data are adequate to assess whether multiple stocks are being fished.
- Estimates are available of fecundity at size, growth rates, and natural mortality. There is some knowledge of seasonal patterns of movement or availability.
- Some fishery independent estimates of abundance are available (or fishery dependent estimates have been shown to be reliable).

Assessment of performance

The Australian western rock lobster has been the subject of a very comprehensive research program over a considerable period of time. This is not too surprising since, as indicated elsewhere in this report, the WRL fishery is the largest and most valuable rock lobster fishery in the world, with catches in excess of 8,000t per year since the early 1960s, averaging 10,700t per year since 1980. Moreover since limited entry to the fishery was initiated in the early 1960s, it has also been a consistently profitable fishery. It is the highest value fishery in Australia and forms a very significant part of the regional economy in Western Australia. For this and other reasons there has been a tradition of close and effective co-operation in management and research between government and industry over an extended period of time, with good support from the fishing industry for basic and applied research on the target species.

Reviews of research on the WRL may be found in Hancock (1981), Brown (1991) and Phillips and Brown (1989). The basic biology, including the identity of the species, was established early, and all basic life history parameters (fecundity, growth, natural mortality) have been studied and are well understood. Tagging studies, as well as information on spatial and temporal patterns of catches, have established the seasonal and life history stage movement patterns of WRL. Genetic studies indicate a single panmictic population, although there is still some uncertainty about spatial structuring of the population within the area of the fishery. Particularly impressive has been the long history and quality of investigations into larval settlement and recruitment, and their relationship to spawning stock, environmental factors, and subsequent recruitment to the fishery and catches, summarized in a series of publications (Caputi and Brown, 1989, 1993; etc). There is a continuous time series of data on larval settlement since the late 1960s. In recognition of concerns about using fishery dependent catch rates as an index of stock abundance, a fishery independent survey of spawning stock levels was established and has operated since 1992.

Strengths relative to this criterion

- There has been a well funded, well co-ordinated, and well executed research program on western rock lobster since the early 1960s. This program has been well supported by the fishing industry.
- The fishery is targeting a single well-identified species, which is not found elsewhere.
- The basic life history parameters of fecundity, growth and natural mortality are well established.
- Fishery independent surveys of spawning stock are available since 1992.
- Larval settlement has been monitored since 1969 and has been shown to be an accurate predictor of fishery recruitment. A clear relationship has been established between larval settlement and environmental factors, but for the range of stock levels observed there is no relationship with breeding stock levels.
- While the spatial origin of egg production is uncertain, there are studies under way to better understand larval mixing and recruitment under various oceanographic circumstances.

Weaknesses relative to this criterion

- Despite evidence of a single genetic stock, there is acknowledged uncertainty about spatial structuring in the population.

Recommendations

The time series of larval settlement and fishery independent spawning stock surveys provides a sound critical element for assessment and management of this stock. It is important to ensure that a future downgrading of this monitoring will not occur given the current changes to full cost recovery in the fishery.

Performance Indicator 1B: There is adequate knowledge about the fishery

Score: 95

The intent of this performance indicator is to evaluate the extent to which there is sufficient knowledge of the fishery, including spatial and temporal patterns in catch and effort by all fishing methods, to allow an effective evaluation of the effects of the fishery on the target species.

Elements considered in scoring include that:

1. There is adequate monitoring of catch and effort.
2. There is adequate information on fishing methods and fishing patterns.
3. There is adequate information on gear selectivity and on changes in catchability over time.

100% Scoring Guidepost

- There are comprehensive data available at fine spatial and temporal resolution on fishing effort in all sectors and on catches and discards (by size and sex) from all fishing methods.
- There is an at-sea observation program to measure discarding and fishing practices.
- Research programs have established gear selectivity, discard mortality, and key determinants of catchability including, where relevant, environmental influences and changes in fishing technology and practices.

80% Scoring Guidepost

- Total annual catch and effort by major fishing methods are known for the major spatial zones of the fishery. Data are available to estimate levels of discards. Data on size composition of the catch are available on a regular basis.
- Gear selectivity of major fishing methods is known.
- Standardized catch rates are available for assessments, if required.

Assessment of performance

Monitoring of the fishery, and research on the potential impacts of the fishery on the target species, have been comprehensive, for the same reasons that research on the biology and population dynamics of the WRL has been comprehensive (the value and importance of the fishery). The history of this monitoring and research is recorded in the same review papers (refs).

Annual catch and effort data are available since 1945 (the start of the “modern” fishery, and the start of significant levels of catch), with effort recorded as nominal pot lifts. More detailed spatial and temporal patterns in catch and effort data are available since 19xx, and the current commercial fishers’ compulsory monthly logbook was introduced in 19xx. In addition, a voluntary commercial fishers’ research logbook was introduced in 19xx, currently involving about 30% of the fleet. This records daily catch and fishing effort data, as well as supplementary information on (discards, environmental conditions). Fish processors also complete compulsory returns on production by grade (size) category. An at-sea commercial catch monitoring program has operated since 19xx. Data from all these monitoring programs are stored and maintained on a research database.

A significant recreational fishery has developed for WRL in shallow waters close to population centers. This comprised 4% of the total catch by the late 1980s, and has increased further to almost 8% in recent years. Licenses are required for recreational fishers to catch WRL, and there is an annual postal survey that is used to estimate the total annual catch.

Research has been undertaken on gear and gear selectivity. Handling practices and discard mortality have also been the subject of research (Brown and Caputi, 1986). Both these areas of research have been used to modify and standardize gear (pots), and to develop codes of practice for on-board handling and discarding of WRL that fall outside legal size limits.

Changes in fishing power (effective versus nominal effort) have been of major concern and have received detailed attention (Fernandez et al, 1998). Time series of standardized commercial catch rates have been developed and used in stock assessments, along with fishery independent surveys.

Strengths relative to this criterion

- There is a comprehensive program to collect and analyze data on catch and effort for the commercial fishery. This relies on a compulsory reporting requirement for all fishers, augmented by a voluntary research logbook program with a significant level of industry participation.
- Logbook data are supplemented with an independent at sea observer program that also collects information on size composition of the catch and level of discards.
- Information is also available in recent years on levels of recreational catch.
- There has been considerable research effort on design of gear and handling practices to minimize discard mortality.
- The impacts of changes in technology on fishing power have been investigated, and time series of standardized catch rates are available.
- Fishers from all areas participate in the logbook program, and while they are not randomly chosen, they do provide a relative indicator of catch distribution and catch rate.

Weaknesses relative to this indicator

- Even as strong as the logbook program is, there may be some minor concerns about whether the data from the voluntary logbook program are representative of the fleet as a whole.

Recommendations

Improvement in recording of data for at sea monitoring program and voluntary logbook

Impacts of cost recovery

Performance Indicator 1C: There is a well-defined and effective harvest strategy to manage the target populations

Score: 87

The intent of this performance indicator is to evaluate the extent to which there is a well-defined and effective harvest strategy in place that will maintain the target species at productive levels, or recover the target species to productive levels if already below such levels.

Elements considered in scoring include that:

1. Fishing effort is contained.
2. Management tools (input and/or output controls) are specified and appropriate.
3. The relationship between assessment advice and subsequent decisions is clear, and action is timely.

100% Scoring Guidepost

- There is an explicit and precautionary harvest strategy in place for management of the target species at sustainable levels.
- The harvest strategy specifies monitoring and stock assessment methods, and agreed rules for setting management measures on the basis of assessments.
- Effort levels are commensurate with the productive potential of the resource.

80% Scoring Guidepost

- There is an implicit harvest strategy in place that constrains harvest rates to sustainable levels.
- The harvest strategy is adaptive, and management measures are set on the basis of best scientific information, taking account of uncertainty.
- Effort levels are contained, and if excessive, measures are in place that are reducing overall levels of effort.

Assessment of performance

The history of management measures in this fishery is described more fully elsewhere (see Appendix 1). Early measures included limits on minimum size and the taking of egg bearing females, introduced in the late 1800s. Closed seasons to protect spawning stock were first introduced in 1962, and limited entry including limits on number of boats and pots was instituted in 1963. Use of escape gaps in pots became mandatory in 1966, with reductions in pots in 1987 and 1992, and further restrictions on retention of female lobsters in 1992. The use of output controls (quotas) has been debated, but the fishery remains input managed.

The success of these management measures is demonstrated by the maintenance of high average levels of catch over an extended period of time (average of 10,700t over the past two decades). Variations in catch from year to year are closely related to larval settlement levels 3 or 4 years earlier, and these in turn seem to be more influenced by environmental factors than by levels of spawning stock.

Nevertheless, exploitation rates have been high (ref) and evidence emerged in the early 1990s that egg production was at historically low levels (15 to 20% of unfished levels, Walters et al, 1993). There was no evidence of declines in recruitment at these levels, and in fact no evidence at all of a relationship between parental stock levels and subsequent larval settlement and recruitment to the fishery.

Nevertheless, a decision was taken to institute measures to rebuild the stocks to at least 25% of unfished egg production levels. Current evidence is that the stock has recovered to about 30% of pristine egg production over the past six years (Hall, unpublished data). Clearly this has been a successful strategy and a demonstrated response to a perceived problem. Nevertheless, some concern could be expressed for the fact that the problem was allowed to arise in the first place. The speed of response to the perceived problem appears adequate, particularly taking into account the need to work through a consultative process.

The current harvest strategy consists of a set of input controls designed to maintain the stock above 25% of pristine egg production. It is not clear if these reference levels are intended as a target or limit. Current effort levels would apparently stabilize the stock at about 30% of pristine egg production (Hall, unpublished data).

Strengths relative to this criterion

- A wide array of input controls is in place, designed to protect egg production and maintain stocks at productive levels.
- There is clear evidence of an effective management response to assessment advice, which suggested that the stock might have been overfished in the early 1990s.
- A biological reference point has been set, and management measures aim to maintain the stock above this level.
- Fishing effort is contained and current effort levels appear to be sustainable.

Weaknesses relative to this criterion

- The biological reference points now stated for the stock could be misinterpreted as somewhat ambiguous as a range of 20-25% is commonly stated, even though we have been told that 25% can now be considered a limit reference point in this fishery.

Recommendations

- The current harvest strategy should be formalized and made more explicit, and alternatives explored and evaluated.

Performance Indicator 1D: There is a robust assessment of the impacts of fishing on the target species.

Score: 87

The intent of this performance indicator is to evaluate the extent to which the methods used to assess the current and future impacts of the fishery on the target species are robust and rigorous.

Elements considered in scoring include that:

1. The assessment models used are appropriate to the biology of the species and the nature of the fishery.
2. The methods used to fit the models to data are statistically rigorous.
3. The sensitivity of the assessment to major uncertainties in data and assumptions has been evaluated and is reflected in management advice.

4. The assessment evaluates current stock status relative to prescribed reference points, and the future consequences of current harvest strategies.

