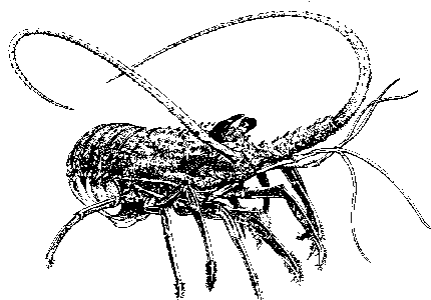

Fisheries discussion paper

Opportunities for the
Holding/Fattening/Processing and
Aquaculture of Western Rock Lobster
(*Panulirus cygnus*)



A discussion paper compiled by Fisheries WA

Fisheries management paper No. 122



FISHERIES
WESTERN AUSTRALIA

Fisheries Western Australia

November 1998

ISSN 0819-4327

EXECUTIVE SUMMARY

The objective of this discussion paper is to describe policy options for dealing with rock lobster enhancement, grow-out and aquaculture issues. It is designed to serve as the policy framework for dealing with future applications to hold/fatten/process and aquaculture western rock lobster and administer existing practices.

The paper will specifically address:

- rock lobster processing through the existing rock lobster industry which is site-based and has its numbers controlled through Ministerial Policy Guidelines;
- the holding and fattening of rock lobsters either through existing rock lobster fishing and processing, or through the legal purchase of rock lobsters with a view towards value adding;
- closed cycle hatchery production;
- grow-out of puerulus obtained from the wild;
- relocation of puerulus into areas of low recruitment;
- enhancement of artificial habitat so that overall rock lobster production of some areas can be increased, particularly during periods of moderate and low puerulus recruitment;
- the use of legal size animals;
- access to and use of under-size animals; and
- enhancement of existing wild capture fisheries either through relocation of puerulus or habitat enhancement.

WOULD YOU LIKE TO COMMENT?

The Minister for Primary Industry; Fisheries and Fisheries WA would like to know what *you* think about the content and format of this report and the proposed management options. In the process of researching this document, consultation took place with key stakeholders in the fishery, and we would now like to hear the views of the wider community. Individual or joint submissions are welcomed.

Points To Consider In Your Submission

To ensure your comments are as effective as possible, please:

- clearly and briefly describe each separate subject you wish to discuss;
- assist us by referring to the relevant section and page numbers in the paper;
- tell us whether you agree or disagree with any or all of the issues identified under each heading, or simply comment on those of interest to you;
- clearly state your views and feel free to quote from other documents/sources of information; and
- feel free to suggest ways of solving any of the issues you have raised.

Responses To Submissions

The issues raised in all submissions will be summarised, according to the items discussed, and published. The results of the submission phase will be considered when management options for the fishery are determined.

Where And When To Send Your Submission

The closing date for submissions is close of business January 22, 1999. Please send your submission before this date, together with your full name and address, and association details (if applicable) to:

The Executive Director
Attention: Manager, Rock Lobster
Fisheries WA
Locked Bag 39
Cloisters Square Post Office
PERTH WA 6850

Where To Get Further Copies Of This Document

For extra copies of this document, please contact:

Fisheries WA
Community Awareness Branch
Locked Bag 39
Cloisters Square Post Office
PERTH WA 6000

CONTENTS

EXECUTIVE SUMMARY	2
WOULD YOU LIKE TO COMMENT?	3
SUMMARY OF RECOMMENDATIONS	6
Holding, Fattening and Conditioning	6
Holding and Culture of Undersized Rock Lobsters	7
Habitat Modification and Puerulus Enhancement	8
1.0 INTRODUCTION	10
2.0 MANAGEMENT OF THE ROCK LOBSTER FISHERY AND PROCESSING INDUSTRY	10
2.1 Wild Stock Fishery	10
2.2 Rock Lobster Processing - Existing Processors	11
2.3 Fattening, Holding and Conditioning of Rock Lobster by Existing Processors, Fishermen and those other than Managed Fishery Licence Holders	11
2.3.1 Fattening, Holding and Conditioning of Rock Lobster by Existing Rock Lobster Processors	11
2.3.2 Fattening, Holding and Conditioning of Rock Lobster by Licensed Rock Lobster Fishermen	13
2.3.3 Industry Development	15
3.0 HOLDING AND CULTURE OF UNDERSIZED ROCK LOBSTER	17
3.1 Closed Cycle Culture Hatchery Production	17
3.2 On-growing of Wild Captured Puerulus/Juvenile Rock Lobster	19
4.0 HABITAT MODIFICATION AND PUERULUS ENHANCEMENT	22
4.1 Relocation of Puerulus to Enhance Areas of Low Recruitment and Increase Puerulus Survival	22
4.2 Artificial Habitat Enhancement	23

