Rock Lobster Enhancement and Aquaculture Subprogram: Strategic planning, project management and adoption

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Australian Government
Fisheries Research and Development Corporation

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Table of Contents

Project Objectives……...1
Non-Technical Summary……1
Outcomes Achieved……4
Background……5
Need……..11
Objectives……12
General Methods……..13
Results / Discussion……..16
Benefits……20
Further Development……20
Conclusion……20
Appendices……...21

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OBJECTIVES:

1. Establishment of a framework for the delivery of commercial outcomes from projects undertaken within the Rock Lobster Enhancement and Aquaculture Subprogram, and a strategy for the longer term, self-sustainable coordination and management of research relevant to rock lobster enhancement and aquaculture.

2. Development and implementation of strategic plans and the facilitation of research and extension to assist the establishment of rock lobster aquaculture and enhancement systems in Australia.

3. Coordination of a wide range of discipline-based (ie nutrition, reproduction, husbandry) research projects across a range of rock lobster species relevant to different regions of Australia.

4. Facilitate independent reviews of research projects within the Subprogram as required to optimize research efficiency and project outcomes.

5. Identification and procurement of funding from a variety of sources additional to FRDC to compliment or enhance existing rock lobster enhancement and aquaculture research in Australia and New Zealand.

6. Facilitate the delivery of outcomes from the RLEAS in the form of annual workshops, newsletters, media releases, final reports, workshop proceedings and scientific publications.

7. Provide a single point of contact for rock lobster enhancement and aquaculture research in Australia and liaise with state-based industry bodies relevant to the rock lobster sector for the on-going delivery of rock lobster enhancement and aquaculture research.

8. Facilitate the functions of a RLEAS Steering Committee to ensure ongoing research programs have a high degree of industry relevance and focus.

NON TECHNICAL SUMMARY:

To date, the RLEAS has managed a portfolio of 19 projects representing a total investment from FRDC and stakeholders of nearly $17 million between 1998 and 2006. Outcomes from 12 of these projects have been delivered to date. Not only have the activities of the RLEAS and its Steering Committee ensured that this research remains highly focused, but it has fostered collaboration that would have been unlikely to eventuate in the absence of the subprogram. In addition, the strategic management provided by the RLEAS and the Subprogram Leader have ensured savings in project costs that far exceed the cost of running the coordination component of the subprogram. The

coordination component of the RLEAS represents only 3.5% of the total investment in the subprogram, with travel costs for researchers and stakeholders managed through the coordination projects representing more than half of this cost. It was essential to maintain an independent Subprogram Leader to coordinate a national project of this nature, and as projects representing more than $8 million were still active within the RLEAS at the commencement of this project, on-going management is required to ensure relevant outcomes were delivered to industry.

This Subprogram managed the following projects:

2002/045 – Assessing the possibilities for the natural settlement of western rock lobster. Principal Investigator: Dr Bruce Phillips. (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020).

2003/211 - Advancing the hatchery propagation of tropical rock lobsters (Panulirus ornatus). Principal Investigator: Mr Richard McCulloch – BSc(Hons). (MG Kailis Group, 50 Mews Rd, Fremantle, WA 6160).

2003/212 - Propagation of southern rock lobster (Jasus edwardsii) in Tasmania. Principal Investigator: Dr Arthur Ritar. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053).

2003/213 – Establishing post-pueruli growout data for western rock lobster. Principal Investigator: Dr Roy Melville-Smith. (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020).

In addition to project management, the Subprogram developed a range of new projects focussing specifically on rock lobster propagation. Other core activities undertaken by the Subprogram included:

Industry consultation and communication

Activities undertaken in relation to industry consultation and communication included:

- Participated in the West Australian Coastal Tour (October 23-27) facilitated by RLIAC and presented a paper on developments in rock lobster enhancement and aquaculture in support of a policy paper on puerulus collection currently under consideration in WA.
- Provided updates on developments in rock lobster aquaculture at rock lobster congresses and Australasian Aquaculture Conferences in 2005, 2006 and 2007.

Strategic planning

The bulk of the strategic planning within this project focussed on developing a more commercial approach to rock lobster propagation research. As a result of this planning, we developed a model for a joint approach to rock lobster propagation research in Australia. This took the following forms:

1. Through Kenny and Co., a Heads of Agreement for propagation research was tabled.
2. Rather than fund separate projects across Institutions, it was decided to develop a model for a single, multi-participant project with FRDC.
3. A range of example IP management and commercialisation models were proposed.

Communication with FRAB's

Communication with FRAB's over the course of the Subprogram included the following:

- Preparation of annual operating plans between 2004 and 2007.
- Reviews of relevant full research proposals and provision of comments to FRDC between 2004 and 2007.

Development of new research proposals

A wide range of activities were undertaken in an attempt to coordinate development of new research proposals within the Subprogram. These included:

- Meeting with tropical propagation research providers in Cairns to overview progress and discuss future models for propagation research. This included models for on-going ARC Linkage Grants between QDPI&F and The University of Western Australia.
- Meeting with relevant research and industry groups to discuss future options for rock lobster aquaculture and propagation research. Meetings were convened in Townsville, Melbourne and Hobart.
- Coordinating the development of full research proposals for tropical and temperate rock lobster propagation using teleconferences.
- Meeting with MG Kailis to discuss current and future propagation research and future management of the research.
- Convening meetings in Sydney at the Sydney Fish Market to redefine a research approach for propagation. Meetings were attended by representatives from TAFI, AIMS, QDPIF, FRDC and MG Kailis. An approach was agreed upon whereby TAFI would act as lead agent on a new proposal focussing on water quality, nutrition and metamorphosis.
- Convening meetings at the Lobster Congress in 2007 to finalise new project applications.

Review of research progress and direction

Review of research progress and direction was undertaken in conjunction with the RLEAS Steering Committee. This included:

- Convening Steering Committee meetings and annual meetings in Port Lincoln South Australia in 2004, Hobart, Tasmania in 2005, Adelaide, South Australia in 2006 and Cairns, Queensland in 2007. Minutes of these meetings are presented in Appendix IX.
- Project principal investigators interviewed and progress reports scrutinised at the Steering Committee meetings and 6 month progress reports were reviewed, approved and submitted to FRDC.
- Facilitated communications between propagation research centres via monthly e-mail updates.

Coordination of research extension

- All publications arising from the RLEAS were reviewed and either approved and published or advice was provided suggesting suppression of the outcomes until a firm base for commercialisation had been established.
- The Subprogram generated proceedings from all workshops. These proceedings are presented as separate documents to this final report.

Collaboration with international partners

The Subprogram attempted to foster collaboration with international partners in the following ways:

- Facilitated meetings with the Argentinian Chamber of Commerce, FRDC and active propogation research providers in Queensland and Tasmania.
- Attended the first ACIAR/Vietnam project meeting in Nha Trang in April, 2005 in an attempt to maintain an understanding of developments in rock lobster aquaculture in Vietnam.
- Participated in the annual CSIRO/ACIAR research meeting held in Queensland in 2006 to review progress associated with this project.
- Prepared and presented a paper on developments in rock lobster aquaculture in Australasia for the American Soybean Meal Association conference in Cambodia.

- Attended the FRDC Rock Lobster Post-Harvest Subprogram steering committee meeting and workshop in New Zealand on October 4-6, 2006 to promote Australian research into rock lobster enhancement and aquaculture and maintain links with this Subprogram.

Identification and procurement of additional funding

- It was envisaged that additional research funding for propagation research would be contingent upon the form of commercial entity established for ongoing rock propagation research. As this entity was not established, only discussions in principle were held.

Liaison with FRDC

- In addition to reporting described above, direct feedback was provided to FRDC through presentation of proposals on the future management of rock lobster propagation research to the FRDC Board in August, 2005.

OUTCOMES ACHIEVED

1. High levels of interaction and cooperation between research providers, scientists and commercial partners located across Australia with the common goal of establishing rock lobster aquaculture technologies through facilitation of workshops, meetings and strategic planning exercises.

2. The commencement of procedures and arrangements for the longer term, self-sustainable coordination and management of research relevant to rock lobster propagation research.

3. Technology for the successful commercial culture of a variety of rock lobster species from eggs, capacity to reseed the wild fishery using aquaculture reared juvenile lobsters, procedures and equipment for the large-scale harvesting of rock lobster puerulus while maintaining biological neutrality, and knowledge and techniques that allow the successful feeding, health management, husbandry, harvesting and sale of rock lobsters from puerulus to market size through the implementation and facilitation of strategic research and extension for the net benefit of the Australian rock lobster aquaculture and wild fishing sectors.

4. Reductions in the cost of conducting highly focussed research into rock lobster aquaculture and enhancement while improving the quality and quantity of outputs from the research program for the net benefit of the Australian rock lobster aquaculture and wild fishing sectors.

5. Improvements in the extension of research results arising from research into rock lobster aquaculture and enhancement and an increase in the commercialisation of research results leading to the establishment of commercial rock lobster aquaculture and enhancement systems.

KEYWORDS: Rock lobster, aquaculture.

BACKGROUND

Research and development is underway within Australia and New Zealand to provide technology for use in rock lobster enhancement and aquaculture systems so they can be internationally competitive and can operate in harmony with the wild fisheries. The success of this research program, given the diversity in potential lobster aquaculture species, culture regions, research providers and research disciplines is highly dependent on our capacity to coordinate these inputs.

The Status of Australian Rock Lobster Enhancement and Aquaculture

Commercial rock lobster enhancement and aquaculture is in its infancy in Australia. A number of States are investigating rock lobster aquaculture potential in various forms, the dominant methods including 1) on-growing of adults through a moult to increase weight whilst allowing sale at periods of peak demand/value; 2) on-growing of wild-caught puerulus (newly-settled juveniles) to a small (and potentially very valuable) market size of around 200-300 g, and 3) culture of phyllosoma from eggs through the 11 larval stages to puerulus and subsequent ongrowing to market size as above. In addition, the potential exists through improved survival rates, for aquaculture to provide stock for reseeding and enhancement of the wild fishery.

Further short-term development of a rock lobster aquaculture industry in Australia based on on-growing of wild-caught puerulus is technically feasible based on research completed to date within the FRDC Rock Lobster Enhancement and Aquaculture Subprogram, but will depend on the capacity of commercial aquaculture groups to liaise and work with the wild capture sector and to invest in the development of these aquaculture systems.

On-growing of wild-caught adult lobsters through a moult to increase weight whilst allowing sale at periods of peak demand/value is also technically feasible based on research completed within the FRDC Rock Lobster Enhancement and Aquaculture Subprogram and commercial activities to date. Further development of this sector will depend on the capacity of the wild capture sector to adopt on-growing techniques in aquaculture systems and to develop cost-effective value-adding procedures.

Despite technical and commercial potential existing for short-term developments in rock lobster aquaculture in Australia, long-term viability of a rock lobster aquaculture industry in Australia vests with closure of the life cycle of spiny lobsters. This is a difficult area of research that will consume a significant amount of resources over a long period of time (at least 5-10 years). It will require inputs from individuals and organisations with a wide range of expertise and a mechanism to facilitate collaborative research and development is essential if an outcome is to be achieved. This represents one of the fundamental functions of the Rock Lobster Enhancement and Aquaculture Subprogram.

Evolution of the Rock Lobster Enhancement and Aquaculture Subprogram

To address the growing interest in rock lobster enhancement and aquaculture, the Fisheries Research and Development Corporation established the Rock Lobster Enhancement and Aquaculture Subprogram (RLEAS) in July, 1998 following consultation with industry and scientists. The Subprogram was established with the following objective or "mission":

"To provide technology for use in Australian rock lobster enhancement and aquaculture systems so they can be internationally competitive and can operate in harmony with the wild fisheries".

"Enhancement" is used to describe processes that could improve the market value of an adult rock lobster collected from the wild (under existing guidelines) usually through supplementary feeding in sea-based cages or land-based tanks. Enhancement is also being used to describe the potential for aquaculture systems to produce additional puerulus or juveniles for use in reseeding programs for the wild fishery. "Aquaculture" describes the rearing of rock lobster from eggs to a marketable size in an intensive culture system or the ongrowing of juvenile lobsters to a marketable size in intensive culture systems.

The RLEAS has now completed two 3-year phases and significant scope exists to enter a third. A broad summary of these phases is presented below:

Phase I (1998-2001)

A subprogram approach to the management of this research portfolio was considered necessary by the FRDC given the potential for overlap between research projects, differing views from different sectors of the rock lobster industry in Australia, and the need to ensure adequate levels of communication between all stakeholders. At the time of establishment, the RLEAS consisted of 6 core projects investigating a range of challenges associated with the technical capacity for rearing spiny lobsters in aquaculture systems with no clearly defined strategy for further development. The core projects included:

98/300: Propagation of rock lobster – development of a collaborative national project with international partners. Principal Investigator: Dr Piers Hart (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053)

98/301: Facilitation, administration and promotion of the FRDC Rock Lobster Enhancement and Aquaculture Subprogram. Principal Investigator: Dr Robert van Barneveld (Barneveld Nutrition Pty Ltd, PO Box 42, Lyndoch, SA, 5351)

98/302: Towards establishing techniques for large-scale harvesting of pueruli and obtaining a better understanding of mortality rates. Principal Investigator: Dr Bruce Phillips (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020)

98/303: Feed development for rock lobster aquaculture. Principal Investigator: Dr Kevin Williams (CSIRO Division of Marine Research, Marine Laboratory, 233 Middle Street, Cleveland, Qld, 4163)

98/304: Pilot study of disease conditions in all potential rock lobster aquaculture species at different growth stages. Principal Investigator: Assoc Prof Louis Evans (Curtin University of Technology, Aquatic Sciences Research Unit, GPO Box U1987, Perth, WA, 6001)

98/305: Determination of optimum environmental and system requirements for juvenile and adult rock lobster holding and grow-out. Principal Investigator: Assoc Prof Mike Geddes (University of Adelaide, Department of Zoology, GPO Box 498, Adelaide, SA, 5001)

During the course of the first phase of the Subprogram, an additional two projects were approved by the FRDC Board, including:

99/314: Preliminary investigation towards ongrowing puerulus to enhance rock lobster stocks while providing animals for commercial culture. Principal Investigator: Dr Caleb Gardner (Tasmanian Aquaculture and Fisheries Institute, Marine Research laboratories, Nubeena Crescent, Taroona, TAS, 7053)

99/315: Propagation techniques. Principal Investigator: Dr Piers Hart (Tasmanian Aquaculture and Fisheries Institute, Marine Research laboratories, Nubeena Crescent, Taroona, TAS, 7053)

As part of the above research program, the RLEAS convened three national workshops (Geraldton, Hobart, New Zealand), hosted a lobster health workshop in Perth, Western Australia, a lobster propagation workshop in Hobart, Tasmania, and an international symposium on lobster health management in Adelaide, South Australia in conjunction with the Third International Lobster Congress.

The Subprogram evolved from being actively opposed by the wild fishing sector in many states, to being an integral part in the future development of the rock lobster sector. A degree of harmony was established between the wild fishery and the aquaculture sector, and a high degree of research

coordination was established between states and internationally with researchers in New Zealand and Japan. None of this would have been possible without an independent Subprogram Leader and a highly responsive Steering Committee that is strongly represented by industry members from across Australia. The presence of a coordination component within the RLEAS resulted in savings in the operation of new and existing projects far exceeding $500,000. During this phase of the program, outcomes were delivered from 4 core projects.

Phase II (2001-2004)

Phase II of the RLEAS was characterized by an increase in focus and strategic research direction. The RLEAS published research priorities with an increased focus on closure of the life cycle and enhancement, while maintaining a firm research base in priority areas such as health and nutrition. During Phase II of the program a total of 11 new projects were funded, including:

2000/185: Evaluating the release and survival of juvenile rock lobsters released for enhancement purposes. Principal Investigator: Dr Caleb Gardner. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053)

2000/211: Investigation into tail rot necrosis in live-held adult rock lobsters. Principal Investigator: soc Prof Mike Geddes. (University of Adelaide, Department of Zoology, GPO Box 498, Adelaide, SA, 5001)

2000/212: The nutrition of juvenile and adult lobsters to optimise survival, growth and condition. Principal Investigator: Dr Kevin Williams. (CSIRO Division of Marine Research, Marine Laboratory, 233 Middle Street, Cleveland, Qld, 4163).

2000/214: Advancing the hatchery propagation of rock lobsters. Principal Investigator: Dr Bradley Crear. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053).

2000/263: Reducing rock lobster larval rearing time through hormonal manipulation. Principal Investigator: Dr Mike Hall. (Australian Institute of Marine Science, Marine Biotechnology, PMB No 3, Townsville Mail Centre, Qld, 4810).

2001/094: Health assurance for Southern rock lobsters. Principal Investigator: Dr Judith Handlinger. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, Tasmania, 7053).

2001/211: Strategic planning, project development and facilitation of research and extension towards the establishment and maintenance of rock lobster aquaculture and enhancement systems in Australia. Principal Investigator: Dr Robert van Barneveld. (Barneveld Nutrition Pty ltd, 19-27 Coonan Rd, South Maclean, Qld, 4280)

Phase III (2004-2007)

The current application seeks to take the RLEAS into its third and probably most critical phase. The strategic research areas are increasingly focusing on propagation and the outcomes from existing and subsequent research will dictate how the subprogram exists in the future.

2002/045 – Assessing the possibilities for the natural settlement of western rock lobster. Principal Investigator: Dr Bruce Phillips. (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020).

2003/211 - Advancing the hatchery propagation of tropical rock lobsters (Panulirus ornatus). Principal Investigator: Mr Richard McCulloch – BSc(Hons). (MG Kailis Group, 50 Mews Rd, Fremantle, WA 6160).

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2003/213 – Establishing post-pueruli growout data for western rock lobster. Principal Investigator: Dr Roy Melville-Smith. (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020).

As well as an extended research program, a number of commercial rock lobster activities began during this phase of the RLEAS. A basis for collection of puerulus from the wild and on-growing to a marketable size was established in Tasmania. This form of aquaculture and enhancement is based on high mortality of wild puerulus in their first year post settlement (anywhere from 75-97%) compared with animals brought ashore and ongrown in tanks where the mortality is minimal (2% in Tasmania). This gives rise to the theory aquaculturists can ongrow the 'excess' that would have died in the wild. In 2001 in Tasmania, 7 licences were issued for the collection of 50,000 puerulus each, but to date, there has been limited commercial activity surrounding the use of these licenses. Aquaculture activities in South Australia continued to focus on on-growing and value adding to adult wild-caught lobsters. Activities included investigations into the holding and feeding of lobsters in land-based tanks using both existing flow through systems and infrastructure or recirculation systems. M G Kailis forged an alliance with the Queensland Department of Primary Industries to investigate the potential of culturing and growing tropical rock lobsters. Rock lobster aquaculture based on quota buy-out schemes in return for puerulus collection licenses (in the order of 1 tonne of quota in return for 40,000 puerulus) continued to be assessed in New Zealand.

The value of the subprogram approach and the RLEAS was clearly demonstrated during this phase. The RLEAS initiated reviews of core research programs and made significant changes to the direction of some of these projects as a result of the reviews. MG Kailis became an active participant in the subprogram, firstly through a private investment in research through the Queensland Department of Primary Industries, and secondly, as the lead agency in project 2003/211. The RLEAS convened (or is convening) three national workshops (Cairns, Geelong (in conjunction with the Second National Lobster Congress and the Rock Lobster Post-Harvest Subprogram) and Fremantle (in conjunction with the Third National Lobster Congress and the Rock Lobster Post-Harvest Subprogram)), a number of research planning forums and participated in the World Aquaculture Society meeting in Beijing in 2002. Again, the presence of the RLEAS resulted in significant improvements in the delivery of relevant outcomes and cost savings in the projects through enhanced collaboration and coordination.

The potential value of rock lobster aquaculture to Australia is reflected in the investment in this Subprogram to date. Between 1998 and 2006 a total of $6.14 million has been invested by FRDC, $6.32 million has been invested by research agencies and $4.49 million has been contributed as cash by commercial and other sources.

With a total investment of $16.96 million, it is important that we embrace mechanisms that will ensure rock lobster enhancement and aquaculture becomes a commercial reality in Australia in the near future. A core function of the current application will be the identification of innovative ways to deliver coordinated outcomes to industry and for the on-going management of research and development relevant to rock lobster enhancement and aquaculture.

Outcomes

To date, the strategic research areas have focussed on techniques for puerulus collection from the wild, biological neutrality of wild stocks, larval rearing/propagation of tropical and temperate species of rock lobsters, capacity for hormonal manipulation of the larval cycle, nutrition of juveniles and adult lobsters, on-growing of juveniles and system requirements, health of aquaculture reared juveniles, enhancement of wild stocks through reseeding or resettlement and capacity to increase the natural settlement of puerulus in the wild through the provision of artificial substrates. Outcomes from this research that have provided technical capacity for commercial rock lobster aquaculture systems in Australia include:

Biological neutrality:
Because of the high natural mortality, a regional investigation using historical data revealed that the impact of puerulus removals on subsequent catches was estimated to be minimal except in the case of removal of very large quantities in low settlement years, but even this could be countered by effort reductions in the wild capture sector. While regional, this outcome suggests that there is potential to base rock lobster aquaculture on puerulus collection in the short term.

Puerulus collection:
Investigations into developing methods to catch large numbers of pueruli found that pueruli of the western rock lobster are easiest to catch near the shore (depths <5 metres) and in locations with fringing reefs using a modified sandwich collector. Studies in Tasmania showed that southern rock lobster pueruli could be caught in a range of locations using both sandwich and bag collectors.

Nutrition:
Research has generated an enhanced knowledge of the factors influencing the acceptability of dry pelleted food by juvenile and adult rock lobsters plus an improved understanding of the protein and protein:energy requirements of juvenile rock lobsters. A database on the digestibility of ingredients for rock lobsters has been prepared and a pelleted diet that induces growth rates in tropical lobsters equivalent to that achieved with mussels is now available.

Health:
Autopsy and health monitoring procedures have been developed. A study on tail fan necrosis that develops in some situations with adult caught lobsters held in aquaculture systems has revealed that abrasions during capture predispose the tail fan to infection with naturally occurring vibrio species. Methods were assessed for the prevention of tail fan abrasion during capture.

On-growing juveniles and adults:
A range of systems for on-growing juvenile and adult tropical and temperate species of lobsters have been assessed. These assessments have demonstrated that lobsters are fairly robust in a variety of systems. Studies with adult southern rock lobsters have demonstrated that rates of gain in sea-based systems and have outlined the effect of photoperiod and temperature on growth and survival in juvenile southern rock lobsters.

Propagation:
This application has developed as a result of consultation with industry, the FRDC and research providers. The format of an on-going subprogram management project was dicussed at the RLEAS Steering Committee meeting in September, 2003 and it was decided that it was premature to consider a more commercial/corporate form of delivery. The Steering Committee recommended that a renewed application be submitted to the FRDC in a similar format to the one used for projects 1998/301 and 2001/211.

A significant amount of research has been undertaken into the propagation of southern and tropical rock lobsters. It is clear that nutrition and health are primary limitations to the rearing process. Progress is also being made in the hormonal manipulation of larval phases.

Enhancement:
Enhancement and reseeding experiments undertaken with the southern rock lobster have successfully demonstrated that aquaculture reared juveniles behave in a similar way to wild lobsters when returned to their natural habitat. This research has also investigated movement of reseeded juveniles and clearly indicates that reseeding programs are likely to result in an increase in viable adults within the fishery.

Extension

A core function of the RLEAS has been extension of results and communication with both the aquaculture and wild capture sectors. Some activities that have been undertaken to facilitate this

include:

National workshops:
Six national workshops have been convened since the RLEAS commenced. Each workshop has produced a comprehensive set of proceedings. Workshops have been convened in Western Australia, Tasmania, Queensland, Victoria and New Zealand. In addition, workshops have been delivered in the field of lobster health in Western Australia and South Australia.

Website:
A detailed website has been developed and linked to the FRDC website. The site contains details of the RLEAS activities, publications, newsletters and forthcoming events. It can be found at www.frdc.com.au/research/programs/rleas/.

Newsletters:
The RLEAS publishes a newsletter entitled "Lob ReLEASe". Copies are provided to all state-based rock lobster associations and government departments for distribution.

Annual operating plans and strategic plan:
An annual operating plan for the RLEAS is prepared and distributed to all Fisheries Research Advisory Bodies and relevant government departments for use in discussions relating to rock lobster aquaculture and the identification of priorities defined within the RLEAS.

Conferences and workshops:
The RLEAS has an identifiable logo that is used by all researchers presenting at national and international conferences. The Subprogram Leader has also represented the RLEAS at the World Aquaculture Society meetings in Beijing and will represent the Subprogram at the WAS meeting planned for Hawaii in March, 2004.

Application Development

A status report on the RLEAS was presented to the FRDC Board in Townsville in August, 2003. This report outlined the fact that the RLEAS represents a mechanism implemented by the FRDC for the management of research and exists at their discetion. Also highlighted was the need for continued subprogram management given the critical nature of the research currently underway.

The role of the RLEAS and the fact that the subprogram was facing renewal was presented at the 6th Annual RLEAS workshop in Fremantle in September, 2003. Discussions ensued with members of both the aquaculture and wild capture sectors in relation to the format of on-going Subprogram management.

Meetings have been held with Mr Roger Edwards acting on behalf of the Australian Southern Rock Lobster Industry. These meetings focussed on the relationship between the Southern Rock Lobster Industry and the RLEAS and how the RLEAS could be used to deliver outcomes to this industry in conjunction with new research and development plans and priorities being established. The RLEAS has also interacted significantly with the FRDC Rock Lobster Post-Harvest Subprogram to ensure there are no overlaps between the operations of the subprograms.

NEED

1. Research Relevance and Acceptance

The RLEAS is recognised as the focal point for rock lobster enhancement and aquaculture research. The Australian Southern Rock Lobster Industry has identified rock lobster culture and grow-out as a high priority and their strategic plan has identified the RLEAS as the basis for on-going development in this area through strategic alliances. Tropical rock lobsters are seen as holding the greatest short term potential as an aquaculture species. MG Kailis commenced independent research with the Queensland Department of Primary Industries into propagation and grow-out of P.ornatus, but have now invested in collaborative research within the RLEAS having recognised the scope of the task and the need for a coordinated approach. The potential value of rock lobster aquaculture and the RLEAS is evidenced by the fact that the projects operating within the Subprogram have attracted $4.5 million in cash contributions between 1998 and 2006. There is a need to maintain this focal point for rock lobster enhancement and aquaculture research to ensure the science remains relevant, to attract additional investment, to coordinate research nationally and where appropriate, internationally, and to ensure all opportunities are being captured.

2. Research Efficiency and Output

To date, the RLEAS has managed a portfolio of 19 projects representing a total investment from FRDC and stakeholders of nearly $17 million between 1998 and 2006. Outcomes from 12 of these projects have been delivered to date. Not only have the activities of the RLEAS and its Steering Committee ensured that this research remains highly focused, but it has fostered collaboration that would have been unlikely to eventuate in the absence of the subprogram. In addition, the strategic management provided by the RLEAS and the Subprogram Leader have ensured savings in project costs that far exceed the cost of running the coordination component of the subprogram. The coordination component of the RLEAS represents only 3.5% of the total investment in the subprogram, with travel costs for researchers and stakeholders managed through the coordination projects representing more than half of this cost. It is essential to maintain an independent Subprogram Leader to coordinate a national project of this nature, and as projects representing more than $8 million are still active within the RLEAS, on-going management is required to ensure relevant outcomes are delivered to industry.

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2. Development and implementation of strategic plans and the facilitation of research and extension to assist the establishment of rock lobster aquaculture and enhancement systems in Australia.

3. Coordination of a wide range of discipline-based (ie nutrition, reproduction, husbandry) research projects across a range of rock lobster species relevant to different regions of Australia.

4. Facilitate independent reviews of research projects within the Subprogram as required to optimize research efficiency and project outcomes.

5. Identification and procurement of funding from a variety of sources additional to FRDC to compliment or enhance existing rock lobster enhancement and aquaculture research in Australia and New Zealand.

6. Facilitate the delivery of outcomes from the RLEAS in the form of annual workshops, newsletters, media releases, final reports, workshop proceedings and scientific publications.

7. Provide a single point of contact for rock lobster enhancement and aquaculture research in Australia and liaise with state-based industry bodies relevant to the rock lobster sector for the on-going delivery of rock lobster enhancement and aquaculture research.

8. Facilitate the functions of a RLEAS Steering Committee to ensure ongoing research programs have a high degree of industry relevance and focus.

GENERAL METHODS

Industry consultation and communication

The Subprogram Leader, Dr van Barneveld, continued to promote the activities of the RLEAS through a website and direct communication with industry organisations and representatives. Heavy reliance was placed upon ongoing maintenance of the Steering Committee with representatives from the rock lobster wild fishing sectors and the aquaculture sectors across Australia and New Zealand for the provision of strategic direction and advice.

Strategic planning

Strategic planning for the RLEAS was based on outcomes from the previous research program and ongoing consultation between the Subprogram Leader and members of industry and researchers in Australia and New Zealand. The strategic plan was maintained and updated annually using the website and electronic distribution. The strategic planning process identified those factors that represented restrictions to the initial establishment of rock lobster aquaculture (eg. propagation, nutrition) and enhancement (eg. monitoring survival, prevention of disease introduction to the wild fishery) processes, and then utilises a relative ranking score from the various rock lobster fisheries across Australia.

It became clear over the course of the project that outcomes from the propagation research were significant and held some commercial potential. In an attempt to contain IP leakage and ensure a valuable commercial outcome for the Australian lobster sector, the Subprogram attempted to facilitate the rock lobster propagation commercialisation process and IP protection mechanisms. The proposed process broadly involved the following:

- Engagement of a range of expertise in consultation with the identified stakeholders to develop:
    - an R&D model for the Project (based around the current RLEAS model)
    - a commercialisation model for the Project, addressing the likely options for commercialisation of the outcomes of the R&D work;
    - a taxation and revenue model, addressing the tax and revenue implications of both the R&D model and the commercialisation model; and
    - a legal model which will encompass:-
        - IP ownership, and protection and risk management strategies, developed in the context of the R&D and commercialisation models; and
        - entry, exit and ongoing contribution (as the basis for continuing participation), for multiple investors and contributors, including some overseas investors, and the potential for both government and/or venture capital funding, which accommodates the tax and revenue model.

- To identify stakeholders in any commercial entity based on investment in previous, current or future rock lobster propagation research.

- To foster a single-minded research environment where all contributions, regardless of funding source, are directed towards the commercial-scale production of rock lobster puerulus from eggs.

Communication with FRAB's

Communication with FRAB's was via distribution of an annual operating plan for the RLEAS in December of each year combined with direct communications. The Subprogram Leader also attended the annual FRDC FRAB workshop to promote the activities and objectives of the RLEAS.

Development of new research proposals

New research proposals were developed through the use of facilitated strategic planning meetings. Using priorities published in the RLEAS Strategic Plan, the Subprogram Leader convened meetings with relevant researchers and research institutions to:

1. Define the planned outcomes of the new proposal;
2. Manage an indicative budget for the research as defined by the Steering Committee;
3. Identify which researchers/institutions are best placed to undertake the research;
4. Promote collaboration between researchers and institutions where appropriate;
5. Seek external expertise and inputs as required;
6. Ensure the new proposals meets the objectives of the subprogram and that the research remains relevant and focussed.

The Subprogram Leader ensured new research proposals were distributed to FRABS and the RLEAS Steering Committee for comment and ratification before submitting the proposals to FRDC on behalf of the lead agencies, or facilitating adjustments to the proposals prior to submission.

Coordination of research reports

The Subprogram Leader continued to collate progress and final reports from projects within the Subprogram in March and September each year for delivery in a common format to FRDC. These reports were distributed to members of the Steering Committee for comment and review.

Review of research progress and direction

The RLEAS Steering Committee interviewed the Principal Investigator of each project within the Subprogram once annually as part of the Steering Committee meeting. Principal Investigators were expected to report progress against contracted milestones, justify any changes in research direction, and demonstrate that the research program is making a valuable contribution towards the achievement of the subprogram objectives. The Steering Committee made recommendations to the FRDC Board in relation to potential changes to the objectives of the research program, or instances where project progress was unsatisfactory.

Coordination of research extension

A major function of the Subprogram Leader was the organisation and delivery of an annual research workshop to highlight the activities and outputs of the RLEAS. Workshops were convened with presentations from invited speakers and researchers aimed at delivering key messages to end-users for use in practical rock lobster aquaculture and enhancement systems.

The Subprogram Leader was responsible for the approval of all media releases and scientific publications arising from research projects within the Subprogram using the RLEAS Steering Committee communication policy as a guide.

Collaboration with international partners

The Subprogram Leader has already established a major international collaboration between researchers in Australia and New Zealand through project 98/301. This was achieved through direct interaction with researchers in New Zealand and involvement of these scientists in the RLEAS research program. There was further opportunity to build on relationships initiated with Japanese researchers by AIMS, CSIRO and TAFI as the RLEAS continues to evolve. In all cases, international collaborations will be based on a two-way flow of information and where possible, research funds.

Identification and procurement of additional funding

The RLEAS was committed to ensuring the research program remained commercially focussed. In keeping with this, the Steering Committee and Subprogram Leader examined numerous options for future management of the Subprogram including commercial entities and alliances.

Liaison with FRDC

The Subprogram Leader was the conduit for communications between FRDC and subprogram participants in relation to project contracts, project reports, new submissions and general correspondence. The Subprogram Leader also represented the RLEAS at the annual FIRDC FRAB and other Subprogram meetings.

RESULTS/DISCUSSION

Industry consultation and communication

Activities undertaken in relation to industry consultation and communication included:

- Provided an update on developments in rock lobster aquaculture to the Board of Southern Rocklobster Ltd in Melbourne in December, 2004.
- Met with Roger Edwards from Southern Rocklobster Ltd in Adelaide to discuss future propagation research options and the role of the southern rock lobster industry in these developments in January, 2005.
- Participated in the West Australian Coastal Tour (October 23-27) facilitated by RLIAC and presented a paper on developments in rock lobster enhancement and aquaculture in support of a policy paper on puerulus collection currently under consideration in WA (see Appendix III).
- Provided updates on developments in rock lobster aquaculture at rock lobster congresses and Australasian Aquaculture Conferences in 2005, 2006 and 2007 (see Appendix IV).

Strategic planning

The bulk of the strategic planning within this project focussed on developing a more commercial approach to rock lobster propagation research. This included the following meetings:

- Met with Kenny and Co. in Brisbane on several occasions to discuss options for the management of Intellectual Property arising from the RLEAS propagation program and the development of new model contracts.
- Met with MG Kailis and participating research institutions on August 27, 2006 to discuss how to progress the recently approved propagation research program subsequent to the commercial success at MG Kailis to produce *P.ornatus* puerulus.
- Met with Andrew Jeffs and Mike Powers from Darden Restaurants on September 26, 2006 to discuss possible entry and investment into the propagation research program.
- Drafted a response letter from Patrick Hone to Alex Kailis about the status of the rock lobster propagation commercialisation project and current propagation research proposal.
- Met with Alex Kailis to discuss the status of rock lobster propagation commercialisation on October 26, 2006.
- Convened teleconferences with Darden to discuss potential involvement in the rock lobster propagation commercialisation project.

As a result of these discussions, we developed a model for a joint approach to rock lobster propagation research in Australia. This took the following forms:

4. Through Kenny and Co., a Heads of Agreement for propagation research was tabled (see Appendix V).
5. Rather than fund separate projects across Institutions, it was decided to develop a model for a single, multi-participant project with FRDC. The contract developed for this approach is presented in Appendix VI).
6. A range of example IP management and commercialisation models were proposed.

These documents caused the participating institutions significant angst and stalled the momentum that had been gathered within the Subprogram. A range of meetings were convened in an attempt to resolve some of the issues (see Appendix VII).

It soon became clear that it was unlikely that a resolution would be reached in the short term and there was an urgent need to progress existing research projects before resolving a way forward for a more commercial approach to rock lobster propagation research. It was decided following meetings in

September, 2007 to draft individual contracts for research projects with TAFI, AIMS, and QDPIF and then make decisions relating to future opportunities for commercialisation as part of a new Subprogram.

Communication with FRAB's

Communication with FRAB's over the course of the Subprogram included the following:

- Preparation of annual operating plans between 2004 and 2007 (see Appendix VIII).
- Reviews of relevant full research proposals and provision of comments to FRDC between 2004 and 2007.
- Presentation of an update on the RLEAS Subprogram to the SA FRAB in March, 2005.