100% Scoring Guidepost

- Assessment models and methods have been developed specifically for, and are appropriate to, the species and fishery in question and take account of all known and significant impacts of the fishery on the target species.
- Agreed harvest strategies are in place that specify monitoring strategies, assessment methods and decision rules for determining management response to assessment results. These harvest strategies have been formally evaluated using Monte Carlo simulation methods that take account of a wide range of uncertainties.

80% Scoring Guidepost

- Assessment models and methods are appropriate to the species and fishery and meet internationally accepted standards of rigor.
- Current stock size and harvest rates have been estimated and evaluated against appropriate limit reference points.
- The assessment takes account of key uncertainties and these are reflected in the management advice.

Assessment of performance

There have been three different approaches to stock assessment for WRL, each applied at a different point in time. The first period from the 1970s to the late 1980s involved use of surplus production models based around analysis of commercial catch and effort data (ref). This approach was replaced in the early 1990s by development of a detailed spatial simulation model, using more realistic assumptions about stock dynamics and fishing effects (Walters et al, 1993). This approach allowed better use of knowledge of stock specific life history parameters, stock movement, and effort distribution. It also allowed more explicit evaluation of more detailed and realistic management options. It was this analysis, along with data on increasing effort, increasing efficiency of fishing deeper

waters, and decreasing breeding stock that was used to argue the case for concerns about overfishing in the early 1990s, and to help design a recovery strategy.

Since the “new” management arrangements were implemented in 1992/93, there have been annual updates and reports made available to industry and managers on the status of the stock, including evidence for recovery of the spawning stock. These reports have been based around presentation of data from the fishery, particularly on the fishery independent spawning stock surveys instituted in 1992, the continuing monitoring of puerulus (larval) settlement, together with fishery dependent catch rates. The reports pay particular attention to the recovery in the spawning stock indices (for each of three management zones in the fishery), noting whether recovery appears to have reached target levels (usually expressed relative to corresponding levels in the late 1980s). It is not at all clear from these reports that estimates of recovery are based on an annually updated quantitative stock assessment. The only information presented in support of recovery is empirical plots of survey indices and commercial catch rates. There is also little evidence of a detailed analysis of uncertainties in stock recovery (although error bars are shown on plots of survey indices).

More recently, a report has been made available to fishers and managers, summarizing the effects of the 1992/93 management measures on various indicators (breeding stock, catch, effort, catch rates, discards) up to 1996/97 (Anon, 1998?). This document provides a useful empirical evaluation of the outcomes of the management measures (plots of data) but does not appear to be based on any formal quantitative modeling.

Several unpublished reports were provided to the review team outlining recent (post 1993) work in quantitative assessment and modeling (ref). There is a current research project to develop more sophisticated simulation models to replace the Walters et al (1993) model. Work on these models is currently on hold and few details were provided (other than their purpose, to evaluate future region-specific management options, and to incorporate economic considerations in evaluating options). The most recent modeling focus has been to develop models of moderate complexity to investigate the differential impact of the various management measures put in place in 1992/93 in aiding stock recovery. Technical details of this model were provided in an unpublished report, and another report

outlined the main conclusions from the analyses. This work appears to be technically sound, but is still at an early stage of development and has yet to formally presented or reviewed. In particular, there has been little attempt so far to assess sensitivities to a range of possible uncertainties in data and model assumptions.

On request from the review team, estimates were provided of current stock levels relative to other reference points (B_{MSY}).

Strengths relative to this criterion

- Past evaluations (Walters et al, 1993) have evaluated stock status and have been used to explore the possible consequences of management options. This research was instrumental in identifying a possible problem with the stock, and in identifying a possible solution to that problem. The modelling was published in a prestigious international journal and was at the forefront of such research at the time.
- More recent assessment advice appears to have been based almost entirely on a set of empirical stock indicators, the most important of which is a time series of fishery independent estimates of spawning stock levels. The strength of such assessment rests on the quality of the data. This would appear to be sound.
- Recent modeling, to investigate the differential impacts of recent management measures, appears sound but needs to be taken further and has yet to be formally presented or reviewed.

Weaknesses relative to this criterion

- There is a lack of adequate documentation for recent quantitative assessments, which have yet to be formally presented or reviewed.
- Current quantitative assessment lacks a thorough analysis of sensitivities to uncertainties in data and model assumptions.
- Current quantitative assessments focus on effects of current management measures, but should be expanded to include an evaluation of the consequences of future measures, considering a wider range of management options.

Recommendations

- Make publicly available comprehensive documentation on current assessments and seek external peer review.
- Undertake a more comprehensive risk assessment of current strategies.
- Continue to develop models to evaluate future management options.

Performance Indicator 1E: Stocks are not depleted and harvest rates are sustainable

Score: 92

The intent of this performance indicator is to evaluate whether the target species is currently overfished, and whether current harvest levels are sustainable.

Elements considered in scoring include that:

1. The assessment indicates that stocks are above specified limit reference levels.
2. The assessment indicates that harvest rates are below specified limit reference levels.
3. The limit reference points used meet acceptable international standards.

100% Scoring Guidepost

- The limit reference point selected for the stock is at least as precautionary as B_{MSY} .
- Weighted across all major uncertainties, there is better than a 90% chance that the stock is above the limit reference point.
- The limit reference point selected for the exploitation rate is at least as precautionary as F_{MSY} .
- Weighted across all major uncertainties, there is better than a 90% chance that the current exploitation rates are below the limit reference point.

80% Scoring Guidepost

- A biomass limit reference point has been chosen that is appropriate for the species and is above levels for which major declines in recruitment have been observed or are expected.
- The stock is assessed to have a better than 70% chance of being above the limit reference point.

- A limit reference point has been chosen for the exploitation rate that is appropriate for the species.
- There is greater than a 70% chance that the current exploitation rate is below the limit reference level.

Assessment of performance

Evaluation against this performance indicator is made more difficult by the absence of formally published quantitative assessment information. Evaluation against the scoring guideposts is therefore undertaken against published empirical data on spawning stock levels (refs) and unpublished reports on quantitative assessments (refs).

The current biological reference point used in this fishery is 25% (sometimes 20-25%) of unfished levels of egg production (here designated E_0). Its choice is apparently based on a desire to recover the stock to levels corresponding approximately to those in the late 1970s. It should be noted that, even without other considerations, this level would appear to be precautionary. Despite the stock having reached levels as low as 15% of E_0 , there is no empirical evidence that this led to a decline in recruitment levels (larval settlement or subsequent fishery recruitment). Recruitment seems to be mainly environmentally determined (ref).

The biological reference point B_{MSY} is now being advocated internationally as a default (precautionary) limit reference point for stock management. Calculating B_{MSY} for WRL requires some assumptions to be made about stock and recruitment. Assuming a “steepness” in a Beverton-Holt stock recruitment relationship of 0.95 (Francis, 1993) allows an estimate of B_{MSY} for WRL which turns out to be well below the current suggested reference level of 25% of E_0 (ref). Therefore on both empirical and theoretical counts, the current WRL reference point can be considered precautionary (especially if it is regarded as a limit reference point).

Current available information does not allow an estimate of the probability that the stock is above the reference level. However empirical (ref) and modelling (ref) results clearly indicate that the stock has recovered to about 30% of E_0 , and may even recover further under current management arrangements.

This would also suggest that current fishing mortality rates are also safe, although this has not been formally evaluated.

Strengths relative to this criterion

- There is clear empirical evidence of a recovery of the stock to well above the current management reference level. That is, the stock can no longer be considered as overfished.
- The biological reference point chosen (25% of E_0) is well above B_{MSY} , which is a current default precautionary limit.
- Indications from unpublished data are that fishing mortality rates are substantially below F_{MSY} (Hall, 1999).

Weaknesses relative to this criterion

- There is no quantitative risk assessment for current stock status, so it is difficult to quantify levels of risk (but empirical evidence suggests that they are likely to be low).

Recommendations

- There is a need to develop a more quantitative assessment of risks of overfishing.

Relative weighting of the performance indicators for Principle 1

Utilizing the judgement-based weighting protocol described in Sections 6.2.1 and 6.2.2 of this report, the Evaluation Team arrived at cardinal indices of relative importance for the performance indicators associated with MSC Principle 1. These weights of relative importance were derived using AHP's paired comparisons as to the relative importance of each indicator. The derived weights represent the team's collective judgement as to the extent to which each indicator should contribute to the overall evaluation of the WA Rock Lobster Fishery.

Indicators	Normalized Weight
1A - Knowledge of target species	0.15
1B - Knowledge of the fishery	0.12

1C - Well defined harvest strategy	0.23
1D - Assessment of impact on target species	0.19
1E - Stocks not depleted, sustainable harvest	0.32

Importance-weighted aggregate score for Principle 1

Multiplying the indicator scores by their respective weights of relative importance and summing the scores across all indicators yields an overall normalized, weighted score for this principle of:

90

This computed score significantly exceeds the 80-point threshold for certification. The general conclusion to be reached is that, over the breadth of issues and considerations included in this Principle, WA Fisheries managers are doing an exemplary job of managing the WA Rock Lobster Fishery for the sustainability of the resource. Though the overall performance falls within the exemplary range, there are nevertheless areas for improvement that are outlined in the recommendations under each indicator.

PRINCIPLE 2 - ECOSYSTEM MANAGEMENT

Performance Criterion 2A: There is adequate knowledge of the ecosystem and its values where the fishery operates

Score = 80

The intent of this performance indicator is to enable an evaluation of the extent to which there is sufficient knowledge of the ecosystem and its values so that the fisheries management system can determine the nature of the effects of fishing on the ecosystem. This includes the extent to which there is a sufficient and appropriate process that operates to gather such knowledge.

Elements considered in scoring include that:

1. Knowledge of the distribution of habitats and major assemblage types in relation to the distribution of the fishery is adequate.

2. Knowledge of the species diversity, population structures and the natural trophic relationships among species throughout the fished areas is adequate.
3. The types and distribution of functional feeding guilds of hard and soft substrates in the fished areas is well known.
4. The distributions of protected species are well known, together with the nature and distributions of their critical habitats.
5. Knowledge of the natural variability in the ecosystem is adequate, including the natural physical forcing factors such as dominant currents, seasonal patterns in oceanographic conditions, and river or coastal runoff.

100% Scoring Guidepost

- The major habitat types have been determined and mapped across the areas where the fishery operates, using a comprehensive biophysical habitat classification.
- There is comprehensive comparative data with non-fished but otherwise comparable ecosystems on species diversity, population structures and the natural trophic relationships among species.
- There is comprehensive comparative data with non-fished but otherwise comparable ecosystems on the types and distribution of functional feeding guilds of hard and soft substrates.
- The distributions of protected species and the habitats upon which they depend have been identified and mapped, including an assessment of temporal variability.
- The dominant natural large-scale factors responsible for structuring the coastal ecosystems and their composition are known, and the nature, spatial and temporal extent of the dominant ecological effects of the major ocean currents and river inputs have been defined.