SUMMARY OF RECOMMENDATIONS

Holding, Fattening and Conditioning

Existing Rock Lobster Processors (Restricted and Unrestricted)

1. That rock lobster processing licences may be extended to include the enhancement of value of the western rock lobster catch, through its holding, fattening and conditioning. Rock lobster processors who undertake holding and/or fattening and conditioning of rock lobsters will require approvals from relevant Government agencies. Waste management plans and records (i.e. numbers of animals held, numbers of animals that die, amount of feed not consumed) will also be required.
2. Rock lobster processors will not be permitted to hold/fatten/condition rock lobsters in facilities outside of the existing constraints imposed by the annexure policy unless they hold a separate aquaculture licence.
3. Any rock lobster processor undertaking holding, fattening and conditioning should be required to provide an inspection facility on site to enable effective compliance checks to be made.
4. All rock lobsters which are held and become setose, tarspot, berried, undersize or oversize during the rock lobster season must be immediately returned to the wild.
5. In conjunction with Recommendation 4, rock lobsters which are setose, tarspot, berried, undersize or oversize outside of the legal fishing period may be held only during the closed rock lobster fishing season.

Industry Development

6. Existing rock lobster fishermen may undertake holding, fattening and conditioning in a privately-owned licensed facility on land or at sea provided that they:
 - maintain records as determined by Fisheries WA;
 - obtain an aquaculture licence suitably endorsed for rock lobster;
 - obtain approvals from relevant local Government and State Government agencies prior to their being endorsed to hold, fatten or condition rock lobsters;
 - have appropriate tenure;
 - use only legally-taken rock lobster;
 - may only be processed for export through a licensed rock lobster processor;
 - hold no setose, tarspot, berried, undersize or oversize rock lobsters at a fisherman's facility within the rock lobster season;
 - only hold rock lobsters until two days before the next open season;
 - only undertake local product sales (door or boat);
 - use no more than one facility per managed fishery licence; and
 - accept that Fisheries WA management and compliance costs for fattening and holding rock lobster are cost recoverable from industry.
7. No large scale at-sea holding or aquaculture of rock lobsters shall be approved until a Code of Practice and a Disease Contingency Plan have been released.

8. Any allocation of sea floor or sea cages for holding or aquaculture of rock lobsters must be assessed through the Fisheries WA aquaculture licence approval process.
9. Licences for fattening, holding and conditioning of rock lobsters may be granted to people other than existing managed fishery licence holders in the future. However, until such time as the costs associated with moving outside of the existing rock lobster industry processing/wild fishery arrangement are able to be identified, no new licences outside the industry will be granted. Fisheries WA will progress this issue through a consultative process (two year maximum time frame).
10. Should any aquaculture licences be granted to anyone other than commercial rock lobster fishermen after the consultative process is complete, then the conditions in Recommendation 6 shall apply. Compliance costs will need to be factored into fees associated with the granting of a new licence.

Holding and Culture of Undersized Rock Lobsters

11. Any proponent undertaking the aquaculture of western rock lobster (including closed cycle production and/or growing of puerulus) will require an aquaculture licence under Section 92 of the *Fish Resources Management Act 1994*.

Closed Cycle Aquaculture Hatchery Production

12. Rock lobster aquaculture licence holders will have the right, subject to the approval of the Executive Director of Fisheries WA, to take a number of rock lobster for brood stock purposes. Hatchery operators would be encouraged, in the first instance, to contract rock lobster fishermen to supply the brood stock in season.
13. Any rock lobsters which are sold undersized as a result of hatchery production must be able to be identified at point of sale. Options include internal tags, external tags, sealed packages, dyes and other external markings which clearly identify the source of the product.
14. Closed cycle aquaculture operations will be able to process their product in such a way as to gain maximum financial return, including exporting directly from their premises. Management and compliance costs will not be cost recovered during the research and development phase of closed cycle rock lobster aquaculture.

On-Growing of Wild Captured Puerulus/Juvenile Rock Lobster

15. Access to puerulus (last stage of a lobster's larval development) from the wild for on-growing will be granted, using a mechanism which ensures biological neutrality is maintained.
16. The trading or sale of puerulus harvested from the wild may be undertaken on a commercial basis by those who have licensed premises to aquaculture rock lobster.
17. Additional compliance and management costs associated with the collection, selling and on-growing of rock lobsters must be met by the proponent or participant in the on-growing activity.

18. Licensed on-growing facilities shall be permitted to utilise hatchery-sourced animals, legally collected puerulus or legal sized animals.