Development of new research proposals

A wide range of activities were undertaken in an attempt to coordinate development of new research proposals within the Subprogram. These included:

- Meeting with tropical propagation research providers in Cairns to overview progress and discuss future models for propagation research. This included models for on-going ARC Linkage Grants between QDPI&F and The University of Western Australia.
- Meeting with relevant research and industry groups to discuss future options for rock lobster aquaculture and propagation research. Meetings were convened in Townsville, Melbourne and Hobart.
- Coordinating the development of full research proposals for tropical and temperate rock lobster propagation using teleconferences.
- Meeting with MG Kailis to discuss current and future propagation research and future management of the research.
- Convening meetings in Sydney at the Sydney Fish Market to redefine a research approach for propagation. Meetings were attended by representatives from TAFI, AIMS, QDPIF, FRDC and MG Kailis. An approach was agreed upon whereby TAFI would act as lead agent on a new proposal focussing on water quality, nutrition and metamorphosis. This proposal was supported by the FRDC Board with a number of qualifications and formed the basis of the joint project application.
- Reviewing the existing nutrition components of the rock lobster propagation application (2006/235) and suggested a range of amendments.
- Convening a teleconference with Clive Jones, Danielle Johnston and Matt Kenway to discuss current and future nutrition research on October 30, 2006.
- Convening meetings at the Lobster Congress in 2007 to finalise new project applications.

Coordination of research reports

The following was undertaken to coordinate research reports to FRDC:

- Draft final reports for projects 2001/094, 2000/263 and 2000/214 were reviewed and comments returned to Principal Investigators for consideration and development of the final draft of the reports.
- Draft final report for project 2002/045 "Assessing the possibilities for the natural settlement of western rock lobster" was reviewed and comments returned to the Principal Investigator for consideration and development of the final draft of the reports.
- Reviewed progress report for project 2004/248 and provided feedback to FRDC and the Principal Investigator.
- Final report for 2001/211 was completed and submitted to FRDC.
- Reviewed draft final report for Project 2000/214 and provided comments to FRDC and the Principal Investigator.

- Prepared draft meeting minutes and provided response letters to all milestone reports and currently outstanding final reports for 2006.

Review of research progress and direction

Review of research progress and direction was undertaken in conjunction with the RLEAS Steering Committee. This included:

- Convening Steering Committee meetings and annual meetings in Port Lincoln South Australia in 2004, Hobart, Tasmania in 2005, Adelaide, South Australia in 2006 and Cairns, Queensland in 2007. Minutes of these meetings are presented in Appendix IX.
- Project principal investigators interviewed and progress reports scrutinised at the Steering Committee meetings and 6 month progress reports were reviewed, approved and submitted to FRDC.
- Facilitated communications between propagation research centres via monthly e-mail updates (see Appendix X).

Coordination of research extension

- All publications arising from the RLEAS were reviewed and either approved and published or advice was provided suggesting suppression of the outcomes until a firm base for commercialisation had been established. A full list of publications is presented in Appendix XI.
- The Subprogram generated proceedings from all workshops. These proceedings are presented as separate documents to this final report.

Collaboration with international partners

The Subprogram attempted to foster collaboration with international partners in the following ways:

- Facilitated meetings with the Argentinian Chamber of Commerce, FRDC and active propogation research providers in Queensland and Tasmania.
- Attended the first ACIAR/Vietnam project meeting in Nha Trang in April, 2005 in an attempt to maintain an understanding of developments in rock lobster aquaculture in Vietnam.
- Participated in the annual CSIRO/ACIAR research meeting held in Queensland in 2006 to review progress associated with this project.
- Prepared and presented a paper on developments in rock lobster aquaculture in Australasia for the American Soybean Meal Association conference in Cambodia (see Appendix XII). There was some interest in these developments at the conference, but my belief is the audience did not appreciate the potential for this aquaculture sector.
- Attended the FRDC Rock Lobster Post-Harvest Subprogram steering committee meeting and workshop in New Zealand on October 4-6, 2006 to promote Australian research into rock lobster enhancement and aquaculture and maintain links with this Subprogram.

Identification and procurement of additional funding

It was envisaged that additional research funding for propagation research would be contingent upon the form of commercial entity established for ongoing rock propagation research. As this entity was not established, only discussions in principle were held including:

- Meetings with Dardenne Restaurants in Cairns with QDPI and MG Kailis to discuss investment in rock lobster propagation research.
- Meetings with King Island Marine Aquaculture in Sydney to discuss investment in rock lobster propagation research.
- Teleconferences and e-mail liaison with TAFI to discuss ARC funding and the potential impacts of this funding on the current project 2006/235.

Liaison with FRDC

- In addition to reporting described above, direct feedback was provided to FRDC through presentation of proposals on the future management of rock lobster propagation research to the FRDC Board in August, 2005 (see Appendix XIII).

BENEFITS

Benefits arising from this project include:

6. High levels of interaction and cooperation between research providers, scientists and commercial partners located across Australia with the common goal of establishing rock lobster aquaculture technologies through facilitation of workshops, meetings and strategic planning exercises.

7. The commencement of procedures and arrangements for the longer term, self-sustainable coordination and management of research relevant to rock lobster propagation research.

8. Technology for the successful commercial culture of a variety of rock lobster species from eggs, capacity to reseed the wild fishery using aquaculture reared juvenile lobsters, procedures and equipment for the large-scale harvesting of rock lobster puerulus while maintaining biological neutrality, and knowledge and techniques that allow the successful feeding, health management, husbandry, harvesting and sale of rock lobsters from puerulus to market size through the implementation and facilitation of strategic research and extension for the net benefit of the Australian rock lobster aquaculture and wild fishing sectors.

9. Reductions in the cost of conducting highly focussed research into rock lobster aquaculture and enhancement while improving the quality and quantity of outputs from the research program for the net benefit of the Australian rock lobster aquaculture and wild fishing sectors.

10. Improvements in the extension of research results arising from research into rock lobster aquaculture and enhancement and an increase in the commercialisation of research results leading to the establishment of commercial rock lobster aquaculture and enhancement systems.

FURTHER DEVELOPMENT

As a result of this project, a further submission was made to FRDC for continuation of the RLEAS. This project was funded and will be on-going until June, 2010.

CONCLUSION

The RLEAS continued to deliver a highly focussed and collaborative research program into rock lobster enhancement and aquaculture and refined this focus specifically to propagation research over the course of this project. Despite the best efforts to commercialise the propagation research program it was difficult to garner agreements across all stakeholders and changes in approach will be required if this is to ever eventuate.

APPENDIX I – Intellectual Property

There is no intellectual property arising from this project.

APPENDIX II - Staff

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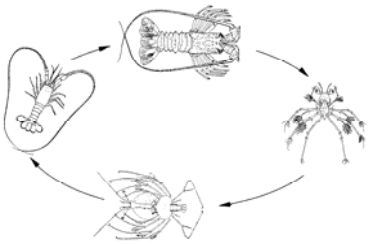
Appendix III – WA Coastal Tour Presentation 2006

The Future of Rock Lobster Enhancement and Aquaculture in Australia

Dr Robert van Barneveld
Leader, FRDC Rock Lobster Enhancement and Aquaculture Subprogram

Propagation



Summary

- Pathways to industry development
- Progress and outputs
- Propagation

Approaches to Enhancement and Aquaculture

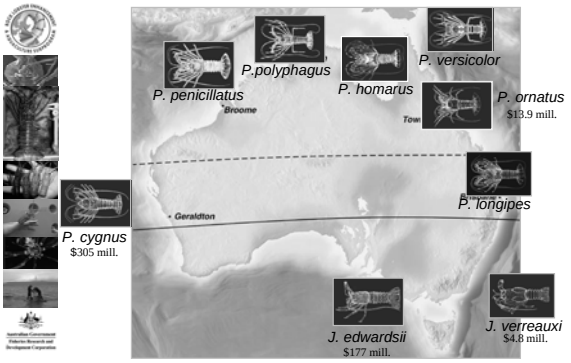
Puerulus
↓
Collection
↓
On-growing
↓
Market **Re-seeding**

Approaches to Enhancement and Aquaculture

Adult
↓
Collection
↓
On-growing/ value-adding → **Redistribution**
↓
Market ← **Recapture**

Approaches to Enhancement and Aquaculture

Broodstock
↓
Culture
↓
On-growing
↓
Market **Re-seeding**



Southern Rock Lobster

- Settlement enhancement
- Puerulus collection
  - Re-seeding scheme vs quota buy-out
  - Collection feasible
  - Trials unsuccessful

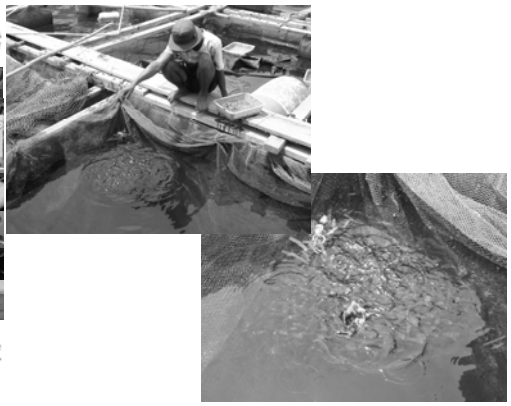
- Propagation
  - Closure of *J.edwardsii* and *J.verreauxi*
- Translocation
- Adult holding and enhancement

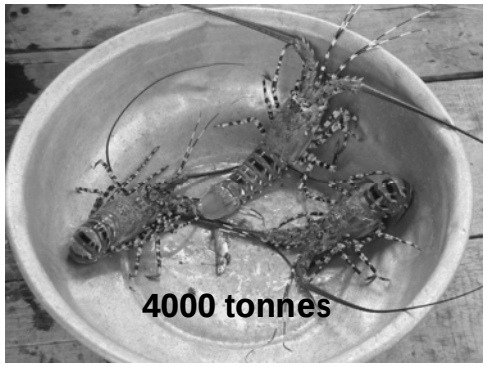
Western Rock Lobster

- Settlement enhancement
  - Artificial structures
- Puerulus collection
  - Biological neutrality
  - Collection methods
  - Significant property rights issues
- Propagation
  - No research to date of life cycle closure
- Translocation
  - Interest in results arising from Tasmania
- Adult holding and enhancement

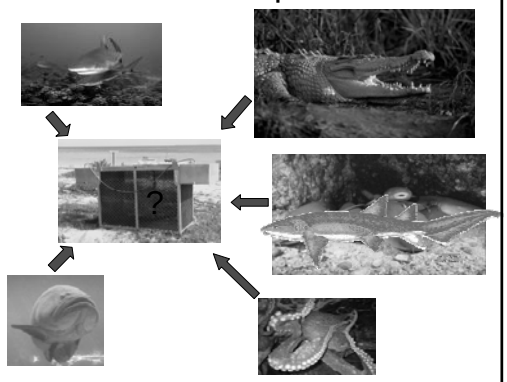
Tropical Rock Lobster

- Settlement enhancement
- Puerulus collection
  - Significant interest from indigenous populations
  - Predators an issue in the Torres Strait
- Propagation
  - Successful culture of *P.ornatus*
- Translocation
- Adult holding and enhancement





Predators in Australian tropical waters



Progress and Outputs

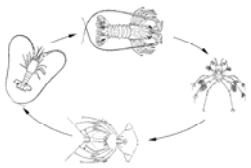
Progress and Outputs

- Biological neutrality
- Puerulus collection
- Health
- Nutrition
- On-growing and system design
- Enhancement/re-seeding

Robust aquaculture species

Biological neutrality

- Regional study completed
- Collections unlikely to influence wild capture fishery



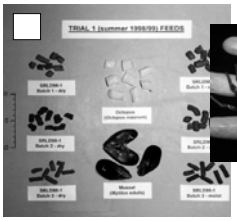
Puerulus collection

- Collector types examined
- Suitable technology available in WA and Tasmania

On-growing of juveniles and system design

Nutrition

- Manufactured feeds developed for grow-out
- Focus on *P.ornatus*

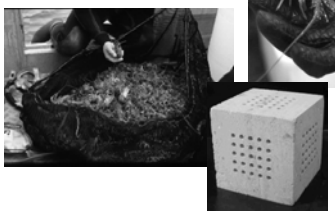


Health

- Tail fan necrosis
- Health monitoring for reseeding

Enhancement

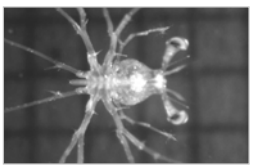
- Survival and behavior of reseeded juveniles
- Release protocols
- Habitat requirements
- Enhancing settlement



Enhancement

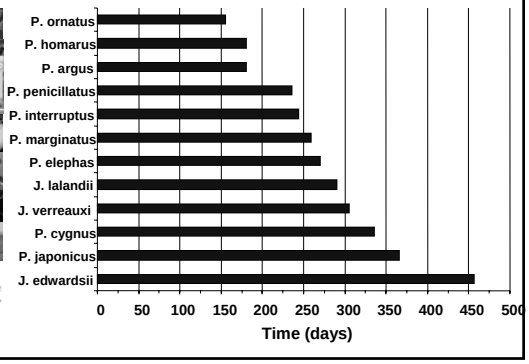
- Translocating rock lobsters to increase yield
- Shifting undersize lobsters to new areas to increase product quality or add value
- Feasibility study complete
- New project underway

Propagation

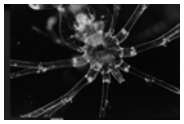


Length of Phyllosoma Period in Rock Lobster Species

Only 5% of marine species have larval phases exceeding 3 months



Propagation

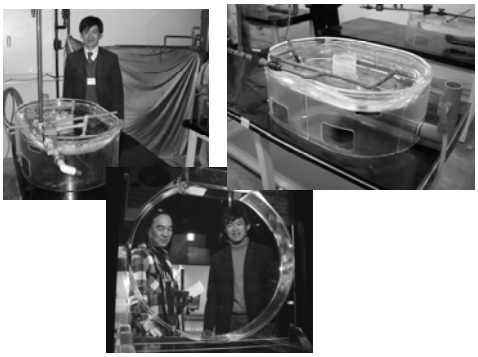


- Nutrition
- System design
- Health
- Broodstock conditioning
- Hormonal manipulation of larval phases

Propagation Research - Japan

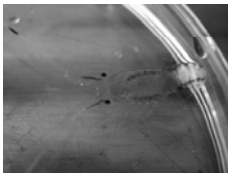
Static culture systems - >20 years have provided detailed understanding of larval biology

Propagation Research - Japan



Propagation

- Routine culture of *P.ornatus* and *J.edwardsii* to Stage V in large numbers
- Successful culture of *J.edwardsii*
- Successful culture of *P.ornatus*
- Successful culture of *J.verreauxi*



Propagation

- Collaborative research project developed
- $AUD1.55 million over 5 years
- QDPIF, AIMS and TAFI
- Primary research focus is the culture of *P. ornatus*
- Adapt outcomes to the culture of temperate species
- ARC have just invested in additional research with TAFI

Propagation

- Focus on culture from Stage VI to Stage XI
- Replacement of Artemia with manufactured feeds for all phases
- Management of water quality using ozonation
- Monitoring water quality using advanced PCR techniques
- Benchmarking project progress with large scale culture

Propagation

- Investigating IP, research management and commercialisation models
- Integration of public and private sector investors
- Capacity for overseas or new investments?

Conclusions

- Significant research effort underway in Australia and New Zealand
- Rock lobster grow-out technically feasible
- Closure of the life-cycle remains a high priority and represents the future of an Australian industry
- Wild-capture sector should maintain a close watching brief on developments and wherever possible should ensure some involvement in the development process

Acknowledgements

Research outlined in this presentation was funded in part by the Fisheries Research and Development Corporation through the Rock Lobster Enhancement and Aquaculture Subprogram

Appendix IV – Conference Subprogram Presentations

THE FUTURE OF ROCK LOBSTER ENHANCEMENT AND AQUACULTURE IN AUSTRALIA

Robert J. van Barneveld
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3-15 Dennis Rd, Springwood QLD 4127. rob@barneveld.com.au.

Development of a rock lobster aquaculture industry in Australia is dependent on our capacity to secure reliable sources of seed stock in the form of puerulus or juveniles. This represents a significant impediment given the task of rearing of large numbers of rock lobster larvae to metamorphosis at will and is undoubtedly one of the greatest challenges in aquaculture today. To date, outcomes from investment (>$AUD20 million) in rock lobster enhancement and aquaculture research have been significant. Initial research covered a broad range of research areas, but this has become increasingly focused over time. At this point in time, the research program has provided 1) evidence that high natural mortalities far exceed our capacity to collect rock lobster puerulus from the wild for use in aquaculture systems and as a consequence, in a carefully managed fishery, collection of reasonable quantities of puerulus from the wild is unlikely to impact on wild stocks; 2) technical and practical capacity to collect rock lobster puerulus from the wild for on-growing; 3) basic manufactured diets for use in rock lobster aquaculture and evidence that acceptable growth rates and product quality can be achieved with manufactured diets; 4) capacity to manipulate rock lobster appearance and quality through nutrition; 5) basic assessments of the health of aquaculture-reared rock lobsters; 6) assessment of rock lobster grow-out capacity in sea cages and land-based systems as well as technical advances in systems design and management; 7) a clear demonstration that aquaculture-reared juveniles can be successfully returned to the wild with a net benefit for overall rock lobster stocks; 8) demonstration that the hormones triggering moults in *P.ornatus* are similar to those involved in the moult cycles of insects; and 9) investigations into the capacity to enhance natural settlement of western rock lobsters using artificial substrates. In short, the research program to date has demonstrated that as an aquaculture species spiny lobsters are robust. The technical information derived from research could be successfully applied to commercially rear rock lobsters in aquaculture systems if a reliable source of puerulus or juveniles could be identified. With the exception of high settlement years in Western Australia, and collection of juveniles in the Torres Strait by indigenous communities, collection of puerulus or juveniles from the wild is highly unlikely to form the basis of a rock lobster aquaculture industry in Australia. Consultation with the wild capture sectors has made it clear that while collection of puerulus from the wild may be technically feasible, issues surrounding property rights, access and variation in puerulus settlement from year to year will ensure that this is a very shaky basis on which to establish an industry.

Culture of spiny lobsters will become a commercial reality in Australia based on very promising research results. To date, Australian scientists have produced puerulus from eggs of both temperate (*J.edwardsii*) and tropical (*P. ornatus*) spiny lobster species. In 2004 a *J.edwardsii* Stage 11 phyllosoma was progressed through metamorphosis to the puerulus stage that subsequently moulted to a juvenile. This was achieved in 300 days compared with an estimated 450 days for larval phases of this species in the wild. It should be noted, however, that the larval rearing time for rock lobsters is significantly longer than any other aquaculture reared crustacean species and may influence the approach to make this form of aquaculture commercially viable. In 2006, an Australian company was also successful in rearing *P.ornatus* puerulus from eggs in less than 150 days following very high survival of phyllosoma to Stage X and XI.

Capturing the Benefits:
Developing a commercial basis for the propagation of rock lobster in Australia

Dr Robert van Barneveld
Leader, FRDC Rock Lobster Enhancement and Aquaculture Subprogram

Reality check….

- Within the next 5-10 years, spiny lobsters reared from eggs will reach the international market place
- Some of these lobsters will originate from Australia
- Australia is a world leader in propagation research

Reality check….

- Development of lobster aquaculture systems worldwide will depend on access to puerulus produced from eggs
- Management of technologies and capacity to produce puerulus from eggs is critical if Australia is to retain a competitive advantage

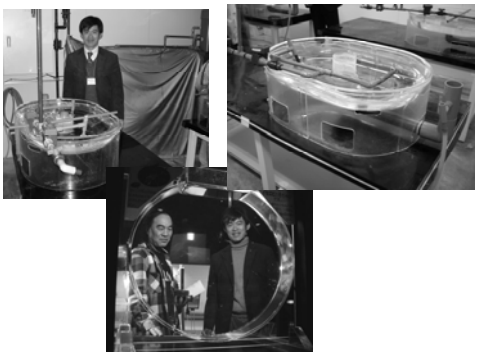
Summary

- Developments and interest in the propagation of lobsters internationally
- Progress in Australia towards propagation of lobsters
- Capturing research benefits for Australia

Propagation Research - Japan

Static culture systems - >20 years have provided detailed understanding of larval biology

Propagation Research - Japan



Culture Species in Japan

- *Jasus edwardsii* 250 - 437 days
- *Jasus lalandii* 306 days
- *Sagmariasus verreauxi* 189 - 359 days
  Panulirus japonicus 231 - 417 days
- *Panulirus longipes* 281 - 294 days
- *Panulirus argus* 141 days
- *Palinurus elephas* 65 – 132 days

Vietnam

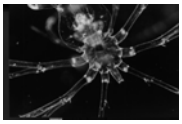
2000-3000 tonnes/annum

Vietnam

Other Culture/Interest

- Australia
- USA
- South America
- Asia (co-culture with crabs and other species)

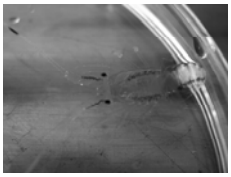
Propagation - Australia



- Nutrition
- System design
- Health
- Broodstock conditioning
- Hormonal manipulation of larval phases
- Water quality

Propagation - Australia

- Routine culture of *P.ornatus* and *J.edwardsii* to Stage V in large numbers
- Successful culture of *J.edwardsii*
- Successful culture of *P.ornatus*
- Successful culture of *S.verreauxi*



Propagation - Australia

- On-going research aimed at refining processes and success rate
- Nutrition - Replacement of Artemia with manufactured feeds for all phases; refinement of diets
- Health - Management of water quality using ozonation

Development of Aquaculture Systems

- Nutrition
- Husbandry
- System design
- Health

Spiny lobsters are a very robust aquaculture species

Development Constraints

- Supply of puerulus
  - Puerulus collection
    - Sustainability/neutrality
    - Ownership
    - Reliability of supply
  - Lifecycle closure
    - No longer a constraint

Capturing Benefits

- Limited amount of protected technology has arisen from the Australian research program
- Competitive advantage vests with know-how and experience
- How do we ensure this know-how and competitive advantage is retained and managed?
- How do we manage the development of new technologies ?
- Difficult to progress……..

Capturing Benefits - Challenges

- 2 state-based research organisations
- 1 Commonwealth research organisation
- 1 Commonwealth research and development corporation
- 1 commercial partner

- 3+ interested commercial partners from Australia and overseas
- 1 industry partner
- Federal funding of parallel research

Capturing Benefits - Challenges

- Maintenance of research capacity
- Sufficient investment in R&D
- Key needs of all existing parties are met
- Capacity to involve new stakeholders
- Managing international interest while maintaining a benefit for Australia
- Recognising concerns from existing rock lobster sectors

Capturing Benefits - Options

- Protection of all new technologies and applications through patents etc – difficult and unrealistic
- Development of a commercial hatchery involving existing research providers and commercial partners – not core business
- Maintenance of a competitive advantage – difficult but more realistic

Capturing Benefits - Future

- On-going development of leading edge technologies
- Active and strict control of information flow
- Strategic commercial and industry partnerships
- Co-ordinated commercial approach to R&D with key research partners

Conclusions

- Closure of the life cycle of spiny lobsters has been achieved – Commercial up-scaling underway
- Lobsters reared from eggs will enter the market place in the next 5-10 years
- Australia is a world-leader in the propagation of spiny lobsters
- Our capacity to manage our competitive advantage will influence how lobster aquaculture systems develop in Australia and overseas

Acknowledgements

Research outlined in this presentation was funded in part by the Fisheries Research and Development Corporation through the Rock Lobster Enhancement and Aquaculture Subprogram

Appendix V – Proposed Heads of Agreement for Propagation Research

Dated this day of 2008

between **THE DEPARTMENT OF AGRICULTURE, FISHERIES & FORESTRY**

and **THE AUSTRALIAN INSTITUTE OF MARINE SCIENCE**

and **MG KAILIS PTY LTD**

and **THE TASMANIAN DEPARTMENT OF PRIMARY INDUSTRIES, WATER & ENVIRONMENT TRADING AS THE TASMANIAN AQUACULTURE & FISHERIES INSTITUTE**

and **THE UNIVERSITY OF TASMANIA (SCHOOL OF ZOOLOGY) TRADING AS THE TASMANIAN AQUACULTURE & FISHERIES INSTITUTE**

and **THE QUEENSLAND GOVERNMENT**

and **TRADECO**

and **HOLDCO**

HEADS OF AGREEMENT

Messrs **KENNY & CO**
Solicitors
Level 5
316 Adelaide Street
BRISBANE QLD 4000

Tel: + 61 7 3221 7499
Fax: + 61 7 3221 7371
Email: john@entrelaw.com

These **HEADS OF COLLABORATION AGREEMENT** are made this day of 2008

between **THE DEPARTMENT OF AGRICULTURE, FISHERIES & FORESTRY** of ## in the said state ("DAFF")

and **THE AUSTRALIAN INSTITUTE OF MARINE SCIENCE PTY LTD (ACN ##)** whose registered office is at ## in the Australian Capital Territory ("Instimar")

and **MG KAILIS PTY LTD (ACN 47 008 684 802)** whose registered office is at ## in the state of Western Australia ("Kalis")

and **THE TASMANIAN DEPARTMENT OF PRIMARY INDUSTRIES, WATER & ENVIRONMENT trading as THE TASMANIAN AQUACULTURE & FISHERIES INSTITUTE** and **THE UNIVERSITY OF TASMANIA (SCHOOL OF ZOOLOGY) trading as THE TASMANIAN AQUACULTURE & FISHERIES INSTITUTE** of ## in the state of Tasmania ("Aquatas")

and **THE QUEENSLAND GOVERNMENT** of ## in state of Queensland ("Q Co")

and **TRADECO PTY LTD (ACN ##)** whose registered office is at ## in the said state ("Tradeco")

and **HOLDCO PTY LTD (ACN ##)** whose registered office is at ## in the said state ("Holdco")

(each of Holdco and Tradeco jointly and severally "the Entities")

BACKGROUND

A. The Collaborators have been working together for the Research and Development for the Project. Considerable progress has been made and the Collaborators have decided to work together to develop a common platform for the Rights.

B. The Collaborators intend to become joint Collaborators through the Entities to operate a Project for the purposes of promoting and commercialising the Business.

C.

COLLABORATOR	SHAREHOLDING NOMINEE	% OF SHARES	DIRECTOR NOMINEE
1. The Department of Agriculture, Fisheries & Forestry			
2. The Australian Institute of Marine Science Pty Ltd			
3. Mg Kailis Pty Ltd			
4. The Tasmanian Aquaculture & Fisheries Institute			
5. The Queensland Government			

D. Holdco shall be the vehicle for the Project, and will hold the Rights for the purposes of the Project, which it will licence to ##.

E. Kenny & Co Solicitors act on behalf of ##. All other parties have been encouraged and afforded the opportunity to obtain independent professional advice.

NOW THESE HEADS OF AGREEMENT RECORD that the Collaborators agree to use their best endeavours to speedily negotiate and settle a Collaboration Agreement in accordance with the timetable in Schedule 6 and the diagram in Schedule 7 and the General Conditions and Schedules to these Heads of Agreement.

EXECUTED as an Agreement on the date referred to above.

_____

Signed by ## both personally and for and on behalf of **THE DEPARTMENT OF AGRICULTURE, FISHERIES & FORESTRY** in the presence of:-)

_____
Witness

Signed by ## both personally and for and on behalf of **THE AUSTRALIAN INSTITUTE OF MARINE SCIENCE PTY LTD (ACN ##)** in the presence of:-)

_____
Witness

Signed by ## both personally and for and on behalf of **MG KAILIS PTY LTD (ACN ##)** in the presence of:-)

_____
Witness

Signed by ## both personally and for and on behalf of **THE TASMANIAN DEPARTMENT OF PRIMARY INDUSTRIES, WATER & ENVIRONMENT TRADING AS THE TASMANIAN AQUACULTURE & FISHERIES INSTITUTE** in the presence of:-)

_____
Witness

Signed by ## both personally and for and on behalf of **THE UNIVERSITY OF TASMANIA (SCHOOL OF ZOOLOGY) TRADING AS THE TASMANIAN**)

AQUACULTURE & FISHERIES INSTITUTE in the presence of:-)

_____
Witness

Signed by ## both personally and for and on behalf of **THE QUEENSLAND GOVERNMENT** in the presence of:-))))

_____
Witness

Signed by ## both personally and for and on behalf of **TRADECO PTY LTD (ACN ##)** in the presence of:-))))

_____
Witness

Signed by ## both personally and for and on behalf of **HOLDCO PTY LTD (ACN ##)** in the presence of:-))))

_____
Witness

GENERAL CONDITIONS

1 PROJECT

1.1 All parties to this Agreement other than the Entities ("the Collaborators") agree to operate an incorporated Project through the Entities throughout the World for;

(a) conduct of the Project

(b) any other project the Shareholders unanimously decide.

1.2 In respect of the Project, the Collaborators will:-

(a) confine to the Entities their respective activities concerning the Project; and

(b) refrain from any activity in competition with the Entities either directly or indirectly.

2 CONTRIBUTIONS

2.1 As a basis for their respective involvements in the Project, DAFF and Instimar, Kailis and Tradeco and Q Co shall contribute their complementary skills towards the Project in the manner set out in Schedules 1 to 5.

2.2 The Contributions may be amended from time to time by unanimous decision of the Shareholders.

2.3 The Collaborators acknowledge their participation in the Project and their respective shareholding is dependent on their respective ongoing proper provision of their Contributions as defined herein.

3 ADMINISTRATION

3.1 During their respective Terms, each Collaborator acknowledges and agrees:-

(a) the proper outgoings of the Entities shall be administered by the Co-Ordinator; PROVIDED ALWAYS that all cheques will be signed by the Co-Ordinator;

(b) each Entity shall conduct its bank account as directed by the Co-Ordinator;

3.2 The financial accounts of the Entities will be prepared by the Secretary on a quarterly basis and forwarded by facsimile or email to each Director and the Accountant including:-

(a) previous quarter profit and loss accounts and balance sheets;

(b) subsequent quarter cash flow projections;

which records shall be circulated no later than fourteen (14) days of the conclusion of each quarter.

3.3 A meeting of the Board of Directors shall occur not less than once during every three (3) consecutive calendar months or after giving forty eight (48) hours notice.

3.4 All periodic secretarial and administrative tasks within the Project shall be overseen by ## and ## as required at the time and from time to time at the expense of the Entities.

3.5 All Decisions referred to in Schedule 4 shall be made by all shareholders unanimously.

4 RIGHTS

4.1 Each Collaborator hereby assigns to Holdco their Rights in respect of the Project.

4.2 All Collaborators shall give all information to Tradeco and the Co-Ordinator concerning the Project.

5 EXIT

5.1 [Refer to schedule 5]

6 RESTRAINT

6.1 Upon termination of their respective involvement within the Scope of Venture through the Entities, for whatever reason, the Collaborators undertake to the Entities and each other as follows namely:-

(a) not to compete with the Entities directly or indirectly within the Project; or

(b) represent any other person in relation to activities within the Project;

for a period of not less than one (1) year from the date of termination of the Scope of the Venture in any territory or country of the world where the Entities have commenced to trade.

6.2 The Collaborators accept the reasonableness of these restraints.

7 INTERPRETATION

Accountants those accountants chosen by the Directors at the time and from time to time, and who in the first instance shall be BDO Kendalls in Brisbane;

Collaboration

Agreement	that agreement to be negotiated and executed by the parties in accordance with these Heads of Agreement;
Directors	those persons who are directors of the Entities at the time and from time to time, and who in the first instance shall be the Co-Ordinator and ##;
Entities	jointly and severally Tradeco and Holdco;
Project	that Rock Lobster Enhancement and Aquaculture Subprogram to develop the Rights which will be commercialised through Tradeco accordance with the Project Plan and in accordance with the Collaboration Agreement
Project Plan	That plan developed under the direction of the coordinator for the conduct of the project and from time to time.
Rights	those rights of intellectual property in relation to the Project;
Secretary	the Secretary of the Entities at the time and from time to time, who in the first instance shall be RBV;
Shares	those shares in the Entities;
Shareholder	a person who holds Shares in the Entities and who in the first instance shall be DAFF, Instimar, Kailis, Tradeco and Q Co;
Term	that period of time during which a Shareholder holds Shares in the Entities;
Collaborators	all Directors and Shareholders at the time and from time to time;
World	all countries and territories of the world.

SCHEDULE 1

CONTRIBUTION OF TASMANIAN AQUACULTURE AND FISHERIES INSTITUTE

1. Provision of working capital for the Project

SCHEDULE 2

CONTRIBUTION OF QUEENSLAND GOVERNMENT

1. Provision of working capital for the Project

SCHEDULE 3

CONTRIBUTION OF DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY

1. Provision of working capital for the Project

SCHEDULE 4

CONTRIBUTION OF THE AUSTRALIAN INSTITTE OF MARINE SCIENCE

SCHEDULE 5

CONTRIBUTION OF MG KAILIS

SCHEDULE 4
UNANIMOUS DECISIONS OF AN EXTRAORDINARY GENERAL MEETING

1. Allot additional shares.
2. Change name of the Entities.
3. Merge the Business with that of another person.
4. Issue a mortgage.
5. Wind up the Entities.
6. Appoint a receiver.
7. Grant a guarantee.
8. Issue a Power of Attorney.
9. Cease the Business or cease to trade.
10. Cancel a debt.
11. Make an investment.
12. Amend Contributions from time to time.
13. Obtain additional funding.
14. Develop projects other than the Project.

SCHEDULE 5
ALTERNATIVE EXIT MECHANISMS

OPTION 1

(Remaining shareholders either buy-out the Outgoing Shareholder or vice versa.)

5.1 Should a Collaborator wish to sell their Shares, then the following sequential procedure will be followed, namely:-

(a) the outgoing Shareholder will place a price per share on their Shares (the "Price") and offer their Shares to the remaining Shareholders at the Price;

(b) the remaining Shareholders will have fourteen (14) days from the date of the offer set out in sub-clause (a) (the "Offer") to accept or reject the Offer;

(c) if the remaining Shareholders accept the Offer they must purchase the outgoing Shareholders Shares at the Price;

(d) if the remaining Shareholders reject the Offer or fail to respond to the Offer within fourteen (14) days then the outgoing Shareholder must purchase the remaining Shareholders' Shares at the Price.

5.2 In the event a Collaborator is in breach of their obligations under this Heads of Agreement and within seven (7) days of notice in writing such breach is not corrected, they can be evicted as a Shareholder in which case the abovementioned sequence of share offers set out in Clause 5.1 will occur.

OPTION 2

5.1 Should a Collaborator wish to sell their Shares, they shall offer them at a price determined by that outgoing Shareholder, to:-

(e) the remaining Shareholders in their respective proportions;

(f) the extent all Shares are not thereby acquired, to the remaining Shareholders out of proportion to their Shareholding; and

(g) the extent any Shares are still thereby available, the Shareholder may sell them to a third party, provided that person is not a competitor of the Entities and is acceptable to the remaining Collaborators.

5.2 In the event a Collaborator is in breach of their obligations under this Heads of Agreement and within seven (7) days of notice in writing such breach is not corrected, they can be evicted as a Shareholder in which case the abovementioned sequence of share offers set out in Clause 5.1 will occur.