80% Scoring Guidepost

- There is knowledge of the major types of habitat in the area of the fishery, and aspects of their distribution.
- Research has been or is being undertaken on the predators and prey of the lobster.
- The presence and distribution of protected species in the area of the fishery is known.

- There is knowledge of the natural variability in the ecosystem, including natural physical forcing factors such as dominant currents and seasonal patterns in oceanographic conditions.

Assessment of Performance

The fishery is considered to have reasonable knowledge of the identity and general distributions of protected and other icon species and their important habitats in relation to the fishery. However, there is only limited knowledge of the ecosystem more generally, including main substrates, habitats, species diversity and trophic relationships for non-target species where the fishery operates. Existing knowledge is mainly in inshore and shallow waters. There is little available knowledge of the deeper water habitats and ecosystem where the bulk of the fishery operates.

Overall, the evaluation is that considerably more basic knowledge of the ecosystem is required, particularly in deeper waters outside the coastal reef system, in order to enable potential impacts of the fishery to be fully evaluated.

Strengths relative to this Indicator

- The major habitat types and their distributions in shallow inshore waters where the fishery operates are reasonably known, and this knowledge is best in the Abrolhos and Dongara areas.
- The main predators and food of the lobster in the shallow coastal reef systems and inshore waters are known.
- The distributions of the main protected and highly valued species are adequately known
- Large scale oceanographic processes that affect the ecosystem and the lobster are adequately known or are being adequately studied in research projects.

Weaknesses relative to this indicator

- Knowledge of the distribution of some habitats in shallow coastal waters, such as algal beds, seagrass assemblages, and soft sediment faunal assemblages is weak.
- Knowledge of the habitats in deeper waters (>20m) is limited to only very basic information about the substrate.

- The dominant predators and prey of the lobster are known only for inshore waters, and this only from fished areas.
- The natural trophic and functional interactions between lobster and their predators and prey are poorly known.
- The interactions between coastal development, the lobster and the ecosystem are largely unknown.

Recommendations

- The fishery should initiate the development of a research program of habitat mapping across the full extent of the area in which the fishery operates. This would include the inshore and offshore waters, and be based on existing, data, knowledge and activities.
- Research strategies should be developed to study the natural trophic interactions between lobsters and their food in fished and unfished areas.

Research strategies should be developed to evaluate the interactions of coastal developments with the lobster, particularly the young, and dependent and associated species and habitats.

Performance Indicator 2B: There is adequate knowledge of the fishery-based risk factors for the ecosystems

Score = 90

The intent of this performance indicator is to evaluate the extent to which knowledge of the operations of the fishery is sufficient for the fisheries management system to be able to identify the nature and importance of potential risks that the fishery may pose to the ecosystem. This includes the use of specific gear types, fishing deployment techniques, mooring and channel creation in fishing areas, and ancillary factors such as ropes, anchors, buoys, bait, discarded consumables, gear lost at sea, potential introductions of pest species, the impact of discards, the nature and extent of bycatch, and the disturbance to normal behavior of icon species.

Elements considered in scoring include that:

1. There is adequate knowledge of the potential for effects of the type of gear used in the fishery on the ecosystems, habitats and species that occur within the fished areas.
2. There is adequate knowledge of the potential for effects of the fishery operations on the ecosystems, habitats and species that occur within the fished areas.

3. There is adequate knowledge of the potential for ecosystems, habitats and species that occur within the fished areas to recover after fishing (or the fishery activity) has been removed.

100% Scoring Guidepost

- The extent of potential risks from fishing gear on the ecosystems, habitats and species that occur in the fished areas have been studied in detail and quantified, including the nature of any irreversible changes.
- The extent of potential risks from fishing operations on the ecosystems, habitats and species that occur in the fished areas have been studied in detail and the risks quantified, including the nature of any irreversible changes.

80% Scoring Guidepost

- There is adequate knowledge of the types of fishing gear used, and the extent and location of their use.
- There is adequate knowledge of fishing practices, including levels and types of bycatch and discards, and amount and type of bait.
- There is adequate knowledge of lost gear and disposable wastes.

Assessment of Performance

The risk factors in the fishery are considered to be reasonably well known, although the long term cumulative environmental risks of fishing operations in the Abrolhos Islands or in the coastal reef ecosystems are not fully understood. New research is proposed to attempt to identify the extent of some of these risks. The extent of reversibility of any impacts is poorly known, and in particular substrate damage in shallow and deep waters.

Overall, the evaluation is that the risk factors in the fishery are adequately known, although this is less certain for the deeper offshore waters and the localized impacts of fishing operations in the Abrolhos Islands where the periodic use of the islands as fishing bases may potentially have impacts that are irreversible.

Strengths relative to this indicator

- There is adequate knowledge of the type of gear used, and the extent and pattern of use.
- Knowledge of gear damage, gear loss and other gear-related risks to the near-shore reef systems
- Extent and nature of by-catch, bait use and discards.
- Knowledge of lost equipment, bait bands, and consumable wastes.

Weaknesses relative to this indicator

- There is uncertainty about the source of all bait bands in coastal waters (coastal shipping may be contributing bands that appear in litter and are a risk to wildlife).
- The risk of gear damage and interactions with protected species, while seemingly low in offshore waters, is uncertain.
- The potential for irreversibility of substrate damage is only poorly known.

Recommendations

- The fishery should develop and implement a procedure for uniquely labelling and identifying bait bands used in the WRL, and a subsequent monitoring to identify their proportional contribution to coastal litter, with reference to other sources of similar plastic straps.
- The fishery should develop a research strategy to identify and assess any historic changes to coral reef habitats of the Abrolhos Islands that may be related to fishing operations.

Performance Criterion 2C: A scientifically defensible ecological risk assessment has been conducted to determine the potential impacts of the fishery on the environment.

Score = 65

The intent of this performance indicator is to evaluate the extent to which there are robust assessments or predictions of impacts of the fishery, and if they are based on reliable methods for estimating risks, inferring or detecting ecological changes, use data derived from robust sampling designs, and could infer important ecological changes if they were occurring.

1. There have been adequate studies of, or assessments of, the impacts in space and time of the fishery on the ecosystem.
2. Impact detection and assessment is based on appropriate ecological understanding, on assumptions, sampling designs and inferential models that are appropriate, and uses space and time scales that are ecologically important.
3. The cause-effect models used in experimental studies to evaluate the nature of fishery impacts are appropriate, including their ecological, toxicological and statistical basis.
4. The natural dynamics of the ecosystem is adequately accounted for in determining the fishery-based impacts.
5. Factors outside the fishery management system that can have an impact on the fishery or the ecosystem are adequately considered in determining fishery-based impacts.

100% Scoring Guidepost

- The effects of the fishery have been determined by detailed comparative studies between fished and non-fished but otherwise comparable ecosystems, across large space and time scales and using a broad range of ecological attributes.
- Studies of causes and effects in the fishery are comprehensive across habitats, functional guilds, and protected species, and use ecologically important attributes and statistically robust designs.
- The impact-detection designs include space and time across a range of scales.
- The impact-detection designs include and control for the effects of factors outside the fishery in determining fishery impacts.

80% Scoring Guidepost

- There has been a comprehensive and peer-reviewed evaluation of the risks posed by the fishery to the environment (ecological risk analysis), based on existing information.
- Such an evaluation is based, at least in part, on information from fished versus unfished areas.
- There have been studies to address specific identified impact issues, and these have evaluated ecological risks using scientifically robust methods.

Assessment of Performance

The risks to the ecosystem from the fishery or its operations have not been studied in any detail. The best available information is from studies conducted in the Abrolhos Islands, but this is of limited scope in terms of ecological attributes, space and time.

Overall, the evaluation is that there has been an inadequate assessment of the risks of the fishery to protected species, to the physical and biological structure of inshore and offshore habitats, and to trophically related or otherwise dependent species.

Strengths relative to this indicator

- Studies of gear and fishing operations damage on and near reef systems of the Abrolhos Islands
- Studies of pot damage/impacts from other Australian lobster pot fisheries

Weaknesses relative to this indicator

- No comprehensive inventory of all the risk factors for the effects of the fishery on the ecosystems has been undertaken.
- Assessments of the impacts of the fishery have not been undertaken by comparing fished with unfished areas.

Requirements for Continued Certification

1. - Within 14 months of certification, a comprehensive and scientifically defensible assessment of the risks of the fishery and fishing operations to the ecosystem (ecological risk assessment) must be completed, based on existing knowledge, and taking into account points 2 to 5 in criterion 2C. The assessment should consider risks of all aspects of fishing (see intent in criterion 2B) on species (including protected and ecologically related species), habitats, and biotic communities (see criterion 2A). The risk assessment will identify and prioritize gaps in knowledge. The risk assessment will produce a set of prioritized risks, and strategies to address those risks, including research strategies that will result in data of comparable value to those obtained from comparative studies between fished and unfished areas. The risk assessment will be reviewed by independent and external expert reviewers, and be available for public comment.

2. - Within 24 months of certification, an Environmental Management Strategy for the fishery will be prepared and distributed for public comment and input. The EMS will address impacts of the fishery on the environment, and will include proposed objectives, strategies, indicators and performance measures. The EMS will specify an operational plan, including implementation actions and a supporting program of research. Future research should aim to provide information on the impacts of the fishery on the ecosystem that is at least as scientifically valid as that produced by studies of fished versus unfished areas.

3. - Within 36 months of certification, the EMS will be effectively incorporated within the operational arrangements for the fishery

Performance Criterion 2D: The fishery does not have unacceptable impacts on the ecosystem structure or function, on habitats, or on the populations of dependent or otherwise associated species.

Score = 75

The intent of this criterion is to evaluate the extent to which the fishery has unacceptable impacts on important aspects of the ecosystems, habitats or associated species where it operates.

The following are within acceptable limits:

1. The effects of the removal of target species biomass on species that depend on it as a food source.
2. The effects of the removal of target species biomass on species that it consumes as food.
3. The effects of the fishery on the habitat structure, productivity and species diversity in fished areas.
4. The effects of by-catch, discarded species, including the target species, and bait on trophic structure and dynamics, species diversity, and productivity in fished areas.

100% Scoring Guidepost

- In the major fishing areas, the impacts of fishing on the distributions or abundance of the populations of the main prey and the predators of the target species are within acceptable limits, which have been defined.

- In the main habitats, the impacts of fishing on the structure, primary and secondary productivity and species diversity are within acceptable limits, which have been defined.

80% Scoring Guidepost

- No unacceptable impacts of the fishery on ecological systems have been demonstrated.
- Where specific impacts have been studied, the impacts are contained within acceptable limits.
- Research programs are investigating the impacts of the fishery on the main habitats and the main predators and prey of the target species.
- Attempts have been made to identify acceptable limits to change for ecological impacts on key habitats and species.