Habitat Modification and Puerulus Enhancement

Relocation of Puerulus to Enhance Areas of Low Recruitment and Increase Puerulus Survival

19. If the relocation of puerulus were to proceed, it would be funded from the commercial and/or recreational rock lobster fishery and the subsequent benefits available to all stakeholders in the fishery.

Artificial Habitat Enhancement

20. That the benefits from artificial habitat enhancement should accrue to the general community and stakeholders. Where exclusive access has been granted such as sea ranching, natural recruitment must be identified and included in any compensatory controls to ensure biological neutrality.

1.0 INTRODUCTION

The prime objective of the *Fish Resources Management Act 1994* (the *Act*) is sustainability of the resource, with a further objective being to maximise the return to the community from the available aquatic resources of this State.

One of the species in which there is increasing interest and potential for expansion is the western rock lobster, the basis of a \$300 million fishery which currently supports a commercial fleet of 603 boats and about 25,000 recreational fishers.

It became apparent that there was a need for a policy framework to enable possible holding, fattening and conditioning of rock lobsters, including closed cycle aquaculture. A consultant was engaged to assess puerulus enhancement with respect to potential benefits to the existing West Coast Rock Lobster Managed Fishery, aquaculture and the community¹.

There has been increasing interest from within the wild capture and processing sectors of the existing West Coast Rock Lobster Managed Fishery for holding and/or fattening of rock lobsters in order to increase the value and take advantage of the increasing proportion of the existing catch which is being consigned as live animals for export markets. The keeping, breeding, hatching or culturing of fish is currently identified as aquaculture under the *Act* and consequently requires licensing and assessment through the various processes currently set up with respect to aquaculture.

2.0 MANAGEMENT OF THE ROCK LOBSTER FISHERY AND PROCESSING INDUSTRY

2.1 Wild Stock Fishery

There are currently 603 fishermen entitled to fish in the West Coast Rock Lobster Managed Fishery. The fishery is managed as an input controlled managed fishery, with an average seasonal catch of approximately 10,500 tonnes. There are 69,291 pots licensed within the fishery which, with the temporary 18 per cent pot reduction, equates to approximately 56,819 pots in the water.

The West Coast Rock Lobster Managed Fishery is considered to be one of the best input control managed fisheries in the world. A long term decline in the breeding stock appears to have been addressed as a result of the management package (which included the 18 per cent temporary pot reduction) which was introduced in 1993/94.

The outlook for rock lobster product is good, with the breeding stock recovering and good recruitment leading to above average catch predictions for the next few years.

¹ The report *The Use of Rock Lobster Puerulus to Increase Western Rock Lobster Production - A Background Paper and Policy Document for the Fisheries Department of Western Australia* was produced for the Rock Lobster Industry Advisory Committee tour in 1997.

2.2 Rock Lobster Processing - Existing Processors

The Ministerial Policy Guideline Number 4 *Determining what is “in the better interest of the industry” for rock lobster processing authorisation* (July 1996) describes the activities under which the existing rock lobster processing licensees can undertake their business. There are currently 19 restricted and seven unrestricted licensed processors within Western Australia.

Section 2.5 of this guideline (holding of live rock lobsters) says:

‘Only holders of unrestricted rock lobster processing authorisations should be allowed to hold live rock lobster for the intention of export or interstate consignment.

*Restricted rock lobster processing authorisation holders should be entitled to legally hold live, raw or cooked **whole** rock lobster for wholesale sale, retail sale or consignment within Western Australia.*

Rock lobsters held by commercial fishermen, unrestricted processors and restricted processors with appropriate authorisations should be limited to those rock lobsters that are in a form that, at any time they are held and inspected, would be considered legally caught rock lobsters. For the West Coast Rock Lobster Fishery [sic] this would mean processors should not be allowed to have in their possession undersized, setose or tarspot rock lobsters unless they were legal form at the time they were caught and acquired.

Fishermen with commercial rock lobster fishing authorisations should be entitled to legally hold live or whole raw rock lobster for wholesale. Commercial fishermen should be required to deliver all live lobsters that they hold to a retailer or authorised processor within 48 hours of the close of an authorised catching season.’

2.3 Fattening, Holding and Conditioning of Rock Lobster by Existing Processors, Fishermen and those other than Managed Fishery Licence Holders

2.3.1 Fattening, Holding and Conditioning of Rock Lobster by Existing Rock Lobster Processors

Existing rock lobster processors can process legal size rock lobsters, hold them and sell them. Although Ministerial Policy Guideline No. 4 is silent on the matter of keeping, it does identify a potential difficulty with respect to rock lobsters which were legal when taken, but which through either growing setae, mating in captivity, or moulting become illegal during the course of being held live. This situation leads to potential difficulties from a compliance perspective.