SCHEDULE 6

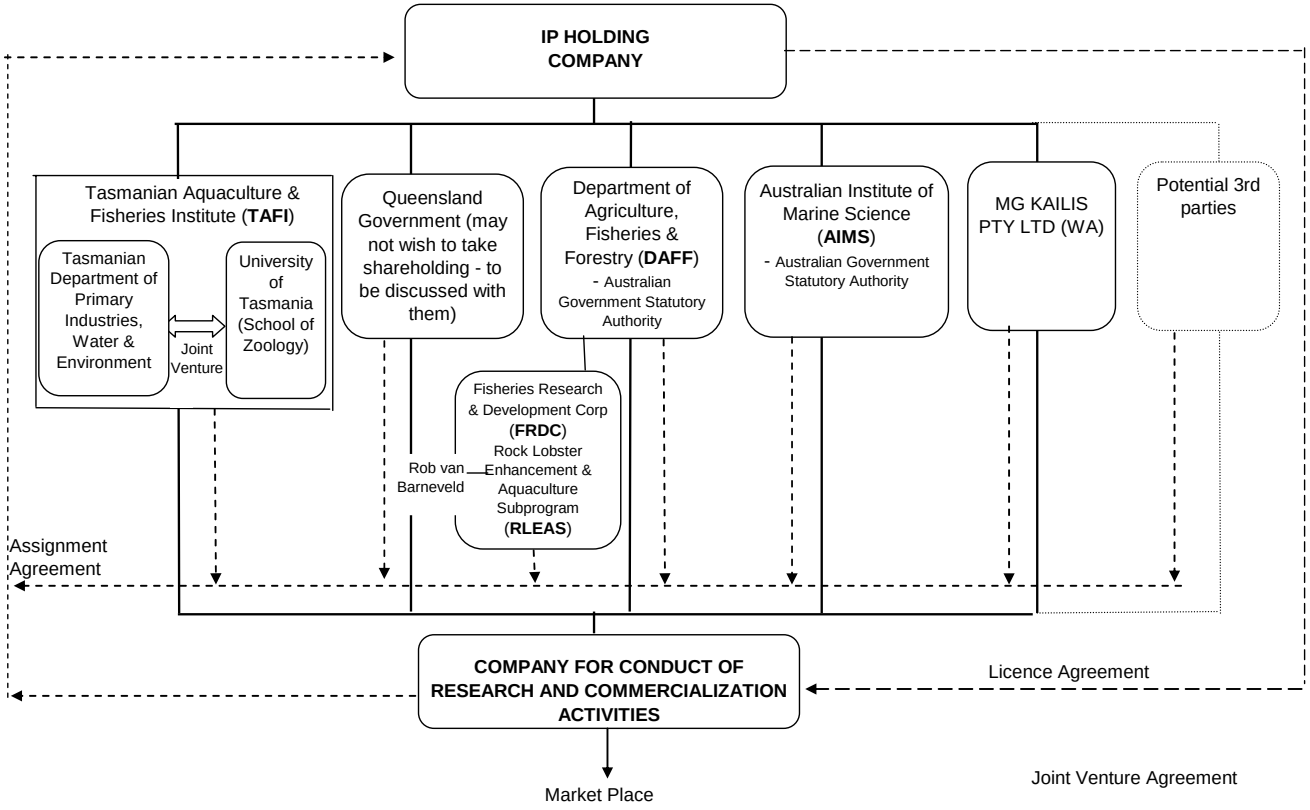
TIMETABLE

ACTION	PERSON RESPONSIBLE	BY WHEN	ESTIMATE
6.	Kenny & Co + Client	ASAP	See separate Actions List
7.	Kenny & Co + Client	ASAP	See separate Actions List
8.	Kenny & Co + Client	ASAP	Hourly rate for solicitor convening discussion
9. Conduct Rights audit, if necessary.	Kenny & Co	TBA	Hourly rate for solicitor conducting audit
10. Obtain new holding company.	Kenny & Co	ASAP	$1,064.00 per company without seal **OR** $1,086.00 per company with seal
11. Prepare Assignment Agreement from existing owners of Rights in favour of new holding company.	Kenny & Co	ASAP	Hourly rate for solicitor handling matter
12. Issue further shares in both companies and trading company in line with accountant's advice.	Kenny & Co	ASAP	Hourly rate for solicitor handling matter
13. Lodge share allotment details with ASIC, together with forms 304 for appointment of directors and form 203 for details of registered office.	Kenny and Co	ASAP after step 5	Hourly rate for solicitor handling matter
14. Prepare Licence Agreement between holding company and trading entity.	Kenny & Co	ASAP	$770.00
15. Prepare and circulate Heads of Collaboration Agreement.	Kenny & Co	ASAP	
16. Circulate and obtain feedback in respect of first draft of Heads of Agreement, Licence and Assignment Agreements.	Client	TBA	Hourly rate for solicitor handling matter

17. Prepare second draft of Heads of Collaboration Agreement, Licence and Assignment Agreements.	Kenny & Co	ASAP	Hourly rate for solicitor handling matter
18. Sign Heads of Collaboration Agreement.	Client	ASAP	Hourly rate for solicitor handling matter
19. Sign Assignment and Licence Agreements.	All parties	ASAP	Hourly rate for solicitor handling matter
20. Prepare first draft of Boilerplate Collaboration Agreement.	Kenny & Co	ASAP	$1100 - $1650
21. Circulate and obtain feedback.	Client	ASAP	Hourly rate for solicitor handling matter
22. Prepare second draft of Collaboration Agreement and changes to Constitution of Entities.	Kenny & Co	ASAP	$1100 - $1650
23. Sign Collaboration Agreement and amend Constitution of Entities.	Kenny & Co + Client	ASAP	Hourly rate for solicitor handling matter

SCHEDULE 7

FRDC PROPOSED CORPORATE STRUCTURE



Appendix VI – Draft Multi-Party FRDC Contract

Dated this day of 2008

Between **FISHERIES RESEARCH AND DEVELOPMENT CORPORATION ABN 74 311 094 913**

and **UNIVERSITY OF TASMANIA (UTAS)**

and **QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES (QDPIF)**

and **AUSTRALIAN INSTITUTE OF MARINE SCIENCES (AIMS)**

and **MG KAILIS PTY LTD**

PROJECT AGREEMENT

for the «ProjectTitle»,

Project Number: «ProjectID»

Australian Government

Fisheries Research and Development Corporation

This **PROJECT AGREEMENT** is made the day of 2008

between **FISHERIES RESEARCH AND DEVELOPMENT CORPORATION (ABN 74 311 094 913)** a body incorporated in accordance with the Primary Industries and Energy Research and Development Act 1989 (Cth) (FRDC) of the first part.

and **UNIVERSITY OF TASMANIA** ("UTAS") as represented by and acting through the Tasmanian Aquaculture and Fisheries Institute of Nubeena Crs, Taroona, Tasmania of the second part;

and **QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES** ("QDPIF") of 2/80 Ann Street, Brisbane, Queensland of the third part;

and **AUSTRALIAN INSTITUTE OF MARINE SCIENCES** ("AIMS") of Cape Ferguson, Townsville, Queensland of the fourth part;

and **MG KAILIS PTY LTD** (MGK) of 50 Mews Rd, Fremantle, Western Australia of the fifth part

In the context of the Background THIS AGREEMENT RECORDS that the FRDC hereby Appoints the Research Providers to conduct the Project under the supervision of UTAS and in accordance with this Agreement and the Research Providers acknowledge and undertake to FRDC and the other Research Providers that they accept this Agreement on these conditions TO THE INTENT that the Operative Provisions shall be deemed and interpreted as part of this Agreement.

EXECUTED as an Agreement on the date referred to above.

SIGNED for and on behalf of the **FISHERIES RESEARCH AND DEVELOPMENT CORPORATION** in the presence of:

Signature of witness	Signature of FRDC representative
Name of witness	Dr Patrick Hone Executive Director

SIGNED for and on behalf of the **QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES AND FISHERIES**, in the presence of:

Signature of witness	Signature of QDPI representative
Name of witness	Name and title

SIGNED for and on behalf of the **AUSTRALIAN INSTITUTE OF MARINE SCIENCES**, in the presence of:

Signature of witness	Signature of AIMS representative
Name of witness	Name and title

SIGNED for and on behalf of the **MG KAILIS PTY LTD**, in the presence of:

Signature of witness	Signature of MG Kailis representative
Name of witness	Name and title

SIGNED for and on behalf of the **UNIVERSITY OF TASMANIA (UTAS)**, in the presence of:

Signature of witness	Signature of UTAS representative
Name of witness	Prof Allan Canty PVC-Research (Acting)

OPERATIVE PROVISIONS
PART 1 CONDUCT OF THE PROJECT

1 APPOINTMENT

1.1 The FRDC hereby Appoints the Research Providers for the Term to:-

(a) conduct the Project:-

(i) in accordance with this Agreement;

(ii) diligently, to a high scientific standard, using professional care and skill, and in accordance with accepted scientific, ethical, business and financial principles; and

(iii) with a view to accomplishing the objectives of the Project and achieving the Milestones efficiently and expeditiously;

(iv) under supervision at the time and from time to time by UTAS,

(b) meet, and report via UTAS against, all Milestones;

(c) appoint personnel with the necessary skills, qualifications and experience to undertake and conduct the Project;

(d) work in co-operation with each other and through UTAS to effectively supervise the activities of the Principal Investigator and all Personnel in the conduct of the Project;

(e) apply appropriate equipment and facilities and Capital Items to conduct the Project;

(f) comply with any Special Conditions and with any reasonable direction of the FRDC and UTAS;

(g) respond promptly in writing to any reasonable queries by the FRDC or UTAS in relation to the Project; and

(h) notify the FRDC and UTAS, as soon as possible, but no later than 20 Business Days, if an act or omission of the Research Provider or Personnel causes, or is likely to cause, a problem or delay that has, or is likely to have, a material impact on the Research Provider's ability to complete the Project;

and the Research Providers hereby accept this Appointment on these conditions.

1.2 Each Research Provider undertake to FRDC and the other Research Providers to:-

(a) provide all Deliverables to the FRDC;

(b) achieve all Milestones; and

(c) otherwise complete the Project within the timeframes specified in this Agreement.

1.3 This Agreement will commence on the Start Date and, subject to the Agreement, will continue in force until the earlier of:-

(a) Six (6) months after the Project Completion Date; or

(b) Termination of the Agreement.

2 LEGAL, POLICY AND ETHICAL REQUIREMENTS

2.1 Each Research Provider undertakes to the FRDC and the other Research Providers to:-

(a) not knowingly infringe the IP Rights of any person in conducting the Project; and

(b) ensure that the Project is conducted in accordance with all applicable laws; and.

(c) where the Project involves research being conducted on humans or animals:-

(i) comply with all applicable codes in relation to humans or animals, adopted by the National Health and Medical Research Council or the relevant institution ethics committee;

(ii) provide to the FRDC upon request, evidence that the Project has been approved by the National Health and Medical Research Council or the relevant institution ethics or biosafety committee; and

(iii) notify the FRDC of the death or serious injury to any marine animal that is a member of:-

(A) a Listed Threatened Species;

(B) a Listed Marine Species;

(C) a Protected Species; or

(D) any other species that is likely to attract adverse media scrutiny or comment,

(iv) within ten (10) days of becoming aware of such death or serious injury;

(d) where the Project involves the use of recombinant DNA techniques:-

(i) comply with the principles and guidelines on the use of recombinant DNA techniques approved by the Australian Government's Genetic Manipulation Advisory Committee or any equivalent or successor body; and

(ii) provide to the FRDC upon request, evidence that the Project has been approved by the relevant institutional Ethics or Biosafety Committee;

(e) where the Project involves the use of currently unregistered agricultural or veterinary chemicals:-

(i) obtain all necessary permits from the Australian Pesticides and Veterinary Medicines Authority and comply with all relevant requirements specified in the Agricultural and Veterinary Chemicals Code; and

(ii) provide to the FRDC upon request, evidence that the Project has been approved by the relevant institutional Ethics or Biosafety Committee;

(f) where the Project involves changes to the natural environment, or can have an effect on the natural environment:-

(i) ensure all necessary permits or licences are obtained from the relevant State, Territory or Commonwealth authority; and

(ii) provide to the FRDC upon request, evidence that the Project has been approved by the relevant institutional Ethics of Biosafety Committee.

2.2 If, in conducting the Project, the Research Provider intends, or is required, to collect data by requesting 50 or more third parties (including individuals, organisations or businesses) to complete the Survey, the Research Provider must, before providing the Survey to any third party:-

(i) provide the Survey to the Australian Government Statistical Clearing House (SCH) for approval; and

(ii) provide written evidence to the FRDC that the SCH has approved the Survey.

3 WARRANTIES

3.1 Each Party warrants to the other Parties that, to its knowledge :-

(a) that Party, is, and will at all times during the Term be entitled to grant the express and implied licences of IP Rights that are granted or otherwise arise pursuant to this Agreement; and

(b) anything done by or on behalf of that Party (including for the Research Provider by any Personnel) in the course of conducting the Project, including the development of the Project Material, will not infringe the IP Rights or Moral Rights of any other person;

(c) that Party will not engage, and has not engaged, in conduct that exposes the other Parties to risk of liability for IP Rights infringement;

(d) all information provided by that Party to another Party in connection with this Agreement is, in all material respects, complete, up-to-date, accurate and not misleading;

(e) it has disclosed to the other Parties in writing the full details of:-

(i) the amounts and sources of all resources to be used to carry out the Project; and

(ii) any other person or entity who has or may have an interest in the Project Material;

(f) the Principal Investigator and the Research Provider Resources will be available for the Project as specified in this Agreement;

(g) it has not breached, and will not breach, any confidentiality obligations in relation to any Information provided to, or to be provided to, and used by the other Parties in relation to this Agreement;

(h) it has the right to use all assets that it is required to use to carry out the Project; and

(i) it is able to assure the other Parties that the person executing this Agreement on its behalf is duly authorized to do so.

3.2 Each Party must:

(a) notify the other Parties within 10 Business Days in the event of any change to any of the information or details warranted to in clause 3.1.

(b) acknowledges it is a serious offence under Division 137 of the Criminal Code Act 1995 (Cth) to give false and misleading information to the FRDC or its officers or agents.

PART 2 PERSONNEL

4 PERSONNEL

4.1 Each Research Provider undertakes to the FRDC and the other Research Providers, as follows to:-

(a) make the Personnel available for the operation of the Project; and

(b) ensure that:

(i) all Personnel will remain subject to the terms and conditions of their employment with that Research Provider;

(ii) all Personnel will be replaced on reasonable request by the FRDC, provided that such replacement personnel have the time commitment, qualifications and competency to undertake the Project, and have similar expertise and ability to those of the Personnel they are replacing; and

(iii) all Personnel may be withdrawn by the Research Provider upon 90 Business Days notice to the FRDC, or as soon as reasonably possible, provided it provides replacements for such personnel who are reasonably acceptable to the FRDC;

(iv) before commencing any further work on the Project or accessing any Project Material or Confidential Information all Personnel that are to participate in the Project or have access to any Project Material or Confidential Information, have:-

(A) assigned to the Research Provider their entire interest, other than their Moral Rights, in any Project IP that they may develop or acquire; and

(B) been directed to keep confidential the Confidential Information; and

(C) undertaken to conduct their work in respect of the Project in accordance with the terms of this Agreement.

5 STUDENT INVOLVEMENT

5.1 If the Research Provider has Contributing Students who are involved in the Project, or who has students under their supervision, that Research Provider undertakes to FRDC and the other Research Providers, and acknowledges and agrees that that Research Provider shall ensure that:-

(a) those students comply with Part 13 (Confidential Information) notwithstanding that the Student may own the copyright in his or her Student Thesis;

(b) IP Rights developed by the student are owned in accordance with this Agreement, provided that the student will own the copyright in his or her Student Thesis;

(c) the only restrictions on publishing a Student Thesis will be those reasonably necessary to protect Confidential Information, Background IP, Project IP or Sub-program IP and in accordance with this Agreement;

(d) the FRDC will not inhibit the right of a student to have his or her thesis examined, but an examiner may be required to sign a confidentiality agreement to protect Confidential Information; and

(e) before a student becomes involved in the Project, the FRDC may require that the student and the institution in which the student is enrolled enter into a written agreement, in a form approved by the FRDC setting out the terms on which the student is involved in the Project, which shall be consistent with the principles in this clause 5.

6 PRINCIPAL INVESTIGATOR

6.1 Where the Principal Investigator is unable to undertake work in respect of the Project, the Research Provider undertakes to the FRDC and the other Research Providers, to:-

(a) notify the FRDC in writing within 10 Business Days of becoming aware of that inability or likely inability;

(b) provide reasons for that inability, and details of an interim replacement until a final replacement is found; and

(c) at the earliest opportunity, but no later than 60 Business Days after providing written notice under clause (a), engage a replacement Principal Investigator that has been approved by the FRDC, such approval not to be unreasonably withheld.

6.2 If the Research Provider is unable to nominate an acceptable replacement Principal Investigator under clause 6.1, the FRDC may expel the Research Provider in accordance with Part 18.

7 SUBCONTRACTING

7.1 Subject to clause 7.2 the Parties agree that any Research Provider may subcontract the performance of any part of that Research Providers responsibilities under this Agreement to one or more other of the other Research Providers or other person, which right to subcontract is expressly conditional upon:-

(a) the Research Provider:

(i) obtaining the prior written approval of the FRDC and UTAS;

(ii) executing a Third Party Agreement with the Research Provider or subcontractor which agreement will be in the form and on the terms and conditions as approved in writing by the FRDC and UTAS to the Research Provider prior to the execution of any such sub-contract; and

(iii) acknowledging to the FRDC that, notwithstanding such subcontracting, the Research Provider is not relieved nor discharged of its obligations under this Agreement; and

(b) the subcontractor being, in the opinion of the FRDC and UTAS, of good reputation and practices, of competent qualifications sufficient to accomplish the terms of the sub-contract.

7.2 Notwithstanding clause 7.1 the Parties acknowledge UTAS shall not have the right to sub contract the supervision of the Project to any other Research Provider or subcontractor.

7.3 The Research Provider:

(a) warrants that the subcontractor will be bound by a Third Party Agreement on equivalent terms and conditions to those of the Research Provider under this Agreement, and particularly the Research Provider will ensure that the obligations and liabilities imposed on the Research Provider under those clauses listed in Schedule 5 are also imposed on the subcontractor; and

(b) will at all times indemnify and keep indemnified the FRDC and every other Research Provider from and against any loss (including reasonable legal costs and expenses) incurred as a result of breach by the Research Provider or any subcontractor of the obligations of this Agreement or any Third Party Agreement as the case may be.

PART 3 VARIATION TO THE PROJECT

8 VARIATIONS

8.1 Other than by way of their respective participation in the Commericalization Process, any Variation to the Project proposed by the Research Provider must be effected in accordance with this clause 8 or clause 12.

8.2 Subject to clauses 8 or 12, each Research Provider undertakes to FRDC and the other Research Providers not to vary the Project in any way (including any Variation to the due dates for the Milestones as specified in Schedule 4 – Schedule of Payments) without the prior written approval of the FRDC.

8.3 During the Term, any Party to this Agreement (Requesting Party) may request a Variation to the Project, which may or may not include a Variation to the FRDC Funds, which request:

(a) must be in writing; and

(b) shall contain full details of the proposed Variation, including the reasons for the Variation and the likely effects of the Variation on any aspect of the Project or the Agreement, and:-

(i) if the impact of a proposed Variation or related series of Variations would amount to an increase in FRDC Funds of more than $30,000 (excluding GST):-

(A) the proposed Variation will be considered a new application and will be resubmitted as such to the FRDC for evaluation, and if approved;

(B) the amendments to the Agreement will be effected in accordance with this Agreement;

(ii) if the impact of a proposed Variation or related series of Variations would:-

(A) amount to an increase in FRDC Funds of $30,000 (excluding GST) or less; or

(B) result in a decrease in FRDC Funds,

(iii) the proposed Variation will be considered a minor funding application and will be resubmitted to the FRDC as such for evaluation, and if approved:-

(A) the Variation may be agreed by an exchange of correspondence between authorised representatives of the Parties, which exchange may be made electronically, including by email; or

(B) if the impact of a proposed Variation or related series of Variations has a non-funding impact, the Variation may be agreed by an exchange of correspondence between authorised representatives of the Parties, which exchange may be made electronically, including by email.

8.4 The FRDC will not be liable for any additional work undertaken or expenditure incurred by the Research Provider pursuant to a Variation to this Agreement unless:-

(a) such Variation has been effected in accordance with this clause 8; and

(b) the additional expenditure has been agreed to by the FRDC.

8.5 Any Party may reject a request to Vary the Project.

PART 4 FUNDING

9 FRDC FUNDS

9.1 The FRDC shall pay to UTAS, on behalf of the Research Providers, the FRDC Funds as specified in Schedule 4 – Schedule of Payments, subject to:

(a) the Research Providers having completed, in accordance with the Agreement and to the FRDC's and UTAS' reasonable satisfaction, the relevant Milestone specified in Schedule 4 – Schedule of Payments; and

(b) UTAS having delivered a Tax Invoice to the FRDC for the payment sought.

9.2 The final payment of the FRDC Funds to UTAS, on behalf of the Research Providers, is subject to:-

(a) the Research Providers having completed, in accordance with the Agreement and to the FRDC's and UTAS' reasonable satisfaction, all Milestones specified in Schedule 4 – Schedule of Payments;

(b) the Research Provider having delivered to the FRDC and UTAS:-

(i) the Final Report, in accordance with clause 51;

(ii) the Final Financial Report, in accordance with clause 50; and

(iii) any Project Material specified for such delivery in Schedule 5 – R&D Funding Application and Schedule 6 – Special Conditions;

(c) the reconciliation of FRDC Funds in accordance with clause 10; and

(d) the Research Provider having published, in accordance with clause 38, all Project Data identified in Schedule 9 – Project Data unless the FRDC or UTAS otherwise agrees in writing, such agreement not to be unreasonably withheld.

9.3 UTAS is responsible for disbursing the payments in clauses 9.1 and 9.2 to the Research Providers, as specified in Schedule 4 – Schedule of Payments, on behalf of the FRDC.

10 RECONCILIATION OF FRDC FUNDS

10.1 Subject to the compliance by a Research Provider with their obligations under Clause 9.1, the FRDC and UTAS will notify the Research Provider as to whether:-

(a) further FRDC Funds are payable by the FRDC to the Research Provider; or

(b) the Research Provider is required to refund any surplus FRDC Funds or pay any FRDC Income to the FRDC; or

(c) there are no further payments to be made between the Parties and no further action is required by the Parties or a Collaborator.

10.2 If the FRDC or UTAS notifies the Research Provider, in accordance with clause 10.1, that the Research Provider is required to refund any surplus FRDC Funds to the FRDC, then the Research Provider undertakes to FRDC and the Research Provider:-

(a) as soon as is practicable refund to the FRDC the surplus FRDC Funds; and

(b) provide an Adjustment Note to the FRDC at the same time as the refund referred to in this clause 11.2; and/or

(c) pay any FRDC Income to the FRDC, then the Research Provider must:-

(i) as soon as practicable pay to the FRDC the FRDC Income; and

(ii) pay to the FRDC any applicable GST at the same time the Research Provider pays to the FRDC the FRDC Income under clause 10.2 (a).

11 DEFERRED PAYMENT OF FRDC FUNDS

11.1 The FRDC may, without derogating from any other right it may have, defer payment of FRDC Funds as specified in the relevant Tax Invoice if:-

(a) the Research Provider fails to comply with any requirement of that Research Provider under this Agreement, until such breach is remedied to the reasonable satisfaction of the FRDC; or

(b) the FRDC does not have sufficient industry contributions or funds from the Commonwealth at the time a payment is due.

11.2 The deferment of a payment under this clause 11 does not constitute a breach of the Agreement by the FRDC.

12 HEADS OF EXPENDITURE

12.1 Each Research Provider undertakes to the FRDC and the other Research Providers that:-

(a) it shall apply the FRDC Funds for the purpose of the Project only and exclusively in respect of the Heads of Expenditure;

(b) for each Head of Expenditure, the Research Provider must record each transaction made under that Head of Expenditure in sufficient detail to identify:-

(i) each good or service purchased or provided; and

(ii) the respective relevant cost to the Research Provider.

12.2 Subject to clause 12.3, the Research Provider may transfer FRDC Funds in respect of the Heads of Expenditure.

12.3 The Research Provider must not transfer FRDC Funds referable to the Heads of Expenditure without the prior written approval of the FRDC where that transfer is:-

(a) equal to or more than 20% of the FRDC Funds; or

(b) to or from capital.

13 ADDITIONAL RESOURCES

13.1 The Research Provider must provide or procure, at no cost to the FRDC, all additional resources including the retention of subcontractors necessary to conduct the Project and the fulfilment of the Research Provider's obligations under the Agreement, including:-

(a) the Third Party Resources to be provided to the Research Provider set out in Schedule 5 – R&D Funding Application; and

(b) all necessary facilities, services, and premises.

13.2 If the Third Party Resources to be procured by the Research Provider are unavailable or reduced by any amount, or the Research Provider becomes aware of a potential reduction, the Research Provider must within:-

(a) 20 Business Days, notify the FRDC in writing of:-

(i) the reduction;

(ii) the reasons for the reduction; and

(iii) the anticipated impact on the Project; and

(b) 60 Business Days, take reasonable steps to secure from other third parties that have been approved by the FRDC, alternative funding or contributions.

13.3 Where the Research Provider is unable to secure alternative funding or contributions in accordance with clause 13.2, and if, in the FRDC's or UTAS' reasonable opinion, the Project cannot be continued at an acceptable standard unless the Research Provider secures such funding, the FRDC may, at its absolute discretion, agree to provide additional funds to compensate for the reduction in the Third Party Resources.

13.4 The Research Provider must not accept an increase in the Third Party Resources that, of itself, or in conjunction with other increases, would amount to a 20% or greater increase in total Third Party Resources, without the FRDC's prior written approval, which approval will not be unreasonably withheld. In seeking the FRDC's approval, the Research Provider must, as soon as practicable and at least within 20 Business Days of becoming aware of the potential increase, notify the FRDC in writing of:-

(a) the reasons for the proposed increase;

(b) the anticipated impact of the proposed increase on the Project and any possible impact on FRDC Funds;

(c) a request for the FRDC's approval to accept the proposed increase; and

(d) involvement of any Research Provider and their respective contribution to the Third Party Resources.

PART 5 NOT USED

14 NOT USED

PART 6 BACKGROUND IP

15 OWNERSHIP OF IP

15.1 Each Party acknowledges the ownership by the respective Parties of the Background IP of the other respective Parties.

15.2 Subject to the rights granted in this Part 6, and any Third Party Agreement, the Parties acknowledge and agree that:

(a) a Party retains the right to control and use its Background IP; and

(b) that their respective ownership of the Background IP does not change; and

(c) the Background IP owner may continue to use its Background IP.

16 WARRANTY

16.1 Each Research Provider represents and warrants to the FRDC and the other Research Providers, that:-

(a) to its actual knowledge or belief, without the need to make additional enquiries, conduct searches or seek legal or patent opinion it is the owner of, or is otherwise entitled to provide, the Background IP which that Research Provider makes available for the Project;

(b) except to the extent:-

(i) disclosed in Schedule 11; or

(ii) in the case of any Background IP not specified in Schedule 11, notified in writing to the other Party at the time of offering such Background IP,

(iii) the Party has not entered any agreement regarding, or otherwise dealt with, that Background IP that is inconsistent with the rights granted to the other Party as described in this Agreement; and

(c) it will not enter any agreement in relation to, or otherwise deal with, that Background IP in a manner that restricts the exercise of the rights granted to the other Party as described in this Agreement.

17 LICENCE TO USE FRDC BACKGROUND IP

17.1 The FRDC hereby grants to each Research Provider an irrevocable, non-exclusive, royalty-free, worldwide licence to use the FRDC Background IP made available for the purposes of carrying out the Project, subject to any restrictions on its use:-

(a) specified in Schedule 11 (including a right to sublicense); or

(b) in the case of any Background IP not specified in Schedule 11 notified in writing to the Research Provider at the time of offering such FR (including a right to sublicense);

and each Research Provider accepts that licence.

18 SUB-LICENCE OF BACKGROUND IP

18.1 The parties agree that the Research Provider may sublicense the licence granted under clause 17.1 of this Agreement:-

(a) with the prior written consent of the FRDC; and

(b) to its sub-contractors and Contributing Students as are agreed in writing by the FRDC to the Research Provider at the time and from time to time.

18.2 The Research Provider acknowledges and agrees that after Termination for whatever reason, the Research Provider has no further right whatsoever to sublicense its rights under this Agreement.

18.3 Notwithstanding anything to the contrary in this Agreement, the right of the Research Provider to sublicense is expressly conditional upon:-

(a) the sub-licence being required to enable the Research Provider to conduct their responsibilities under this Agreement;

(b) the sub-licensee being, in the opinion of the FRDC, of good reputation and practices, of competent qualifications sufficient to effect the terms of the sub-licence;

(c) the sub-licensee executing a Third Party Agreement with the Research Provider which agreement will be in the form and on the terms and conditions as approved in writing at the time and from time to time by the

FRDC to the Research Provider prior to the execution of any such sub-licence; and

(d) the Research Provider having fully satisfied all its obligations to FRDC and other Research Providers hereunder.

18.4 The Research Provider will at all times indemnify and keep indemnified the FRDC from and against any loss (including reasonable legal costs and expenses) incurred as a result of breach by the Research Provider or any sub-licensee of the terms of this Agreement or any sub-licence as the case may be.

RESEARCH PROVIDERS BACKGROUND IP

19 LICENCE TO USE RESEARCH PROVIDERS BACKGROUND IP

19.1 The Research Provider hereby grants to the FRDC an irrevocable, non-exclusive, royalty-free, worldwide licence to use the Research Providers Background IP made available for the purposes of carrying out the Project, subject to any restrictions on its use:-

(a) specified in Schedule 11 (including a right to sublicense); or,

(b) in the case of any RPBIP not specified in Schedule 11, but subsequently notified in writing to the FRDC at the time of offering such RPBIP (including a right to sublicense).

20 SUB-LICENCE OF RPBIP

20.1 The parties agree that the FRDC may sublicense the rights granted under clause 19.1 of this Agreement:-

(a) with the prior written consent of the Research Provider; and

(b) to its contractors, each third party that has been appointed by the FRDC to complete the Project pursuant to this Agreement ("Sub-Licensees").

20.2 Notwithstanding anything to the contrary in this Agreement, the right of the FRDC to sublicense is expressly conditional upon the sub-licensee being required to enable:-

(a) the FRDC to exercise any rights it has under this Agreement;

and

(b) each third party that has been appointed by the FRDC to complete the Project to publish in accordance with this Agreement.

20.3 FRDC will at all times indemnify and keep indemnified each Research Provider from and against any loss (including reasonable legal costs and expenses) incurred as a result of breach by the FRDC or any sub-licensee of the terms of this Agreement or any sub-licence as the case may be.

21 INFRINGEMENT OF BACKGROUND IP

21.1 Each Party undertakes to the others that they will take all necessary steps to give each other prompt written notice of any infringement of Background IP which comes to their attention.

PART 7 PROJECT RIGHTS

22 PROJECT RIGHTS

22.1 Each Party hereby agrees with the other that

the Project IP will be vested in and owned by the FRDC and each of the Research Providers as tenants in common with equal shares, such that each Party to this Agreement will be the respective owner of a legal and beneficial interest of twenty percent (20%) in the Project IP.

23 LICENCE TO USE PROJECT IP

23.1 The FRDC hereby grants to each Research Provider an irrevocable, non-exclusive, royalty-free, worldwide licence to use the Subject Rights (including a right to sublicense) for the purposes of:-

(a) undertaking the Project in accordance with this Agreement;

(b) disseminate and publish the Final Report or any other Project Material; or

(c) for Internal Research, education and teaching, other than Commercialisation;

provided that the Research Provider:-

(a) maintains the confidentiality of Confidential Information;

(b) does not prejudice the Parties ability to:-

(i) protect the Project IP; or

(ii) maximise the commercial return from any Subject Rights.

23.2 The Research Providers hereby grant to the FRDC an irrevocable, non-exclusive, royalty-free, worldwide licence to use the Project IP (including the right to sublicense):

(a) for the purpose of supervising the conduct of the Project in accordance with this Agreement; or

(b) for Internal Research, education and teaching purposes, other than Commercialisation;

provided that the FRDC:-

(c) maintains the confidentiality of Confidential Information;

(d) does not prejudice the Parties ability to:-

(i) protect the Project IP;

maximize the Commercial return from any Project IP

24 SUB-LICENCE OF PROJECT IP BY RESEARCH PROVIDER

24.1 The parties agree that each Research Provider may sublicense the Project IP licensed under clause 23.1 of this Agreement:-

(a) with the prior written consent of the FRDC; and

(b) to its Collaborators and Contributing Students (sub-licensees) as are agreed in writing by the FRDC to the Research Provider at the time and from time to time.

24.2 The Research Provider acknowledges and agrees that after the Termination the Research Provider has no further right whatsoever to sublicense the rights under this Agreement.

24.3 Notwithstanding anything to the contrary in this Agreement, each such sub-licence is expressly conditional upon:-

(a) the sub-licensee being required to enable the Research Provider to conduct the Project;

(b) the sub-licensee being, in the opinion of the FRDC and UTAS, of good reputation and practices, of competent qualifications sufficient to effect the terms of the sub-licence;

(c) the sub-licensee executing a Third Party Agreement with the Research Provider which agreement will be in the form and on the terms and conditions as approved in writing by the FRDC to the Research Provider prior to the execution of any such sub-licence;

(d) the Research Provider having fully satisfied all its obligations hereunder this Agreement; and

(e) the Research Provider acknowledging to the FRDC and UTAS that, notwithstanding such sub-licensee, the Research Provider is not relieved nor discharged of its obligations under this Agreement.

24.4 Each Party will at all times indemnify and keep indemnified each other Party from and against any loss (including reasonable legal costs and expenses) incurred as a result of breach by the indemnifying Party or any sub-licensee of the indemnifying Party of the terms of this Agreement or any sub-licence as the case may be.

25 SUB-LICENCE OF PROJECT IP BY FRDC

25.1 The parties agree that the FRDC may sub-license the rights granted under clause 23.2 of this Agreement:-

(a) with the prior written consent of the Research Provider; and

(b) to its contractors, each third party that has been appointed by the FRDC to complete the Project pursuant to clauses 62.4(b) or 63.6(b).

25.2 Notwithstanding anything to the contrary in this Agreement, the right of the FRDC to sub-license is expressly conditional upon the sub-licence being required to enable:-

(a) the FRDC to exercise any rights it has under this Agreement;

and

(b) each third party that has been appointed by the FRDC under clauses 62 and 63 to complete the Project to publish.

PART 8 MANAGEMENT OF PROJECT IP

26 DEALING WITH PROJECT RIGHTS

26.1 Each Party undertakes to the others to:-

(a) collaboratively respond to a request from the other Party to provide information in its possession regarding Project IP that has been developed by that Party or is under development by the Party for the purposes of the Project ;

(b) use its reasonable efforts to ensure that itself and its employees, agents, contractors, students under their supervision or other persons participating in the Project:-

(i) identify Project IP generated or developed by them; and

(ii) promptly communicate details of that Project IP to the Parties;

(c) not prejudice the protection of Project IP ; and

(d) not use, Commercialise, dispose of, encumber or otherwise deal with or enter any agreement in relation to any interest that it might hold in any Project IP , except as authorised in this Agreement or under separate agreements covering Commercialization.

27 DEVELOPMENTS

27.1 In the event that during the Term, a Research Provider, the FRDC or any sub-licensee creates any Developments to the:

(a) FRDC Background IP,

(b) the Research Provider Background IP,

(c) the Project IP; or

(d) the Sub-program IP, respectively

that Party will notify the other Parties of the nature of the Developments and the mode of carrying out the Developments with practical effect; PROVIDED that in relation to the:-

(e) FRDC Background IP, each Party assigns to the FRDC any IP Rights available in respect of that Development; and

(f) Research Provider Background IP, each Party assigns to the Research Provider any IP Rights available in respect of that Development.

27.2 In connection with such Developments, the Parties will make supply and assist in the preparation of all models, plans, drawings or specifications necessary or convenient for the proper understanding or development of the Developments.

27.3 In the event that such Developments are not capable of being protected by Future Rights, the Parties undertake each to the other will treat the Developments as confidential and will refrain (without the written consent of the other Party) from disclosing to any other person the nature of the Development or any documents or other information acquired by the Party in the course of developing the Development or from using such document or information for any purpose, until such time as the Developments enter the public domain or otherwise lose their confidential nature, other than as a breach of this provision.

28 MORAL RIGHTS

28.1 Each Party will use its reasonable efforts to obtain from its respective employees, agents, sub-licensees and students (including Contributing Students) under their supervision any consents in relation to their Moral Rights that may be reasonably necessary for the Project, the RLEAS or for Commercialization of the Subject Rights.

29 IP REGISTER

29.1 Each Party must maintain a register recording all IP Rights, containing at least the following details:-

(a) date of entry on the register;

(b) description of the IP Rights and whether those rights are Background IP, Subject Rights;

(c) identity of the actual inventor and the Party that developed the IP Rights;

(d) details of any agreements made by the FRDC and the Research Provider or with third parties in relation to disclosure or use of the IP Rights; and

(e) any encumbrances or restrictions on its use.