Assessment of Performance

Any major ecological effects of the fishery would have occurred in the 50s, 60s and early 1970s when the fishery expanded substantially. There is no substantive evidence that can be used to assess the nature and extent of ecological impacts of the fishery in all but some localized areas of the Abrolhos Islands. The risk assessment on the use of bait did not consider the ecological effects of bait use.

Overall, the evaluation is that although there are no ecological impacts of the fishery that are obvious at present, this is probably because the major effects would have occurred several decades ago, and there have been no assessment or monitoring strategies in place to detect current and ongoing impacts, particularly in deeper offshore waters. There are no institutionalized strategies that operate to detect current impacts of the fishery on any important (high priority) ecological attributes should they be occurring. There have been no assessments of the broad-scale ecological impacts of the fishery.

Strengths relative to this indicator

- Despite a long period of fishing, no major impacts of fishing on the marine environment have been identified.
- The distribution, intensity and use of pots across the fishery is well known
- The lobster food and feeding habits are known in one area of inshore reefs.
- The lobster food and feeding habits are known in one area of inshore reefs.

- Bycatch monitoring is conducted.
- Effects of fishing gear and fishing practices have been assessed on reefs in the Abrolhos area.
- Sources, quantities and use patterns of bait have been established.

Weaknesses relative to this indicator

- Effects of fishing gear and fishing practices have been minimally evaluated and monitored.
- The interactions of the fishery with coastal development and their impacts on coastal ecosystems is poorly understood.
- The impact of removing the lobster catch on diet and reproductive success of Australian Sea Lions is poorly understood.
- The effects of lobster removal on the complement of species it eats, while not expected to be of significance, are poorly understood.
- The effects of bait use on trophic structure and species diversity has not been fully assessed.

Recommendations

- The fishery should a strategy for development of a research program on the ecological effects of the use of bait in a variety of habits used by the fishery.

Requirements for Continued Certification

Within 24 months of certification, there will be increased participation of the environmental community or their representatives in the decision-making processes in the fishery. This will include consultation on impending decisions, and involvement (full participation) in decision-making committees at a range of levels in the fishery.

Performance Criterion 2E: The fishery is conducted in a manner that does not have important impacts on protected, endangered, or threatened species.

Score = 90

The intent of this performance indicator is to evaluate the extent to which the fishery has important impacts on highly valued icon species, and particularly those identified in National or State legislation and regulations.

1. There is adequate knowledge of the direct interactions of the fishery on protected, threatened and endangered species, such as through by-catch, entrainment, effects on behavior, or physical disruption of seabird colonies and populations.
2. There is adequate knowledge of the extent of interruptions, removals, mortalities of protected, threatened or endangered species caused by the fishery.

100% Scoring Guidepost

- Research data show that the effects of the fishery or its operation on the populations, distribution and abundance of any protected, endangered, or threatened species (identified under any State or Commonwealth legislation or regulation) that occur in the areas where the fishery operates, and adjacent to shore-based installations, are within acceptable limits.

80% Scoring Guidepost

- The occurrences of any protected, endangered, or threatened species (identified under any State or Commonwealth legislation or regulation) in the areas where the fishery operates have been identified.
- Any formally implemented species management or recovery plans do not identify the fishery as a threatening, or potentially threatening, process.

Assessment of Performance

There is limited information about the interaction of the fishery with protected or other icon species. Anecdotal information suggests that the fishery has only minor interactions with seals, dolphins, whales, manta rays or sea birds.

Overall, the evaluation is that the fishery has an acceptable level of impact on protected species known to occur in the fishing areas, although better information is required to confirm the evaluation.

Strengths relative to this indicator

- Pot design has been adjusted to reduce interactions with seals.

- Important breeding areas for seabirds and seals are designated as reserves.
- Pot damage and fishing operations in and near coral reefs of the Abrolhos are to be managed within an improved Abrolhos Islands Management Plan.
- Fishing for rock lobster has not been cited as a key threatening process under state or federal legislation, and controls on such fishing are not required under any species recovery plans

Weaknesses relative to this indicator

- Within the monitoring program, there does not exist a systematic documentation/quantification of the by-catches of, or other interactions with, seals, seabirds, sharks, manta rays, dolphins or whales.
- The extent to which the availability of lobsters as prey is controlling the recovery of the sea-lion populations is unknown.

Recommendations

1. The fishery should develop research strategies that involve CALM to assess importance of the removal of lobster biomass for the population success of Australian Sea Lions.

Performance Criterion 2F: The impacts of lost fishing gear or lost consumables such as plastic bait-box bands on target and non-target species are minimal.

Score = 90

The intent of this criterion is to evaluate the extent to which fishing gear and waste materials (such as bait bands, bait boxes, or other consumables) that are lost at sea have an impact on the target or non-target species

1. There is adequate knowledge of the extent of lost fishing gear and its ghost fishing effects on target and non-target species, and any physical habitat damage.
2. There is adequate knowledge of the loss of consumable wastes, including bait-box bands, and their effects on target and non-target species, and any physical habitat damage.

100% Scoring Guidepost

- The nature of gear and consumables loss has been measured and assessed across the fishery, and the extent of impacts has been measured and shown to be a negligible threat to habitats, coastal ecosystems or species of concern that may be susceptible (e.g. seabirds, sharks, mammals, turtles, hard corals).

80% Scoring Guidepost

- The extent of gear and consumable loss from the fishery has been estimated in at least one area, and gear or consumable loss from the fishery is not cited as a threatening, or potentially threatening, process in any formally implemented species management or recovery plans.

Assessment of Performance

The fishery has addressed the issue of loss of bait-box bands, although there is a need for constant vigilance to ensure that proper disposal procedures are maintained. The loss of other gear is a continuing problem, but ghost fishing is probably not a major problem given the short life of pots once lost at sea. The impact of lost pots on seal or seabird populations is largely unknown but is probably minor. The loss of gear and its contribution to beach litter is a continuing aesthetic issue.

Overall, the evaluation is that the fishery has only a minor problem with the loss of gear and consumables and their ecological impact on the environment, although the bait band issue needs ongoing vigilance.

Strengths relative to this indicator

- Response to the bait-band issue has been effective.
- Ghost fishing is a limited problem due to the limited life of lost gear and the mandatory use of escape gaps.

Weaknesses

- There is a continuing minor problem of loss of pots, floats, ropes etc that contributes to coastal litter.

- There are recent indications that bait bands may again be an increasing problem, although the sources are unclear.

Performance Indicator 2G: Strategies are employed in the fisheries management system to address and restrain the impacts of the fishery on the ecosystem

Score = 75

The intent of this criterion is to evaluate the extent to which the fisheries management system includes an appropriate set of strategies designed to constrain and reduce any important impacts that may be detected.

1. Regional ecological objectives for habitats and populations have been developed and promulgated.
2. The levels of acceptable change have been developed for a range of habitats and non-target species in the fished areas.
3. Monitoring programs designed to assess fishery impacts are operational.
4. Fishery management measures are in place to enable adjustment of fishery practices where unacceptable impacts have been identified.

100% Scoring Guidepost

- Regional management objectives and strategies designed to adequately protect ecosystems, habitats and populations from degradation are included as environmental objectives in the fisheries management plan.
- Fisheries operations use the objectives and limits for environmental change to guide operational practices.
- Variables related to ecosystems, habitats and populations of non-target species are included within the fisheries monitoring program and in the management plan, and these data are used to guide and revise fishery management practices.

80% Scoring Guidepost

- The fisheries management plan includes management objectives and strategies for key aspects of the ecosystem, including habitats, protected species, and species diversity where potential impacts of the fishery have been identified.
- The fisheries management plan has the appropriate arrangements to adjust fishery operations if adverse ecological impacts of the fishery are detected.

Assessment of Performance

The fisheries management system contains few objectives and strategies designed to assess and monitor the effects of the fishery, and to identify any important impacts if they are occurring. However there has been a positive and reasonably effective response to issues that have arisen (such as fishing in the Abrolhos and bait bands). The use of FHPAs may prove to be an important tool as part of overall strategies to restrain any impacts that may be detected. The Regional Fisheries Ecosystem Reviews will assist in identifying issues, although they appear to lack any implementation procedures.

The evaluation is that the fishery management system appears deficient in taking a precautionary attitude towards detection of environmental impacts.

Strengths relative to this indicator

- Environmental impacts of fishing in areas of the Abrolhos Islands are being addressed using appropriate strategies.
- FHPA program may provide an important mechanism for restraining impacts

Weaknesses relative to this indicator

- While the overall environmental management system for the fishery does address the resource impacts of the fishery on the main non-target organism, octopus, it does not consider the ecological effects of removing octopus or of making prey readily available to octopus.
- Ecological objectives for attributes of the ecosystems are not included in the management system for the fishery.
- There are only limited operational monitoring programs in the fishery that are designed to track the impacts of the fishery on the ecosystem.

Recommendations

1. The fishery should work more actively with AIMAC, FWA, CALM and the environmental NGOs to develop and implement an effective Plan of Management for the Abrolhos Islands (and see Condition 4).

Requirements for Continued Certification

Within 12 months of certification, formal monitoring systems in the fishery will have improved arrangements for recording data on bycatch of, and any interactions of the fishery with, mammals, seabirds, manta rays, dolphins, or whales.

Relative performance of the indicators for Principle 2

Utilizing the judgement-based weighting protocol described in Section 6.2.1 and 6.2.2 of this report, the Evaluation Team arrived at cardinal indices of relative importance for the performance indicators associated with MSC Principle 2. These weights of relative importance were derived using AHP's paired comparisons as to the relative importance of each indicator. The derived weights represent the team's collective judgement as to the extent to which each indicator should contribute to the overall evaluation of the WA Rock Lobster Fishery.

Indicators	Normalized Weight
Knowledge of the ecosystem	0.07
Fishery-based risk factors	0.12
Scientific risk assessment	0.13
Impacts on the ecosystem	0.18
Threatened and Endangered species	0.17
Lost fishing gear and consumable wastes	0.08

Management system restrictions on impacts 0.26

Importance-weighted aggregate score for Principle 2

Multiplying the indicator scores by their respective weights of relative importance and summing the scores across all indicators yields an overall normalized, weighted score for this principle of:

80

This computed score barely meets the 80-point threshold for certification. The general conclusion to be reached is that, over the breadth of issues and considerations included in this Principle, considerable effort is still required in the WA Rock Lobster Fishery to bring it in line with the exemplary efforts being made in managing the resource. While the overall performance falls within the acceptable range, the performance nevertheless for several indicators fell short of expectations. This has led the team to conclude that the WA Rock Lobster Fishery complies with all the MSC Principles and Criteria and is certifiable. For continued certification, the WA Rock Lobster Fishery must meet the specific requirements outlined above.