Although existing rock lobster processors do not usually feed lobsters held live for export, there is little doubt that these animals are eating, if only other animals or algae. Holding mussels or algae in the same tank as rock lobsters may not constitute fattening, although it is clear that the rock lobsters would be able to eat any mussels held in the same tank.

There are a number of issues that need to be dealt with from a policy perspective with respect to the holding of rock lobsters within processing establishments. As a result, a number of recommendations have been made by Fisheries WA, which are discussed in this document.

Recommendations:

- 1. That rock lobster processing licences may be extended to include the enhancement of value of the western rock lobster catch, through its holding, fattening and conditioning. Rock lobster processors who undertake holding and/or fattening of rock lobsters will require approvals from relevant Government agencies. Waste management plans and records (i.e. numbers of animals held, numbers of animals that die, amount of feed not consumed) will also be required.**
- 2. Rock lobster processors will not be permitted to hold/fatten/condition rock lobsters in facilities outside of the existing constraints imposed by the annexure policy unless they hold a separate aquaculture licence.**
- 3. Any rock lobster processor undertaking holding, fattening and conditioning should be required to provide an inspection facility on site to enable effective compliance checks to be made.**
- 4. All rock lobsters which are held and become setose, tarspot, berried, undersize or oversize during the rock lobster season must be immediately returned to the wild.**

Recommendation 4 needs to be addressed in order to reduce the risk of a 'black market' developing that trades in setose, tarspot, berried, undersize or oversize rock lobster.

Currently, the issue of holding lobsters in an illegal condition may not be as difficult as it would first appear, as rock lobster processors generally attempt to turn over stock relatively quickly. The major difficulty clearly arises with animals which are held after the closure of the rock lobster season in order to maximise the financial return from them.

Any animals held in an illegal condition during the closed season may be considered to have changed into an 'illegal' state during holding, as anyone fishing during this period is clearly committing an offence and receipt compliance of any rock lobster during this period is easier to monitor and control. Therefore, rock lobsters which are found to be setose, tarspot or berried during holding may be safely assumed to have been taken during the open season in a legal condition.

Compliance staff will need to target at least five per cent of all fish coming in and out of any holding facility as an audit of the process. These checks would be random and the compliance costs would need to be recovered from the appropriate sector of industry.

Compliance monitoring of processing plants over many years has determined the effectiveness of the five per cent sampling model. In the future any changes to the existing rock lobster season may drive a shift in the current compliance strategies.

Recommendation:

- 5. In conjunction with Recommendation 4, rock lobsters which are setose, tarspot, berried, undersize or oversize outside of the legal fishing period may be held only during the closed rock lobster fishing season.**

There are significant implications for the rock lobster processing industry if additional sites are granted for the holding/fattening of rock lobster by processors. The annexure policy that determines the number of facilities at which rock lobster can be held would be nullified, potentially impacting on the existing industry.

As it is proposed to allow rock lobster fishermen to hold/fatten rock lobsters and there is an existing annexure policy, rock lobster processors will not be permitted to hold/fatten rock lobsters outside of the existing constraints imposed by the annexure policy unless they hold a separate aquaculture licence.

2.3.2 *Fattening, Holding and Conditioning of Rock Lobster by Licensed Rock Lobster Fishermen*

Existing rock lobster fishermen are limited in the processing which they can undertake. Section 82 of the *Act* prohibits processing for a commercial purpose unless the person is authorised to do so by a fish processors licence or in a manner specified in the relevant management plan. Under the terms of West Coast Rock Lobster Managed Fishery Management Plan, rock lobster commercial fishermen may sort lobsters by grade, size and sex, and chill or hold them live on-board the boat within the context of the fishing operations. No other processing of lobsters at sea is permitted.

Rock lobster fishermen may hold live rock lobsters at privately owned facilities, provided they include an inspection facility, animals are kept in marked crates, and they adhere to the provisions of the rock lobster processing guidelines. If rock lobsters contained in this facility are fed, an appropriate licence must be obtained. Any additional compliance costs incurred by Fisheries WA would need to be cost recovered.

As demand for live animals increases and the rock lobster industry looks to 'smooth' their supply more evenly over the year, fishermen may wish to use off-site facilities for the live holding and fattening of rock lobsters. Land-based private facilities may be preferred to maritime-based ones because they are easier to manage from a compliance perspective. The allocation of marine areas for the holding and growing of rock lobsters is discussed in Section 2.3.3 of this document.