30 NOTICE OF INFRINGEMENT

30.1 Each Party undertakes to each of the others to:-

(a) give to each other Party prompt notice of any infringement of Subject Rights and Background IP which comes to their attention; and

(b) give the other all assistance which it may reasonably require in order to protect the Subject Rights.

31 NOT USED

32 SUBJECT RIGHTS ISSUES

32.1 The Parties undertakes each to the other to use their best endeavor to promptly do all acts and things and execute all documents which may be necessary for the purpose of vesting ownership of the legal and beneficial interest in the Subject Rights as required under this Agreement.

PART 9 THIRD PARTIES' USE OF PROJECT IP

33 USE OF PROJECT MATERIAL - THIRD PARTIES

33.1 Where a Third Party has been appointed by the FRDC to complete the Project pursuant to this Agreement, the FRDC may authorise that Third Party to use the Project IP to:-

(a) review and complete the Project;

(b) conduct Internal Research; or

(c) disseminate and publish the Final Report or any other Project Material, but only in accordance with clause 37.

34 A CONTRIBUTING STUDENT'S USE OF PROJECT IP

34.1 Where a Contributing Student has:-

(a) assigned to the Research Provider their entire interest, other that their copyright and Moral Rights, in any Project IP they may develop or acquire; and

(b) undertaken to keep Confidential Information confidential in accordance with clause 4.1 (b) (iv),

the Steering Committee may consent to the inclusion of Project Material in that Contributing Student's Student Thesis on the terms of this clause 34.

34.2 A Research Provider must ensure that a Contributing Student does not include Project Material in their Student Thesis, unless the Steering Committee has agreed in writing to:-

(a) adhere to the procedure set out in clause 34.3; or

(b) the period of time that the Student Thesis is to be withheld from public access, including if the UTAS does not require the Student Thesis to be withheld from public access.

34.3 The procedure referred to in clause 34.2 is that the Research Provider must provide to the Steering Committee a copy of any Student Thesis no later than 60 days before the Student Thesis is due to be examined, and:-

(a) if the Steering Committee does not notify the Research Provider in writing, within 30 days of receipt of the Student Thesis, that obligations of confidence must bind the examiners of the Student Thesis, then the Research Provider may permit:-

(i) the examination of the Student Thesis; and

(ii) the deposit of the Student Thesis in any library, or

(b) if the Steering Committee notifies the Research Provider in writing, within 30 days of receipt of the Student Thesis, that obligations of confidence must bind the examiners of the Student Thesis, then the Research Provider must ensure that:-

(i) the examiners of the Student Thesis sign a confidentiality agreement to protect the Confidential Information, and undertake to the Research Provider to keep confidential all Project Material, Project IP, Sub-program IP, and Background IP included in the Student Thesis, which agreement will be on the same terms as the Research Provider's undertakings in this Agreement; and

(ii) the Student Thesis is withheld from public access for a period determined by the Steering Committee being at least 12 months after examination.

PART 10 OWNERSHIP OF MATERIAL

35 FRDC MATERIAL

35.1 Each Research Provider hereby acknowledge and accept the FRDC's ownership, or control by licence, of FRDC Material and any IP Rights in the FRDC Material.

35.2 Subject to this clause 35, the FRDC grants to the Research Provider a non-exclusive, non-transferable, royalty-free licence for the Term to use the FRDC Material for the purpose of undertaking the Project and for inclusion in the Project Material in accordance with this Agreement.

35.3 Each Research Provider undertakes to the others and FRDC:-

(a) ensure that FRDC Material is used, copied, supplied or reproduced only for the purposes of the Agreement;

(b) keep the FRDC Material secure;

(c) not grant, create or allow any encumbrance or adverse interest in favour of any person over FRDC Material; and

(d) only use the FRDC Material in accordance with any conditions:-

(i) set out in Schedule 6 – Special Conditions, or

(ii) as notified from time to time in writing by the FRDC.

36 PROJECT MATERIAL

36.1 The Parties warrant each to the other that ownership of all:-

(a) Deliverables vests immediately upon their creation, in the FRDC; and

(b) Project Material, other than Deliverables, vests immediately upon its creation, in the Research Provider.

36.2 The Research Provider must ensure that all Deliverables documentation:-

(a) is neatly and legibly compiled and adequately documented;

(b) contains sufficient evidence to support all conclusions, findings and opinions;

(c) is in accordance with the FRDC Standards and formats of which documentation the Research Provider may keep copies as is necessary for its reasonable record keeping requirements, provided that the Research Provider continues to comply with its confidentiality obligations under this Agreement in relation to such material.

36.3 Within 10 Business Days of receiving a request from the FRDC or UTAS, the Research Provider must provide the FRDC with copies of all Project Data created or collected up to the date of the request. The Research Provider's obligation under this clause 36 survives the expiry or Termination of this Agreement, or the expulsion of a Research Provider from the Project.

PART 11 PUBLICATION

37 PUBLICATION OF INFORMATION OR MATERIAL

37.1 Nonetheless, the Parties shall not publish any Information or Material arising from the Project except in accordance with this Part 11.

38 OBLIGATION TO MAKE PROJECT DATA PUBLICLY AVAILABLE

38.1 Subject to approval by all of the Parties to this Agreement, or any direction regarding IP Rights from FRDC, each Research Provider shall only:-

(a) make all Project Data publicly available, through a Custodian; and

(b) publish on the Australian Spatial Data Directory, the meta-data referred to in clause 49.1(b).

38.2 Publication and access to Project Data pursuant to clause 38.1, may only occur

(a) pursuant to licence agreements consistent with the standard data licence terms and conditions set out on the FRDC website or as otherwise agreed to in writing by the FRDC;

(b) with the written permission of all of the Parties to this Agreement

39 NO CHARGE FOR PUBLICATION OF PROJECT DATA

39.1 Subject to clause 39.2, unless the Parties otherwise agree in writing, no Research Provider may charge, or authorise or permit any third person to charge, any fee, cost, charge or other amount to access or use Project Data .

39.2 The Research Provider may authorise a Custodian of Project Data to charge a third party a fee to access Project Data, provided the fee:-

(a) represents the reasonable and direct costs of providing access to that Project Data; and

(b) does not include the cost of the Custodian receiving, storing or otherwise maintaining the Project Data.

40 REQUEST FOR PERMISSION

40.1 At least 30 days prior to any submission for publication, a Party wishing to publish Information or Material arising from the Project, must forward a request in writing to the FRDC, seeking permission to publish the Information or Material, and specifying in the request any Project IP, Sub-program IP, Background IP or Confidential Information contained or referred to in the proposed publication.

Notification

40.2 The FRDC must notify the Requesting Party of its decision as to publication of the relevant Information or Materials within 30 days of receipt of a request. The FRDC's permission may be subject to any conditions that the FRDC may reasonably impose, and include acknowledgments of:-

(a) the FRDC's role in and contribution to the creation of the Information or Material in the publication; and

(b) the Requesting Party's affiliation with the FRDC.

Grant of Permission

40.3 If the FRDC decides in its absolute discretion that the benefits of the Requesting Party's publication, outweigh the potential loss of commercially valuable IP Rights

or other potential disadvantage for the Project, then the FRDC will notify the Requesting Party that permission to publish has been granted, and notify the other Parties to that effect.

Declining Permission

40.4 If the FRDC decides in its absolute discretion that the benefits of publication, do not outweigh the potential prejudice to the potential of the relevant IP then the FRDC will notify the Requesting Party to that effect, giving reasons for the decision, and either:-

(a) suggest alterations to the publication so that it does not disclose information affecting the commercially valuable IP Rights; or

(b) if altering the publication is impractical, delay publication for a stipulated period not exceeding 12 months from the date of the request in the case of a Student Thesis.

41 PARTY CONFIDENTIAL INFORMATION

41.1 Notwithstanding the other provisions of this Part 11, no Party may publish any Information or Material containing Confidential Information or Background IP of a Party unless authorised by that Party.

42 MINIMUM REQUIREMENTS FOR RESEARCH PROVIDER PUBLICATIONS

42.1 With the permission of the other Parties to this Agreement a Research Provider may disseminate or publish Project Material under this Part 11, where the Research Provider undertakes to:-

(a) acknowledge the contribution that the Australian Government has made to the Project through the FRDC. The appropriate form of words for the acknowledgement is at Schedule 6 – Special Conditions;

(b) display the Australian Government logo on the Project Material and in promotional material, unless the FRDC agrees otherwise in writing;

(c) include copyright notices on the Project Material that are in accordance with FRDC Standards (which can be found on the FRDC web site at http://www.frdc.com.au), unless the FRDC agrees otherwise in writing;

(d) attribute authorship in respect of the Project Material so as to not infringe the Moral Rights of any person;

(e) consult with UTAS and the other Parties to this Agreement throughout the publication process, including providing to the FRDC the final draft produced and obtaining the FRDC's approval of that draft before publication, which approval will not be unreasonably withheld; and

(f) provide a copy of the published Project Material to UTAS and the other Parties to this Agreement within 20 Business Days of the date of publication.

43 PUBLIC ANNOUNCEMENTS

43.1 Each Research Provider undertakes to UTAS and the other Research Providers to refrain from making any public announcement in relation to the Project or this Agreement without obtaining the FRDC's written approval, except if required by law

or a regulatory body, in which case the Research Provider must, to the extent practicable, first consult with and take into account the reasonable requirements of the FRDC.

PART 12 COMMERCIALISATION

44 FIRST RIGHT OF REFUSAL

44.1 The Parties agree that MGK has a right of first refusal to Commercialise Project IP on the following terms:

(a) MGK must notify the Steering Committee that it wishes to Commercialise Project IP by the end of the Term;

(b) the Parties through the Steering Committee will negotiate in good faith details of an agreement to cover the terms of Commercialisation which will include:

(i) exclusive rights to MGK for a period of 5 years from the end of the Term;

(ii) appropriate confidentiality provisions;

(iii) MGK must exercise its rights at its own risk and indemnify the other Parties against any liability arising from Commercialisation; and

(iv) payment of a reasonable royalty taking into account the respective contributions of each Party to the development of the Project IP; and

(c) if the Parties are unable to agree on the terms on which MGK will obtain the rights to Commercialise Project IP, the Parties will not during the 6 month period after the end of the Term offer any third party the right to Commercialise Project IP on terms more favourable than those offered to MGK.

PART 13 CONFIDENTIAL INFORMATION, SECURITY AND PRIVACY

45 CONFIDENTIAL INFORMATION

45.1 Except as otherwise provided in this clause 45, each Party must keep confidential and not disclose any Confidential Information.

Employees

45.2 Each Research Provider and the FRDC undertakes to FRDC and the other Research Providers to use its reasonable efforts to ensure that:-

(a) its respective employees, directors, officers, advisers, students (including Contributing Students) and subcontractors who participate in, or are engaged in conducting the Project, or acquire access to Confidential Information, must comply with the obligation of confidentiality under this clause as though they were Parties to this Agreement; and

(b) any of the above mentioned persons who cease to be employees, directors, officers, advisers, students or subcontractors must continue to be bound by such obligations of confidentiality.

Permitted use and disclosure

45.3 Each Party may:-

(a) disclose Confidential Information to its:-

(i) employees;

(ii) directors and officers; and

(iii) legal, financial or other professional advisers,

who have a need to know for the purposes of this Agreement (and only to the extent that each has a need to know), provided the disclosure is made subject to an obligation of confidentiality in accordance with clause 45.2;

(b) use and disclose Confidential Information where authorised under this Agreement;

(c) disclose Confidential Information to the extent required by law or by a lawful requirement of any government or governmental body, authority or agency having authority over the Party.

45.4 Disclosure of Confidential Information as permitted in clause 45.3 may only occur provided that in each case the Party wishing to disclose or use Confidential Information, gives the other Parties reasonable sufficient notice in the circumstances of any proposed disclosure.

45.5 The FRDC may use and disclose FRDC Confidential Information as required at its discretion for the purposes of this Agreement or otherwise for the purposes of the FRDC operations such as public accountability reasons, including to its responsible Minister or in response to a request by a House or a Committee of the Parliament.

Exceptions

45.6 The obligations imposed on a Party by this clause 45 will not apply to Confidential Information which:-

(a) is Excluded Information;

(b) is independently developed by an employee or officer of the Party owing the obligation of confidentiality while having no knowledge of the Confidential Information;

(c) in the case of Research Provider Confidential Information, the Research Provider has agreed may be disclosed by the FRDC; or

(d) in the case of FRDC Confidential Information, the FRDC has agreed may be disclosed by the Research Provider.

45.7 The recipient has the onus of showing that any of the above exceptions apply.

Combination of information

45.8 A combination of information will not be taken to be in the public domain merely because it contains information in the public domain.

45.9 A Party must not transfer the other Party's Confidential Information outside Australia, or allow persons outside Australia to have access to such information, without the prior written approval of the other Party.

Return of Confidential Information

45.10 On the expiration or Termination of this Agreement or the expulsion of a Research Provider under Part 18, each Party (the First Party) must deliver to the other Parties, and not retain any copies, all material forms of the other Parties' Confidential Information except for:-

(a) information that is confidential to both Parties; and

(b) one copy of such Confidential Information as is necessary for reasonable record keeping processes; and

(c) if requested by the other Party, also deliver to the other Party, a statutory declaration executed by an authorised person on behalf of the First Party that to that person's knowledge, all of the other Party's Confidential Information held or acquired by the First Party has either been destroyed or delivered to the other Party and that none of the other Party's Confidential Information has been retained by the First Party, its officers, employees, agents or contractors.

Survival

45.11 The obligations of confidentiality imposed on a Party will survive Termination of this Agreement and/or the expulsion of a Party from the Project.

46 SECURITY

46.1 Each Research Provider undertakes to the FRDC and the other Research Providers:-

(a) take reasonable steps and follow UTAS' supervision to ensure that FRDC Material, FRDC Confidential Information and FRDC Related Personal Information held in connection with the Project is protected against loss, unauthorized access, use, modification, disclosure or other misuse; and

(b) adhere to any security procedures advised by the FRDC from time to time, which procedures will not be unreasonable.

46.2 Where an incident occurs that concerns the use or disclosure of FRDC Material, FRDC Confidential Information or FRDC Related Personal Information or that may have a potential material impact on the Project (a Security Incident), the Research Provider must notify the FRDC immediately on becoming aware of that incident. Where oral notification is provided, it must be followed by written notification within 2 Business Days.

46.3 If a Security Incident occurs, the Research Provider must comply with any reasonable directions of the FRDC and the Proposal Team in order to rectify the security problem.

47 PRIVACY

47.1 Each Research Provider undertakes to the other parties to:-

(a) comply, as if it were an agency bound by the Privacy Act 1988 (Cth) (Privacy Act), with those provisions of the Privacy Act concerning the security, use and disclosure of FRDC Related Personal Information to which the FRDC is subject in respect of that FRDC Related Personal Information and which affect the Project;

(b) only use FRDC Related Personal Information for the purposes of fulfilling its obligations under the Agreement;

(c) not disclose any FRDC Related Personal Information obtained in connection with the Agreement without the written authority of the FRDC;

(d) ensure that only authorised Personnel have access to any FRDC Related Personal Information and that all such persons are made aware of the provisions referred to in this clause 47.1;

(e) co-operate with any reasonable demands or enquiries made by the Privacy Commissioner;

(f) give to any person:-

(i) on his or her request;

(ii) on payment of a reasonable charge; and

(iii) having taken reasonable steps to satisfy itself of that person's identity;

(iv) access to that person's Personal Information held by the Research Provider, except to the extent that the Research Provider is required or authorised by law to refuse to provide the person with access to that Personal Information;

(g) if a person about whom the Personal Information relates notifies the Research Provider that the Personal Information is not accurate, correct or up-to-date, take reasonable steps to:-

(i) correct the Personal Information; or

(ii) include with the Personal Information a statement setting out the person's claim to this effect;

(iii) inform in writing any person, on his or her request, of the content of any provision of the Agreement that is inconsistent with an approved privacy code binding the Research Provider or a National Privacy Principle as set out in the Privacy Act;

(h) not transfer FRDC Related Personal Information outside Australia, or allow parties outside Australia to have access to such information, without the prior written approval of the FRDC;

(i) after the information is no longer required for the purpose for which it was originally collected by the Research Provider, consult with the FRDC on the destruction or permanent de-identification of any FRDC Related Personal Information;

(j) immediately notify the FRDC of, and co-operate with the FRDC in resolving, any complaint in connection with FRDC Related Personal Information alleging an interference with privacy; and

47.2 The Research Provider must take such steps as are reasonable in the circumstances to enable, or to assist the FRDC to enable, any person on request to ascertain:-

(a) whether the Research Provider has possession or control of any records that contain FRDC Related Personal Information referred to in clause 47.1; and

(b) if the Research Provider has possession or control of a record that contains FRDC Related Personal Information:-

(i) the nature of the FRDC Related Personal Information;

(ii) the main purposes for which the FRDC Related Personal Information is used; and

(iii) the steps that the person should take if the person wishes to obtain access to the record containing the FRDC Related Personal Information.

47.3 The Research Provider's obligations in this clause 47 are in addition to, and do not restrict, any obligations it may have under the Privacy Act or any privacy codes or principles contained in, authorised by, or registered under, any law.

48 NOT USED

PART 14 PROJECT ADMINISTRATION AND REPORTS

49 PROJECT ADMINISTRATION

49.1 The Research Providers undertake to UTAS and FRDC:-

(a) comply with any reasonable direction (within the general scope of administration of the Agreement) given by, or on behalf of, the FRDC or UTAS;

(b) ensure that all Project Data and all Deliverables are accompanied by meta-data, which conforms to the ANZLIC standards that are current at the time, which include ANZLIC profile of ISO 19115:2005;

(c) maintain records, in sufficient detail and in good scientific manner, which are complete and accurate and which fully and properly reflect all work done and results achieved in the performance of the Project (Research Records);

(d) keep and maintain the Research Records for the Term and for 7 years after expiry or termination of this Agreement; and

(e) keep the Research Records confidential in accordance with its obligations under Part 15 of this Agreement and must not use the records or any information contained in the records, except to the extent permitted by this Agreement.

50 REPORTS

50.1 Each Research Provider undertakes to the FRDC and the other Research Providers to provide:-

(a) to UTAS and FRDC a Milestone Progress Report:-

(i) on the date specified in Schedule 4 – Schedule of Payments; and/or

(ii) within 20 Business Days after receiving a request from the FRDC for a Milestone Progress Report.

(b) to FRDC a financial report within 10 Business Days after receiving a request from the FRDC for such a report and with a Final Financial Report on the Project Completion Date.

50.2 All financial reports (including the Final Financial Report) must be:-

(a) prepared in accordance with the FRDC Standards; and

(b) otherwise acceptable to the FRDC, in the FRDC's reasonable opinion.

50.3 The Final Financial Report must include a financial statement that:-

(a) describes each transaction made under each Head of Expenditure;

(b) includes all of the information recorded in accordance with clause 12.1(b); and

(c) certifies that the Research Provider has, in respect of all employees who performed any part of the Project, paid all wages and provided all entitlements due under any industrial instrument (as that term is defined in the Corporations Act 2001 (Cth)).

51 FINAL REPORT

51.1 Each Research Provider must provide:-

(a) the FRDC and UTAS with the draft Final Report on the date specified in Schedule 4 – Schedule of Payments and in accordance with the FRDC Standards;

(b) the Final Report, including any modified version of the Final Report or any amendments required by the FRDC within 40 Business Days of receipt of the notice referred to in clause 51.2.

51.2 Within 40 Business Days after receipt of the draft Final Report, the FRDC must notify each Research Provider in writing:-

(a) that the draft Final Report is acceptable; or

(b) of any amendments that are required (in the reasonable opinion of the FRDC) including if a modified version of the Final Report is required for public release.

52 ACCOUNTS

52.1 The Research Provider must at all times maintain proper accounts in relation to the Project. Such accounts must:

(a) be complete and be maintained up-to-date;

(b) be kept in a manner that permits them to be conveniently and properly audited;

(c) be drawn in accordance with any applicable Australian accounting standards;

(d) enable the extraction of all information relevant to the Agreement; and

(e) be kept for at least 7 Financial Years after the expiry or termination of the Agreement.

52.2 Audits under clause 53 may be conducted of:-

(a) the Research Provider's practices and procedures as they relate to the Agreement, including security procedures;

(b) the manner in which the Research Provider performs its obligations under the Agreement;

(c) the compliance of the Research Provider's invoices and reports with its obligations under the Agreement; and

(d) any other matters reasonably determined by the FRDC or UTAS to be relevant to the performance of the Research Provider's obligations under the Agreement.

53 AUDITS

53.1 The Research Provider must:-

(a) co-operate with audits of the Project at the frequency and in relation to the matters specified by the FRDC, (including on an ad hoc basis if requested by the FRDC), for the purpose of ensuring that the Project is being properly performed and administered. The FRDC may appoint an independent person to assist in the audits. Audits may consider all aspects of the Research Provider's performance, including but not limited to any performance indicators, benchmarks or targets; and

(b) participate promptly and cooperatively in any audits conducted by the FRDC or its nominee.

53.2 Each Party must bear its own costs of any audits.

53.3 Each Research Provider must promptly take, at no additional cost to the FRDC, corrective action to rectify any error, non-compliance or inaccuracy identified in any audit in the way the Research Provider has under the Agreement :-

(i) performed the Project; or

(ii) calculated fees, or any other amounts or charges billed to the FRDC.

53.4 Except for those circumstances in which notice is not practicable or appropriate (eg. caused by a regulatory request with shorter notice or investigation of theft or breach of contract), and without limiting any other right, recourse or remedy of the FRDC, the FRDC will give the Research Provider reasonable notice of an audit and, where reasonably practicable, an indication of which documents and/or class of documents the auditor may require.

53.5 The requirement for, and participation in, audits does not in any way reduce the Research Provider's responsibility to perform its obligations in accordance with this Agreement.

53.6 The FRDC shall use reasonable endeavours to ensure that audits performed pursuant to clause 53.1 do not unreasonably delay or disrupt in any material respect the Research Provider's performance of its obligations under this Agreement.

53.7 Any amendments to the Agreement resulting from audits must be effected in accordance with clause 10 of Schedule 3.

54 ACCESS TO THE RESEARCH PROVIDER'S PREMISES AND RECORDS

54.1 Each Research Provider undertakes to FRDC and UTAS to ensure that:

(a) its subcontractors grant the FRDC and UTAS and its nominees (including the Auditor-General) access, as required by the FRDC and UTAS, to the Research Provider's premises and all data, records, accounts and other financial material or material (including any FRDC Material) relevant to the performance of the Agreement, however and wherever stored or located, under the Research Provider's or its subcontractors' custody, possession or control for inspection and/or copying;

(b) any subcontract entered into for the purpose of the Agreement contains an equivalent clause granting the rights specified in this clause 54 and clause 53 with respect to the subcontractors' premises, records, accounts, financial material and data, and those of its employees, agents or subcontractors.

54.2 In the case of documents or records stored on a medium other than in writing, the Research Provider must make available on request at no additional cost to the FRDC or UTAS such reasonable facilities as may be necessary to enable a legible reproduction to be created.

54.3 Without limiting any other provision of the Agreement, the Auditor-General or a delegate of the Auditor-General or the Privacy Commissioner or a delegate of the Privacy Commissioner, for the purpose of performing the Auditor-General's or Privacy Commissioner's statutory functions and/or powers respectively, may, at reasonable times and on providing reasonable notice to the Research Provider's representative specified in Schedule 12 – Notice Details:-

(a) access the premises of the Research Provider or its subcontractor;

(b) require the provision by the Research Provider or its subcontractor, its employees or agents, of records and other information which are related to the Agreement; and

(c) access, inspect and copy documentation and records or any other matter relevant to the Research Provider's obligations or performance of the Agreement, however stored, in the custody or under the control of the Research Provider, its employees, agents or subcontractors.

54.4 This clause 54 applies for the Term and for a period of 7 years from the date of its expiration or Termination.

54.5 In the exercise of the general rights granted under this clause 54, the FRDC or UTAS must use reasonable endeavours not to unreasonably interfere with the Research Provider's performance under this Agreement in any material respect.

54.6 If in exercising the rights granted under this Agreement, the FRDC or UTAS unreasonably interferes with the Research Provider's performance of its obligations under the Agreement in a material respect and that interference substantially delays the Research Provider in performing its obligations, the Research Provider may request an extension of time to perform its obligations.

54.7 The FRDC or UTAS must not unreasonably refuse a request pursuant to clause 54.6 where:-

(a) the Research Provider:

(i) substantiates the request, within a reasonable time, to the satisfaction of the FRDC;

(ii) advises the FRDC of the delay within 10 Business Days of the exercise of the rights and the delay occurring; and

(iii) has taken or takes all reasonable steps to minimize any delay.

(b) the delay could not have been reasonably contemplated or allowed for by the Research Provider before entering the Agreement.

54.8 In no circumstances will any extension of time pursuant to clause 54.7 exceed the amount of any delay directly arising from the exercise of the rights.

54.9 In no circumstances will the Research Provider be entitled to any delay costs or other costs or expenses of whatever nature relating in any way to the exercise of any rights under this clause 54 other than to the extent expressly provided for under this clause 54.

54.10 Without limiting any of their other obligations under the Agreement, each Research Provider must, at its cost, ensure that it keeps full and complete records in accordance with all applicable Australian Accounting Standards and that all data and records relating to the Agreement or its performance are maintained in such a form and manner as to facilitate access and inspection under this Agreement.

54.11 If a Research Provider:

(a) reasonably believes that the FRDC, in exercising the rights granted under clauses 53 and 54, will cause the Research Provider to incur direct expenses that, having regard to the value of that Research Providers Appointment, substantially and materially exceed those which it would otherwise have to incur in meeting its obligations under this clause 54.11 (excessive direct expenses), it may give notice of that belief to the FRDC; and

(b) substantiates that its direct expenses in complying with the exercise of the rights in such circumstances are excessive,

the FRDC and the Research Provider must negotiate any appropriate reimbursement, but in no circumstances will any reimbursement be greater than the direct expenses incurred.

54.12 Nothing in this Agreement reduces, limits or restricts in any way any function, power, right or entitlement of the Auditor-General or a delegate of the Auditor-General or the Privacy Commissioner or a delegate of the Privacy Commissioner. The rights of the Commonwealth under the Agreement are in addition to any other power, right or entitlement of the Auditor-General or the Privacy Commissioner or their respective delegates.

54.13 Any access to the premises of a Research Provider by the FRDC or UTAS or any third party that is permitted by virtue of the Agreement shall be subject to the compliance by the FRDC or that third party with reasonable directions of the Research Provider relating to occupational health and safety, confidentiality and security.

PART 15 CAPITAL ITEMS

55 CAPITAL ITEMS

55.1 Each Research Provider may use the FRDC Funds to acquire or construct Capital Items:-

(a) in accordance with Schedule 5 – R&D Funding Application; or

(b) as otherwise agreed by the Parties in writing.

55.2 Unless otherwise specified in Schedule 6 – Special Conditions, during the Term and for such other period that the FRDC may request:-

(a) subject to clause 55.4, all Capital Items remain the property of the Research Provider;

(b) the use and loss of Capital Items will be at the risk of the Research Provider until delivered into the physical possession of the FRDC;

(c) the Research Provider must:-

(i) keep each Capital Item secure and maintain them in good working order;

(ii) account for each Capital Item in accordance with the Research Provider's established procedures;

(iii) repair or replace a Capital Item as required during the course of the Project, unless the Parties agree that:-

(A) the damage requiring repair or replacement was caused by a pre-existing defect in the Capital Item; or

(B) replacement or repair is not appropriate;

(iv) promptly comply with each notice issued by the FRDC under clause 55.4; and

(v) without the prior written approval of the FRDC, which approval will not be unreasonably withheld, the Research Provider must not dispose, transfer, encumber, assign, licence or otherwise deal with a Major Capital Item, except in accordance with this clause 55.

55.3 Within 20 Business Days after:-

(a) the Project Completion Date; or

(b) earlier Termination of the Agreement;

each Research Provider must notify the FRDC and UTAS in writing of:-

(c) each Major Capital Item; and

(d) each Capital Item that the Research Provider wishes to continue to use for its own purposes, including:-

(i) the intended use of each item; and

(ii) how the intended use will benefit the fishing industry.

55.4 At any time during the Term and for up to 20 Business Days after receiving the notice referred to in clause 55.3, the FRDC may notify each Research Provider in writing of:-

(a) each Capital Item that the FRDC agrees the Research Provider may continue to use for its own purposes; or

(b) each Capital Item that the Research Provider must:-

(i) transfer ownership to the FRDC, for no consideration; and

(ii) deliver into the physical possession of the FRDC; or

(c) the FRDC's requirements for the disposal of all other Major Capital Items.

55.5 The FRDC will pay all reasonable transport or disposal costs incurred by the Research Provider under clause 55.4 (b).

55.6 Each Research Provider must, at its own cost, bring into existence, sign, execute or otherwise deal with any document which may be necessary or desirable to:-

(a) give effect to this clause 55 and any directions, imposition or advice given by UTAS or the FRDC under this clause 55; and/or

(b) secure the FRDC's rights under this clause 55.

55.7 At times when a Capital Item is not required for the purpose of the Project, and until the FRDC or UTAS notifies the Research Provider in writing to stop using that item, the Research Provider may, at its risk, use that item:-

(a) prior to the Project Completion Date, at the premises where the Project is being conducted; and

(b) after the Project Completion Date, anywhere in Australia,

(c) for internal, academic, or non-commercial research and teaching purposes (whether related to the Project or not) intended to be of benefit to the fishing industry.

PART 16 EMPLOYER OBLIGATIONS

56 EMPLOYER OBLIGATIONS

56.1 Any officer, subcontractor, employee, student or agent of a Research Provider involved in the Project remains at all times an employee, independent contractor, student or agent of the Research Provider.

56.2 Each Research Provider must:-

(a) at all times and at its own expense comply with the provisions of any relevant legislation and industrial instruments (as that term is defined in the Corporations Act 2001 (Cth)) in respect of the persons the Research Provider uses to conduct any part of the Project; and

(b) indemnify the FRDC for any payment which the FRDC is required to make (including but not limited to payments under the Superannuation Guarantee (Administration) Act 1992 (Cth), payroll tax, other taxes and any penalties on an indemnity basis) and any Losses incurred by the FRDC (including, but not limited to, the tax effect of the loss of any tax deductions) if, despite the provisions of the Agreement, the FRDC is held at any time to be the

employer or principal of any persons referred to in clause 56.1or becomes liable to pay any amounts in respect of such person.

56.3 For the purposes of clause 56.2(b), the FRDC will be deemed to be acting as agent or trustee for and on behalf of the Research Provider's officers, employees, contractors or agents from time to time.

57 EQUAL EMPLOYMENT OPPORTUNITY

57.1 The Research Provider must:

(a) comply with its obligations, if any, under the Equal Opportunity for Women in the Workplace Act 1999 (Cth) (Act);

(b) not enter into a subcontract under the Agreement with a subcontractor named by the Director of Equal Opportunity for Women in the Workplace Agency as an employer currently not complying with the Act.

57.2 Any subcontract must include a provision that requires the subcontractor to notify the Equal Opportunity for Women in the Workplace Agency of any failure to comply with the Act.

PART 17 INDEMNITIES AND INSURANCE

58 INDEMNITY

58.1 Each Research Provider must at all times indemnify each other Research Provider, the FRDC, its officers, employees, agents, contractors, and third parties appointed by the FRDC to complete the Project ("those indemnified"), as will the other Research Providers, from and against all Losses:-

(a) incurred by any of those indemnified; or

(b) arising from any claim, suit, demand, action or proceeding by any person against any of those indemnified,

to the extent such Loss was caused or contributed to in any way by a breach of clause 3.1 or by any unlawful, wilfully wrongful or negligent act or omission of the Research Provider, or any Personnel in carrying out the Project or in connection with this Agreement.

58.2 Any of those indemnified may enforce the indemnity in clause 58.1 in favour of any of those indemnified for the benefit of each of those indemnified.

58.3 Each Research Provider's liability to indemnify those indemnified under clause 58.1 will be reduced proportionally to the extent that a wilfully wrongful or negligent act or omission of a third party that is not:

(a) contracted to the Research Provider; or

(b) a related body corporate of the Research Provider; or

the FRDC, its officers, employees, agents or contractors or another Research Provider contributed to the Loss, as established by the Research Provider.

58.4 Nothing in the indemnity contained in clause 58 will in any way reduce or qualify the rights of other parties at common law in respect of the events that are the subject of the indemnity.

59 INSURANCE

59.1 Each Research Provider must, at its own expense, effect and maintain with a reputable insurance company during the Term (except in the case of professional indemnity insurance which must also be maintained until the expiration of 7 years after the expiration or termination of the Agreement) the following categories of insurance:-

(a) a public liability insurance policy for an amount not less than $10 million per occurrence;

(b) a products liability insurance policy for an amount not less than $10 million per occurrence;

(c) workers compensation insurance for an amount required by the relevant State and Territory legislation or, where common law liability is not covered by the relevant statutory scheme, common law employers' liability cover of not less than $50 million in the aggregate in any 12 month period; and

(d) professional indemnity insurance for an amount not less than $5 million per claim and in the aggregate in any 12 month period.

59.2 The taking out of the insurance policies referred to in clause 59.1 does not relieve the Research Provider of any obligation or liability which it has under any other provision of the Agreement.

59.3 Each Research Provider:

(a) must, if requested by the FRDC and without delay, provide evidence without delay that is acceptable to the FRDC of the insurances referred to in clause 59.1 (including copies or policy wordings) and their currency;

(b) is not required to effect and maintain the insurances specified in clause 59.1 if the Special Conditions exempt the Research Provider from compliance with clause 59.1.

PART 18 TERMINATION

60 TERMINATION

60.1 If the FRDC does not agree to provide additional funds under clause 13.3 or the Parties do not agree to a Project Variation, either the FDRC may Terminate the Agreement, or the Research Provider may withdraw from the Project, by giving at least 30 days written notice to the other Party.

60.2 Withdrawal by a Research Provider, or Termination by the FRDC, under this clause 60 does not constitute a breach of the Agreement by either Party or cause any liability to arise in relation to any Loss suffered by either Party as a result of the Termination or withdrawal.

61 TERMINATION ON DEFERMENT OF FRDC FUNDS

61.1 Where the FRDC defers a payment:-

(a) a Research Provider may withdraw from the Project for convenience by providing the FRDC at least 60 Business Days written notice, provided that if at any time during the period of notice the FRDC is able to continue funding the Project, the Research Provider may cancel the notice of withdrawal; and

(b) the FRDC may Terminate the Agreement.

61.2 If the Agreement is Terminated under clause 61.1:-

(a) the FRDC is not obliged to make any further payment to the Research Providers;

(b) the FRDC will be liable only for any reasonable costs in respect of unavoidable Loss incurred by the Research Provider and directly attributable to the Termination of the Agreement, provided that:-

(i) the costs are fully substantiated to the FRDC;

(ii) the costs must not exceed the total FRDC Funds payable under the Agreement and must not include loss of potential profit; and

(iii) for the avoidance of doubt, reasonable costs in respect of unavoidable Loss include costs incurred in conducting the Project prior to the date of Termination and in respect of which FRDC Funds would otherwise have been paid.

62 TERMINATION ON NOTICE BY THE FRDC

62.1 The FRDC may Terminate the Agreement at any time by providing 60 Business Days written notice.

62.2 Upon receiving a notice of Termination referred to in clause 62.1, each Research Provider shall:-

(a) stop work as specified in the notice and comply with any other directions or requests included in the notice, in particular in relation to FRDC Material and Project Material;

(b) comply with all obligations in the Agreement relating to FRDC Material and Project Material;

(c) take all available steps to minimise or avoid any Loss resulting from that Termination and to protect FRDC Material and Project Material; and

(d) continue work on any part of the Project not affected by the notice; and

(e) provide the FRDC with a report that describes what work has been performed by the Research Provider under the Agreement up until the date of Termination.

62.3 If this Agreement in Terminated in accordance with clause 62.1, or a Research Provider withdraws in accordance with clause 61.1, the FRDC will be liable only for any reasonable costs in respect of unavoidable Loss incurred by the Research Provider and directly attributable to the Termination or withdrawal of the Research Provider, provided that the costs are fully substantiated to the FRDC. These costs must not exceed the total FRDC Funds payable under the Agreement and must not include loss of potential profit. For the avoidance of doubt, reasonable costs in respect of unavoidable Loss include costs incurred in conducting the Project in accordance with the Agreement prior to the date of Termination or withdrawal and in respect of which FRDC Funds would otherwise have been paid.