PRINCIPLE 3 - MANAGEMENT SYSTEMS

Performance Criterion 3A: A management plan or management system is in place

Score: 85

The intent of this performance indicator is to evaluate the extent to which there is a comprehensive and effective management plan or management system in place for the fishery.

The management plan or system includes:

1. Clear short and long term sustainability (resource and environment) objectives.
2. Operational criteria and performance measures related to the objectives.
3. Strategies and procedures for implementing the plan.
4. Processes for monitoring and performance evaluation.
5. Guidelines for acting on evaluations.

6. An effective consultative process.
7. Consideration of legal and customary rights of indigenous or subsistence fishers.
8. Dispute resolution mechanisms for processes arising within the plan.
9. A process for periodical external review of the management plan or system.

100% Scoring Guidepost

- The management system includes all of the above elements.
- An evaluation has been undertaken which shows that the management system fully complies with relevant international and national agreements.
- The management system includes comprehensive strategies and procedures for implementation.
- Performance evaluation is frequent and thorough.
- The consultative process is transparent and includes all substantial stakeholders.
- Management plans and/or arrangements are subject to independent external audit.
- There are no subsidies supporting fishing operations.

80% Scoring Guidepost

- The management system comprises at least elements 1 to 5 of criterion 3A.
- Fishing appears to comply with international and national agreements (including agreed catch limits).
- A set of general arrangements operate to see that the management plan is implemented.
- The consultative process is inclusive.
- Management plans and arrangements are open to public scrutiny.
- There are no unusual or unique subsidies supporting fishing operations.

Assessment of Performance:

The fishery is not conducted under a controversial unilateral exemption to an international agreement. Overall there is an effective and reasonably comprehensive management system in place for the fishery.

The main thrust of the management measures used in this input-controlled fishery up to the early 1990s, has been to contain the inevitable increases in effective fishing effort that have occurred as the fishery and technology developed, and curtail the wasteful mortality of juveniles caused by poor fishing practices (Brown and Caputi, 1986).

Management in the 1990s focussed solely on rebuilding the breeding stock by significant reductions in the rate of exploitation. The reasons for so doing were numerous. Declines in the standard indices of egg production to levels never before recorded were seen and an estimate from the fishery model (Walters *et al.*, 1993) suggested egg production had declined to 15-20% of its unfished level. In addition, the deep water breeding stock became increasingly vulnerable to capture because of the use of Global Positioning Systems (satellite navigation) and color echo sounders (Brown et al. 1995).

As a result of a 1993/94 management package, the breeding stock and egg production have been returned to levels recorded in the late 1970s-early 1980s and appear to be stabilizing (Anon., 1998).

A comprehensive review of the long-term management strategies for the fishery and in particular an evaluation of the management options for the resource was made by Bowen (1994). Additional information is available in Appendix 1.

The management system, which controls these arrangements, is complex. It is not contained in a single management plan, as the Management Plan for this fishery (West Coast Rock Lobster Management Plan 1993) is a legal document which specifies who may operate in the fishery and the manner in which they can fish under the pot entitlement arrangements for the fishery. The management system includes, Regulations (issued under Fish Resources Management Regulations 1995), Notices under the Management Plan, License conditions, and Ministerial Guidelines.

Strengths Relative to This Indicator

- The management system is effective in managing the fishery.
- There are both resource and environment long term objectives in the management system.
- Systems for development of strategies and procedures for implementation are in place.

- There is a process for acting on evaluations.
- A general system of performance indicators is in place, based on annual reports and reports to parliament.
- There is a comprehensive, consultation process in place.
- Consideration of rights of indigenous fishers is taking place.
- Dispute resolution procedures are in place.

Weaknesses Relative to This Indicator:

- There is no single document that covers the management of the fishery. The documentation pertaining to management of the fishery is disparate, not generally available, and it was difficult to determine if all the relevant documents were examined.
- The environmental objectives are extremely general and not explicit, and are not specific to the western rock lobster fishery.
- There are no specific guidelines for action on evaluations,
- The consultative process is not inclusive, and the environmental community is not involved in the management decision-making process.
- There appears to be no process for external review of the management arrangements, except for specific questions, such as the National Competition Policy Legislation.

Recommendations

- The management plan is synthesized into a single document, which is made readily accessible to all stakeholders. This document should include statements of aims and objectives, performance indicators and consultative arrangements.
- Environmental objectives should be included in the plan, and the strategies for their implementation should include consultation with the environmental community.
- An external review of the management arrangements should be undertaken.

3B There is a harvest strategy to achieve the management objectives for the target species

Score:90

The intent of this performance indicator is to evaluate the extent to which there is an effective harvest strategy in place for management of the target species.

1. The harvest strategy should include monitoring of the resource and fishery, a periodic assessment of the status of the resource, and the way in which harvest levels will be altered on the basis of assessments.
2. Actions should be taken in a timely and adaptive fashion on the basis of the best available information, using a precautionary approach to deal with scientific uncertainty.
3. Harvest strategies should maintain stocks at productive levels (specified by appropriate target and limit reference points), and should provide for the recovery of depleted stocks to specified levels within specified time frames.
4. Harvest strategies should be evaluated using robust assessment methods that consider the use of a range of management tools.
5. Stock assessments and harvest strategy evaluation should be undertaken in an open process and the methods and results made available in published reports.
6. There should be periodic external review of stock assessments and harvest strategy evaluations.

100% Scoring Guidepost

- Stock assessments are published documents subject to periodical external review.
- Harvest strategies are explicit and have been formally evaluated and externally reviewed.

80% Scoring Guidepost

- Stock assessments are written documents available for public examination.
- Harvest strategies are implicit but are designed to achieve a sustainable resource.

Assessment of Performance

The current harvest strategy consists of a set of input controls designed to maintain the spawning stock above 20-25% of pristine egg production. The success of this measure is demonstrated by maintenance of high average levels of catch over an extended period of time. The fishery is currently experiencing the highest catch levels on record.

Strengths Relative to This Indicator

- The harvest strategy is effective in that the catches have been maintained for a long period at a relatively constant level, with the variations in catch being explained after scientific assessment, or due to management arrangements.
- The harvest strategies are well understood and the data on which they are based are discussed in public forums and published accounts such as the "State of the Fishery" on an annual basis.

Weaknesses Relative to This Indicator

- The annual scientific assessment on which the harvest strategy is based is not generally available, although the outcomes of the assessment are presented and discussed in public forums and annual reports.
- The harvest strategies are not explicit.
- There is no external review of the harvest strategy.

Recommendations

- Make publicly available comprehensive documentation on current assessments and seek review.

3C There is a strategy to manage the environmental impacts of fishing

Score:80

The intent of this performance indicator is to evaluate the extent to which there is an effective strategy in place to manage the environmental impacts of fishing.

1. Strategies have been put in place to address significant environmental impacts of fishing.
2. The effectiveness of such strategies has been assessed.

100% Scoring Guidepost

- Effective strategies are in place to address and reduce significant impacts; such strategies have been demonstrated to be feasible and achievable in this or other similar fisheries and ecosystems.

80% Scoring Guidepost

- Potential environmental impacts of fishing have been considered.
- Strategies are implemented or being developed to address publicly identified concerns about environmental impacts of fishing.

Assessment of Performance

The information that is available, suggests low adverse impact levels of interaction of the fishery with protected and endangered species, including whales, turtles and seals.

The potential environmental impacts of fishing have been considered, but mainly in the Abrolhos area. The Abrolhos Islands has been identified as a sensitive area and consideration has been made of potential impacts of fishing on the habitat, and protected and endangered species.

Because of publicly identified concerns with waste from fishing operations, a waste disposal plan has been introduced and the fishers generally support it.

Strengths Relative to This Indicator

- Some environmental impacts of fishing have been considered, such as at the Abrolhos Islands, have been dealt with, are in the process of being solved, or a research program is being implemented.
- Effective strategies have been implemented to address publicly identified concerns, such as waste from fishing operations.

Weaknesses Relative to This Indicator

- Almost no action has been taken to consider the general effects of fishing or the fishery on the environment, other than at the Abrolhos Islands.
- The information available to accurately assess the impact of the fishery on protected and endangered species is limited.

Recommendations

- A comprehensive assessment of the risks of the fishery and fishing operations on the ecosystem should be undertaken, and strategies developed to manage any adverse impacts, which are identified.

3D There is a research and monitoring strategy designed to support the management plan for the fishery

Score:87

The intent of this performance indicator is to evaluate the extent to which there is an effective research and monitoring strategy that supports and is closely linked to the overall management of the fishery.

1. There is a strategic plan for monitoring and research linked to the management plan.
2. The plan balances consideration of needs across resource and environmental management objectives.

100% Scoring Guidepost

- The plan is comprehensive and balanced.
- There is wide stakeholder input in development of the plan, and the plan is subject to external review.

80% Scoring Guidepost

- The plan puts greatest emphasis on resource sustainability but addresses high priority environmental concerns.
- The plan is a publicly available document.
- The fraction of the value of the fishery spent on research and monitoring is appropriate.

Assessment of Performance

The fishery has a long history of comprehensive research investigations and monitoring programs into a very wide range of aspects of the biology of the western rock lobster. There is an extensive published body of knowledge of the lobster arising from this research. Recent or ongoing research and monitoring programs are reported through Research Status Reports.

The research studies are linked to the needs of the fishery through the Management Advisory Committee, and research needed for management assessment are initiated and reviewed through this mechanism.

Strengths Relative to This Indicator

- The research and monitoring systems are very strong in support of the resource, including biology of the species, management arrangements and compliance.

Weaknesses Relative to This Indicator

- The research program is not strongly directed at environmental questions, and in particular at the impact of the fishery and fisheries operations on the ecosystem, except at the Abrolhos islands.

Recommendations

- The research program should be expanded to incorporate studies directed at determining the impact of the fishery and fisheries operations on the ecosystem.

3 E There are compliance and enforcement strategies designed to support the management plan for the fishery

Score:95

The intent of this performance indicator is to evaluate the extent to which there is an effective compliance and monitoring strategy in place to support the management of the fishery.

1. There is an effective process for development and implementation of cost-effective compliance and enforcement strategies.
2. The effectiveness of such strategies is measured.
3. There are periodical external reviews of strategies.
4. Fishers will assist and cooperate with management authorities in the collection of catch, discard, and other information of importance to the effective management of the fishery.

100% Scoring Guidepost

- There is a very high level of compliance with agreed management arrangements and measures.
- Fishers are significantly involved in the collection of catch, discard and other information.
- Strategies are judged to be effective by external reviewers.

80% Scoring Guidepost

- There is an adequate level of compliance with agreed management arrangements and measures.
- Fishers are involved in the collection of catch and other information.