Currently, under the provisions of the aforementioned Management Plan and the Ministerial Policy Guideline No. 4, a fisherman holding a managed fishery licence for the West Coast Rock Lobster Managed Fishery can only hold lobsters *for a maximum of two days* after the rock lobster fishing season closes.

If it were permissible to retain rock lobster for a longer period, proponents would need to clear their stock before the next rock lobster season commences. This would reduce compliance costs and still meet the marketing requirement for a year-round supply of rock lobster.

Currently, the West Coast Rock Lobster Managed Fishery licensee at a private facility must:

- hold their lobsters in crates which are clearly identified as theirs;
- not feed the rock lobsters;
- sell to a licensed processor;
- provide an inspection facility should a compliance officer wish to inspect the catch; and
- own the premises in which the rock lobsters are held.

In the past, an exemption has been issued for a rock lobster fisher to experimentally hold and feed rock lobsters. Not surprisingly, this exemption drew interest from the general rock lobster fishery, from those who wish to undertake similar experiments in future rock lobster seasons.

If commercial fishermen apply for and are granted an aquaculture licence under the current provisions of the *Act*, they could export their product directly either to inter-state or international markets. This has significant cost implications for compliance, as the number of sites requiring inspection would increase.

With current processing licenses, all rock lobster taken within the season can be examined at a limited number of processing establishments. With an expansion of sites where rock lobster can be legally processed, and particularly if an 'illegal' product can be held, there are cost implications.

Compliance activities will have to be significantly changed from the current processing-based compliance activities - with an at-sea and end product presence - to one which must expend equal effort at sea, at processing establishments and at markets. This situation may result in a significant increase in costs for compliance.

For the West Coast Rock Lobster Managed Fishery which is fully cost recovered, any additional costs must be attributed to either the fishery as a whole or to the beneficiary. If there are increased management costs resulting from expansion of the existing rock lobster fishing industries or development of new associated ones (such as rock lobster aquaculture), the question of who should meet the increased costs associated with these ventures needs to be considered. It is considered that increased management costs due to fattening and holding must be met by their proponents.

Recovery of the costs incurred by Fisheries WA owing to the extra compliance measures that are required by allowing holding and fattening needs to take place as soon as these processes are started. However, closed cycle aquaculture hatchery production and on-growing of wild captured puerulus/juvenile rock lobster should be treated as developmental and not attract full cost recovery during the developmental stages.

Rock lobster management (including processing arrangements) are included in the current Fisheries WA National Competition Policy review. The results of this review may include changes to the current structure of the rock lobster processing industry.

Recommendation:

- 6. Existing rock lobster fishermen may undertake holding, fattening and conditioning in a privately-owned licensed facility on land or at sea provided that they:**
 - **maintain records as determined by Fisheries WA;**
 - **obtain an aquaculture licence suitably endorsed for rock lobster;**
 - **obtain approvals from relevant local Government and State Government agencies prior to their being endorsed to hold, fatten or condition rock lobsters;**
 - **have appropriate tenure;**
 - **use only legally-taken rock lobster;**

- **may only be processed for export through a licensed rock lobster processor;**
- **hold no setose, tarspot, berried, undersize or oversize rock lobsters at a fisherman's facility within the rock lobster season;**
- **only hold rock lobsters until two days before the next open season;**
- **only undertake local product sales (door or boat);**
- **use no more than one facility per managed fishery licence; and**
- **accept that Fisheries WA management and compliance costs for fattening and holding rock lobster are cost recoverable from industry.**

2.3.3 Industry Development

The rock lobster industry will require an aquaculture licence under section 90 of the *Act* and needs to meet Recommendations 8 and 9 of this document.

Marine areas may be used for extensive or semi-extensive ranching or holding western rock lobsters. There is an established process through the Inter-departmental Committee for Aquaculture for the assessment of aquaculture licence applications. Under Section 92, the Executive Director may issue a licence if he is satisfied that:

- (a) the person is a fit and proper person to hold such a licence;
- (b) it is in the better interests of the aquaculture industry to grant the licence;
- (c) the activities to be conducted under the licence are unlikely to adversely affect other fish or the aquatic environment; and
- (d) the activities to be conducted under the licence have been approved by the relevant authorities.

Prior to allowing any large scale at-sea holding or aquaculture of rock lobster, a Disease Risk Assessment must be undertaken. A proponent of at-sea holding of lobsters may have to have indemnity against any impact on the natural population. As this is a vital issue, no large scale at-sea holding will be approved until a strategic Disease Risk Assessment and management plan has been prepared.