62.4 If the FRDC is the Continuing Party:-

(a) the licences granted by the Research Provider to the FRDC under clauses 19 and 20 extend to allow the FRDC, subject to any reasonable conditions imposed by the Research Provider, to:-

(i) use Research Provider Background IP that is incorporated in any Project Material that exists at the date of termination for the purposes of completing the Project;

(ii) use the Project IP and Sub-program IP for the purposes of completing the Project;

(b) the FRDC may appoint a third party to complete the Project.

62.5 Prior to a third party being appointed, the FRDC must provide the Research Provider with written notice advising of the identity of each third party it intends to appoint.

62.6 If the FRDC appoints a third party to complete the Project:-

(a) the Research Provider must disclose to:-

(i) the FRDC; and

(ii) any third party appointed by the FRDC to complete the Project and that has agreed to keep Confidential Information confidential,

all Project Data, the methods used and all results and conclusions reached in carrying out the Project, access to the Research Provider's records and all information and explanations in relation to the Project; and

(b) subject to any reasonable conditions imposed by the Research Provider and the licences of Project Material granted to the FRDC;

(i) the FRDC; and

(ii) any third party appointed by the FRDC to complete the Project and that has agreed to keep Confidential Information confidential,

are entitled to use any IP Rights arising in relation to the Project, including any Project Material, to complete the Project.

62.7 For avoidance of doubt, ownership of IP Rights in Project Material that exists at the date of Termination is not affected by the Termination, and the Parties can only Commercialise Project Material that exists at the date of Termination in accordance with clause 44.

63 DEFAULT BY RESEARCH PROVIDER

63.1 Without prejudice to its rights at common law, the FRDC may, by notice in writing to the Research Provider:

(a) expel a Research Provider from the Project immediately if the Research Provider;

(i) becomes insolvent or bankrupt;

(ii) makes an assignment of its assets for the benefit of creditors or enters into any arrangement or composition with its creditors or has a receiver and manager appointed on behalf of debenture holders or creditors;

(iii) goes into liquidation or passes a resolution to go into liquidation, otherwise than for the purposes of reconstruction, or becomes

subject to any petition or proceedings in a court for its compulsory winding-up or becomes subject to supervision of a court either voluntarily or otherwise; or

(iv) suffers any execution against its assets having adverse effect on its ability to perform the Agreement.

(b) require the Research Provider to show cause why the Research Provider should not be expelled ("show cause notice") where the Research Provider:-

(i) is charged with an indictable offence;

(ii) assigns its rights otherwise than in accordance with the requirements of this Agreement;

(iii) has failed to achieve, to the reasonable satisfaction of the FRDC, any Milestone within 20 Business Days after the date specified in Schedule 4 – Schedule of Payments;

(iv) has failed to remove or avoid a conflict of interest when directed to do so by the FRDC;

(v) has failed to meet any other obligation under this Agreement and where the project undertaken by the Research Provider is, in the opinion of the FRDC, no longer viable.

63.2 Upon receiving a show cause notice under clause 63.1(b), the Research Provider must respond in writing within 20 Business Days.

63.3 The FRDC must consider the Research Provider's response provided under clause 63.2, and may:

(a) expel the Research Provider immediately by notice in writing if the FRDC considers that the problem or problems that prompted the show cause notice are unlikely to be resolved to its reasonable satisfaction within 10 Business Days; or

(b) enter into negotiations with the Research Provider to attempt to resolve the problem or problems that prompted the show cause notice.

63.4 If the Research Provider does not respond to the show cause notice in accordance with clause 63.2, the FRDC may expel the Research Provider immediately by notice in writing.

63.5 If, upon expulsion of the Research Provider under this clause 63, there are any surplus FRDC Funds, those surplus FRDC Funds must be repaid by the Research Provider to the FRDC upon expulsion and, if not repaid, is recoverable by the FRDC from the Research Provider as a debt.

63.6 If the Research Provider is expelled under this clause 63:-

(a) subject to the Agreement, the Parties are relieved from future performance, without prejudice to any right of action that has accrued at the date of th expulsion;

(b) the FRDC's rights to recover damages are not affected and FRDC may appoint a third party to complete the project;

(c) the Research Provider must:-

(i) comply with all obligations in the Agreement relating to FRDC Material, Project Material and Capital Items;

(ii) disclose to:-

(A) the FRDC; and

(B) any third party engaged by the FRDC to complete the Project and that has agreed to keep Confidential Information confidential;

all Project Data, the methods used and all results and conclusions reached in carrying out the Project, access to the Research Provider's records and all information and explanations in relation to the Project; and

(d) subject to any reasonable conditions imposed by the Research Provider, the licences of Project Material granted to the FRDC under this Agreement:

(i) the FRDC; and

(ii) any third party engaged by the FRDC to complete the Project and that has agreed to keep Confidential Information confidential,

are entitled to use any IP Rights arising in relation to the Project, including any Project Material, to complete the Project.

64 DEFAULT BY FRDC

64.1 Without prejudice to its rights at common law, the Research Provider may, by notice in writing to the FRDC, withdraw from the Project immediately if the FRDC fails to comply with the Agreement and:-

(a) if the failure is capable of remedy, the Research Provider, by notice in writing to the FRDC, requires the FRDC to remedy the failure; and

(i) the FRDC does not commence to remedy the failure within 10 Business Days of being given the notice referred to in clause 64.1 (a); and

(ii) the FRDC fails to remedy the failure within 20 Business Days of being given the notice referred to in clause 64.1 (a); or

(b) if the failure is not capable of remedy, the Research Provider provides the FRDC with 10 Business Days notice in writing of its intention to withdraw.

64.2 If a Party withdraws from the Project the remaining Parties must meet for the purpose of agreeing on whether or not to continue the Project or a Variation of the Project and the terms to which that continuation would be subject.

PART 19 GOVERNMENT TAXES, LEVIES AND CHARGES

65 GOVERNMENT TAXES, LEVIES AND CHARGES

65.1 The FRDC Funds are inclusive of all levies and taxes, but not GST.

65.2 The amounts specified in Schedule 4 – Schedule of Payments do not include GST. GST will be added to the amounts specified in Schedule 4 – Schedule of Payments

at the time that each payment of FRDC Funds is paid to the Research Provider if the Research Provider is liable to pay GST.

65.3 Where a Taxable Supply is made under the Agreement, the Research Provider must

(a) provide the FRDC with a Tax Invoice; and

(b) with the relevant Milestone Progress Report.

65.4 If the amount of any GST payable by the FRDC to the Research Provider in relation to any supply under the Agreement differs for any reason from the amount of GST actually paid or payable by the Research Provider in relation to that supply, the difference must be paid by the Research Provider to FRDC or by FRDC to the Research Provider (as the case may be) and the Research Provider must supply FRDC with an Adjustment Note in this respect as soon as practicable.

65.5 Any outgoing cost, expense or cost paid or payable by the Research Provider which may be reimbursed by the FRDC must first be reduced by the amount of any input tax credit entitlement before being claimed from the FRDC.

65.6 If a payment by the Research Provider to satisfy a claim by the FRDC under or in connection with this Agreement (for example, under an indemnity given by the Research Provider or for a breach of any representation or warranty by the Research Provider) gives rise to a liability to pay any GST in respect of a Taxable Supply by the FRDC, the Research Provider must pay, and indemnify the FRDC from, the amount of that GST.

65.7 The amount recoverable by the FRDC in respect of any indemnity, representation or warranty given by the Research Provider under the Agreement includes the amount of GST payable on the cost or expense in relation to which the indemnity, representation or warranty is paid, but will exclude the amount of any input tax credit or other credit to which the FRDC, as the taxable supplier, is entitled in respect of the cost or expense recovered.

65.8 Each Research Provider warrants that they are registered under the GST Law and that each Party will notify the other promptly if it ceases to be registered for the purpose of the GST Law.

PART 20 INTERPRETATION

66 RULES FOR INTERPRETING THIS AGREEMENT

66.1 Unless expressly stated to the contrary or the context otherwise requires:-

(a) the capitalised expressions in this Agreement will have the meanings set out in Schedule 2;

(b) headings are for convenience only, and do not affect interpretation of this Agreement;

(c) a reference to legislation (including subordinate legislation) is to that legislation as amended, re-enacted or replaced, and includes any subordinate legislation issued under it;

(d) a reference to dollars or $ is a reference to Australian dollars; and

(e) a reference to a document or agreement, or a provision of a document or agreement, is to that document, agreement or provision as amended, supplemented, replaced or novated;

(f) a reference to a Party to this Agreement or to any other document or agreement includes a permitted substitute or a permitted assign of that Party;

(g) a reference to a Research Provider, or the Research Provider, includes each and every Research Provider that is a Party to this Agreement, severally;

(h) a reference to a person includes any type of entity or body of persons, whether or not it is incorporated or has a separate legal identity, and any executor, administrator or successor in law of the person;

(i) a reference to any thing (including a right, obligation or concept) includes each part of it;

(j) the singular denotes the plural and vice versa, and any gender denotes the other genders.

66.2 If a word is defined, another part of speech has a corresponding meaning.

66.3 If an example is given of any thing, the example does not limit the scope of that thing.

66.4 The word “Agreement” includes an undertaking or other binding arrangement or understanding, whether or not in writing.

66.5 No rule of construction will apply in the interpretation of this Agreement to the disadvantage of one Party on the basis that that Party put forward or drafted the Agreement or any part of it.

66.6 A reference to a matter being to the knowledge of a person means that the matter is to the best of the knowledge and belief of that person after proper enquiry, and includes enquiries that a reasonable person would be prompted to make by reason of knowledge of a fact.

66.7 For the purposes of warranties with respect to the IP Rights, a thorough search of the following databases maintained by IP Australia satisfies the requirement that the Research Provider make proper enquiries:-

(a) patents databases;

(b) trade marks databases; and

(c) designs databases.

66.8 Words and expressions used in this Agreement that are defined in the GST Law have the same meaning as in the GST Law, unless the context otherwise provides.

67 BUSINESS DAYS

67.1 If the day on or by which a person must do something under this Agreement is not a Business Day, the person must do it on or by the next Business Day.

68 INCONSISTENCY

68.1 Unless otherwise agreed by the Parties in writing, if there is any inconsistency between clauses1 to 69 of the Agreement (these terms and conditions) and the Schedules, then the documents will prevail in the following order:-

(a) Schedule 6 – Special Conditions;

(b) clauses 1 to 69 of the Agreement (these terms and conditions) and Schedule 3; and

(c) the remaining Schedules,

to the extent of the inconsistency.

69 GRANT OF APPROVAL

69.1 The grant of any approval or consent by the FRDC under this Agreement will not relieve the Research Provider from any liability under this Agreement.

SCHEDULE 1 - BACKGROUND

A. The FRDC's mission is to maximize economic, environmental and social benefits for its stakeholders through effective investment and partnership in research and development. To achieve this mission, the FRDC is responsible to its stakeholders to:

(a) plan, invest in and manage fisheries research throughout Australia; and

(b) facilitate the dissemination, adoption and Commercialization of the results of this research.

B. The FRDC has funded the RLEAS program and through the supervision of the other Research Providers by UTAS. Accordingly, all Research Providers have undertaken considerable research and development on the Project. The Research Providers have applied for further funding through the FRDC.

C. The Parties now wish to enter into an agreement for the conduct of the Project under Appointment of the Research Providers by FRDC and the supervision by UTAS of the Research Providers in respect of their obligations under this Agreement.

SCHEDULE 2 – DEFINITIONS

Adjustment Note has the same meaning as in the GST Law;

this Agreement this Project Agreement including all recitals, schedules and any other agreements expressed to be supplemental to this Agreement;

ANZLIC the Spatial Information Council of Australia and New Zealand (formerly known as the Australia New Zealand Land Information Council);

Appointment the appointment of the Research Provider by FRDC in accordance with this Agreement and "Appoint" shall have a corresponding meaning;

Auditor-General the Auditor-General of the Commonwealth of Australia, as appointed under the Auditor-Generals Act 1997 (Cth).

Background those circumstances recorded in Schedule 1 in which this agreement is settled and signed by all the Parties.

Background IP as the context requires, those rights which have been agreed to be contributed to the Project by either or both of the:-

(a) FRDC, as FRDC Background IP and described in Schedule 11; and

(b) Research Provider, as Research Provider Background IP and described in Schedule 11,

(c) and, for the avoidance of doubt, which rights specifically do not include any Project IP or Sub-program IP.

Business Day any day of the week other than Saturday, Sunday or a public holiday in the Australian Capital Territory.

Capital Items any item that is identified in Schedule 5 – R&D Funding Application as a Capital Item.

Collaborator one of those other research providers supervised by the Research Provider.

Commercialise that process to be undertaken by the Parties for the commercial exploitation in the marketplace of the Project IP and:-

(a) in the case of a product:-

(i) use, manufacture, make, sell, hire, or otherwise dispose of;

(ii) offer to manufacture, make, sell, hire or otherwise dispose of; or

(iii) import it or keep it for the purpose of doing any of the actions referred to in paragraph (a)(i) or (a)(ii);

(b) in the case of a method or process, do any of the actions in paragraph (a) in respect of the method or process, or a product resulting from the method or process; and

(c) licence or otherwise entitle any third party to do any of the actions in paragraphs (a) or (b),

(d) regardless of whether any revenue is generated or intended to be generated,

and "Commercialisation" shall have a corresponding meaning.

Commonwealth the Commonwealth of Australia.

Confidential Information as the context requires, either or both of the:-

(a) FRDC Confidential Information; and

(b) Research Provider Confidential Information.

Conflict of Interest any circumstances in which, due to a direct or indirect relationship (commercial or otherwise and including any potential relationship or opportunity or inducement and any such situation which comes into existence after the commencement of this document) involving the Research Provider, or any of its personnel, and another person or entity, the Research Provider is unable to discharge its obligations under this Agreement in an objective and independent manner to the best of its ability.

Contributing Student any person who is enrolled in a higher degree program at a self-accrediting higher education institution in Australia, or a private education provider accredited by a State or Territory Government and:-

(a) is to undertake work in relation to, or otherwise participate in, any part of the Project; or

(b) wishes to use, reproduce or adapt Project Material in developing a Student Thesis.

Custodian an entity being one of the following, namely:-

(a) recognised by ANZLIC as a custodian of a fundamental dataset, or a component of that dataset;

(b) listed on the FRDC website as a Custodian for the purposes of the Project Agreement; or

(c) the FRDC otherwise agrees in writing is a Custodian for the purposes of the Project Agreement.

Deliverables the required deliverables for the Project, being:-

(a) the Milestone Progress Reports specified in Schedule 4 – Schedule of Payments;

(b) the Final Financial Report; and

(c) the Final Report.

Developments any method or approach which can be adapted to the Project IP, which would make any of them cheaper, more effective, easier, more useful,

more valuable, or in any way improved, in any part of the World, whether subject to Future Rights or not.

Excluded Information any information that:-

(a) is, or became generally available in the public domain, except through disclosure contrary to this Agreement, or any obligation of confidence owed by the Parties to each other; or

(b) is made available to a Party (the Recipient Party) by a person who, to the Recipient Party's knowledge, was not under any obligation of confidence in relation to that information at the time the information is made available to the Recipient Party.

Final Financial Report that final financial report to be delivered under this Agreement by a Research Provider to FRDC.

Final Report that final report to be delivered under this Agreement by a Research Provider to FRDC.

Financial Year a full year ending on the 30th day of June.

FRDC Background IP jointly and severally each and every one of those IP Rights arising from the conduct of research, funding, projects and sub-programs undertaken by the FRDC, outside the scope of the RLEAS and the Project, and which IP Rights the FRDC has agreed to contribute to the Project, including but not limited to those IP Rights:-

(a) identified in Schedule 11 – Background IP as FRDC Background IP and any other IP Rights that the FRDC has offered to contribute as Background IP for the Project at the time and from time to time; and

(b) in all information and materials disclosed or provided by the FRDC (whether before or after the date of this Agreement) to the Research Provider for the purpose of the Project.

FRDC Confidential Information that Information which:-

(a) is designated in Schedule 7 – Confidential Information as confidential to the FRDC; or

(b) the FRDC notifies the Research Provider in writing as confidential to the FRDC.

FRDC Funds the FRDC payments specified in Schedule 4 – Schedule of Payments.

FRDC Income any income specifically identified as FRDC Income in Schedule 5 – R&D Funding Application, but does not include costs directly incurred by the Research Provider in order to derive the income.

FRDC Information means all Information relating to the FRDC whether or not it was generated or processed by, or on behalf of, the FRDC.

FRDC Material means any Material provided by the FRDC to the Research Provider for the purposes of this Agreement, or copies of Material so provided.

FRDC Related Personal

Information	Personal Information about persons who are or have been officers, employees, contractors or clients of the FRDC or users of FRDC Information.
FRDC Standards	the FRDC's current design and content standards set out on the FRDC web site from time to time, including in relation to:- (a) the Milestone Progress Report; (b) financial reports; (c) the Final Report; (d) copyright notices; and (e) other matters for which the FRDC determines a standard.
Future Rights	jointly and severally all those IP Rights which may arise or be acquired after the date of this Agreement, and in respect of all media either in existence now or in the future.
GST	has the same meaning as in the GST Law.
GST Law	has the same meaning as in the A New Tax System (Goods and Services Tax) Act 1999 (Cth) and any regulations made pursuant to that Act.
Heads of Expenditure	each and every one of those following categories of expenses approved for expenditure of the FRDC Funds as specified in the Project Budget included in Schedule 4 – Schedule of Payments:- (a) salaries; (b) travel; (c) operating; and (d) capital.
Information	each and every one of those trade secrets, ideas, concepts, procedures, items of advice, specifications, lists, managerial techniques and strategies, techniques, elements of practical expertise, compilations of data, formulas, patterns, devices, discoveries, plans and other information, operations, facilities, customers, personnel, assets, programs, and know-how, whether in writing or otherwise, but specifically excluding the Excluded Information.
IP Rights	jointly and severally, each and every right relating to an intellectual, commercial or industrial property, whether registered or not and whether protected by statute or not, including the Future Rights, patent rights, copyright, design rights, trade mark rights, any Developments, any circuit layout rights, any plant variety rights, any rights in business reputation (including rights to bring suit for passing off or trade practices breaches), any other intellectual property as defined by Article 2 of the Convention Establishing the World Intellectual Property Organisation of July 1967 and any right to make application of any of the above anywhere in the World, but specifically excluding Moral Rights.

Internal Research	research and development conducted by a:- (a) Party; or (b) where a third party has been appointed by the FRDC pursuant to clauses 62.4(b) or 63.6(b) to complete the Project, by that third party, for the purpose of performing its ordinary functions and carrying out its core business but specifically excludes any research and development being carried out for any Commercialization.
Listed Marine Species	has the same meaning as in the Environment Protection and Biodiversity Conservation Act 1999 (Cth).
Listed Threatened Species	has the same meaning as in the Environment Protection and Biodiversity Conservation Act 1999 (Cth).
Loss	any loss, damage (whether direct or indirect), liability, cost or expense including legal expenses on a solicitor and own client basis, and Losses will have a corresponding meaning.
Major Capital Item	a Capital Item that:- (a) cost more than twenty thousand dollars ($20,000) when purchased; or (b) has a depreciated value (determined at a reasonable rate of depreciation nominated by the FRDC or as otherwise agreed by the Parties) that, at the Project Completion Date, is five thousand dollars ($5,000) or greater.
Material	jointly and severally those graphs, models, photographs, letter, lists, formulae, notes, brands, techniques, protocols, correspondence, drawings, data, photographs, and other written material or software, equipment, organisms (living or dead), facilities and premises whether in existence before, on or after the date of this Agreement.
Milestone	a milestone as specified in Schedule 4 – Schedule of Payments the accomplishment of which generates income.

Milestone Progress Report	a written report provided to another Research Provider in FRDC on the Research Provider's progress in achieving a Milestone.
Moral Rights	the right of integrity of authorship, the right of attribution of authorship, and the right not to have authorship falsely attributed, more particularly as conferred by the Copyright Act 1968 (Cth), and rights of a similar nature anywhere in the World whether existing before, on or after the date of this Agreement.
Party	the FRDC or the Research Provider, as the context requires.
Person	includes any person, firm, corporation, legal entity or partnership or organised group of person or legal successors or representatives of the foregoing.
Personal Information	any information or an opinion (including information or an opinion forming part of a database), whether true or not, and whether recorded in a material form or not, about a natural person whose identity is apparent, or can reasonably be ascertained from the information or opinion.
Personnel	each and every one of those personnel appointed by the Research Provider to conduct the Project for and on behalf of the Research Provider and in respect of the Agreement as it related to the Research Provider.
Principal Investigator	that person identified as the Principal Investigator in Schedule 5– R&D Funding Application, and who is responsible for the supervision and administration of the Project on behalf of the Research Provider, and includes any person subsequently approved, in writing, by the FRDC, to replace that person.
Privacy Commissioner	means the Commonwealth Privacy Commissioner, as appointed under the Privacy Act 1988 (Cth).
Project	that discrete, research or training activity or series of activities, to be carried out by the Research Providers, or Third Parties, and which has been recognised as the Project by the FRDC, and which research and development project is described in Schedule 5 of this Agreement, and includes the preparation, presentation and delivery of Project Material.
Project Completion Date	the date on which the Research Provider is required to complete the final Milestone as specified in Schedule 4 – Schedule of Payments.
Project Data	the data sets listed in Schedule 9 – Project Data, but does not include Confidential Information.
Project Material	each and every aspect of Material created or collected by or for a Research Provider or required to be created or collected by a Research Provider as part of, or in the course of performing the Project in accordance with this Agreement or by any use of FRDC Funds, including:- (a) the project material listed in Schedule 5 – R&D Funding Application;

(b) all Deliverables;

(c) Project Data; and

(d) any other report the Research Provider must prepare under this Agreement,

and using the Project IP.

Project IP jointly and severally, those IP Rights arising from the conduct of, or developed in the course of carrying out the Project under this Agreement, but which IP Rights do not include:-

(a) the FRDC Background IP;

(b) the Research Provider Background IP;

(c) any Third Party IP Rights in existence prior to the creation or development of the Project IP; or

(d) the Sub-program IP.

Protected Species has the same meaning as in the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) (Dictionary and Schedule 12 - Protected species of those regulations) made pursuant to the Environment Protection and Biodiversity Conservation Act 1999 (Cth).

Research Provider each person Appointed pursuant to this Agreement to undertake the Project and being University of Tasmania, Queensland Department of Primary Industries, Australian Institute of Marine Sciences and MG Kailis Pty Ltd and includes, where the context so requires, any Personnel, assigns, legal successors or representatives of the foregoing.

Research Provider Background IP jointly and severally, each and every one of those IP Rights arising from the conduct of research, projects and sub-programs by the Research Provider, outside the scope of the RLEAS and the Project, and which IP Rights the Research Provider has agreed to contribute to the Project, including but not limited to those IP Rights:-

(a) identified in Schedule 11 – Background IP referred to as RPBIP and any other IP Rights that the FRDC has offered to contribute as Background IP for the Project at the time and from time to time; and

(b) in all information and materials disclosed or provided by the Research Provider (whether before or after the date of this Agreement) to the FRDC for the purpose of the Project.

Confidential Information that Information which:-

(a) is designated in Schedule 7 – Confidential Information as confidential to the Research Provider; or

(b) the Research Provider notifies the FRDC in writing as confidential to the Research Provider.

Research Provider

Personnel	each and every one of personnel of the Research Provider allocated to the Project including any:- (a) officers, employees, contractors and agents of the Research Provider, and (b) students, including Contributing Students, participating in the Project.
Research Provider Resources	any financial or other contributions provided by the Research Provider in relation to the conduct of the Project as set out in Schedule 5 – R&D Funding Application.
RLEAS	that managed sub-program involving the Research Providers and the Collaborators, entitled the Rock Lobster Enhancement and Aquaculture Sub-program, established by the FRDC in July 1998, with the objective to provide technology for use in Australian rock lobster enhancement and aquaculture systems, so they can be internationally competitive and can operate in harmony with the wild fisheries, and which sub-program comprises of a number of related projects, intensively coordinated and integrated to achieve a planned research and development outcome, thereby maximising the collaboration between researchers, fisheries managers and fishing industry interests.
Special Conditions	the special conditions (if any) set out in Schedule 6 – Special Conditions.
Start Date	the date specified for the first milestone in Schedule 4 – Schedule of Payments.
Steering Committee	the committee established under the Special Conditions.
Student Thesis	a thesis by a Contributing Student that:- (a) is required to be examined for the Contributing Student to complete academic requirements for the award of a higher degree; and (b) contains Project Material or Project IP, or otherwise refers to Project Material or Project IP.
Subject Rights	each of the Project IP and the Sub-Program IP.
Sub-program IP	jointly and severally, those IP Rights arising from the conduct of, or developed in the course of carrying out the RLEAS excluding the Project, and which IP Rights do not include:- (a) the FRDC Background IP; (b) the Research Provider Background IP; (c) any Third Party IP Rights in existence prior to the creation or development of the Sub-Program IP; or (d) the Project IP.
Survey	that survey or questionnaire circulated by UTAS in accordance with clause 2.2 of this Agreement.

Tax Invoice	has the same meaning as in the GST Law.
Taxable Supply	has the same meaning as in the GST Law.
Term	the period referred to in clause 1.2 of the Operative Conditions and includes any extension of that period agreed by the Parties.
Terminate	means the termination of this Agreement under Part 18 – Termination, and "Termination" shall have a corresponding meaning.
Third Party Agreement	an agreement between a Party and one or more third parties setting out the terms upon which that third party will be involved in the conduct of the Project.
Third Party Resources	any financial or other contributions provided by a third party in relation to the conduct of the Project as set out in Schedule 5 – R&D Funding Application, whether obtained by the FRDC or the Research Provider.
Variation	that process specified in clause 8 of the Operative Provisions by which the terms of this Agreement are varied, and "Vary" shall have a corresponding meaning.
World	jointly and severally all territories and countries in the world, including the Commonwealth of Australia.

SCHEDULE 3 - GENERAL OBLIGATIONS

1 NEGATION OF EMPLOYMENT PARTNERSHIP AND AGENCY

1.1 The Research Provider must not:-

(a) represent itself, and must ensure that its employees do not represent themselves, as being employees, partners or agents of the FRDC; or

(b) by virtue of the Agreement be, or for any purpose be deemed to be, an employee, partner or agent of the FRDC.

2 CONFLICT OF INTEREST

2.1 Subject to clause 2.2 of Schedule 3, each Research Provider warrants to the other Research Providers and FRDC that, to its knowledge, at the date of signing the Agreement, no Conflict of Interest exists or is likely to arise in the performance of its obligations under this Agreement.

2.2 Where a Conflict of Interest, a risk of Conflict of Interest or a perceived Conflict of Interest arises in the performance of the Research Provider's obligations under the Agreement, the Research Provider must notify the FRDC and UTAS immediately of the situation and must follow all reasonable directions by the FRDC or UTAS about the method for managing the conflict of interest, risk of conflict of interest or perceived conflict of interest.

3 COMPLIANCE WITH FRAUD POLICY

3.1 FRDC Funds and FRDC Material must only be used for the purposes of the Project and in accordance with this Project Agreement.

3.2 The Research Provider must notify the FRDC immediately on becoming aware of:-

(a) any loss or overpayment of FRDC Funds;

(b) any loss of FRDC Material or Project Material; or

(c) any misuse or potential misuse of FRDC Funds or FRDC Material, including dishonestly obtaining a benefit by deception or other means.

3.3 Where oral notification is provided, it must be followed by written notification within two (2) Business Days.

3.4 The Research Provider must comply with any reasonable directions of the FRDC in order to recover any loss or overpayment, or rectify any misuse or potential misuse.

4 DISPUTE RESOLUTION

4.1 Each Party undertakes to use all reasonable endeavours in good faith to resolve any disputes or differences that arise between the Parties in connection with this Agreement.

4.2 A Party may give the other Party a notice of dispute (dispute notice), and the Parties will each use reasonable endeavours to resolve the dispute within 20 Business Days of the giving of the dispute notice.

4.3 Notwithstanding the existence of a dispute or difference each Party shall continue to perform their responsibilities under the Agreement, unless a Party has insufficient resources to continue.

4.4 If, after 20 Business Days, the Parties have not resolved the dispute in accordance with clause 4.2 of Schedule 3, then either Party may submit the dispute or difference to:-

(a) formal or informal mediation; or

(b) arbitration in the Australian Capital Territory by a single arbitrator:

(c) appointed by the arrangement of the Parties; or

(d) if the Parties cannot agree, appointed by the Supreme Court of the ACT in accordance with the Commercial Arbitration Act 1986 (ACT),

(e) and the other Party agrees that the dispute shall thereafter be resolved by arbitration in accordance with this clause 4 of Schedule 3.

4.5 If the dispute or difference is submitted to mediation and is not settled within 30 days of the submission to mediation (unless such period is extended by agreement of the Parties), any Party may either:-

(a) submit the dispute to arbitration in accordance with clauses 4.6 and 4.7 of Schedule 3; or

(b) commence legal proceedings.

4.6 The arbitration referred to in clause 4.5 of Schedule 3 must be conducted in accordance with the Commercial Arbitration Act 1986 (ACT), except that:-

(a) the arbitrator must observe the rules of natural justice but is not required to observe the rules of evidence;

(b) a Party may have legal or other representation;

(c) the arbitrator does not have the power conferred by section 25 of the Commercial Arbitration Act 1986 (ACT);

(d) the arbitrator must include in the arbitration award the finding on material questions of law and of fact, including references to the evidence on which the findings of fact are based; and

(e) the Parties irrevocably agree to consent pursuant to section 38(4)(a) or section 39(1)(b) of the Commercial Arbitration Act 1986 (ACT) to an appeal or application to the Supreme Court of the ACT on any question of law that arises out of an arbitration award or in the course of the arbitration.

4.7 Where a dispute or difference is submitted to arbitration and the quantum of the dispute or difference is less than $50,000, or the dispute is not directly related to a monetary sum, arbitration shall take place using the submission of documents alone unless both Parties agree otherwise.

4.8 Liability for costs, including the arbitrator's fees, may be determined by the arbitrator, but if not, will be borne equally by the Parties to the dispute.

4.9 Subject to this clause 4 of Schedule 3, only if the dispute has not been resolved:

(a) by negotiation in accordance with clause 4.2 of Schedule 3; or

(b) by mediation in accordance with clause 4.4 of Schedule 3,

(c) may any Party commence legal proceedings.

4.10 Nothing in this clause 4 prevents any Party from seeking urgent injunctive relief.

5 EXCUSABLE DELAY

5.1 A Party (non-performing Party) will not be liable for any default or delay in performance of its obligations under the Agreement if, and to the extent that, the default or delay is caused by an Excusable Delay Event. For the purposes of this clause 5 of Schedule 3, an Excusable Delay Event means any:-

(a) fire, flood, earthquake, elements of nature or act of God;

(b) riot, civil disorder, rebellion or revolution;

(c) delay in passing any relevant legislation, including appropriation bills; or

(d) other similar cause beyond the reasonable control of the non-performing Party,

(e) but in each case only if, and to the extent that:-

(i) the non-performing Party is without fault in causing the default or delay; and

(ii) the default or delay could not have been prevented by reasonable precautions and cannot reasonably be circumvented by the non-performing Party at its expense through the use of alternate sources, work around plans or other means.

5.2 When an Excusable Delay Event has occurred, the non-performing Party will be excused from further performance of the obligations affected for as long as the circumstances prevail provided the non-performing Party continues to use its best endeavours to recommence performance whenever and to whatever extent possible without delay. The non-performing Parties must immediately notify the other Party of the Excusable Delay Event and describe at a reasonable level of detail the circumstances causing such delay.

5.3 If the Research Provider is excused from the performance of its obligations pursuant to clause 5 of Schedule 3 for more than 90 consecutive days, the FRDC may Terminate this Agreement immediately by written notice to the Research Providers without limiting any other rights it may have.

5.4 If the FRDC Terminates this Agreement under clause 5 of Schedule 3, the FRDC will be liable only for any reasonable costs in respect of unavoidable Loss incurred by the Research Providers and directly attributable to the Termination of the Agreement, provided that the costs are:

(a) fully substantiated to the FRDC.

(b) must not exceed the total FRDC Funds payable under the Agreement and must not include loss of potential profit.

5.5 For the avoidance of doubt, reasonable costs in respect of unavoidable Loss include costs incurred in conducting the Project in accordance with the Agreement

prior to the date of termination and in respect of which FRDC Funds would otherwise have been paid.

6 SEVERABILITY

6.1 Each provision of this Agreement and each part of such provision, will, unless the context otherwise necessarily requires it, be read and construed as a separate and severable provision or part. If any provisions or part of such provision is void or otherwise unenforceable for any reason, then that provision or part (as the case may be) will be severed and the remainder will be read and construed as if the severable provision or part had never existed.

7 APPLICABLE LAW

7.1 This Agreement will be governed by the laws in force in the Australian Capital Territory and the Parties agree to submit to the non-exclusive jurisdiction of the courts of the Australian Capital Territory.

8 NOTICES, REQUESTS AND WRITTEN APPROVALS

8.1 For the purposes of this clause 8:-

(a) a Recipient Party is a Party receiving a notice or request under the Agreement from the other Party;

(b) a Recipient is the Recipient Party's representative as specified in Schedule 12 – Notice Details; and

(c) a Recipient Party's Address is the address specified in Schedule 12 – Notice Details.

8.2 A notice or request or written approval to a Recipient Party must be in writing addressed to the Recipient, and:-

(a) left at or sent by prepaid post or facsimile to the Recipient Party's Address; or

(b) sent by email to the regular business email address of the Recipient.

8.3 A notice or request or written approval given in accordance with clause 8.2 of Schedule 3 is received:-

(a) if left at the Recipient Party's Address, on the date of delivery;

(b) if sent by prepaid post, five (5) Business Days after the date of posting;

(c) if sent by facsimile, when the sending Party's facsimile system generates a message confirming successful transmission of the total number of pages of the notice to the facsimile number of the Recipient Party; and

(d) if sent by email, when the Recipient sends an acknowledgement of receipt by return email unless the Recipient Party's email system sends an automated out-of-office email notification.

8.4 In the case of notices or requests or written approval sent by email the sending party must, when sending the email, request that the recipient acknowledges receipt by return email.

9 ENTIRE AGREEMENT

9.1 The Agreement constitutes the entire agreement between the Parties and supersedes all communications, negotiations, arrangements and agreements, either oral or written, between the Parties with respect to the subject matter of the Agreement.

10 AMENDMENT

10.1 This Agreement can only be amended, supplemented or replaced by:-

(a) the Parties completing the proforma document set out in Schedule 8 – Proforma Amendment Agreement; or

(b) another document signed by the Parties.

11 ASSIGNMENT AND NOVATION

11.1 The Parties agree that:-

(a) subject to clause 11.2 of Schedule 3, a Research Provider must not assign or attempt to assign or otherwise transfer or encumber any rights or obligations under the Agreement without the prior written approval of all the other Parties; and

(b) a Research Provider must not consult with any other person or body for the purpose of entering into an agreement that will require novation of this Agreement without first consulting the FRDC.

11.2 The Parties acknowledge and agree that the FRDC's rights and obligations under the Agreement may be transferred at any time:-

(a) to the Commonwealth; or

(b) a third party nominated by the Commonwealth.

11.3 The FRDC must advise the Research Provider within 10 Business Days of such a transfer occurring.

12 WAIVER

12.1 A waiver by a Party in respect of a breach of a provision of the Agreement by the other Party will not be deemed to be a waiver in respect of any other breach, and the failure of a Party to enforce at any time any of the provisions of the Agreement will in no way be interpreted as a waiver of such provision.

13 CONTINUATION OF CLAUSES

13.1 The following clauses in the Operative Provisions will survive the expiration or Termination of this Agreement:

(a) (Warranties) – Clause 3.1;

(b) (FRDC Material) – Clause 35 ;

(c) (Project Material) – Clause 36;

(d) (Licence to use FRDC Background IP) – Clause 17;

(e) (Licence to use Research Providers Background IP) – Clause 19;

(f) (Project Rights) – Clause 22;

(g) (Licence to use Project IP) – Clause 23;

(h) (Publication) – Part 11;

(i) (Confidential Information) – Clause 45;

(j) (Security) – Clause 46;

(k) (Privacy) – Clause 47;

(l) (Accounts) – Clause 52;

(m) (Audits) - Clause 53;

(n) (Capital Items) – Clause 55;

(o) (Indemnity) – Clause 58;

(p) (Insurance) – Clause 59;

(q) (Termination on notice by FRDC) – Clause 62.7,

(r) (Government Taxes, Levies and Charges) – Clause 65;

(s) (Resolution of Disputes) – Clause 4 of Schedule 3 .