Assessment of Performance

Levels of acceptance of the rules regulating the Western Rock lobster fishery and of compliance with those rules within the commercial catching sector is very high. The level of illegal activity, which continues to occur, is of a magnitude that has little significant impact on management objectives. The current enforcement costs are low, at about 1% of the landed value.

Strengths Relative to This Indicator

- The compliance arrangements are effective and considerable efforts are made to make them cost effective.
- There is considerable fisher involvement in data collection, including the use of voluntary logbooks.

Weaknesses Relative to This Indicator

- Monitoring and measurement of the effect of the fishery on endangered and protected species needs to be improved.

Recommendations

- Action should be taken to identify whether the bait bands, that are causing concern, arise from the fishery or other sources.

3F Fishing operations are carried out in a manner that minimizes unintended impacts on the resource and the ecosystem

Score:90

The intent of this performance indicator is to evaluate the extent to which fishing operations are carried out in a manner that minimizes unintended impacts on the resource and ecosystem.

1. The fishery does not use destructive fishing practices such as use of explosives or poisons.
2. There are strategies and measures to minimize inadvertent impacts of fishing on target species. These could include altering the selectivity of gear, and improving handling and discarding practices.
3. There are strategies and measures to minimize inadvertent impacts of fishing on ecological systems. These could include altering the deployment of gear, use of by-catch exclusion devices, and minimizing operational wastes such as loss of fishing gear, oil spills and disposal of bait box bands.

100% Scoring Guidepost

- There is an effective code of conduct for responsible fishing that is fully supported by fishers.
- Fishing gear and operations are designed for minimum impact on non-target species and the ecosystem.
- Release procedures for target species ensure maximum survival at release.
- There is no operational waste from fishing operations.

80% Scoring Guidepost

- There is an education and awareness program for fishers concerning responsible fishing practices.
- Fishing is conducted in a way that attempts to reduce impacts on non-target species and the ecosystem.
- Release procedures for target species attempt to minimize mortality at release.
- Operational waste is at low levels, and plans to minimize it are supported by fishers.

Assessment of Performance

The fishery does not use destructive fishing practices such as use of explosives or poisons.

The fishery has a long history of the use of escape gaps in the pots to allow escape of undersized lobsters.

There is a code of conduct for responsible fishing that is supported by the majority of fishers.

Recent impact issues that have been considered by the management system are:

1. Abrolhos Islands (including rock lobster pot fishing) relative to natural environmental effects (such as storm damage),
2. impact of imported bait on the environment,
3. impact of lost bait bands on sharks
4. impact of octopus predation on rock lobsters caught in pots
5. ghost fishing by lost pots
6. bycatch and discards from the fishery
7. trawling closures near the Abrolhos Islands
8. plans for a marine park at Jurien Bay

Strengths Relative to This Indicator

- No destructive fishing practices are used in the fishery, and the method used to capture the rock lobsters (pots) cause minimum adverse impacts.
- A code of practice for the operations of the fishery ensures minimum impacts on the undersized and oversized portion of the catch.
- There is an active program, which is supported by the fishers, to minimize operational wastes from the fishery.

Weaknesses Relative to This Indicator

- There are still some operational wastes from the fishery and some of these have been shown (bait bands) to have adverse effects on other species.

- Impacts of the fishery on the ecosystem have only been partly investigated.

Relative performance of the indicators for Principle 3

Utilizing the judgement-based weighting protocol described in Sections 6.2.1 and 6.2.2 of this report, the Evaluation Team arrived at cardinal indices of relative importance for the performance indicators associated with MSC Principle 3. These weights of relative importance were derived using AHP's paired comparisons as to the relative importance of each indicator. The derived weights represent the team's collective judgement as to the extent to which each indicator should contribute to the overall evaluation of the WA Rock Lobster Fishery.

Indicators	Normalized Weight
Management system/plan	0.30
Management objectives & harvest strategy	0.16
Strategy to manage environmental impacts	0.16
Research and monitoring strategy	0.16
Compliance and enforcement strategies	0.11
Fishing operations	0.11

Importance-weighted aggregate score for Principle 3

Multiplying the indicator scores by their respective weights of relative importance and summing the scores across all indicators yields an overall normalized, weighted score for this principle of:

87

As this computed score exceeds the 80-point threshold for certification, the general conclusion to be reached is that, over the breadth of issues and considerations included in this Principle, WA Fisheries managers are doing an exemplary job of providing a thorough management system for the WA Rock

Lobster Fishery.. Though the overall performance falls well within the range required for certification, there are nevertheless areas for improvement that are outlined as weaknesses under each indicator.

10.0 TRACKING, TRACING AND IDENTIFICATION OF FISH AND FISH PRODUCTS

10.1 The risk of fish and fish products from non-certified sources being mixed with certified fish

There is little chance that other species of rock lobsters from outside the WA Fishery would ever be mixed with the Western Rock Lobster *P. cygnus*. The species is distinctive to the only other lobster species in the general area (the Southern Rock Lobster) both in size and color. Additionally, the price for southern lobsters is significantly different and higher making it economically undesirable to mix southern lobsters in with western lobsters upon shipment.

10.2 A description of the control systems in place that address the risk identified in 10.1 above

Documents from 10 processors in Western Australia were reviewed, along with 3 randomly selected site audits at processing plants. There is absolute control and documentation for received lobsters as well as shipped product. Along with shipping and receiving records and invoices, each processor is audited 2 times a year by AQIS, the Australian Quarantine and Inspection Service, for quality control and HACCP (Hazard Assessment Critical Control Point). The Australian National HACCP requirements mandate that each processor be able to track shipped product back to the date shipped and the location of shipment. In addition, two other factors help ensure the chain of custody for Western Rock Lobsters:

1. Each processor is visited weekly by fisheries compliance officers during the fishing season to check on catch data and look for landings of illegal lobsters.
2. The entire Western Rock Lobster Fishery has been evaluated and certified, so all lobsters caught within this fishery and processed in Australia are eligible to carry the MSC ecolabel.

10.3 Description of the final point at which the certification body guarantees that a product is sourced from the fishery evaluated

From the information provided and the audits conducted, SCS can assure the MSC and the general public that any Western Rock Lobster leaving a processing plant in Western Australia originates from the certified fishery.

11.0 CONTROVERSIAL ISSUES

11.1 Explicit identification and discussion of controversial issues.

The Jurien Marine Reserve Issue

Western Australia has recently embarked on a major program of establishing new marine reserves. In 1994 the WA government released its 'New Horizons in Marine Management' policy on the conservation and management of the State's Marine Environment and in particular on establishing a system of multiple-use marine conservation reserves. The enabling legislation setting up the Marine Parks & Reserves Authority and the Marine Conservation Branch of CALM was passed in 1997.

The first reserve to be established under the new procedures is in the Jurien Bay area. The general area of the new reserve has been established by a broad-scale analysis of the needs for marine reserves, and CALM is now negotiating with stakeholders to decide on the boundaries and zoning for different uses in the reserve.

The conservation lobby has argued strongly for the inclusion of a large representative set of areas in the reserve to be designated as "no-take", on the grounds that this is the best mechanism for securing an adequate amount of representative habitats and species diversity into long term secure protection.

The fishing industry, and Fisheries Western Australia, have cooperated and are active participants in the negotiations over the Jurien reserve. The conservation lobby has recently withdrawn from active

negotiations over the reserve because of their perception that the fishing lobby has prevented the zoning of an adequate set of areas as “no-take” in the proposed reserve.

The Jurien reserve debate interacts strongly with the certification of the fishery. The conservation lobby is asserting that certification of the rock lobster fishery will provide strong support to the fishing sector in support of its assertion that fishing does little or no damage to the environment and can co-exist with high levels of nature protection. This view is strongly opposed by the conservation lobby, on the grounds that there is no evidence from any areas in Western Australia that can be used to justify the lack of ecological impacts, or the potential for fishing activities to co-exist with high levels of nature protection. The conservation lobby has also suggested that the reserve could be used effectively to provide control areas (of no fishing) to enable the fishery to assess its level of impact on similar habitats outside the Jurien reserve.

At present CALM is proceeding with the reserve declaration process, although the conservation lobby has declared its opposition to the process and the most likely set of outcomes.

12.0 ISSUES FOR CONTINUED CERTIFICATION

It is the assessment team's consensus judgement that the WA Rock Lobster Fishery is deserving of certification based on its overall compliance with the MSC Principles and Criteria. On balance, the team was quite favorably impressed with the management system and the resource sustainability of the fishery as they pertain to the Principles and Criteria of the MSC.

Given the WRL fishery is notably deserving of certification under the MSC standards, there are still a number of factors that the certification team believes are important to address in order to strengthen the overall management of the fishery and ensure that the fishery stays on course to maintaining "sustainability".

The Assessment Team recommends that, for the purposes of continued certification:

- The WRL fishery agree to improvement on the requirements set forth in this report (Section 9.1, Principle 2) and outlined below through a formalized written memorandum of understanding between the managers/industry and the certification body.
- A schedule be agreed that provides for regular monitoring inspections at least once a year that focuses on compliance with the requirements set forth in the report (as outline below) and continued conformity with the standards of certification. The principle focus of the monitoring program should be on the efforts of the WRL fishery managers to develop a better understanding of the potential impacts the fishery may be having on the environment.
- The WRL Fishery management is re-evaluated (as opposed to monitoring) on a five-year cycle.

Requirements for Continued Certification

2C Ecological Risk Assessment - Within 14 months of certification, a comprehensive and scientifically defensible assessment of the risks of the fishery and fishing operations to the ecosystem (ecological risk assessment) will be completed, based on existing knowledge, and taking into account points 2 to 5 in criterion 2C. The assessment should consider risks of all aspects of fishing (see intent in criterion 2B) on species (including protected and ecologically related species), habitats, and biotic communities (see criterion 2A). The risk assessment will identify and prioritize gaps in knowledge. The risk assessment will produce a set of prioritized risks, and strategies to address those risks, including research strategies that make maximum use of comparisons between fished and unfished areas. The risk assessment will be reviewed by independent and external expert reviewers, and be available for public comment.

2C Environmental Management Strategy - Within 24 months of certification, an Environmental Management Strategy for the fishery will be prepared and distributed for public comment and input. The EMS will address impacts of the fishery on the environment, and will include proposed objectives, strategies, indicators and performance measures. The EMS will specify an operational plan, including implementation actions and a supporting program of research. Future research should aim to provide

information on the impacts of the fishery on the ecosystem that is at least as scientifically valid as that produced by studies of fished versus unfished areas.

2C Operation of the EMS - Within 36 months of certification, an Environmental Management Strategy will be effectively incorporated within the operational arrangements for the fishery

2D Transparency of Decision Making - Within 24 months of certification, there will be increased participation of the environmental community or their representatives in the decision-making processes in the fishery. This will include consultation on impending decisions, and involvement (full participation) in decision-making committees at a range of levels in the fishery.