Recommendations:

- 7. No large scale at-sea holding or aquaculture of rock lobsters shall be approved until a Code of Practice and a Disease Contingency Plan have been released.**
- 8. Any allocation of sea floor or sea cages for holding or aquaculture of rock lobsters must be assessed through the Fisheries WA aquaculture licence approval process.**
- 9. Licences for fattening, holding and conditioning of rock lobsters may be granted to people other than existing managed fishery licence holders in the future. However, until such time as the costs associated with moving outside of the existing rock lobster industry processing/wild fishery arrangement are able to be identified, no new licences outside the industry will be granted. Fisheries WA will progress this issue through a consultative process (two year maximum time frame).**

- 10. Should any aquaculture licences be granted other than commercial rock lobster fishermen after the consultative process is complete, the conditions in Recommendation 6 shall apply. Compliance costs will need to be factored into fees associated with the granting of a new licence.**

3.0 HOLDING AND CULTURE OF UNDERSIZED ROCK LOBSTER

Fisheries WA will work closely with any proponents of holding, fattening, conditioning and aquaculture of western rock lobster to ensure that they have sufficient technological skills and understanding of some of the difficulties which they may face in undertaking a venture of this type.

While existing wild fisheries participants may wish to be involved in rock lobster aquaculture, they should not be advantaged in any way over an applicant with aquaculture expertise.

Recommendation:

- 11. Any proponent undertaking the aquaculture of western rock lobster (including closed cycle production and/or on-growing of puerulus) will require an aquaculture licence under Section 92 of the *Fish Resources Management Act 1994*.**

3.1 Closed Cycle Culture Hatchery Production

There are significant technological barriers to the closed cycle aquaculture of the western rock lobster (*Panulirus cygnus*). The animals have long, complicated and delicate phyllosoma (lobster larval) stages, with differing dietary requirements for each.

Difficulties with intensive aquaculture research in Japan on the similar *Panulirus japonicus* species has indicated that closed cycle aquaculture is still a number of years from commercial reality. Notwithstanding this, it is appropriate to determine a policy framework should rock lobster aquaculture prove possible within WA.

The use of rock lobster species other than those found within WA for aquaculture would be assessed under the translocation guidelines². Any aquaculture hatchery proposal for rock lobster must be licensed and undergo an assessment process.

Ideally, brood stock should be collected by purchasing them from existing commercial fishermen. Should this prove difficult, Fisheries WA will investigate other processes consistent with those used to gather brood stock in other aquaculture industries.

Recommendation:

- 12. Rock lobster aquaculture licence holders will have the right, subject to the approval of the Executive Director of Fisheries WA, to take a number of rock lobster for brood stock purposes. Hatchery operators would be encouraged, in the first instance, to contract rock lobster fishermen to supply the brood stock in season.**

² Ministerial Policy Guideline No. 5: *The aquaculture and recreational fishing stock enhancement of non-endemic species in Western Australia*

If there are difficulties with the handling and quality of brood stocks obtained, these can be addressed. However, this is not likely to be a significant issue as many rock lobsters are handled well enough during catching and processing to survive the rigours of international air travel.

If the closed cycle aquaculture of western rock lobster was to proceed, there are two issues which need to be addressed. These are:

- (i) that the product may be differentiated by colour or other quality-related factors; and
- (ii) that the operational economics may require proponents to sell animals under the current legal size for existing commercial fisheries.

In order for aquaculture ventures to compete with wild capture fisheries, they will need to be able to differentiate their product. It is hoped that aquaculture products may be able to take advantage of the marketability of the bright red or vermilion colour of western rock lobster to achieve a sustainable market advantage. If this were the case, it would provide a further method for differentiating the product from a compliance perspective and may encourage investment in aquaculture of western rock lobster.

If this is not undertaken, the hatchery production may serve as a cover for black market activities utilising wild captured animals.

In the first instance, distinctive packaging of all aquaculture products until they have left the retailers - or in the case of supplies to restaurants, up to the point of consumption - is likely to be sufficient to differentiate them from wild captured ones.

Recommendation:

- 13. Any rock lobsters which are sold undersized as a result of hatchery production must be able to be identified at point of sale. Options include internal tags, external tags, sealed packages dyes and other external markings which clearly identify the source of the product.**

There would undoubtedly be an impact from an aquaculture industry upon the market for wild captured western rock lobster. However, in many instances the aquaculture product may be able to return a peak price by finding market niches which complement rather than compete with wild capture fisheries. For example, aquaculture-grown rock lobsters may achieve the greatest return during the closed commercial fishing season, thereby reducing their direct competition with those from the wild capture fishery.