13.2 All clauses that are required to give effect to the clauses referred to in clause 13.1 of Schedule 3 will also survive the expiration or termination of the Agreement.

14 GIVING EFFECT TO THE AGREEMENT

14.1 Each Party must do anything (including execute any document), and must ensure that its employees and agents do anything (including execute any document), that the other Party may reasonably require to give full effect to the Agreement.

15 COSTS AND EXPENSES

15.1 Each Party must pay its own expenses incurred in negotiating and preparing the Agreement and any related documentation.

16 COUNTERPARTS

16.1 The Agreement may be executed in counterparts.

SCHEDULE 4 - SCHEDULE OF PAYMENTS

ITEM 1 - Project Number:

ITEM 2 - Project Title:

ITEM 3 - Start Date:

ITEM 4 - Project Completion Date:

ITEM 5 - Principal Investigator:

ITEM 6- Project Objectives:

ITEM 7 - Project Budget:

FRDC Corporation funds

ITEM 8 - Schedule of Payments:

SCHEDULE 5 - R&D FUNDING APPLICATION

SCHEDULE 6 SPECIAL CONDITIONS

1. **Project Management**

1.1 This project and other FRDC projects involving rock lobster propagation will be managed under the auspices of an FRDC Rock Lobster Propagation Subprogram with a designated Subprogram Leader, Dr Robert van Barneveld. In addition to other duties outlined in FRDC Project 2007/238, the Subprogram Leader will act as the Secretariat for a Project Management Committee.

1.1 The Parties will set up a Project Management Committee comprised of at least one representative from each Party and any other member unanimously agreed by the representatives of the Parties.

1.2 Any representative on the Project Management Committee may appoint an alternate by notifying the alternate's name to the other members at least 24 hours before a meeting of the Steering Committee. An alternate has the same right to vote as the person for whom he or she is acting as alternate.

Costs associated with participation in the Project Management Committee, including time and travel costs will be met by the Parties, respectively.

1.3 The role of the Project Management Committee will be to:

(1) revise the project objectives as required to ensure they remain relevant and consistent with the overall objective of providing commercially-viable rock lobster propagation technologies.

(2) monitor the progress of the Project through the Reports provided to UTAS;

(3) make and implement decisions relating to the conduct of the Project as long as those decisions are consistent with the provisions of this Agreement;

(4) discuss and determine any proposed variations to any aspect of the Project;

(5) consult with the Parties on with the aim of agreeing on appropriate provisions for Commercialisation taking into account the principles in clause 44;

(6) discuss and seek to resolve any disagreement or potential dispute between the Parties before it becomes a dispute to be resolved in accordance with item 4 of Schedule 3 (Dispute Resolution);

(7) manage the Project IP, including by:

a. negotiating the terms of the Commercialisation as contemplated by clause 44;

b. identifying and notifying the Parties of existing and future Project IP;

c. making recommendations about which Project IP should be:

A. retained as confidential and, if so, for what period;
B. protected by patent or any other form of Intellectual Property protection; or
C. disclosed in any publication.

1.4 The parties desire to fully collaborate with each other and will reach decisions by consensus.

1.5 The Project Management Committee will be chaired by the FRDC Rock Lobster Aquaculture Subprogram Leader.

1.6 The Project Management Committee will meet face to face at least once every six (6) months and as required. All meetings must be convened upon at least fourteen (14) days prior written notice given to all members. A quorum for meetings will be one representative from each Party present in person or through an alternate.

1.7 A Party may replace their representative on the Project Management Committee by notice to the other Parties.

SCHEDULE 7 CONFIDENTIAL INFORMATION

ITEM 1 - FRDC Confidential Information

«FundingProvider»

ITEM 2 - Research Provider Confidential Information

«ResearchProvider»

SCHEDULE 8 PROFORMA AMENDMENT AGREEMENT

DEED OF AMENDING AGREEMENT NO. «DeedNumber»

Fisheries Research and Development Corporation (ABN 74 311 094 913) a body incorporated in accordance with the Primary Industries and Energy Research and Development Act 1989 (Cth) (**FRDC**).
«ResearchProviderName» ABN: «ABN» «ResearchProviderAddress» (Research Provider).

RECITALS

A. On **«AgreementDate»**, the Parties entered into an agreement for the conduct of an R&D project by the Research Provider (**Original Agreement**).

B. The Parties have agreed to amend the Original Agreement on the terms and conditions set out in this Deed of Amendment No. «**DeedNumber**».

OPERATIVE PROVISIONS

1.1 INTERPRETATION

(a) Definitions

The following definitions apply in this document.

Deed of Agreement No. «DeedNumber» means the terms and conditions of this deed, including any schedules, annexures and any other documents specifically incorporated in this Deed of Agreement No. «**DeedNumber**» by reference.

Original Agreement means the agreement between the FRDC and the Research Provider dated «**AgreementDate**».

Party means the FRDC or the Research Provider, as the context requires.

Except as specified in this Deed of Amendment No. «DeedNumber», other terms have the same meaning as in the Original Agreement.

1.2 Rules for interpreting this Deed

Headings are for convenience only, and do not affect interpretation. The following rules also apply in interpreting this Deed of Amendment No «DeedNumber», except where the context makes it clear that a rule is not intended to apply.

(a) A reference to:

(i) a document or agreement, or a provision of a document or agreement, is to that document, agreement or provision as amended, supplemented, replaced or novated;

(ii) a Party to the Deed of Amendment No. «DeedNumber» or to any other document or agreement includes a permitted substitute or a permitted assign of that Party;

(iii) a person includes any type of entity or body of persons, whether or not it is incorporated or has a separate legal identity, and any executor, administrator or successor in law of the person; and

(iv) any thing (including a right, obligation or concept) includes each part of it.

(b) A singular word includes the plural, and vice versa.

(c) If a word is defined, another part of speech has a corresponding meaning.

(d) If an example is given of any thing (including a right, obligation or concept), such as by saying it includes something else, the example does not limit the scope of that thing.

(e) The word agreement includes an undertaking or other binding arrangement or understanding, whether or not in writing.

2. AMENDMENT

2.1 Amendment

The Parties have agreed to amend the Original Agreement in accordance with this Deed of Amendment No. «DeedNumber».

2.2 Ratification of Original Agreement

Subject to the Variations contained in this Deed of Amendment No. «DeedNumber» and any other formal Variations previously agreed by the Parties, the Parties confirm and ratify all of the provisions of the Original Agreement. The Original Agreement remains in full force and effect and must be read and construed as if the terms of this Deed of Amendment No. «DeedNumber» were inserted by way of substitution or addition.

2.3 Amendment not to affect rights

Nothing contained in, or effected by, this Deed of Amendment No. «DeedNumber» abrogates, prejudices, diminishes or otherwise affects any powers, rights, remedies or obligations of any person arising under or in respect of the Original Agreement before the date of execution of this Deed of Amendment No. «DeedNumber».

3. AMENDMENTS

With effect from the date of execution of this Deed of Amendment No. «DeedNumber», the Original Agreement is amended as set out in Annexure 1.

4. GENERAL

4.1 Amendment

This Deed of Amendment No. «DeedNumber» may only be amended or supplemented in writing, signed by the Parties.

4.2 Governing law

This Deed of Amendment No. «DeedNumber» is governed by the law in force in the Australian Capital Territory.

4.3 Liability for expenses

Each Party must pay its own expenses incurred in negotiating, executing, stamping and registering this Deed of Amendment No. «DeedNumber».

4.4 Giving effect to this document

Each Party must do anything (including execute any document), and must ensure that its employees and agents do anything (including execute any document), that the other Party may reasonably require to give full effect to this Deed of Amendment No. «DeedNumber».

4.5 Counterparts

This Deed of Amendment No. «DeedNumber» may be executed in counterparts.

4.6 Attorneys

Each person who executes the Deed of Amendment No. «DeedNumber» on behalf of a Party under a power of attorney declares that he or she is not aware of any fact or circumstance that might affect his or her authority to do so under that power of attorney.

This **DEED OF AMENDING AGREEMENT** is **EXECUTED** as a deed.

DATE

SIGNED for and on behalf of the Fisheries Research and Development Corporation in the presence of:

Signature of witness	Signature of FRDC representative
Name of witness	Name and title of FRDC representative

SIGNED for and on behalf of «ResearchProviderName», by its duly authorised representative, in the presence of:

Signature of witness	Signature of Research Provider representative
Name of witness	Name and title of Research Provider representative

ANNEXURE 1 – LIST OF AMENDMENTS
«Annexure1»

SCHEDULE 9 PROJECT DATA

«scheduleProjectData»

SCHEDULE 10 NOT USED

«Annexure1»

SCHEDULE 11 BACKGROUND IP

FR

Item: Nature of Right* Description Sufficient to Identify Background IP

1

2

3

4

5

* Specify whether the right stems from: copyright, patent, trade mark, design, circuit layout right, plant breeder's rights or other (please specify).

RPBIP

Item: Nature of Right* Description Sufficient to Identify Background IP

1

2

3

4

5

* Specify whether the right stems from: copyright, patent, trade mark, design, circuit layout right, plant breeder's rights or other (please specify).

SCHEDULE 12 NOTICE DETAILS

FRDC Representative

Name

Position

Postal Address

Email Address

Telephone

Facsimile

Research Provider Representative

Name

Position

Postal Address

Email Address

Telephone

Facsimile

TABLE OF CONTENTS

1	APPOINTMENT	4
2	Legal, Policy And Ethical Requirements	5
3	Warranties	6
4	Personnel	7
5	Student involvement	7
6	Principal Investigator	8
7	Subcontracting	8
8	Variations	9
9	FRDC Funds	10
10	Reconciliation Of FRDC Funds	11
11	Deferred Payment Of FRDC Funds	11
12	Heads Of Expenditure	12
13	Additional Resources	12
14	NOT USED	13
15	OWNERSHIP OF IP	13
16	Warranty	13
17	Licence To Use FRDC BACKGROUND IP	14
18	Sub-Licence Of Background IP	14
RESEARCH PROVIDERS BACKGROUND IP		15
19	Licence To Use Research Providers Background IP	15
20	Sub-Licence Of RPBIP	15
21	Infringement Of Background IP	15
22	PROJECT Rights	16
23	Licence To Use PROJECT IP	16
24	Sub-Licence Of PROJECT IP By Research Provider	16
25	Sub-Licence Of Project IP By FRDC	17
26	Dealing With PROJECT Rights	18
27	Developments	18
28	Moral rights	19
29	IP register	19
30	Notice of infringement	19
31	NOT USED	19
32	Subject Rights Issues	19
33	A Third Party'S Use Of Project Material - THIRD PARTIES	19
34	A Contributing Student's Use Of Project IP	20

35	FRDC Material	21
36	Project Material	21
37	Publication of information or material	21
38	Obligation To Make Project Data Publicly Available	22
39	No Charge For Publication Of Project Data	22
40	REQUEST FOR PERMISSION	22
41	Party Confidential Information	23
42	Minimum Requirements For Research Provider Publications	23
43	Public announcements	23
44	first right of refusal	24
45	Confidential Information	24
46	Security	26
47	Privacy	26
48	NOT USED	28
49	Project Administration	28
50	Reports	28
51	Final Report	29
52	Accounts	29
53	Audits	30
54	Access To The Research Provider's Premises And Records	31
55	Capital Items	32
56	Employer Obligations	34
57	Equal Employment Opportunity	35
58	Indemnity	35
59	Insurance	35
60	Termination	36
61	Termination On Deferment Of FRDC Funds	36
62	TERMINATION On Notice By The FRDC	37
63	Default by Research Provider	38
64	Default by FRDC	40
65	Government Taxes, Levies And Charges	40
66	Rules For Interpreting This Agreement	41
67	Business Days	42
68	Inconsistency	43
69	Grant Of Approval	43
1	Negation Of Employment Partnership And Agency	54

2	Conflict Of Interest	54
3	Compliance With Fraud Policy	54
4	Dispute Resolution	54
5	Excusable Delay	56
6	Severability	57
7	Applicable Law	57
8	Notices, Requests And Written Approvals	57
9	Entire Agreement	57
10	Amendment	58
11	Assignment And Novation	58
12	Waiver	58
13	Continuation Of Clauses	58
14	Giving Effect To The Agreement	59
15	Costs And Expenses	59
16	Counterparts	59

Appendix VII – Propagation Commercialisation Meeting Minutes

Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Meeting

Monday, April 23, 2007
FRDC, Canberra
10.30 am – 2.30 pm

Attendees:
Dr Robert van Barneveld (RLEAS), Prof Colin Buxton (TAFI), Dr Ian Poiner (AIMS), Mr James Fogarty (MGK), Mr John Hargreaves (QDPI), Ms Edwina Menzies (Deacons)

Agenda:

1030:	Meeting objectives and desired outcomes
1035:	Brief overview of individual organization concerns with current contract
1100:	Detailed discussion of contract concerns with Edwina Menzies
1200:	Working lunch
1200:	Recommended changes to contract based on discussions
1300:	Practical implications of contract changes on current project
1330:	Pathway to commercialization of propagation research
1400:	Future role of Darden in propagation research program/Darden visits
1415:	Other business
14.30:	Close

MG Kailis Feedback

The MG Kailis Group (MGK) has over a number of years invested significant funds in *P. ornatus* propagation research, first in a joint venture with QDPI&F (now QDPI) as the original project partners, and then subsequently including FRDC and AIMS

MGK is now pursuing the commercialisation of P. Ornatus aquaculture, which was the ultimate objective of the project work.

It is therefore of critical importance that any further research projects should focus on areas that will assist MGK in its commercialisation pursuit of *P. ornatus*, and in particular that any know-how and/ or protectable IP produced will be protected, including initiatives to minimise the risk of leakage from research providers.

At this stage the current FRDC contract format does not provide an acceptable framework to protect the investment made to date and, in particular, the substantial investment to be made by MGK in the commercialisation process.

With the number of research platforms increasing, the opportunities for leakage of IP

has multiplied. Significant protective measures need to be put in place to allow MGK to make the significant investment required to commercialise *P. ornatus*, which was the original objective of the project.

MGK believes the number of research platforms should be contained and work on *P. ornatus* propagation should be limited to MGK and QDPI, with QDPI staff on employment terms satisfactory to MGK with regard to know-how and IP protection. MGK and QDPI have the knowledge, facilities and expertise to fully explore propagation of *P. ornatus*, and any proliferation of propagation activities in addition to this is simply counter to the objective of commercialisation, and creates an unnecessary risk in IP leakage.

Other research partners would undertake specific project work other than full propagation and/or commit to other species within the project.

MGK propose as follows:

- Only nominated parties (MGK & QDPI) would work on the *P. ornatus* species, except for specific project work agreed by these parties (for example specific disease or nutrition work).
- MGK to have the right to commercialisation technology of *P. ornatus* into the future at no cost.
- MGK's right to commercialise is exclusive for a period of 5 years from the date of project completion.
- If MGK fail to take adequate steps to commercialise the technology in this time (with criteria established to assess this) then project participants acting collectively are able, should they so desire, to include additional commercialisation parties.
- Program staff to be individually identified and engaged on service contracts acceptable to MGK in regard to IP protection. Basically, all parties who work on the project, including individuals, should be prevented from working with any other parties other than MGK to commercialise *P. ornatus,* or to disclose information to any other party who they know to be interested in commercialising *P. ornatus*.
- Given MGK's activities will be of a commercial nature, MGK to have absolute discretion on information flow between itself and research providers during the course of the program.
- "Know How" existing currently within MGK to be shared with research providers at the sole discretion of MGK.
- MGK would be included in all discussions with research providers when project goals are being established with a view to ensuring research is focused toward commercialisation.

Note MGK should be read as MG Kailis Group or any subsidiary, of it, involved in propagation activities of P. Ornatus.

TAFI Feedback

1. The agreement should be with UTas not TAFI. We have made this change throughout the agreement, shown tracked.

2. Clause 20 deals with the FRDC sublicensing the rights granted to it by the Research Providers under clause 19. In clause 18, under which Research Providers may sublicence the rights granted to them by the FRDC, the Research Providers are required to indemnify the FRDC against any loss incurred as a result of a breach by the Research Provider or sub-licensee of the terms of the Agreement or any sub-licence. I cannot see why the FRDC should not give a similar indemnity to the Research Providers. I recommend that a clause similar to 18.4, requiring the FRDC to indemnify Research Providers, be included in clause 20.

3. We note that Schedule 4 (payments, project objectives, completion date etc), Schedule 5 (funding application), Schedule 6 (special conditions), Schedule 7 (confidential information), Schedule 9 (project data), Schedule 10 (FRDC third party funders), Schedule 11 (background IP) and Schedule 12 (notice details) are all yet to be completed. We presume that these Schedules will be a direct lift from the project. UTas is not able to sign off on this agreement until this information is provided.

4. We note the provisions with regard to personnel in clause 4.1. In particular, 4.1(iv) requires personnel working on the Project to assign to the Research Provider (i.e. UTas) their interest in any Project IP; undertake to keep confidential information confidential, and undertake to conduct their work in accordance with the agreement. We are seeking clarification that this is possible as per our discussion in Melbourne last week.

5. Clause 5 deals with student involvement and provides that IP Rights developed by the student are to be owned in accordance with the agreement, which means a deed of assignment must be signed by any students working on the project. Does the FRDC require the student and UTas to enter into a written agreement dealing with the student's participation in the project?

6. Variations to the project are dealt with in clause 8. Clause 8.6 refers to the 'Commercialisation Process' which may contradict some obligations under the agreement. Any contradiction is to be interpreted in favour of the Commercialisation Agreements which will take precedence over any inconsistent provision in this Project Agreement. It's difficult to comment further on these provisions at this point as we have not seen the Commercialisation Agreement and don't know what it will cover, however, we note that clause 8.6(c) states that no Research Provider may complain or terminate the agreement in the event of such a contradiction. This makes us nervous and is a risk that will need to be discussed and managed appropriately.

7. I note the discussion at the Melbourne meeting as to the difference between ownership and access with respect to IP. Research providers can reasonably expect to own IP. However, to make this agreement attractive to our commercial partner (Kailis), I believe that they will require clarification of their access to the IP for commercialisation. While the terms of such a licence are not critical to the signing of this agreement.

8. We believe that some of the student IP aspects are overly restrictive e.g., on publication and there are inconsistencies. Clause 34.3 (b) (ii) indicates a

withholding period of 24 months after thesis examination and in clause 40.4 (b) a period of up to 18 months is mentioned. We believe 12 months is an appropriate with holding period in both instances.

9. As noted in Melbourne, there seems to be a great deal of trust requested in relation to adoption of the ComEnt commercialisation plan, with no time frame indicated beyond the five year life of the project. Our experience to date suggests this is going to be difficult to finalise. We suggest that agreement IP clauses take precedence over the ComEnt proposal unless complete consensus is reached.

10. Clause 31 on costs of protection says that the funds would come from the project. Our understanding is that these costs can be significant, and we question the ability of the project to cover these expenses.

11. Part 12, clause 44, deals with the Commercialisation Process. The process this clause establishes is noted but again it is difficult to comment or advise further as the documents referred to have not been developed. Clause 44.7 states that Commercialisation Income is to be distributed in accordance with schedule 6, but again, this schedule is blank so it is not possible to comment on this. When the 'Commercialisation Process', 'Commercialisation Plan', and 'Commercialisation Agreements' have been developed, they will need to be referred to us for comment.

12. The requirements regarding confidentiality and security of information are set out in clauses 45 and 46. Note that under clause 48, the FRDC may provide a copy of the agreement and other information listed to 'Third Party Funders'. This is probably acceptable but it is not clear who these bodies are so it is not possible to comment on whether this is appropriate or not.

Lastly, there is currently an intention that other research including the current ARC project on rock lobsters will come under the RLEAS commercialisation plan. The current FRDC contract does not specifically say this, nor is it clear how the various conflicts between different contract obligations would be dealt with. This needs to be discussed.

QDPI Feedback

1. Clause 3.1 The warranties FRDC requires from Research Providers should be reciprocated by FRDC to the Research Providers.

2. Clause 4.1 As part of DPI&F employment conditions, employees commit to respect confidentiality. It may be difficult however, to ensure compliance if an employee wishes to terminate their employment.

3. Clause 4.1(b)(iii) insert after 'upon 90 days' the words "or as soon as reasonably possible".

4. Clause 4.1(iv)(B) & (C) the word 'undertaken' should be substituted with "have been directed".

5. Clause 8.6 This clause is unacceptable as the Commercialisation Process/Agreements are not in existence. Furthermore, DPI&F is concerned that any Contradiction is to be interpreted in favour of a Commercialisation agreement over the project agreement.

6. Clause 9.3 The disbursement method must be clarified. DPI&F can only receipt funding in response to an invoice raised by DPI&F.

7. Clause 10.2 The term 'surplus funds' needs to be defined.

8. Clause 10 .2 relates to the treatment of surplus FRDC funds, however, Clause 10 .2 (c) bears no relationship to surplus funds and needs to be a separate Clause in its own right relating to Income.

9. Clause 13.1 All contributions under this agreement should be specified prior to the execution of the agreement or be subject to a further agreement. However, additional resource requirements, not budgeted and brought about by causes out of the control of the Research Provider, are to be met by FRDC.

10. Clause 14.2(c) This is too uncertain as the Commercialisation documents are not yet available.

11. Clause 20.1(b) Third Party Funders need to be identified and approved by all parties.

12. Clause 24.4 These and all indemnities in the agreement required by FRDC to be given by the Researcher Providers to FRDC should also be provided by FRDC to the Research Providers.

13. Clause 26.1 References to 'IP Rights' should be amended to 'Project IP'.

14. Clause 30.1 (a)'IP Rights' be amended to 'Subject Rights and Background IP'.

15. Clause 31.1(b) as above.

16. Clause 32 delete the last paragraph. This agreement will govern the obligations of each party.

17. Clause 34.1(a) Student would probably want to retain copyright in their thesis.

18. Clause 40.2 (c) this clause does not appear to be relevant in the context of 'include acknowledgements of'.

19. Clause 40.4(b) 18 months is inconsistent with 24 months in clause 34.3.

20. Clause 41.1 include 'or background IP' after 'Confidential Information'.

21. Clause 43.1 amend 'Each Research Provider undertakes to TAFI and the other Research Providers' to read 'Each party undertakes to the other Party…'.

22. Clause 44.1 (b) should read '30 days'

23. Clause 44.3 delete 'notwithstanding any Contradiction of this agreement'. 'Contradiction' is not a defined term.

24. Clause 52 DPI&F will need to verify with Internal Audit whether it can comply with this timeframe.

25. Clause 54.4 as above.

26. Schedule 2 Definition of ComEnt Delete the words "selected by FRDC".

27. Schedule 3 FRDC should provide same warranties.

28. Schedule 3 Delete 5.2.

General Comments

29. Schedules to be completed before DPI&F can fully comment on the agreement.

30. DPI&F will need to comment on the Commercialisation documents.

31. DPI&F requires that a mutual indemnity from FRDC be given to all Research Providers.

32. DPI&F requires that the IP clauses in the Project agreement should take precedence until the commercialisation documents have been agreed to.

Progressing Propagation Research –
Participants Meeting Outcomes (Draft)

Monday, April 23, 2007
FRDC, Canberra
10.30 am – 2.30 pm

Background

Following the Rock Lobster Enhancement and Aquaculture Subprogram (RLEAS) Steering Committee meeting in Melbourne on April 12, 2007, a second meeting was convened to define a way forward for both the approved propagation research project and future rock lobster propagation research and subsequent commercialization. The meeting was attended by:

Robert van Barneveld (RLEAS), Colin Buxton (TAFI), Ian Poiner (AIMS), James Fogarty (MGK), John Hargreaves (QDPI), Crispian Ashby (FRDC), Edwina Menzies (Deacons).

Summary of meeting outcomes

The meeting considered feedback from all parties on the proposed FRDC contract and management of propagation research.

Prior to discussing contract specifics, it was deemed important to consider the MG Kailis position and how this relates to a future research and commercialization program.

All parties respected the MG Kailis position and the desire to minimize IP leakage, but there was a need to identify practical solutions to undertaking research within these constraints whilst maintaining the needs of all parties involved. A number of key points were raised and discussed:

1. Up to this point, we have been collectively confounding issues surrounding the approved propagation research project and the need to protect all intellectual property surrounding rock lobster propagation now and in the future. The current FRDC contract has contributed further to this. It is important to recognize that there are two distinct issues we are dealing with here. Through the proposed FRDC contract, we appear close to agreement on how the contract can be amended to meet the needs of all with these contractual obligations extending to all research undertaken within that project. What is not clear is how we protect the entire propagation research portfolio, a significant amount of which exists outside the auspices of FRDC contracts (for example, AIMS indicated that the approved FRDC project represents only 20% of their research investment in rock lobster propagation).

2. When considering potential leakage around rock lobster propagation, research undertaken to date and commercial experience suggests that the most sensitive production phase will be the metamorphosis between Stage XI phyllosoma and puerulus. Indeed, the proposed research within the approved FRDC project has not defined what research needs to be undertaken in relation to metamorphosis and despite most research providers having the capacity to rear eggs, few can produce puerulus. For this reason, it would probably be more appropriate to look at actual puerulus production as an IP control point rather than maintenance of broodstock and larvae. It is also likely that this could be managed as a control point far more effectively than maintenance of broodstock.

3. The right for MG Kailis to not participate in the proposed collaboration was respected, but it must be recognized that FRDC would actively pursue maintenance of the remaining stakeholders within a collaborative framework with or without a commercial partner in the first instance.

Approved project discussions:

Based on the above discussions, there was sufficient agreement to warrant discussion of some of the contract detail proposed for the approved project. There is a need to have this agreement in place before June 30, 2007 if this project is to proceed (to meet the accounting requirements of some of the Universities and Government departments).

In principle, there was agreement surrounding the following:

1. All parties are comfortable with a multi-signatory agreement based around an equal IP share. More justification will need to be supplied to both TAFI and QDPI to justify this arrangement given the disproportionate investment from the participants.
2. All parties agree that MGK should be offered first right of refusal for technologies arising from this project and within a specified time period, have exclusive access to these technologies subject to satisfactory use.
3. There was in principle agreement that there would be communication around specific aspects of a project where collaborative work was involved, but there would be no requirement for any party to disclose all of their know-how in relation to propagation.
4. The project will be managed under the auspices of an FRDC Subprogram and a Management Committee will be formed comprising representatives from MGK, FRDC, QDPI, TAFI and AIMS in the first instance.
5. It was recognized that project objectives and direction should be reviewed given the delay in commencing the research and that the Management Committee would take a lead role in this process.
6. The contract will detail additional requirements to ensure that staff working on the project are aware of confidentiality arrangements and that additional procedures are in place to protect project IP.
7. Participants in the project will be required to ensure that IP arising from student activity within the project is subject to ownership and management as detailed in the FRDC contract.

8. All references to commercialization agreements will be removed from the proposed contract. These will be managed via a separate process.

Unresolved issues:

1. While it was agreed that staff movements represent a significant point for IP leakage, there appear to be limited legal avenues to prevent this under an FRDC or other contract for any organization. We will need to rely on appropriate management within projects on a case by case basis, and rapidly move to capturing the entire propagation research portfolio.

Capturing the Portfolio:

All parties are willing to enter negotiations aimed at capturing the entire propagation portfolio – it has been suggested that the best initial model to pursue this is similar to a cooperative research centre incorporation model.

To progress this, commencement of the approved propagation project and establishment of a Management Committee is seen as an important first step as follows:

1. Secure current project agreement and establish Management Committee;
2. Finalise a new FRDC propagation management program (which would be used to fund the establishment of a CRC like entity);
3. Pursue a CRC model for incorporation.

Under a CRC incorporation model, the Parties would intend for the Company to be a non-profit scientific institution to:

a) create a research collaboration in rock lobster propagation with the capability of pursuing world class research and training relevant to the rock lobster propagation;
b) ensure that the Parties with their differing disciplines and background will, through their participation in the collaboration, add value to each other so that the performance of the collaboration will be greater than that of each Party acting independently;
c) promote a managed and cooperative approach to research in rock lobster propagation so as to maximise the benefits from that research;
d) commercialise IP in such a manner as to maximise the likelihood of increasing the relative competitiveness of the Australian rock lobster sector and to benefit the Australian environment and the Australian economy generally but without precluding benefit from accruing to the industry, environment and economy of the nations of any overseas based Parties.

In the first instance, parties would include (based on FRDC project agreements):

- FRDC
- MG Kailis
- QDPI
- AIMS
- TAFI

Agreement between parties could be based on a cooperative research centre participants agreement that would cover objectives, promises, relationships of the parties, resources, accounting and reporting, IP management and commercialisation, allocation of risk, student involvement, publication principles, conflicts and dispute resolution etc.

There would need to be agreement on how shares in the company would be defined in the first instance and then adjusted to account for on-going investment.

Actions:

Immediate actions arising from the meeting include:

1. Edwina Menzies will make contract adjustments as per discussions and comments from participants.
2. The revised contract will be circulated for comment.
3. Robert van Barneveld will meet with FRDC and MG Kailis to discuss the meeting outcomes and their ongoing involvement in the project and program.
4. Robert van Barneveld and FRDC will meet with Darden Restaurants to discuss their interest in rock lobster propagation research and the Australian research program.

Example IP Management for Rock Lobster Propagation

1. Background IP

1.1 Contribution of Background IP

Each Project Participant will make its Background IP available to the Project as specified in the applicable Project Details and this clause 0.

1.2 Warranty

Each Project Participant represents and warrants to the other Project Parties that:

(a) as far as it is aware, without having made any enquiry, at the date it is provided for the relevant Project, it is the owner of, or is otherwise entitled to provide, the Background IP which it makes available for the Project;

(b) except to the extent:

(i) disclosed in the Project Details; or

(ii) in the case of any Background IP not specified in the Project Details, notified in writing to the other Project Parties at the time of offering such Background IP,

the Participant has not entered any agreement regarding, or otherwise dealt with, that Background IP that is inconsistent with the rights granted to the other Project Parties as described in the Project Details or this clause 0; and

(c) it will not enter any agreement in relation to or otherwise deal with that Background IP in a manner that restricts the exercise of the rights granted to the other Project Parties as described in the Project Details or this clause 0.

1.3 Licence for Project use

Each Project Participant in a Project grants to the other Project Parties an irrevocable, non-exclusive, royalty-free, worldwide licence (including a right to sublicense for the purposes of sub-contracting any aspect of the Project) to use the Project Participant's Background IP made available to that Project during the term of the Project for the purposes of carrying out the Project, subject to compliance by those other Project Participants with clause 1.5 and any restrictions on its use:

(a) specified in the Project Details; or,

(b) in the case of any Background IP not specified in the Project Details, notified in writing to the other Project Parties at the time of offering such Background IP.

1.4 Licence for Commercialisation

Each Project Participant will grant a licence to the Company, on reasonable terms set out in the Project Details, or to be agreed by the Participant and the

Company, to use the Participant's Background IP for the purposes of Commercialising Project IP from the Project (including the right to sub-licence) provided that:

(a) the Project IP has been developed using that Background IP in accordance with this agreement and, where applicable, the relevant Project Details; and

(b) that Background IP is required for the Commercialisation of such Project IP,

subject to any restrictions on its use specified or notified in accordance with clause 1.3.

1.5 Obligations on Project use

Where Project Parties are granted a licence under clause 1.4 for the use of Background IP contributed by another Project Participant (**"the contributing Project Participant"**) for a Project, each of the Project Parties must:

(a) use that Background IP only for the purposes of carrying out the Project and not for any other purpose;

(b) keep confidential and not disclose that Background IP or any documents or material containing or referring to that Background IP that may prejudice the existence of any Intellectual Property in that Background IP;

(c) only disclose that Background IP to its:

(i) employees and contractors;

(ii) directors and officers; and

(iii) students referred to in clause **Error! Reference source not found.**,

who have a need to know for the purposes of the Project (and only to the extent that each has a need to know) and ensure that those persons comply with the obligations under this clause;

(d) comply with any restrictions on use of the Background IP specified or notified by the owning Project Participant pursuant to clause 1.3; and

(e) on the contributing Project Participant's request, immediately deliver to the contributing Project Participant all documents or materials containing or referring to the Background IP which are:

(i) in its possession, power or control; or

(ii) in the possession, power or control of persons who have received the Background IP under clause 1.5(c),

except to the extent that it reasonably requires the Background IP for the purpose of performing its obligations or exercising its rights under this agreement, the Commonwealth Agreement or by law.

1.6 Acknowledgment

Subject to the rights granted in this clause 0, the Parties acknowledge and agree that a Party retains the right to control its Background IP and that ownership of the Background IP does not change.

1.7 Register

The Company shall maintain a register recording all Background IP under this agreement, including any encumbrances or restrictions on its use specified or notified in accordance with clause 1.3.

1.8 Infringement of Background IP

The Parties agree that they will take all necessary steps to give each other prompt notice of any infringement of Background IP which comes to their attention.

2. Centre IP

2.1 Project IP

Upon its creation, Project IP will be owned as follows:

(a) the Company will be the owner of the legal interest in the Project IP;

(b) the beneficial interest in the Project IP will be owned by:

(i) the Project Participants; and

(ii) the Company,

as tenants in common in the Project Shares specified in the Project Details for the relevant Project (or in equal shares for all Project Parties if shares are not specified in the Project Details), and

(c) the Company will hold the interest of the Project Participants in the Project IP on trust.

2.2 Variations to Project Participants' Project Shares

If the Project Contributions contributed by one or more Project Parties in a Financial Year differs from that specified in the Project Details for that Financial Year, each Project Party's Project Share will be recalculated by the Company in accordance with the following formula as at 1 July of the following Financial Year and will apply to that following Financial Year:

PS = (PC/TPC) x (100%)

where:

PS is the Project Share for a Project Party;

TPC is the total of all Project Parties' Project Contributions made (not Project Contributions owing nor future Project Contributions promised) up to the most recent 30 June; and

PC means the Project Contributions of a Project Party made (not Project Contributions owing nor future Project Contributions promised) up to the most recent 30 June,

provided that the deemed monetary valuation of non-cash Project Contributions for the purposes of this clause 2.2 is made in accordance with clause **Error! Reference source not found.**.

2.3 Centre IP other than Project IP

By executing this agreement, the Participants assign to the Company all of their right, title and interest in all existing and future Other Centre IP.

2.4 Vesting of ownership

The Participants must co-operate with each other Party and promptly do all acts and things and execute all documents which may be necessary for the purpose of vesting:

(a) ownership of the legal and beneficial interest in the Project IP as required under this agreement; and

(b) ownership of the Other Centre IP.

2.5 Dealing with Centre IP

No Participant may deal with, Commercialise, dispose of or encumber any interest which it might hold in Centre IP, without the written consent of the Company.

2.6 Use of Centre IP

A Participant wishing to use Centre IP for any purpose, whether for research or otherwise, not authorised under clause 2.20 must obtain a licence from the Company covering such use. The grant of any such licence will be at the Company's absolute discretion and must include provisions governing ownership and Commercialisation of further Intellectual Property developed from such use. If the proposed use of Centre IP relates to the Activities then the Governing Board will not unreasonably withhold its consent to such use.

2.7 Decision to protect

The Company must decide whether any outcomes from the Activities warrant pursuing patent protection, or other forms of Intellectual Property protection, and if it does, in which countries protection should be sought.

2.8 Apply for protection

Unless otherwise agreed by the Company, the Company is to apply for, maintain and prosecute any form of Intellectual Property protection decided on under clause 2.7.

2.9 Participant's option to patent

Subject to clause 2.10, if the Company exercises its discretion pursuant to clause 2.7 with respect to particular Centre IP and decides that:

(a) patent protection of that Centre IP is not to be pursued; or

(b) patent protection of that Centre IP is not to be pursued in certain countries; or

(c) having applied for patent protection of that Centre IP, prosecution of that application is not to be subsequently pursued,

it will by notice (**"Patent Notice"**), giving such information about the relevant Centre IP and any steps to patent the Centre IP prior to the Patent Notice as is reasonable to allow an informed commercial judgment, grant each of the relevant Project Participants (**"Inventor Participants"**) an option to seek patent protection of that Centre IP pursuant to clause 2.11.