2G Data on Bycatch of Icon Species - Within 12 months of certification, formal monitoring systems in the fishery will have improved arrangements for recording data on the by-catch of, or any other interactions of the fishery with, mammals, seabirds, manta rays, dolphins, or whales.

Recommendations

Along with the formal requirements, there are a number of other factors that the Assessment Team believes could be beneficial to strengthening the management of the WRL fishery. While these are not formal requirements for continued certification, the Assessment Team believes they are worthy of special mention:

1A.

The time series of larval settlement and fishery independent spawning stock surveys provides a sound basis for assessment and management of this stock. The only recommendation would be to put in place measures that ensure that a future downgrading of this monitoring will not occur even given the current changes to full cost recovery in the fishery.

1C

- The current harvest strategy could be formalized and made more explicit, and alternatives explored and evaluated.
- There appears to be a need to closely monitor the longer-term development of recreational effort, as increasing participation rates could result in substantial increases in catches.

1D

- Make publicly available comprehensive documentation on current assessments and seek review.
- Undertake a more comprehensive risk assessment of current strategies.
- Continue to develop models to evaluate future management options.

1E -

There should be some consideration given to developing a more quantitative assessment of the risks of over-fishing.

2A.

- The fishery should consider the initiation of a research program of habitat mapping across the full extent of the area in which the fishery operates. This would include the inshore and offshore waters, and be based on existing data, knowledge and activities.
- Research strategies should be considered for development that better address the natural trophic interactions between lobsters and their food in fished and unfished areas.
- Research strategies should be considered for development that evaluate the interactions of coastal developments with the lobster, particularly the young, and dependent and associated species and habitats.

2B

- The fishery should consider implementing a procedure for uniquely labelling and identifying bait bands used in the WRL, and a subsequent monitoring to identify their proportional contribution to coastal litter, with reference to other sources of similar plastic straps.

- The fishery should consider the development of a research strategy to identify and assess any historic changes to coral reef habitats of the Abrolhos Islands that may be related to fishing operations.

2D

- The fishery could develop a strategy for development of a research program on the ecological effects of the use of bait in a variety of habits used by the fishery.

2E

1. The fishery should consider developing research strategies that involve CALM to assess importance of the removal of lobster biomass for the population success of Australian Sea Lions.

2G

1. The fishery should work more actively with AIMAC, FWA, CALM and the environmental NGOs to develop and implement an effective Plan of Management for the Abrolhos Islands (and see Condition 4).

Appendix 1 - Summary of the Western Rock Lobster Fishery

The western rock lobster (*Panulirus cygnus* George) supports the largest rock lobster fishery in the world, with seasonal catches averaging 10,700 t over the past 18 years (1980-81 to 1997-98). The 596 vessels licensed to participate in the fishery share between \$200 and \$300 million gross per season, making it Australia's most valuable single species fishery. Because of the high prices paid for *P. cygnus* and the good returns a fisher can expect, the stock has experienced very high and increasing exploitation over the past 20 years. The stock is fully exploited.

History of the fishery

Aboriginal people were the first to use *P. cygnus* as a food source, to support their hunter-gatherer existence. A small commercial fishery developed soon after European settlement and in 1897 the first regulation for the fishery was proclaimed, namely a minimum legal size (weight), which has remained virtually unchanged to the present day. By the 1930s, a small fleet of boats was operating out of Fremantle and Geraldton supplying some 250,000 kg annually to the local market. It was not until the end of World War II (1945), when the export of frozen lobster tails to the United States commenced, that exploitation began in earnest. The export of 1 million kg in 1948 grew to 8 million kg by 1958. Since then, the ten seasons 1970-71 to 1979-80 produced average catches of 9.25 million kg with an average of 10.7 million kg over the next 18 seasons (1980-81 to 1997-98). The largest catch of 13.6 million kg was taken in 1998-99 with catches in excess of 12 million kg on four occasions between 1987-88 and 1992-93.

During the developmental years of the fishery (1945-1962) there were no restrictions on licenses and gear and the number of new entrants, boats and pots (traps) grew rapidly. By the late 1950s and

early 1960s, the fishing effort still was rising rapidly but the catch had stabilized at 7-8 million kg. Fishers saw their catch rates and individual catches declining and feared for their economic viability. In 1963, after representation from the fishing industry, the Government introduced a policy of “limited entry” and closed the fishery to new entrants. In 1965 the number of pots fishers could use also was strictly controlled, limiting the total number of pots to 76 623 and boats to 845. Since the introduction of limited entry, both nominal fishing effort (pot lifts) and the effectiveness of that effort continued to increase as fishers built larger vessels and worked more days per month, gaining experience and improving their gear and fish finding technology. In an attempt to offset these increases in fishing effort and efficiency, management, in consultation with industry, introduced measures to shorten the fishing season, strictly define pot design and dimensions and reduce the number of pots and boats in the fishery (Brown, 1991). These measures have been successful in slowing the rate of increase in effective fishing effort, but not stopping it.

An active recreational fishery, operating in the inshore waters (<20 m) around population centres, developed alongside the commercial fishery. In 1988-89, a total of 15 600 licensed recreational fishers caught 460 t, equivalent to 3.8% of the commercial catch of 12,300 t. Seventy eight percent of recreational fishers used pots (maximum of two per person), 29% went diving and 7% used both methods of capture. From continuing postal surveys it is estimated that the annual recreational catch was between 3-4% of the commercial catch (Chubb, unpub.). By 1997-98 the number of licenses had risen to 28 800 with recreational fishers catching an estimated 800 t, or the equivalent of 7.7% of the commercial catch of 10,500 t. The proportion of recreational fishers using both potting and diving to catch lobsters was slightly higher at 9% but the proportion using pots had declined to 67% while the proportion diving increased to 42%.

Major Management Controls

Commercial fishing

The main thrust of the management measures used in this input-controlled fishery up to the early 1990s, has been to contain the inevitable increases in effective fishing effort that have occurred as the fishery and technology developed, and curtail the wasteful mortality of juveniles caused by poor fishing practices (Brown and Caputi, 1986). The regulations forming the foundation of management for the fishery are:

1. A minimum legal carapace length of 76 mm (proclaimed as an equivalent whole weight in 1987).
This provides protection for breeding females only at the Abrolhos Islands.
2. A ban on the taking of egg bearing females (proclaimed 1989).
3. A closed season from 16 August to 14 November (proclaimed 1962), and an extended closure from 1 July to 14 November (proclaimed 1978).
4. Limited entry, which restricted the number of boats and traps that could be used in the fishery (proclaimed 1963 and 1965).
5. The incorporation of a single escape gap (1966) and increased to three escape gaps into every trap and strict design and dimension rules for traps (proclaimed 1984 and 1986).
6. A temporary reduction in the number of pots (10%) for the 1986/87 season (proclaimed 1986).
7. A permanent 10% reduction in pots at 2% per season over the five seasons 1987/88-1991/92 (proclaimed 1987).

The Period 1992-1998

Management in the 1990s focussed solely on rebuilding the breeding stock by significant reductions in the rate of exploitation. The reasons for so doing were numerous. Declines in the standard indices of

egg production to levels never before recorded were seen and an estimate from the fishery model (Walters *et al.*, 1993) suggested egg production had declined to 15-20% of its unfished level. In addition, the deep water breeding stock became increasingly vulnerable to capture because of the use of Global Positioning Systems (satellite navigation) and colour echo sounders (Brown *et al.* 1995). This equipment enabled fishers to map accurately the lobster habitat and to return consistently to the same locations, something previously not possible even with radar. Now the next level of sophistication, the extremely accurate differential GPS, is in use. Coupled with the above were the forecast of a number of poor recruitment years due to the very low puerulus settlements seen over 1990-1994 and the prospects of small numbers of legal-sized rock lobsters surviving to reach sexual maturity in a population that relies upon one or two cohorts for the bulk of the egg production. Perhaps the most convincing argument was the identification of the first signs of recruitment overfishing (Caputi *et al.*, 1995) resulting from the very heavy exploitation of the rock lobster stock.

In July 1992 a package of management initiatives, for the 1992-93 season, was introduced into the fishery following extensive industry consultation of a wide range of options:

For the entire fishery:

- a maximum legal size for females of 115 mm carapace length to boost the numbers of larger older breeding females to reduce the reliance on one or two age classes for egg production;
- a prohibition on the retention of female lobsters (mature) that were mated (tarspotted) and/or possessing ovigerous setae on their pleopods from 15 November to 28 February inclusive to improve the overall survival of breeding female rock lobsters.

Above the 30°S latitude (Zones A and B - see Figure 1)

- a temporary 10% pot reduction from the opening of the season, 15 November, to 9 January inclusive to reduce the fishing mortality of “whites” on their pre-breeding migration.
- a closure (no fishing) from 10 January to 9 February inclusive.

Below the 30^o latitude (Zone C - see Figure 1)

- Boats to nominate a port from which they must operate (land their catch at) for the entire season (15 November to 30 June). This measure was designed to restrict the movement of the Zone C fleet, thereby reducing its efficiency and hence the overall exploitation rate on the stock. The measure also has catch sharing ramifications as some fishermen move around the fishery, in pursuit of higher catch rates, far more than others do.

The results of this package were assessed by researchers and presented to the Rock Lobster Industry Advisory Committee (RLIAC). The RLIAC is a ministerial advisory group that comprises expertise from the commercial fishery, the recreational fishery, the processing sector and Fisheries Western Australia, which considers matters relating to the commercial rock lobster fishery in an objective corporate manner and recommends to the Minister for Fisheries options for management. The RLIAC considered the research and industry advice and found that maximum legal size for females, the protection of mature females (setose and tarspotted) and the temporary pot reductions all were useful management tools in the context of rebuilding the breeding stock. The summer closure in the north and the “home porting” rule, as it became known, were ineffective.

A new management package was implemented in 1993-94, which was instrumental in rebuilding the breeding stock (and egg production) to levels considered safe for this fishery (RLIAC, 1993a, b; Anon., 1998). With subtle changes, the package has remained in place to the present time (1998/99 season). The regulations were:

- A temporary 18% pot reduction for the whole season to reduce the overall exploitation rate on the stock.
- An increase in the legal minimum size from 76 mm CL to 77 mm CL for the period of the “whites” fishery (Nov 15-Jan 31 incl.) to promote both the survival of migrating lobsters and their dispersal to the breeding grounds where they become less vulnerable to fishing.
- A total prohibition on the landing of setose and tarspotted lobsters for the whole season to promote the survival of the existing breeding stock.
- The retention of a legal maximum size for females of 115 mm CL in the southern sector of the fishery and 105 mm CL in the central and northern sectors. This variation was required to balance the variable impact on catches of the new minimum size rule due to changes in the size structure of lobster populations from south to north and the target levels of breeding stock to be reached in each management area.