Recommendation:

- 14. Closed cycle aquaculture operations will be able to process their product in such a way as to gain maximum financial return, including exporting directly from their premises. Management and compliance costs will not be cost recovered during the research and development phase of closed cycle rock lobster aquaculture.**

As the aquaculture-grown rock lobster product will clearly be identified as such, there should be no constraints on its producers selling directly to export markets, as is presently carried out by those aquaculturists who produce marron and yabbies. However it is imperative that if live

aquaculture-grown animals are exported, they can be clearly identified as aquaculture product, particularly if animals are under the existing minimum legal size.

One other issue which needs to be assessed is the scale of investment involved in establishing closed cycle aquaculture of western rock lobster - a difficult species to culture. Industry and Government need to determine the level of commitment and the priority they give to establishing and developing this industry, given the competing demands for limited funding.

It may well be that given the difficulty of producing puerulus from aquaculture-grown phyllosoma that rock lobster closed cycle culture is considered to be a low priority. Potential investors should have these financial and biological issues pointed out to them.

3.2 On-growing of Wild Captured Puerulus/Juvenile Rock Lobster

A current Fisheries Resource Development Corporation (FRDC) project, *Towards establishing techniques for large-scale harvesting of pueruli and obtaining a better understanding of mortality rates* (FRDC Project 98/302) is examining on-growing of wild captured puerulus/juvenile rock lobster in detail, in conjunction with the Puerulus Enhancement Working Group of the Rock Lobster Industry Advisory Committee (RLIAC).

One of the major issues which arises from policies relating to puerulus on-growing is maintaining biological neutrality (i.e. the number of puerulus removed does not affect future breeding stock recruitment). It is important to model natural and fishing mortalities and any impacts of the removal of puerulus on those that remain, so as to provide a basis for managing these collection processes.

To determine a biologically neutral formula for puerulus versus adult take is extremely difficult in WA's input controlled managed rock lobster fishery, as the relationship between survival and fishing mortality may be looser than if a quota management system were in place. This is largely because the removal of a single pot may not decrease the total commercial catch, as efficiency of other pots can increase to compensate for the pot loss. In New Zealand's quota managed rock lobster fishery, a more definite puerulus versus quota formula can be determined.

It is also important to determine the survival rate of puerulus in a variety of sites across the fishery. It is important to determine whether or not density dependence is a prime factor in puerulus survival.

If survival is density dependent, then in years of good recruitment it may be possible to remove significant numbers of puerulus without affecting the recruitment to the fishery. However, if recruitment is not directly density dependent, removal of any puerulus or those above a critical level may have a significant impact on the wild capture fishery.

This is a significant issue which needs to be resolved prior to developing an industry dependent upon puerulus collected from the wild for on-growing.

Recommendation:

- 15. Access to puerulus (last stage of a lobster's larval development) from the wild for on-growing will be granted, using a mechanism which ensures biological neutrality is maintained.**

An holistic management approach can be undertaken which ensures that there is biological neutrality from the harvesting of puerulus particularly from areas of low recruitment. The FRDC report will address this issue in depth, including an assessment of current allocation processes from around the world.

In many fisheries in the world where aquaculture industries rely upon the harvest and on-growing of juveniles, there is a tendency for extreme pressure to be placed upon the local fisheries agency to enable continued harvest, irrespective of whether the natural recruitment is high or low. Indeed, the eel fisheries in South East Asia have been all but obliterated through continual over-harvest of juveniles.

There needs to be a clear audit trail on the take of puerulus and their consignment for sale to prevent an illegal black market or illegal harvesting of puerulus to be carried out. In addition, there is a significant additional compliance cost associated with the collection, selling and on-growing of juvenile rock lobsters, which must be met by the proponent of the on-growing activity.

Recommendations:

- 16. The trading or sale of puerulus harvested from the wild may be undertaken on a commercial basis by those who have premises licensed to aquaculture rock lobster.**
- 17. Additional compliance and management costs associated with the collection, selling and on-growing of rock lobsters must be met by the proponent or participant in the on-growing activity.**

A potential greater concern relates to the harvest of undersized animals for on-growing and their ultimate sale as either legal or undersized animals. Great care must be exercised in ensuring that existing aquaculture operations do not become a laundering operation for the harvest of undersized animals from the wild. Initially therefore, it is proposed that:

Recommendation:

- 18. Licensed on-growing facilities shall be permitted to utilise hatchery-sourced animals, or legally collected puerulus or legal sized animals.**

This notwithstanding, if puerulus are on-grown, they may be able to be sold as sub-legal animals, provided that they fulfil the criteria for product identification as described in Section 3.1 of this document relating to hatchery production

In addition, Government needs to determine its involvement in developing technologies associated with the on-growing of puerulus. Although the difficulties associated with the phyllosoma stages of western rock lobster are removed by growing puerulus, there are still considerable technological issues which need to be addressed for this industry to be viable. The Government may be best positioned, in conjunction with industry, to undertake any research.