2.10 Exception

The right under clause 2.9 will not arise where the Company's decision not to pursue patent protection is based on its reasonable determination that the Centre IP would be more appropriately protected by another form of Intellectual Property protection and it provides written notice of its decision and the reasons for the decision to each of the Inventor Participants within a reasonable time of the decision.

2.11 Response to option to patent

Following receipt of a Patent Notice under clause 2.9, each Inventor Participant will have the option to seek patent protection of the Centre IP specified in the Patent Notice as follows:

(a) within 45 days of receipt of the Patent Notice, each Inventor Participant may, by written notice to the Company:

(i) where clause 2.9(a) applies, elect to seek patent protection of the Centre IP in any or all countries it sees fit;

(ii) where clause 2.9(b) applies, elect to seek patent protection of the Centre IP in those countries in which the Company is not pursuing patent protection; and

(iii) where clause 2.9(c) applies, elect to have the initial patent application assigned to it by the Company and seek patent protection for the Centre IP in its own right;

(b) if an Inventor Participant fails to respond within 45 days of receipt of the Patent Notice, it will have no further right to elect to pursue patent protection of the Centre IP under this clause; and

(c) if more than one Inventor Participant elects to pursue patent protection, those Inventor Participants are deemed to accept the right to pursue patent protection jointly and hold all consequential rights and interests jointly subject to any further agreement between them.

2.12 Rights on election

If an individual Inventor Participant or, where there is more than one, joint Inventor Participants, elect to pursue patent protection of particular Centre IP pursuant to clause 2.11 then:

(a) they will have the right to seek patent protection of the Centre IP at their own cost and at their own risk;

(b) if a patent is granted with respect to the Centre IP, they will own the legal and beneficial interest in that patent;

(c) they will be entitled to all income from Commercialisation of that patented Centre IP; and

(d) they will indemnify the remaining Parties against all liability incurred in relation to use or Commercialisation of that patented Centre IP including IP infringement.

2.13 Company's obligations on election

Subject to being paid its reasonable costs arising from these actions, the Company must promptly do all acts and execute all documents which may be necessary to vest the rights and interests under clause 2.12 in the relevant Inventor Participants.

2.14 Registration in Company name

For the avoidance of doubt, if patenting or other registrable forms of Intellectual Property protection of Centre IP is pursued by the Company, such registration:

(a) is to be in the Company's name; and

(b) where required, will identify:

(i) the inventors of the Centre IP; and

(ii) the beneficial owners of the Centre IP.

2.15 IP register

The Company must maintain an IP register recording Centre IP notified to the Company, containing at least the following details:

(a) date of entry on register;

(b) description of Centre IP; and

(c) identity of the inventor or author and the Party that developed the Centre IP; and

(d) details of any agreements made by the Company with Participants or with third parties in relation to disclosure or use of the Centre IP.

2.16 Notice of infringement

The Participants must give the Company prompt notice of any infringement of Centre IP which comes to their attention and each Party agrees to give the Company all assistance which it may reasonably require in order to protect the Centre IP but only if the Company pays the Participant providing the assistance for all reasonable costs and expenses of doing so).

2.17 Costs of protection

Except for any Commercialisation Expenses to be borne by the Participants in accordance with clause 3.10, the Centre Account may be drawn upon by the Company to meet all costs associated with applying for, maintaining and prosecuting patent or any other form of Intellectual Property protection associated with Centre IP (including any action for infringement of the Centre IP) and the application, maintenance and prosecution of any actions which may be associated with any such Intellectual Property and such drawings shall be taken to be expenses incurred in the performance of the Activities.

2.18 Dealing with Project IP

Each Participant:

(a) must respond to a request from the Company to provide information in its possession regarding Project IP that has been developed by the Participant or is under development by the Participant;

(b) must use its best efforts to ensure that itself and its employees, agents, contractors, students under their supervision or other persons participating in the Project:

(i) identify Project IP generated or developed by them;

(ii) promptly communicate details of the Project IP to the Project Leader; and

(iii) not prejudice protection of Project IP;

(c) must not use, Commercialise, dispose of, encumber or otherwise deal with or enter any agreement in relation to any interest that it might hold in Project IP, except as authorised in this agreement; and

(d) must not seek to revoke any appointment of the Company as trustee of that Participant's interest in the Project IP except in accordance with clause 4.1.

2.19 Company's right to use Project IP

The Company may at all times:

(a) Commercialise the Project IP in accordance with clause 3;

(b) use the Project IP for the research, training and education purposes of the Centre; and

(c) licence any Participant or any other person to use the Project IP for the research, training and education purposes of the Centre,

and must not use or license the Project IP for any other research, training and education purposes except with the written consent of all Project Participants.

2.20 Project Participants' right to use Project IP

Subject to this agreement, each Project Participant has an irrevocable non-exclusive royalty-free right to use the Project IP:

(a) for the purpose of undertaking the Project in accordance with this agreement;

(b) for any other purpose, other than Commercialisation, within the Project Participant's respective Use Field and subject to any Use Field Conditions;

provided that the Project Participant maintains the confidentiality of Confidential Information and does not prejudice the Company's ability to:

(i) protect the Project IP;

(ii) use the Project IP to achieve the Centre Objectives; or

(iii) maximise the commercial return from any Project IP that has significant commercial potential; and

provided further that if the Company does not wish to Commercialise the Project IP, the relevant Project Participants be granted the right to deal with the Project IP in any manner they deem fit on the basis that they indemnify the remaining Parties against all liability arising out of any such Commercialisation.

2.21 Participants' right to use Project IP

Subject to this agreement, each Participant has an irrevocable non-exclusive royalty-free right to use the Project IP:

(a) for internal non-commercial purposes including research and teaching; or

(b) for dissemination to a Participant's constituent members;

provided that the Participant maintains the confidentiality of Confidential Information and does not prejudice the Company's ability to:

(i) protect the Project IP;

(ii) use the Project IP to achieve the Centre Objectives; or

(iii) maximise the commercial return from any Project IP that has significant commercial potential; and

provided further that if the Company or Project Participants do not wish to Commercialise the Project IP, any Participants so requesting will be granted the right to deal with the Project IP in any manner they deem fit on the basis that they indemnify the remaining Parties against all liability arising out of any such Commercialisation.

3. Commercialisation of Centre IP

3.1 Right and responsibility of Company

(a) Subject to paragraph (b) The Company has the exclusive right to Commercialise the Centre IP at its discretion (including a right to sublicense), provided that it:

(i) complies with all obligations under the Commonwealth Agreement regarding Commercialisation;

(ii) complies with all obligations under this agreement and any applicable Project Details regarding Commercialisation (including the applicable Commercialisation Plan and any additional obligations agreed specifically for that Project); and

(iii) endeavours to achieve the Centre Objectives.

(b) The Company must not directly engage in Commercialisation activity of the types defined in paragraphs (a) and (b) of the definition of Commercialise in clause 1.1.

3.2 Discretion of Company

Without limiting clause 3.1, the Company may:

(a) determine that Commercialisation of Centre IP may be undertaken by a Participant, a Project Participant, a person not connected with the Centre, a related body corporate of the Company (as defined in the Corporations Act) or any combination of them; and

(b) grant licences to persons who will undertake Commercialisation of the Centre IP.

3.3 Commercialisation Income - Project IP

Subject to clause 3.10, the Company holds all Commercialisation Income with respect to Project IP on trust for the Project Participants as tenants in common in proportion to their respective Project Shares.

3.4 Protocol prior to Commercialisation

Before the Company Commercialises any Project IP, it must comply with the following procedure:

(a) the Company must provide to each Project Participant a Draft Commercialisation Plan with respect to the Project IP;

(b) each Project Participant may, within 21 days after receipt of the Draft Commercialisation Plan, provide comments to the Company on the Draft Commercialisation Plan and the Company must discuss such comments with the respective Project Participants;

(c) following the consultation process described in paragraphs (a) and (b), if it wishes to proceed with Commercialisation, the Company must provide to each Project Participant a Commercialisation Plan with respect to the Project IP;

(d) the Company must obtain confirmation that each Project Participant has received each Commercialisation Plan and each Project Participant must promptly provide such confirmation;

(e) each Project Participant may, within 21 days after receipt of the Commercialisation Plan, (the **Notice Period**) advise the Company in writing if it:

(i) objects to Commercialisation as set out in the Commercialisation Plan but does not wish to withdraw from involvement in the Commercialisation; or

(ii) objects to Commercialisation as set out in the Commercialisation Plan and wishes to withdraw from involvement in the Commercialisation;

(f) if a Project Participant advises the Company within the Notice Period that it objects to the Commercialisation Plan and wishes to withdraw from involvement in the Commercialisation then:

(i) the Parties that continue with Commercialisation in accordance with the Commercialisation Plan must severally in proportion to their Project Share of the relevant Project IP indemnify the withdrawing Project Participant against any Loss that the withdrawing Project Participant may suffer, incur or sustain as a result of the Commercialisation of that Project IP; and

(ii) its rights to a share of Net Commercialisation Income in relation to that Project IP will be nil.

(g) after completion of the process described in this clause 3.4, the Company may commence Commercialisation of the Project IP in accordance with the Commercialisation Plan, unless Project Participants holding more than 50% of the Project Shares have elected to withdraw under clause 3.4(f).

3.5 Protocol after Commercialisation commences

After commencing Commercialisation of any Project IP:

(a) the Company must provide a progress report to the Project Participants every 6 months with respect to Commercialisation of the Project IP as against the Commercialisation Plan;

(b) subject to clause 3.5(d), the Company may amend the Commercialisation Plan from time to time at its absolute discretion, provided that the Company must notify the Project Participants of any substantial amendments prior to the amendments being made;

(c) within 30 days following notification of any substantial amendments to the Commercialisation Plan, a Project Participant may provide written notice to the Company that it objects to the amendments to the Commercialisation Plan and elects to withdraw from involvement in the Commercialisation, in which case:

(i) the remaining Project Participants must severally in proportion to their Project Share of the relevant Project IP indemnify the withdrawing Project Participant against any Loss that the withdrawing Project Participant may suffer, incur or sustain as a result of the further Commercialisation of that Project IP; and

(ii) its rights to a share of Net Commercialisation Income in relation to that Project IP will be nil.

(d) after completion of the process described in this clause 3.5, the Company may Commercialise the Project IP in accordance with the amended Commercialisation Plan, unless Project Participants holding more than 50% of the Project Shares have elected to withdraw under clause 3.5(c), in which case the Company must continue to Commercialise the Project IP in accordance with the unamended Commercialisation Plan.

3.6 Commercialisation Income - Other Centre IP

If the Company receives any Commercialisation Income from the Commercialisation of Other Centre IP it may retain it for its own purposes.

3.7 Company obligation

The Company shall ensure that Commercialisation of Centre IP complies with this agreement and the Commonwealth Agreement.

3.8 No veto power

For the avoidance of doubt, no Participant or any other person involved in a Project has the power to veto a decision of the Company regarding Commercialisation of Centre IP.

3.9 Commercialisation records

The Company must keep written records of:

(a) all Commercialisation Income it receives; and

(b) all Commercialisation Expenses it incurs.

3.10 Commercialisation Expenses

Without limiting clause **Error! Reference source not found.**, the Participants agree that the Company may use the Commercialisation Income with respect to particular Project IP to pay Commercialisation Expenses or reimburse the Company for previously incurred Commercialisation Expenses with respect to that Project IP. Where Commercialisation Expenses are incurred before Commercialisation Income is received the owners of the relevant Project IP must bear those Commercialisation Expenses in proportion to their Project Share. For the avoidance of doubt, the Participants acknowledge that the Company may in any Financial Year use Commercialisation Income received that Financial Year to reimburse Commercialisation Expenses incurred in previous Financial Years.

3.11 Payment of Net Commercialisation Income

By 31 August each year, the Company must remit to each Project Participant its share of Net Commercialisation Income with respect to the respective Project IP for the previous Financial Year corresponding to Project Shares as at 1 July that year, subject to any adjustments pursuant to clauses 3.4 or 3.5.

3.12 Survival

This clause 3 survives expiration or earlier termination of this agreement.

4. End of trustee appointment

4.1 Removal

The Project Participants may, with the prior approval of all Participants, by notification in writing to the Company without the consent of the Company revoke the appointment of the Company as trustee with respect to specified Project IP for which the Project Participants have beneficial ownership rights. Following such revocation:

(a) all other rights and obligations of the Company in relation to the Project IP survive; and

(b) the Company must sign and execute all documents necessary or convenient to vest the Project IP and the Commercialisation Income and Commercialisation Expenses with respect to the Project IP:

(i) in a new trustee appointed by the Project Participants; or

(ii) if directed by the Project Participants, in the Project Participants that are beneficially entitled to it.

4.2 Resignation

The Company may retire as trustee with respect to specified Project IP by giving at least 6 months notice in writing to the Project Participants. On resignation as trustee the Company must sign and execute all documents necessary or convenient to vest the Commercialisation Income and/or the Project IP in the Project Participants that are beneficially entitled to it.

4.3 Survival

Any trust in relation to Project IP and the provisions of this clause survive termination of this agreement, provided that following termination any Project Participant may revoke a trust with respect to specified Project IP for which it has beneficial ownership rights.

5. Moral rights

Each Project Participant will use its reasonable efforts to obtain from its respective employees (including Specified Personnel), agents, sub-contractors and students under their supervision any consents in relation to their Moral Rights that may be reasonably necessary for the Project or for Commercialisation of the Project IP.

Proposed Steps for Rock Lobster Propagation Research Management and Commercialisation

1. Establish a company using cooperative research centre principles:

The Parties intend for the Company to be a non-profit scientific institution to:

a) create a research collaboration in rock lobster propagation with the capability of pursuing world class research and training relevant to the rock lobster propagation;
b) ensure that the Parties with their differing disciplines and background will, through their participation in the collaboration, add value to each other so that the performance of the collaboration will be greater than that of each Party acting independently;
c) promote a managed and cooperative approach to research in rock lobster propagation so as to maximise the benefits from that research;
d) commercialise IP in such a manner as to maximise the likelihood of increasing the relative competitiveness of the Australian rock lobster sector and to benefit the Australian environment and the Australian economy generally but without precluding benefit from accruing to the industry, environment and economy of the nations of any overseas based Parties.

Initial Parties will be those that have made a cash investment in rock lobster propagation research or who have demonstrated know-how in rock lobster propagation that can contribute to the objectives of the company.

In the first instance, parties would include (based on FRDC project agreements):

- FRDC
- MG Kailis
- QDPI
- AIMS
- TAFI

Agreement between parties could be based on a cooperative research centre participants agreement and will cover objectives, promises, relationships of the parties, resources, accounting and reporting, IP management and commercialisation, allocation of risk, student involvement, publication principles, conflicts and dispute resolution etc.

There would need to be agreement on how shares in the company would be defined in the first instance and then adjusted to account for on-going investment. An equal share per party is suggested as a starting point.

2. Undertake an IP audit of all existing research providers

Considering what IP may exist as patents, know how, copyrights, trade marks, designs, or trade secrets etc from research in rock lobster propagation undertaken to date and not precluding additional information that may exist the base position appears to be:

a) All those actively involved in the research program have developed significant know how (which is an economic asset) and have made significant contributions to the research program to date.
b) While know how is an asset, there does not appear to be any patentable IP given the level of publication to date and the incremental development of the processes that facilitate rock lobster propagation.
c) An overview of all published reports and papers suggests that there are many areas that may be able to be developed into patentable or protectable IP, but we need to structure future research in such a way to demonstrate that our particular combination of technologies/procedures is an order of magnitude better than other combinations or any particular feature in isolation. I was also reminded on numerous occasions during the discussion that "invention" relies on conception not just reduction into practice which is relevant when you consider the origin of some of the ozone treatments and the raceway systems that are being employed in some instances etc.
d) Regardless of whether the above is accepted or rejected as a base position, every research participant should be given the opportunity to nominate any protectable IP they believe they possess as it may affect their equity in any future entity that is formed.

In keeping with the above, it is suggested that we develop an IP self-audit package for use by providers (and potential providers) to ensure all potential protectable IP is identified, to quantify know how that exists, to identify any potential background IP etc.

2. Seek expressions of interest from potential commercialisation entities

It is important to make a distinction between Parties that could contribute to a cooperative research company and those interested in delivering the outcomes, although a Party can be both.

It suggested that the Company seek formal expressions of interest from stakeholders with potential to commercialise IP arising from the research program. These expressions of interest would need to detail capacity to commercialise IP, specific requirements in relation to region and supply, support requirements and other considerations associated with delivery.

Based on existing contact, the following parties could be invited to submit expressions:

- MG Kailis
- Darden Restaurants
- King Island Marine Aquaculture
- Southern Rocklobster Ltd
- Western Kingfish Ltd

Appendix VIII – Annual Operating Plans 2004-2007

Rock Lobster Enhancement and Aquaculture Subprogram

Annual Operating Plan - 2004

Prepared by **Dr Robert van Barneveld**
Subprogram Leader

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A) ACTIVITY DESCRIPTION FOR 2002-2003

i) Sector Progress

Commercial rock lobster enhancement and aquaculture is in its infancy in Australia and it is not yet possible to attribute a GVP to this sector. A number of States are investigating rock lobster aquaculture potential in various forms, the dominant methods including 1) on-growing of adults through a moult to increase weight whilst allowing sale at periods of peak demand/value; 2) on-growing of wild-caught puerulus (newly-settled juveniles) to a small (and potentially very valuable) market size of around 200-300 g, and 3) culture of phyllosoma from eggs through the 11 larval stages to puerulus and subsequent ongrowing to market size as above. In addition, the potential exists through improved survival rates, for aquaculture to provide stock for reseeding and enhancement of the wild fishery.

Further short-term development of a rock lobster aquaculture industry in Australia based on on-growing of wild-caught puerulus is technically feasible based on research completed to date within the FRDC Rock Lobster Enhancement and Aquaculture Subprogram, but will depend on the capacity of commercial aquaculture groups to liaise and work with the wild capture sector and to invest in the development of these aquaculture systems.

On-growing of wild-caught adult lobsters through a moult to increase weight whilst allowing sale at periods of peak demand/value is also technically feasible based on research completed within the FRDC Rock Lobster Enhancement and Aquaculture Subprogram and commercial activities to date. Further development of this sector will depend on the capacity of the wild capture sector to adopt on-growing techniques in aquaculture systems and to develop cost-effective value-adding procedures.

Despite technical and commercial potential existing for short-term developments in rock lobster aquaculture in Australia, long-term viability of a rock lobster aquaculture industry in Australia vests with closure of the life cycle of spiny lobsters. This is a difficult area of research that will consume a significant amount of resources over a long period of time (at least 5-10 years). It will require inputs from individuals and organisations with a wide range of expertise and a mechanism to facilitate collaborative research and development is essential if an outcome is to be achieved. This represents one of the fundamental functions of the Rock Lobster Enhancement and Aquaculture Subprogram.

ii) Major research outputs of the Subprogram

To date, the strategic research areas have focussed on techniques for puerulus collection from the wild, biological neutrality of wild stocks, larval rearing/propagation of tropical and temperate species of rock lobsters, capacity for hormonal manipulation of the larval cycle, nutrition of juveniles and adult lobsters, on-growing of juveniles and system requirements, health of aquaculture reared juveniles, enhancement of wild stocks through reseeding or resettlement and capacity to increase the natural

settlement of puerulus in the wild through the provision of artificial substrates. Outcomes from this research that have provided technical capacity for commercial rock lobster aquaculture systems in Australia include:

Biological neutrality:

Because of the high natural mortality, a regional investigation using historical data revealed that the impact of puerulus removals on subsequent catches was estimated to be minimal except in the case of removal of very large quantities in low settlement years, but even this could be countered by effort reductions in the wild capture sector. While regional, this outcome suggests that there is potential to base rock lobster aquaculture on puerulus collection in the short term.

Puerulus collection:

Investigations into developing methods to catch large numbers of pueruli found that pueruli of the western rock lobster are easiest to catch near the shore (depths <5 metres) and in locations with fringing reefs using a modified sandwich collector. Studies in Tasmania showed that southern rock lobster pueruli could be caught in a range of locations using both sandwich and bag collectors.

Nutrition:

Research has generated an enhanced knowledge of the factors influencing the acceptability of dry pelleted food by juvenile and adult rock lobsters plus an improved understanding of the protein and protein:energy requirements of juvenile rock lobsters. A database on the digestibility of ingredients for rock lobsters has been prepared and a pelleted diet that induces growth rates in tropical lobsters equivalent to that achieved with mussels is now available.

Health:

Autopsy and health monitoring procedures have been developed. A study on tail fan necrosis that develops in some situations with adult caught lobsters held in aquaculture systems has revealed that abrasions during capture predispose the tail fan to infection with naturally occurring vibrio species. Methods were assessed for the prevention of tail fan abrasion during capture.

On-growing juveniles and adults:

A range of systems for on-growing juvenile and adult tropical and temperate species of lobsters have been assessed. These assessments have demonstrated that lobsters are fairly robust in a variety of systems. Studies with adult southern rock lobsters have demonstrated that rates of gain in sea-based systems and have outlined the effect of photoperiod and temperature on growth and survival in juvenile southern rock lobsters.

Propagation:

A significant amount of research has been undertaken into the propagation of southern and tropical rock lobsters. It is clear that nutrition and health are primary limitations to the rearing process. Progress is also being made in the hormonal manipulation of larval phases.

Enhancement:

Enhancement and reseeding experiments undertaken with the southern rock lobster have successfully demonstrated that aquaculture reared juveniles behave in a similar way to wild lobsters when returned to their natural habitat. This research has also investigated movement of reseeded juveniles and clearly indicates that reseeding programs are likely to result in an increase in viable adults within the fishery.

The RLEAS has now completed two 3-year phases and significant scope exists to enter a third. A broad summary of these phases is presented below:

Phase I (1998-2001)

A subprogram approach to the management of this research portfolio was considered necessary by the FRDC given the potential for overlap between research projects, differing views from different sectors of the rock lobster industry in Australia, and the need to ensure adequate levels of communication between all stakeholders. At the time of establishment, the RLEAS consisted of 6 core projects investigating a range of challenges associated with the technical capacity for rearing spiny lobsters in aquaculture systems with no clearly defined strategy for further development. The core projects included:

98/300: Propagation of rock lobster – development of a collaborative national project with international partners. Principal Investigator: Dr Piers Hart (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053)

98/301: Facilitation, administration and promotion of the FRDC Rock Lobster Enhancement and Aquaculture Subprogram. Principal Investigator: Dr Robert van Barneveld (Barneveld Nutrition Pty Ltd, PO Box 42, Lyndoch, SA, 5351)

98/302: Towards establishing techniques for large-scale harvesting of pueruli and obtaining a better understanding of mortality rates. Principal Investigator: Dr Bruce Phillips (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020)

98/303: Feed development for rock lobster aquaculture. Principal Investigator: Dr Kevin Williams (CSIRO Division of Marine Research, Marine Laboratory, 233 Middle Street, Cleveland, Qld, 4163)

98/304: Pilot study of disease conditions in all potential rock lobster aquaculture species at different growth stages. Principal Investigator: Assoc Prof Louis Evans (Curtin University of Technology, Aquatic Sciences Research Unit, GPO Box U1987, Perth, WA, 6001)

98/305: Determination of optimum environmental and system requirements for juvenile and adult rock lobster holding and grow-out. Principal Investigator: Assoc Prof Mike Geddes (University of Adelaide, Department of Zoology, GPO Box 498, Adelaide, SA, 5001)

During the course of the first phase of the Subprogram, an additional two projects were approved by the FRDC Board, including:

99/314: Preliminary investigation towards ongrowing puerulus to enhance rock lobster stocks while providing animals for commercial culture. Principal Investigator: Dr Caleb Gardner (Tasmanian Aquaculture and Fisheries Institute, Marine Research laboratories, Nubeena Crescent, Taroona, TAS, 7053)

99/315: Propagation techniques. Principal Investigator: Dr Piers Hart (Tasmanian Aquaculture and Fisheries Institute, Marine Research laboratories, Nubeena Crescent, Taroona, TAS, 7053)

As part of the above research program, the RLEAS convened three national workshops (Geraldton, Hobart, New Zealand), hosted a lobster health workshop in Perth, Western Australia, a lobster propagation workshop in Hobart, Tasmania, and an international symposium on lobster health management in Adelaide, South Australia in conjunction with the Third International Lobster Congress.

The Subprogram evolved from being actively opposed by the wild fishing sector in many states, to being an integral part in the future development of the rock lobster sector. A degree of harmony was established between the wild fishery and the aquaculture sector, and a high degree of research coordination was established between states and internationally with researchers in New Zealand and

Japan. None of this would have been possible without an independent Subprogram Leader and a highly responsive Steering Committee that is strongly represented by industry members from across Australia. The presence of a coordination component within the RLEAS resulted in savings in the operation of new and existing projects far exceeding $500,000. During this phase of the program, outcomes were delivered from 4 core projects.

Phase II (2001-2004)

Phase II of the RLEAS was characterized by an increase in focus and strategic research direction. The RLEAS published research priorities with an increased focus on closure of the life cycle and enhancement, while maintaining a firm research base in priority areas such as health and nutrition. During Phase II of the program a total of 11 new projects were funded, including:

2000/185: Evaluating the release and survival of juvenile rock lobsters released for enhancement purposes. Principal Investigator: Dr Caleb Gardner. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053)

2000/211: Investigation into tail rot necrosis in live-held adult rock lobsters. Principal Investigator: soc Prof Mike Geddes. (University of Adelaide, Department of Zoology, GPO Box 498, Adelaide, SA, 5001)

2000/212: The nutrition of juvenile and adult lobsters to optimise survival, growth and condition. Principal Investigator: Dr Kevin Williams. (CSIRO Division of Marine Research, Marine Laboratory, 233 Middle Street, Cleveland, Qld, 4163).

2000/214: Advancing the hatchery propagation of rock lobsters. Principal Investigator: Dr Bradley Crear. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053).

2000/263: Reducing rock lobster larval rearing time through hormonal manipulation. Principal Investigator: Dr Mike Hall. (Australian Institute of Marine Science, Marine Biotechnology, PMB No 3, Townsville Mail Centre, Qld, 4810).

2001/094: Health assurance for Southern rock lobsters. Principal Investigator: Dr Judith Handlinger. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, Tasmania, 7053).

2001/211: Strategic planning, project development and facilitation of research and extension towards the establishment and maintenance of rock lobster aquaculture and enhancement systems in Australia. Principal Investigator: Dr Robert van Barneveld. (Barneveld Nutrition Pty ltd, 19-27 Coonan Rd, South Maclean, Qld, 4280)

2002/045 – Assessing the possibilities for the natural settlement of western rock lobster. Principal Investigator: Dr Bruce Phillips. (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020).

2003/211 - Advancing the hatchery propagation of tropical rock lobsters (*Panulirus ornatus*). Principal Investigator: Mr Richard McCulloch – BSc(Hons). (MG Kailis Group, 50 Mews Rd, Fremantle, WA 6160).

2003/212 - Propagation of southern rock lobster (*Jasus edwardsii*) in Tasmania. Principal Investigator: Dr Arthur Ritar. (Tasmanian Aquaculture and Fisheries Institute, Marine Research Laboratories, Nubeena Crescent, Taroona, TAS, 7053).

2003/213 – Establishing post-pueruli growout data for western rock lobster. Principal Investigator: Dr Roy Melville-Smith. (Fisheries WA, WA Marine Research Laboratories, PO Box 20, North Beach, WA, 6020).

As well as an extended research program, a number of commercial rock lobster activities began during this phase of the RLEAS. A basis for collection of puerulus from the wild and on-growing to a marketable size was established in Tasmania. This form of aquaculture and enhancement is based on high mortality of wild puerulus in their first year post settlement (anywhere from 75-97%) compared with animals brought ashore and ongrown in tanks where the mortality is minimal (2% in Tasmania). This gives rise to the theory aquaculturists can ongrow the 'excess' that would have died in the wild. In 2001 in Tasmania, 7 licences were issued for the collection of 50,000 puerulus each, but to date, there has been limited commercial activity surrounding the use of these licenses. Aquaculture activities in South Australia continued to focus on on-growing and value adding to adult wild-caught lobsters. Activities included investigations into the holding and feeding of lobsters in land-based tanks using both existing flow through systems and infrastructure or recirculation systems. M G Kailis forged an alliance with the Queensland Department of Primary Industries to investigate the potential of culturing and growing tropical rock lobsters. Rock lobster aquaculture based on quota buy-out schemes in return for puerulus collection licenses (in the order of 1 tonne of quota in return for 40,000 puerulus) continued to be assessed in New Zealand.

The value of the subprogram approach and the RLEAS was clearly demonstrated during this phase. The RLEAS initiated reviews of core research programs and made significant changes to the direction of some of these projects as a result of the reviews. MG Kailis became an active participant in the subprogram, firstly through a private investment in research through the Queensland Department of Primary Industries, and secondly, as the lead agency in project 2003/211. The RLEAS convened (or is convening) three national workshops (Cairns, Geelong (in conjunction with the Second National Lobster Congress and the Rock Lobster Post-Harvest Subprogram) and Fremantle (in conjunction with the Third National Lobster Congress and the Rock Lobster Post-Harvest Subprogram)), a number of research planning forums and participated in the World Aquaculture Society meeting in Beijing in 2002. Again, the presence of the RLEAS resulted in significant improvements in the delivery of relevant outcomes and cost savings in the projects through enhanced collaboration and coordination.

Phase III (2004-2007)

An opportunity exists to take the RLEAS into its third and probably most critical phase. The strategic research areas are increasingly focusing on propagation and the outcomes from existing and subsequent research will dictate how the subprogram exists in the future.

The potential value of rock lobster aquaculture to Australia is reflected in the investment in this Subprogram to date. Between 1998 and 2006 a total of $6.14 million has been invested by FRDC, $6.32 million has been invested by research agencies and $4.49 million has been contributed as cash by commercial and other sources. With a total investment of $16.96 million, it is important that we embrace mechanisms that will ensure rock lobster enhancement and aquaculture becomes a commercial reality in Australia in the near future.

iii) Related projects and research linkages

The RLEAS currently maintains close research linkages with the following related projects:

1. National Institute of Water and Atmospheric Research, NZ, research into rock lobster aquaculture and enhancement (independent of the research being conducted within the Subprogram).
2. Ferguson Fisheries research into the live-holding and feeding of Southern Rock Lobsters in recirculation systems.
3. All projects being managed by the Rock Lobster Post-Harvest Subprogram.

iv) Role RLEAS has played in industry development

Via the Subprogram Leader and the Steering Committee, the RLEAS has attempted to have an active role in all industry developments to date, either through providing research outcomes to support

industry development, or by providing direct assistance with the procurement of funds or strategies to assist industry development.

v) Operating procedures

This Subprogram is highly responsive to the views of industry and understands the need to accommodate both the research requirements of the future and the needs of the existing wild fisheries and aquaculture industries. To ensure that research conducted within the Subprogram is relevant and meets the above criteria, a Steering Committee has been established to:

- To establish and review strategic directions for the Subprogram;
- To review existing research directions within the guidelines of the FRDC contractual agreements;
- To prioritise new research proposals and develop a priority list that can be used by other funding agencies;
- To ensure that research outcomes are commercially focused where relevant;
- To coordinate industry and research provider involvement so as to maximise usage of available resources;
- To facilitate industry extension and technology transfer;
- To advise on flexible components of budget expenditure;
- The convening of regular meetings (6 monthly);
- To develop an appropriate and approved communications policy;
- Ensure efficient and effective reporting structures;
- To promote the Subprogram and its achievements so that it can become the focus for all research on rock lobster aquaculture and enhancement.

At a minimum Steering Committee members are expected to attend at least two Subprogram meetings per year (one meeting per year will include a Subprogram workshop). Members are also required to comment (out of session) on all written project progress reports, final reports and new project proposals. Sitting fees are not paid to Steering Committee members, but the Subprogram covers travel expenses associated with attendance at the two annual meetings. Subprogram meetings are held at various locations around Australia.

The Steering Committee is comprised of:

- Subprogram Leader;
- FRDC Representative;
- Eleven industry representatives;
- Two Scientific Advisors.

The following should be noted in relation to membership:

- In general, Scientific Advisors will not have active research projects within the Subprogram.
- Proxies are not accepted for Steering Committee members who are unable to attend a particular meeting.
- Membership of the Steering Committee is expertise based.
- Periodically, the Subprogram Leader may invite relevant observers to Subprogram meetings, at his discretion.

Steering Committee members are selected to contribute expertise in one or more of the following areas:

- The marine aquaculture sector;
- The rock lobster wild capture fisheries;
- Seafood processing and marketing;
- Knowledge of the fishing industry and resource allocation;

- Research and development in marine science or aquaculture;
- Communication and technology transfer.

At present, the RLEAS Steering Committee members include:

- Dr Robert van Barneveld (Chair)
- Dr Patrick Hone (FRDC)
- Pheroze Jungalwalla (TAS)
- Neil Stump (TAS)
- Andrew Ferguson (SA)
- Greg Ward (SA)
- Barry Spurrier (VIC)
- David Lucas (VIC)
- Jim Fogarty (QLD)
- Steven Gill (WA)
- John Newby (WA)
- Neil Dorrington (WA)
- Trevor Burkhart (NZ)
- Dr Andrew Jeffs (Scientific Adviser)
- Dr Bruce Phillips (FRDC Rock Lobster Post-Harvest Subprogram Leader).

Steering Committee Membership turnover: From 2003, to ensure the RLEAS Steering Committee remains relevant, one third of the industry representative positions will be declared vacant and will be recalled. Existing or new members will be reappointed as per the above guidelines at the discretion of FRDC.

Industry consultation and communication: The Subprogram Leader, Dr van Barneveld, promotes the activities of the RLEAS through a website, industry newsletters, and direct communication with industry organisations and representatives.

Strategic planning: Strategic planning for the RLEAS is based on outcomes from the existing research program and ongoing consultation between the Subprogram Leader and members of industry and researchers in Australia and New Zealand. The strategic plan is maintained and updated annually using CD-ROM and the web-site for distribution. The strategic planning process identifies those factors that represent restrictions to the initial establishment of rock lobster aquaculture (eg. propagation, nutrition) and enhancement (eg. monitoring survival, prevention of disease introduction to the wild fishery) processes, and then utilises a relative ranking score from the various rock lobster fisheries across Australia.

Communication with FRABS: Communication with FRAB's is via distribution of an annual operating plan for the RLEAS in December of each year combined with direct communications. The Subprogram Leader will also attend the annual FRDC FRAB workshop to promote the activities and objectives of the RLEAS.

Development of new research proposals: New research proposals are developed through the use of facilitated strategic planning meetings. Using priorities published in the RLEAS Strategic Plan, the Subprogram Leader convenes meetings with relevant researchers and research institutions to:

1. Define the planned outcomes of the new proposal;
2. Manage an indicative budget for the research as defined by the Steering Committee;
3. Identify which researchers/institutions are best placed to undertake the research;
4. Promote collaboration between researchers and institutions where appropriate;
5. Seek external expertise and inputs as required.
6. Ensure the new proposal meets the objectives of the subprogram and that the research remains relevant and focussed.

The Subprogram Leader ensures new research proposals are distributed to FRABS and the RLEAS Steering Committee for comment and ratification before submitting the proposals to FRDC on behalf of the lead agencies, or facilitating adjustments to the proposals prior to submission.

Coordination of research reports: The Subprogram Leader collates progress and final reports from projects within the Subprogram in March and September each year for delivery in a common format to FRDC. These reports are distributed to members of the Steering Committee for comment and review.

Review of research progress and direction: The RLEAS Steering Committee interviews the Principal Investigator of each project within the Subprogram at least once annually as part of the Steering Committee meeting. Principal Investigators are expected to report progress against contracted milestones, justify any changes in research direction, and demonstrate that the research program is making a valuable contribution towards the achievement of the Subprogram objectives. The Steering Committee makes recommendations to the FRDC Board in relation to potential changes to the objectives of the research program, or instances where project progress is unsatisfactory.

Coordination of research extension: A major function of the Subprogram Leader is the organisation and delivery of an annual research workshop to highlight the activities and outputs of the RLEAS. Workshops are convened with presentations from invited speakers and researchers aimed at delivering key messages to end-users for use in practical rock lobster aquaculture and enhancement systems.