Recreational Fishing

Recreational fishers must comply with the same rules as commercial fishers; however, they are restricted to a limit of two pots per licensed person with a maximum of four pots per boat, an individual daily bag limit of eight rock lobsters and a boat limit of 16. Recreational fishers (but not commercial fishers) may also dive and use their hands or a blunt crook or hand-held snare to assist in catching their bag limit.

1.5.4 *Current status of the stock*

Natural mortality, fishing mortality and total mortality for *P cygnus* have been estimated at 0.23, 0.64 to 0.78 and 0.87 to 1.01 respectively (Phillips & Brown, 1989). The exploitation rate is estimated in excess of 85% through the animal's entire life and about 60-70% annually (Phillips and Brown, 1989).

These estimates are based on a measure of fishing effort that does not take account of the increases in fishing efficiency (power) that have occurred due to improvements in boats, gear and fish finding technology (e.g. colour echo sounders, global positioning systems, etc). Therefore, they probably underestimate the real situation.

Prior to the introduction of the 1992-93 and 1993-94 management arrangements, breeding stock levels were very low. One reason the fishery may have avoided significant recruitment failure probably was the substantial numbers of sub-legal sized breeding female rock lobsters in the Abrolhos Islands area. It was estimated that this under-sized part of the breeding stock was producing about 35% of the whole fishery's egg production and was acting as a buffer against the effects of fishing. An absence of these rock lobsters probably would have meant the economic demise of the fishery, given the previous levels of exploitation.

As a result of the 1993/94 management package, the breeding stock and egg production have been returned to levels recorded in the late 1970s-early 1980s and appear to be stabilizing (Anon., 1998). Environmental conditions play a vital role in the seasonal recruitment of pueruli to the nursery reefs and subsequently to the catch. For example, although the spawning stock was greatly reduced in the early 1990s, good environmental conditions allowed levels of puerulus settlement equal to those seen in past years. On the other hand, even with high levels of egg production, the puerulus settlement in 1998-99 has been one of the lowest on record (Chubb, unpub.). Environmental factors then are the dominant feature determining the level of recruitment to the fishery (Caputi & Brown, 1989, 1993, Pearce & Phillips, 1994). The fishery is fully exploited and catches are very dependent on the new recruit class entering the fishery. Thus, catches can vary by up to 50% (from 8 to 13 million kg), because of variations in puerulus settlement due to changing environmental conditions.

The managers now consider the sustainability of the western rock lobster fishery assured, and are continuing with the objective of maintaining the exploitation rate at a level that will preserve the breeding stock at current levels.

Current research

(1) *Databases*

The five main databases are:

- (a) commercial fishers' compulsory monthly catch and fishing effort returns;
- (b) commercial fishers' voluntary research logbook daily catch and fishing effort data;
- (c) at-sea commercial catch monitoring data;
- (d) processors' compulsory production and returns by grade (size) category;
- (e) the annual index of puerulus settlement.

These databases are maintained, updated and improved continually, and form the basis for stock assessment.

(2) *Spawning stock estimates*

Indices of the abundance of the spawning stock of the western rock lobster are crucial in maintaining the sustainability of the fishery. Indices have been calculated from commercial monitoring data and research logbook data in combination with biological information collected by Chubb (1991). One of the conclusions of Chubb's (1991) study was that estimates of breeding stock based on catch rate data from the commercial fishery were heavily biased, due to underestimates of effective effort. Thus, indices based on commercial data have been corrected for Brown *et al.*'s (1995) estimated increases in effective effort. To avoid the bias

inherent with fishing industry catch rate based estimates it was decided to commence a breeding stock survey in 1992 that is independent of the fishery. The survey requires chartered rock lobster boats to fish standard pots across a set grid pattern across known breeding grounds (and recorded on GPS) for a set period over the new moon phase at a similar time each year (the moon phase dictates the actual dates). The catch rates obtained provide relative indices of abundance after being standardized for year-to-year variations in catchability resulting from differing environmental influences (e.g. temperature, swell conditions etc). The cost effectiveness of a smaller program (3 survey locations instead of 6) currently is being examined.

(3) *Catch forecasts*

Catch predictions for the total fishery have been made since 1981 using puerulus settlement data (Hancock, 1981; Morgan *et al.*, 1982; Phillips, 1986; Caputi *et al.*, 1995). An index of abundance of pre-recruits one year prior to entering the fishery (Caputi & Brown, 1986; Caputi *et al.*, 1995) was obtained from the commercial monitoring data. This index became less reliable since most sub-legal sized lobsters were escaping capture following the introduction of the multiple escape gap regulation. Nowadays, the puerulus settlement data is used to give a 3 - 4 year forward estimate not only of total catch, but also of “whites” catches in the coastal management zones and “reds” catches in all zones (Caputi *et al.*, 1995). Caputi *et al.* (1995) also examined the effect of nominal fishing effort levels on the catch forecasts. This investigation is continuing as longer time series of puerulus settlement data become available from six additional puerulus collection sites established in 1985. The usefulness of combinations of settlements from different locations to predict regional catches is being

assessed. The forecasts are widely accepted by industry as accurate and are used in a general way for business planning and investment decisions.

(4) Movement, migration and growth

Large and small-scale tagging programs were undertaken through the 1980s and 1990s to determine the extent and strength of the pre-breeding migration and to obtain estimates of growth for various sectors of the fishery. This information has been analyzed and a description of migration by the western rock lobster provided (Chubb *et al.*, unpubl.). Growth data have been analyzed to form the growth transition matrix (L.Cao, Western Australian Fisheries, and Chubb, pers. comm.) in the value optimisation model and Hall and Chubb (pers. comm.) have examined other aspects of growth to include in the model assessing the effects of the individual components of the current management package.

(5) Effective fishing effort and fishing power estimates

An ongoing core program is to determine the rate at which fishing power has increased over the last 20 years due to changes in boats, gear and fish finding technology. The introduction to the fleet of global positioning systems and other technologies and changes in vessel size and power are monitored and components of fishing power and efficiency are being examined, e.g. Fernandez *et al.* (1998).

Estimates of fishing efficiency increases will be used to adjust fishing effort data (pot lifts) to remove the bias from industry based catch rate data, which provides the basis for population abundance estimates and stock assessment.

(6) *Recreational Fishing*

The first survey of recreational fishing conducted from 1976 to 1978 estimated the recreational catch at 174 t (1.6% of the commercial catch). A follow-up large survey of the recreational

fishery was conducted in 1988-89, using field and postal survey techniques. The results showed the recreational catch was 3-4% of the commercial catch from the fishery but, for the first time, highlighted that in the 0-20m depth range around the major population centres of Perth and Geraldton, intense competition for the rock lobster resource existed. In these areas, the recreational catch was estimated at 26% and 21%, respectively, of the total catch (recreational plus commercial) (Chubb *et al.*, unpub.). Annual mail surveys have been conducted since 1986-87 and form the basis of the assessment of recreational catch and fishing effort each season. The recreational data are taken into account in stock assessments.

(7) *Modelling*

In the early 1990s, a fishery model was developed which enabled the assessment of a wide range of management options (Walters *et al.*, 1993). Currently the value optimisation model is being developed to assess the impact of future management options on a regional basis. In addition, a model assessing the impacts of the components of the current management package is nearing completion. Both models are using different but highly sophisticated approaches in which their sensitivity to the assumptions in the models is being tested. These models, the culmination of the understanding of the biology and fishery for the western rock lobster, already are showing the limits to which the data can be used and will direct research towards improving the data collection procedures and providing hard data in place of sensitive assumptions.

1.5.6 *Management proposals*

While an assessment of the combined effects of the five seasons of stable management from 1993/94 to 1997/98 has been undertaken (Anon. 1998), a model is being developed to tease out the effects of the

individual components of those management arrangements. This is an important step, since questions are being asked by industry as to whether an individual component such as the full protection of all breeding females (setose, tarspotted and egg-bearing) all season, by itself would maintain the breeding stock at the required level. All components of the current package would interact with the others to produce an impact on the stock. To ascertain the individual component impacts on the stock requires a sophisticated modelling approach that currently is being undertaken.

With the fishery sustainability of the fishery now assured, both industry and management need to focus on achieving the maximum economic rent (profit) from the western rock lobster fishery and maximising the benefits to Western Australia from the exploitation of this community owned resource. To assist in the assessment of future management options, a value optimisation modelling approach is being developed. A biological model has been developed to assess the stock responses that are then linked to a set of economic data, which will effectively cost out the proposed options, or combination of options, and provide an ability to rank options in terms of their economic benefit and their impact on the brood stock. Proposed arrangements that help to reduce fishing costs and at the same time achieve their objectives in general would increase profits from the fishery.

At the same time, the general philosophy of management is being debated; that is the issue of input controls versus output controls (quota). Total allowable catches (TAC) and individual transferable quotas (ITQ) are often touted as being the best option to maximise the economic benefits of a fishery. From a strictly theoretical, “rational economic” viewpoint this is true. However, in terms of value to the community at large, the judgment of which philosophy to embrace becomes a balancing exercise. The introduction of quotas, in time, would lead to adverse impacts on the economic and social fabric of the industry, especially in small coastal communities and significantly increase research and enforcement costs (all fully cost recovered from the fishery), all of which could defray the theoretical cost benefit of

quota management. While it is true that many rock lobster fishers abhor restrictions of any nature, industry still favours input controls at this time.

The RLIAC recently has introduced a proposal to package management advice to the Minister for Fisheries as a series of rolling three-year plans. This involves assessing the management requirements for a three year period followed by periods where each year the first year is dropped from consideration and the fourth added and so on. The current view is to continue the existing management arrangements until the modelling is completed and the individual impacts of each component of the management package is known. This has now been completed (Hall, unpublished). Options for maintaining sustainability and maximising the benefits to the community of Western Australia will be assessed.

Conclusions

The western rock lobster (*P. cygnus*) is fully exploited throughout its range and supports a substantial shallow water recreational fishery. Modern, purpose-built commercial fishing vessels and sophisticated electronic fish-finding and navigation equipment dramatically have increased the effectiveness of commercial fishing effort (nominally measured as pot lifts) over the past 20 years (Brown *et al.*, 1995). In particular, fishers now are able to target very precisely the dispersed deep water fishing grounds that the breeding stock inhabits. Recognition of the fact that total egg production was dangerously low in the early 1990s and that recruitment overfishing was a real possibility, led to the introduction of management arrangements that rebuilt the breeding stock within five years. This was achieved with a balanced combination of measures designed to reduce the overall exploitation rate and promote the survival of breeding females and recruits to the breeding stock. Effective fishing effort slowly continues to increase, however, the sustainability of the resource is currently considered assured. Management, along with maintaining the sustainability of the western rock lobster fishery,

now has the task of maximizing the benefits from this community owned resource to the industry and the people of Western Australia through the industry preferred philosophy of input controls.

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