In conclusion, the harvest and on-growing of puerulus by existing commercial rock lobster fishermen represents the most likely first step in the development of on-growing technologies.

Following their development and the determination of mechanisms to recover costs associated with additional compliance and marketing controls, there may be scope to further broaden the involvement of persons not currently involved in the rock lobster fishery.

4.0 HABITAT MODIFICATION AND PUERULUS ENHANCEMENT

4.1 Relocation of Puerulus to Enhance Areas of Low Recruitment and Increase Puerulus Survival

At the southern extremity of the western rock lobster's range, puerulus settlement and subsequent recruitment is highly variable and dependent upon environmental conditions. The local environment is clearly suitable for puerulus settlement as in years of high puerulus numbers, high recruitment occurs in these areas. However, suitable oceanic environmental conditions are infrequent in the area and this results in variable returns to the rock lobster industry.

It has been proposed that puerulus be taken from areas of high recruitment and moved to areas of variable and lower recruitment, with a view towards improving overall production from the existing wild capture fishery. Progress is dependent upon determination of the critical density dependence of puerulus survival in areas of high recruitment, ensuring that harvest of puerulus from areas within the fishery with high puerulus recruitment does not impact on future recruitment within those areas.

The most significant factor is ensuring biological neutrality through the harvest of puerulus. This is extremely difficult and would take a dedicated research program to fully assess the implications of harvesting puerulus. There are additional difficulties if animals are to be moved within the wild capture fishery with regard to the ownership of puerulus which have been relocated.

A policy decision needs to be made with respect to marine ranching proposals that allows the benefits to flow to all stakeholders in the fishery.

Recommendation:

- 19. If the relocation of puerulus were to proceed, it would be funded from the commercial and/or recreational rock lobster fishery and the subsequent benefits would be available to all stakeholders in the fishery.**

The above recommendation/proposal is seen as being far superior to one using a compensatory puerulus/pot system - which may have to accommodate the use of pots from one zone to take puerulus from another zone. It also deals with the difficult issue of differentiating between natural recruitment and movement of rock lobsters into an area which would be allocated for the exclusive use of those persons responsible for the enhancement.

Around the world, extensive sea ranching has proven extremely difficult and costly to administer, particularly as it is difficult to differentiate between natural and enhanced recruitment.

Under the principle of cost recovery it is proposed that those who reap the benefit from puerulus enhancement would also meet the cost that this incurs. Extensive ranching costs will almost certainly out-weigh the benefits unless natural recruitment is also able to be exclusively accessed.

If the costs of puerulus enhancement were either allocated across the industry or across the zone of benefit, (e.g. Zone C), then the benefits of an experimental venture could out-weigh the costs. However, an ongoing commitment from Government and/or industry would be predicated on the determination of an appropriate performance measure so that translocated puerulus can be identified, and the success of the enhancement could be subsequently and appropriately quantified.

Through Fisheries WA's Fish And Fish Habitat Protection Program, the setting aside of areas for puerulus enhancement through ranching can be assessed. However, as there are significant interactions with existing commercial and recreational fisheries, there are likely to be significant complications with the extensive allocation of areas for this purpose.

4.2 Artificial Habitat Enhancement

The issues associated with artificial habitat enhancement are similar with respect to puerulus relocation, in terms of costs, benefits and assessing the performance. In areas where recruitment is likely to be driven by a lack of suitable environments, the addition of artificial strata may significantly improve the local recruitment of the fishery.

However, as much of recruitment is environmentally driven, the benefits may be incremental and dependent upon external oceanic or environmental conditions. The returns may not be immediately apparent, or may merely enhance high catch years when the marginal financial return for each additional lobster may be significantly less than usual.

The use of artificial substrates would be subject to scrutiny with respect to environmental impacts. In some instances, there may be a negative impact on the overall environment, particularly if materials are used for substrates which have an extremely long life and may affect either the chemistry or micro environments for puerulus and other marine organisms.

However, artificial habitat enhancement has shown enormous potential in rock lobster fisheries throughout the world and should not necessarily be dismissed.

Recommendation:

- 20. That the benefits from artificial habitat enhancement should accrue to the general community and stakeholders. Where exclusive access has been granted, such as sea ranching, natural recruitment must be identified and included in any compensatory controls to ensure biological neutrality.**

The use of discrete areas for habitat enhancement makes stock identification within them easier than for general puerulus relocation. The additional costs associated with policing either a general community owned resource or specific marine ranching areas would need to be met by their proponents.