The Subprogram Leader compiles a subprogram newsletter "Lob ReLEASe" at least annually or as required highlighting research outcomes, developments in rock lobster enhancement and aquaculture and events relevant to the RLEAS. The Subprogram Leader is also responsible for the approval of all media releases and scientific publications arising from research projects within the Subprogram using the RLEAS Steering Committee communication policy as a guide.

Collaboration with international partners: The Subprogram Leader has established a major international collaboration between researchers in Australia and New Zealand through project initially through project 98/301 and subsequent projects. This was achieved through direct interaction with researchers in New Zealand and involvement of these scientists in the RLEAS research program. There is further opportunity to build on relationships initiated with Japanese researchers by AIMS, CSIRO and TAFI as the RLEAS continues to evolve. In all cases, international collaborations will be based on a two-way flow of information and where possible, research funds.

Identification and procurement of additional funding: Additional funding from sources such as the Public Good Science Fund in New Zealand and AUSIndustry in Australia will be sought with the assistance of the Subprogram Leader and relevant end-users. The Subprogram Leader is already involved with the development of AUSIndustry COMET proposals for the commercialisation of existing technology for rock lobster aquaculture. There are also opportunities for commercial investment in the development of technologies for rock lobster aquaculture in conjunction with the existing research program.

Liaison with FRDC: The Subprogram Leader is the conduit for communications between FRDC and subprogram participants in relation to project contracts, project reports, new submissions and general correspondence. The Subprogram Leader also represents the RLEAS at the annual FRDC FRAB and Subprogram meetings in Canberra.

vi) Meetings and Workshops

The next RLEAS workshop will be held in Tasmania in February 2004 in conjunction with the Rock Lobster Post-Harvest Subprogram and the 7th International Congress on Lobster Biology. The workshop will highlight developments in aquaculture and enhancement. Further details will be made available by the Subprogram Leader.

vii) Summary of current project status

A summary of the status of all RLEAS research projects and their duration is presented in Table 1.

B) SUMMARY OF STRATEGIC PLAN

The RLEAS Steering Committee has reviewed the strategic directions of the Subprogram to ensure that there is a balance between longer term basic research, such as that directed towards propagation, and shorter term, more applied research that may be more closely aligned with regional priorities.

From research completed to date, it is clear that development of technical capacity in the field of rock lobster enhancement and aquaculture will require a long term research and development effort over a period of 5-10 years, with this effort focussing primarily on closure of the life-cycle of spiny lobsters. It is recognised that this type of research requires significant investment, and falls into a “public good” portfolio given there is no existing capacity or industry. With this in mind, the RLEAS is attempting to secure investment into rock lobster propagation research from the FRDC and other stakeholders that is exclusive of budgets relevant to more regional, shorter-term priorities.

While the RLEAS Steering Committee is well placed to define the key limitations to the development of the rock lobster enhancement and aquaculture sector in Australia, it recognises that shorter term priorities are better identified by state-based fisheries research advisory bodies and relevant industry associations. To this end, the RLEAS Steering Committee will respond to regional priorities as advised by the former on an annual basis. In the absence of this advice, the RLEAS views on the key research areas for rock lobster enhancement and aquaculture in Australia in priority order are presented in Table 2.

Table 1. ***RLEAS Project Summary 1998-2006***

Project	**97-98**	**98-99**	**99-00**	**00-01**	**01-02**	**02-03**	**03-04**	**04-05**	**05-06**
98/300 – Propagation of rock lobster – development of a collaborative national project with international partners.		•							
98/301 – Facilitation, administration and promotion of the FRDC Rock Lobster Enhancement and Aquaculture Subprogram.	•	•	•	•					
98/302 – Towards establishing techniques for large scale harvesting of pueruli and obtaining a better understanding of mortality rates.		•	•	•					
98/303 – Feed development for rock lobster aquaculture.		•	•						
98/304 – Pilot study of disease conditions in all potential rock lobster aquaculture species at different growth stages.		•							
98/305 – Determination of optimum environmental and system requirements for juvenile and adult rock lobster holding and grow-out.		•	•						
99/314 – Preliminary investigation towards ongrowing puerulus to enhance rock lobster stocks while providing animals for aquaculture.			•						
99/315 – Propagation techniques.			•						
2000/185 – Evaluating the release and survival of juvenile rock lobsters released for enhancement purposes.				•	•				
2000/211 – Investigation into tail-rot necrosis in live-held adult lobsters.					•				
2000/212 – The nutrition of juvenile and adult lobsters to optimise survival, growth and condition.				•	•	•			
2000/214 – Advancing the hatchery propagation of rock lobsters				•	•	•			
2000/263 – Reducing rock lobster larval rearing time through hormonal				•	•	•			

manipulation.									
2001/094 – Health assurance for southern rock lobsters					•	•			
2001/211 – Strategic planning, project development, and facilitation of research and extension towards establishment and maintenance of commercial rock lobster aquaculture and enhancement systems in Australia.					•	•	•		
2002/045 – Assessing the possibilities for the natural settlement of western rock lobster							•	•	
2003/213 – Establishing post-pueruli growout data for western rock lobster							•	•	•
2003/211 - Advancing the hatchery propagation of tropical rock lobsters (Panulirus ornatus)							•	•	•
2003/212 - Propagation of southern rock lobster (*Jasus edwardsii*) in Tasmania							•	•	•

Table 2. *RLEAS priority research portfolios*

Research focus
1. Broodstock culture and propagation 2. On-growing a) Puerulus – market size - Nutrition - Health - System design b) Adult enhancement 3. Wild fishery enhancement with aquaculture reared lobsters

Propagation

The task of rearing of large numbers of rock lobster larvae to metamorphosis at will is undoubtedly one of the greatest challenges in aquaculture today. Success will only be achieved if there is an intense focus on achieving results that take the project closer to its final goal, if there is genuine collaboration between those involved and a great deal of innovation and willingness to explore new approaches.

The overall goal of propagation research within the RLEAS is to develop the technical ability to produce puerulus at will in any number required and each milestone of each project should contribute measurably to the achievement of this goal. It will likely take more than five years to reach the overall goal given a coordinated and determined effort and may yet prove too difficult at the current level of technical understanding of larval production systems. It is clear that new base survival diets (both for *Artemia* enrichment and for inclusion in a manufactured diet), improved larval husbandry techniques and systems that minimize the proliferation of bacteria will have to be developed. Investigators will need to demonstrate a high level of innovation and determination to overcome these obstacles.

The immediate goal for the propagation research program is to provide the technical ability to spawn adults during any month of the year, and to produce healthy and nutritionally balanced larvae to stage V. Completion of this goal will require the development and implementation of a dedicated broodstock conditioning program, the adoption of standardized *Artemia* husbandry techniques and the development of a base enrichment for *Artemia* that provides at least the minimum nutrition for small larvae, as well as the development of rearing systems and culture techniques that reduce bacterial proliferation in the culture tanks. These projects can run concurrently and should be achieved within three to five years.

Once the base survival enrichment formula has been developed and healthy larvae can be produced to stage V in large quantity, it will be necessary to develop a diet for larger larvae and refine the culture procedures. At present, the most likely candidate for late phyllosoma nutrition appears to be a manufactured diet with a composition based initially on the *Artemia* enrichment formula but progressively modified to meet the needs of larger larvae. Culture systems will be scaled up to commercial size and modified as necessary.

The results of any research undertaken will be evaluated according to their ability to contribute measurably to achieving the immediate goal.

A recent review of propagation research within the RLEAS has resulted in the development of a revised propagation research program which will contain three distinct phases:

PHASE I

- Develop detailed project proposals and milestones consistent with revised goals.
- Primary focus on achieving high growth and survival through to phyllosoma stage V.

The suggested time frame for the completion of stage I is three years.

Goal 1 ***Establish a reliable supply of stage one larvae at any time of year using the following suggested method:***

a) Manipulate photoperiod to control gonad maturation and timing of extrusion.
b) Manipulate incubation temperature to control the developmental period of embryos.
c) Produce larvae monthly.
d) Assess the effect of broodstock diet on phyllosoma quality.

Goal 2 ***Develop a base Artemia enrichment diet that provides adequate nutrition to support growth at a minimum predetermined level from phyllosoma stages I through V using the following suggested method:***

a) Identify and prioritise key obstacles to developing a base enrichment diet.
b) Develop base *Artemia* enrichments incorporating knowledge gained to date.
c) Assess the effect of enrichments on growth of phyllosoma initially in static culture using anti microbial agents if necessary and report results.
d) Continually modify test diets according to results of trials until pre-determined growth and survival standards are met

Goal 3 ***Develop a culture system that suppresses undesirable bacterial blooms and is suitable for use over periods of several months using the following suggested method:***

a) Review and standardise all aspects of *Artemia* husbandry including decapsulation, hatching, on-growing, enriching, and delivery with a view to reducing the bacterial load in *Artemia* and phyllosoma culture systems.
b) Review literature for recent developments in methods of bacterial control in marine larval rearing systems with an emphasis on low intervention techniques suitable for long culture periods.
c) Construct several prototype culture systems based on the review and assess the development of bacterial communities and numbers while culturing early stage phyllosomas. Parallel studies using the larvae of other species readily available and familiar to the investigator and for which the husbandry techniques and larval nutrition are known may also be beneficial.
d) Raise lobster larvae produced in goal 1 and fed *Artemia* enriched in goal 2 using a variety of bacterio-suppressant rearing techniques identified in part b) and developed in part c) of goal 3.

PHASE II

Commencement of stage II is contingent upon successful completion of the second year milestones in stage I. That is Stage II should start one year before the end of stage I. This is to ensure a smooth transition to stage three.

The primary focus of this stage is on the physical and chemical assessment of formulated diets ready for assessment with stage V+ phyllosoma.

Goal 1 Commence preliminary work developing a formulated feed for stage V+ phyllosoma

This goal should be addressed through a project with a 12 month duration and should be contingent upon the successful completion of goals to produce phyllosoma to stage V and above. The suggested methodology is:

a) Assess binders.
b) Produce a test diet based on the knowledge of ingredients gained from the development of *Artemia* enrichments but incorporated into an artificial pellet. The goal is to produce a base survival diet that provides adequate nutrition to support growth and survival at a level predetermined by the research team.

PHASE III

Diet optimisation studies and commercialisation of culture techniques

Goal 1 Upscale larval rearing systems developed in Stage I to semi-commercial scale and capability to produce tens of thousands of puerulus.

Goal 2 Optimise diet for Stage V+ phyllosoma.

The research objectives and outcomes of the RLEAS propagation research program are summarised in the table below:

Goal	**Impediments**	**Research Approach**	**Key performance indicators**	**Time frame**
Technical ability to culture spiny lobster puerulus from eggs, at will and in any number.	1. Regular supply of larvae. 2. Larval nutrition. 3. Larval rearing systems. 4. Larval health.	1. Establish a reliable supply of stage I larvae through improved broodstock management. 2. Develop enriched *Artemia* diets to support phyllosoma growth from stages I-V. 3. Develop *Artemia* husbandry and phyllosoma culture systems to suppress undesirable bacterial blooms. 4. Develop manufactured diets to support phyllosoma stages V and above. 5. Initially focus on 1-2 rock lobster species.	1. Capacity to produce Stage I larvae throughout the year. 2. Enriched *Artemia* diets that support phyllosoma growth from stages I-V. 3. Culture systems that suppress bacterial blooms. 4. Capacity to produce healthy stage V larvae predictably and reliably. 5. Manufactured diets for rearing phyllosoma stages V+. 6. Capacity to produce puerulus at will and in any number.	2002-2007
Efficient production of spiny lobster puerulus from eggs, at will and in any number.	1. Larval nutrition. 2. Control of larval phases.	1. Optimisation of manufactured diets for phyllosoma stages V+. 2. Hormonal manipulation of larval phases.	1. Efficient production of puerulus at will and in any number using manufactured diets and *Artemia*. 2. Reduction in larval rearing time through manipulation of larval phases.	2005-2010
Commercial production of puerulus from eggs at will and in any number.	1. Larval rearing systems. 2. Larval health. 3. Larval nutrition.	1. Upscale research-scale production focusing on rearing systems, survival and the cost-effectiveness of supplying manufactured diets. 2. Expand the number of spiny lobster species cultured.	1. Economically-viable commercial production of a variety of species of spiny lobster puerulus from eggs at will and in any number.	2010+

NUTRITION

Nutrition research is required to facilitate delivery of:

- Multiple sources of nutrients for all growth phases.
- Robust diets that can be altered depending on the availability of raw materials while still supplying the same nutrients.
- A manufactured diet that is water stable, attractive, easy to handle, store and transport, shelf stable and cost-effective.
- Diets suitable to support optimum growth of all phases of the production cycle.
- Minimal impact on surrounding water quality through nutrient loads.
- Diets that support optimum survival of juveniles during their first year of development.
- Technical capacity for nutritional manipulation of moult cycles.
- Technical capacity for nutritional enhancement of lobster product quality in live-held adults.

Where possible, nutrition related projects should be developed in conjunction with the Aquaculture Nutrition Subprogram (see strategic directions for the Aquaculture Nutrition Subprogram on www.frdc.com.au/research/programs/ans).

HEALTH

- Disease-free aquaculture environment.
- Disease-monitoring to ensure disease transfer to the wild fishery is not possible.

In the absence of identifiable diseases, it is difficult to prioritise health research. Linkages with Aquatic Animal Health Subprogram may provide the best opportunities to ensure the above requirements are met.

On-growing of juveniles and system requirements

- Husbandry procedures to ensure optimal growth (stocking density, water temperature, water quality, light, feeding regimes etc).
- Definition of the interaction between system design, nutrition and health of all life stages of rock lobster, and the relative importance.

ENHANCEMENT

- Reseeding of juvenile aquaculture reared juveniles that survive to increase wild fishery stocks and natural egg production levels.

C) COMMUNICATION AND TECHNOLOGY TRANSFER

The RLEAS Steering Committee has defined a policy for the distribution of information arising from research conducted within the Subprogram that forms the basis of the communication plan for this project. This project distributes information on behalf of all projects within the Subprogram with the following objectives:

1. To distribute research outputs (technologies and knowledge) that has a net benefit for the Australian industry and to distribute that information in a timely manner to achieve rapid adoption by industry.
2. To disseminate information about the subprogram's role, activities and achievements to relevant stakeholders.
3. To disseminate information to the general public when it contributes to a positive perception of the sector and/or the FRDC and contributes to the public good.
4. To disseminate information to international partners when there is a two-way flow of information

Target audiences:

1. The Australian wild capture rock lobster sectors, aquaculture stakeholders, aquafeed manufacturers, infrastructure manufacturers and FRDC stakeholders.
2. General public.

Key messages:

1. Research outputs from the projects managed under the subprogram.
2. Role, activities and achievements of the subprogram.
3. Positive image of rock lobster aquaculture (clean and green, environmentally sustainable, economically beneficial for Australia, provides employment in regional Australia etc)

Communication/Extension methods

Annual workshop:

The workshop's primary aim is to deliver information on research outputs to industry stakeholders as it becomes available. It also serves to raise the public perception of the industry in the host state as a body of local media is encouraged to attend and report on the workshop and the development of the industry in that state.

Workshop proceedings:

The proceedings serve to deliver a summary report and research results available from component projects within the subprogram to date. The collection of past proceedings serves as an extensive and valuable resource of knowledge and technologies that can be accessed by the industry on a needs basis. Sales of proceedings are restricted to Australia. However, the Steering Committee may allow overseas sales of past proceedings if it is decided their content no longer provides a competitive advantage to the Australian industry.

Website:

The website serves to communicate current and past research outputs, subprogram activities, industry related events, information on the industry, to provide advice to current researchers, advice to research applicants and information on publications that are available. As such, it serves industry stakeholders, potential farmers and investors, the general public, and research providers. The website can be viewed at www.frdc.com.au/research/programs/rleas.

Newsletter:

The Subprogram publishes an annual/biannual newsletter called "Lob ReLEASe". The newsletter is the principal industry communication of the subprogram and has received good feedback from all sectors of the rock lobster industry. "Lob ReLEASe" communicates information on current and past projects, relevant research outputs, subprogram activities and industry events.

Media releases:

Media releases will be sent from the subprogram when key messages that contribute to public perception or public good arise. The annual workshop provides a key opportunity to achieve extensive media coverage of the industry, the subprogram and the FRDC.

Articles in magazines/newsletters:

Articles on research activities and outputs are regularly submitted to various magazines and newsletters, including the FRDC R&D News.

Conference proceedings:

This project contributes papers on behalf of the subprogram to national and international conferences. These papers highlight the status of Australian rock lobster enhancement and aquaculture and research underway within the subprogram that is contributing to the development of this sector.

The RLEAS communications policy aims to facilitate the orderly release of information produced by research providers managed under the subprogram. This policy covers the publication of final reports and scientific papers and the release of media articles, unsolicited media inquiries/interviews and films. Release of information is based on the following criteria:

- Distribution of information must have a net benefit for the Australian industry.
- Dissemination of information to international partners will be approved when there is a two way flow of information.
- *Ad hoc* requests for results or information will not be accepted.
- Special cases for the supply of information will have to be approved by the Steering Committee and where appropriate, Memorandums of Understanding will be prepared.

A number publications are available or are pending from the Subprogram including:

- Proceedings of a lobster health workshop held in Perth in July, 1998.
- Proceedings of the Rock Lobster Propagation workshop held in Hobart in January, 1999.
- Proceedings of the first annual RLEAS workshop held in Geraldton in March, 1999.
- Proceedings of the second annual RLEAS workshop held in Hobart in February, 2000.
- Proceedings of the third annual RLEAS workshop held in New Zealand in April, 2001.
- Proceedings of the first RLEAS/RLPHS combined Workshop held in Cairns in May 2002.
- Proceedings of the second annual RLEAS/RLPHS combined Workshop held in Fremantle September 03
- Final reports from completed projects.
- "Lob ReLEASe" Volume 1, Issues 1, 2 and 3.
- "Lob ReLEASe" Volume 2, Issue 3
- Scientific publications from completed and existing research projects.

Additional information on the Rock Lobster Enhancement and Aquaculture Subprogram including newsletters, annual operating plans and workshop proceedings can be accessed by visiting the web-site www.frdc.com.au/research/programs/rleas or by contacting the Subprogram Leader:

D) PROPOSED NEW RESEARCH

In response to publication of the RLEAS Strategic Plan, the following pre-proposals were received by the Subprogram for consideration at their Steering Committee meeting in September, 2003.

1. Subprogram management

The RLEAS Steering Committee considered options for the ongoing management of the subprogram given project 2001/211 is due for completion in June 2004. Dr van Barneveld offered suggestions as to how the subprogram could examine options for incorporation so that it could attract additional external funds and so that the management component could possibly become self-sustainable in the long term. The Steering Committee felt that this option was premature and that the best way forward was for the RLEAS to submit a management proposal to FRDC similar to projects 1998/301 and 2001/211. The Steering Committee also offered full support for the on-going management of the core

projects within the RLEAS given the extent of the funding that has been invested and the multi-disciplinary nature of the research.

2. RLEAS Development of tropical lobster grow-out technology
   Principal Investigator: Dr Kevin Williams, CSIRO

Proposed Objectives

1. Coordinate and communicate the research of the joint ACIAR/FRDC project relevant to industry, wild fishery and other relevant stakeholders and to the wider community.
2. Develop cost effective and water stable pelleted lobster feeds that are derived from an understanding of the nutrient requirements of the animal during all phases of the production cycle and the determined nutritive value of available and suitable feed ingredients.
3. Develop land- and/or sea-based culture systems that contribute to the maintenance of high growth rates, good health and high survival of the lobsters during all production phases.
4. Assist indigenous and other commercial tropical rock lobster growout aquaculture establishment in Australia.

The Steering Committee offered the following comments and advice in relation to this proposal:

The RLEAS are keen to maintain an involvement in all research associated with rock lobster aquaculture in Australia. To this end, a small investment as a collaborator in an ACIAR initiated project may be appropriate, however, a decision could not be reached on the current application due to insufficient information relating to the ACIAR and Torres Strait objectives. It was also noted that it is difficult to justify Australian involvement in projects with countries such as Vietnam given the potential competition in the market place, even if there is a two way flow of information as claimed by CSIRO.

E) WORKPLAN FOR 2003

In 2003, the RLEAS has a number of specific objectives:

- Identify additional ways to attract research funds and commercial involvement in the Subprogram.
- Develop further links with the proposed Southern Rock Lobster Industry body.
- Participate in a wider range of industry meetings (aquaculture and wild-capture sector of the rock lobster fishery) to promote the activities and outcomes of the Subprogram.
- Develop pilot scale propagation facilities at participating research institutions.

F) BUDGET

Existing and proposed RLEAS projects and budgets are as follows:

Project ID	02/03	03/04	04/05	05/06
2000/212	$65,000			
2000/214	$172,239			
2000/263	$62,000			
2001/211	$100,000	100,000		
2001/094	$10,100			
2002/045	$147,999	59,793		
2003/213		198,736	167,086	128,326
2003/211		273,616	482,427	578,337
2002/212		232,600	277,433	261,461

2004/239*			119,278	123,069
2004/240*			47,048	46,595
TOTAL	557,338	864,745	926,946	968,124

*Current applications being considered by FRDC

RLEAS has allocated rock lobster propagation as its highest priority. It needs to be recognised that rock lobster propagation is a long term research objective and it is anticipated that investment in propagation alone will need to be in the order of $0.5 million per annum for at least the next 10 years. This needs to be clear when allocating scarce research resources, given that a short term research program is unlikely to yield significant outcomes. It must also be noted that the rewards arising from a long term research program are likely to be great and this is reflected by the strong industry financial commitment to the propagation program.

G) VARIATIONS

Nil.

Dr Robert van Barneveld
RLEAS Leader
December, 2003

Rock Lobster Enhancement and Aquaculture Subprogram

Annual Operating Plan - 2005

Prepared by **Dr Robert van Barneveld**
Subprogram Leader

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Purpose of this document...

This annual operating plan has been prepared to provide a concise snapshot of the planned activities of the Rock Lobster Enhancement and Aquaculture Subprogram (RLEAS) for 2005. It is to be used a guide by fisheries research advisory bodies, research providers, industry stakeholders and potential investors in rock lobster enhancement and aquaculture when assessing:

i) the relevance and potential of rock lobster aquaculture to their specific industry sector or organisational goals,
ii) when making decisions in relation to pending projects relevant to rock lobster aquaculture that may impact on their return on research investment, and;
iii) for information on the role undertaken by the RLEAS in relation to research management and industry liaison.

If information additional information is required and extends beyond the scope of this document, it can be obtained from the RLEAS website (www.frdc.com.au/research/programs/rleas) or the Subprogram Leader, Dr Robert van Barneveld (Ph: 07 5547 8611 or rob@barneveld.com.au). The website also contains a full list of publications generated by the Subprogram or research undertaken within the Subprogram and a copy of the strategic plan.

Why are we investing in rock lobster enhancement and aquaculture research ?...

- The commercial rock lobster fishery is one of the most valuable of all Australian fisheries.
- The rock lobster fishery exhibits the strongest trade balance of any Australian fishery (figure 2).
- If the quantity of rock lobster sold from Australia is to increase, then regardless of species, rock lobster enhancement or aquaculture will be required to either bolster wild stocks or provide an alternative source of product.
- Rock lobster aquaculture potentially represents the most valuable form of any aquaculture based on the ratio of value relative to quantity (Figure 2).

Why invest through a Subprogram ?...

- There was a "market failure" in relation to rock lobster aquaculture research. Existing wild capture sectors were not embracing the opportunity while supporters of aquaculture were not giving due consideration to the wild capture sector.
- There was technical significant overlap between research proposals with the only difference in many cases being the target lobster species.
- There is significant worldwide interest in rock lobster aquaculture, and unless viewed as a national research priority, Australia may be left without the technical potential to compete with other countries in the future.
- Research into rock lobster enhancement and aquaculture is long term, high cost research and involves multiple disciplines. A Subprogram is the most efficient way to manage this investment.

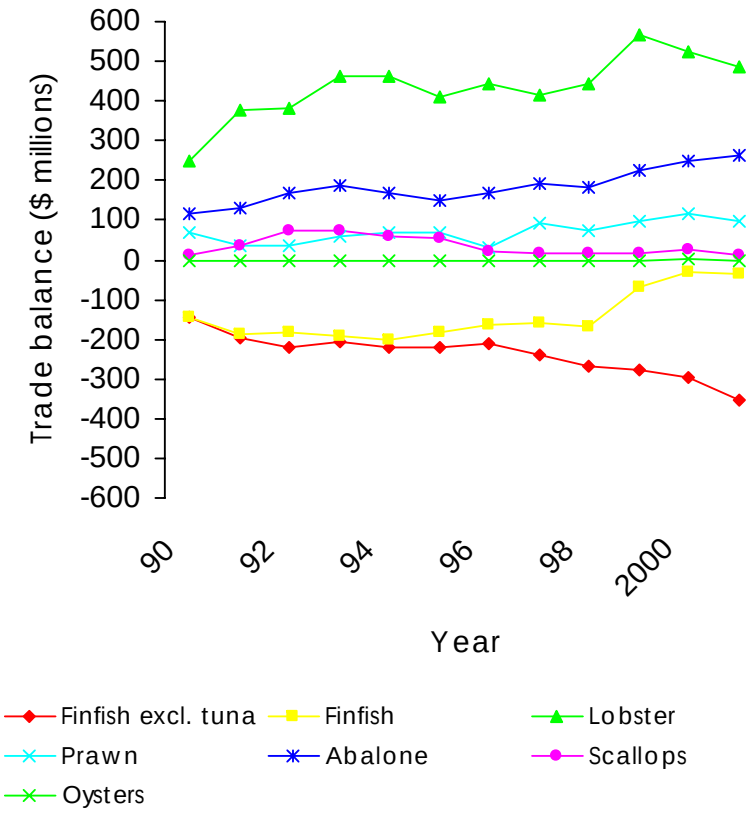

Figure 1. *Trade balance of key Australian fisheries 1990-2001 (Source ABARE).*

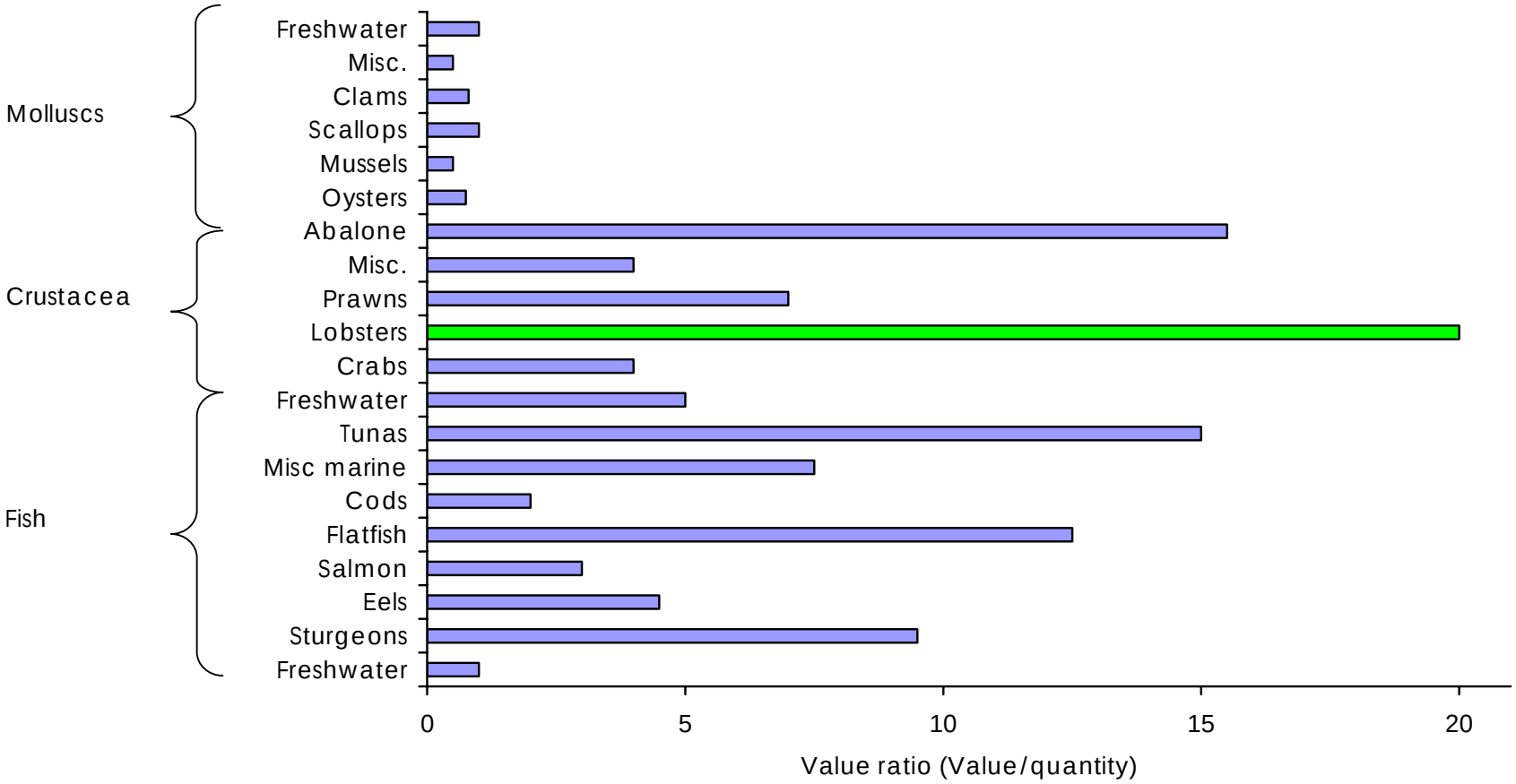

Figure 2. *Comparative value of worldwide aquaculture enterprises relative to potential volume of production (Source FAO).*

How much have we invested in rock lobster enhancement and aquaculture research so far ?...

Between 1998 and 2006, research investment exceeding $17.1 million will have been contributed towards more than 20 projects undertaken within the Rock Lobster Enhancement and Aquaculture Subprogram. This investment has been made by the participating research providers, industry stakeholders and the Fisheries Research and Development Corporation, and reflects the potential for a rock lobster aquaculture sector (Table 1).

Table 1. *Investment in rock lobster enhancement and aquaculture research 1998-2006.*

Project	Research area	FRDC ($)	Applicant ($)	Other ($)
1998/300	Propagation workshop	76,797	10,400	53,000
1998/301	Subprogram management	283,000	30,000	-
1998/302	Biological neutrality	539,075	315,701	28,125
1998/303	Nutrition	135,028	295,404	8,000
1998/304	Health	19,999	38,391	15,000
1998/305	Adult and juvenile grow-out	247,084	190,000	759,651
1999/314	Enhancement	57,064	187,252	-
1999/315	Propagation feasibility	149,889	86,815	242,340
2000/185	Enhancement	264,734	365,113	200,000
2000/211	Health	87,292	19,600	64,223
2000/212	Nutrition	242,420	333,040	29,105
2000/214	Propagation	583,671	449,776	1,052,846
2000/263	Propagation	180,838	770,689	-
2001/211	Subprogram management	320,708	41,033	-
2001/094	Health	77,631	87,659	22,000
2002/045	Enhancement	275,523	62,731	-
2003/211	Propagation	1,334,380	449,725	1,930,419
2003/212	Propagation	771,494	2,321,976	90,000
2003/213	Grow-out	494,149	265,046	-
2004/239	Subprogram management	340,000	50,000	-

WHAT ARE OUR CURRENT CORE RESEARCH AREAS ?...

The RLEAS continues to maintain a focus on closure of the lifecycle of spiny lobsters. Research being undertaken by the Tasmanian Aquaculture and Fisheries Institute and the National Institute of Water and Atmospheric research in NZ has made significant progress, particularly in the maintenance of puerulus health. Well ahead of schedule, TAFI have progressed a Stage 11 phyllosoma through metamorphosis to a puerulus and it is poised to moult to a juvenile. They also have more than 50 Stage XI phyllosoma poised to settle as puerulus, a remarkable achievement given the current focus of the research is to produce large quantities of phyllosoma as required to Stage V. Most importantly, all of this has been achieved in less than 300 days compared with an estimated 450 days for the larval phases in the wild. The outcomes from this research to date provide strong evidence that culture of southern rock lobsters may be a commercial possibility in the not too distant future.

Similar progress is being made by the Queensland Department of Primary Industries, MG Kailis and the Australian Institute of Marine Science, who are working together to culture *P.ornatus*. Research underway in Townsville, Cairns and Broome has fine-tuned broodstock conditioning, and significant numbers of Stage V phyllosoma can be cultured as required.

The Department of Fisheries in Western Australia continues to investigate the potential to on-grow western rock lobsters from puerulus to a marketable size. Research to date has focused on systems design, stocking densities and water temperature and the subsequent influence on growth rate, feed conversion and survival. Other research underway within WA is examining ways to enhance the natural settlement of puerulus using artificial substrates. This research may lead to practical ways to increase the level of recruitment into the fishery and the capacity to collect puerulus for subsequent on-growing in aquaculture systems.

SOME OTHER OUTCOMES...

Recently completed projects have made useful advances in the areas of nutrition, re-seeding, propagation and health. Manufactured diets that support growth of *P.ornatus* have been developed through research undertaken by the CSIRO, high levels of survival have been demonstrated for re-seeded *J. edwardsii* juveniles by TAFI and NIWA, and research undertaken at AIMS has shown that the hormones triggering moults in *P.ornatus* are similar to those involved in the moult cycles of insects.

What are our current research priorities ?...

Full details of RLEAS research priorities can be found in the Subprogram strategic plan on the RLEAS website. In summary, the RLEAS priority research portfolios are:

- Broodstock conditioning and propagation.
- On-growing from puerulus to market size focussing on nutrition, health and system design.
- Adult enhancement.
- Wild fishery enhancement with aquaculture reared lobsters.

How does the RLEAS Steering Committee view current research proposals ?...

PRELIMINARY RESEARCH PROPOSAL 1: SEA-CAGE AQUACULTURE OF WILD CAUGHT PANULIRUS JUVENILES IN TORRES STRAIT (MATT KENWAY, AIMS)
RELEVANT FRAB'S: QUEENSLAND, COMMFRAB

This proposal encompasses the development of rock lobster aquaculture systems in the Torres Strait in conjunction with indigenous communities.

The Steering Committee **endorses** this proposal subject to further consideration in a number of areas. It is relevant to the RLEAS priorities and represents an excellent opportunity to initiate rock lobster aquaculture in Australia.

The following points were noted by the RLEAS steering committee in relation to this proposal.

- No economic assessment/ analysis included in the proposal – this would be beneficial.
- Market impact – need to identify limiting factors to sensitivity analysis re the potential nutrient source.
- Marketable size is assumed to be 600gms.
- RLEAS would be more supportive if contributions/collaborative funding from other RDC's were present. Queensland State Development, QDPI, Regional Indigenous Development Board should all be approached in relation to this project.
- Travel budget needs review.
- Capital allocation should be removed from the budget.

- AFMA approval should be possible based on previous biological neutrality assessment on juveniles. Committee advised that CSIRO have been doing research on Torres Strait since 1983, and have built models of biological neutrality.

PRELIMINARY RESEARCH PROPOSAL 2: CAGE CULTURE OF WESTERN AND SOUTHERN ROCK LOBSTER(BRUCE PHILLIPS, CURTIN UNIVERSITY OF TECHNOLOGY, WA FISHERIES).
Relevant FRAB's: WA.

This project represents a follow on from an existing FRDC project (2003-213).

The Steering Committee supported progression to full proposal with the following qualifications:

- Principal Investigators to have more access to each others sea cage design – subprogram to ensure this link,
- Compliance issues to be addressed.

PRELIMINARY RESEARCH PROPOSAL 3: OVERCOMING SPATIAL DIFFERENCES IN THE BIOLOGY OF ROCK LOBSTERS TO EXPAND THE TASMANIAN FISHERY(CALEB GARDNER, TAFI).
Relevant FRAB's: All

The Steering Committee supported progression to full proposal and suggested a desktop study be done first – 2/3 months for completion, then review the project with the desktop model to be made available for use by other fisheries.

The Steering Committee discussed this PRP with the following points noted:

- There was consensus on the value of the PRP. There was a great deal of industry support from across Australia for this project.
- It may be possible to zone the fishery to achieve some of the outcomes.
- Are there any EPA issues – is an ecological assessment needed?

How does the RLEAS operate ?...

In July 2004, the FRDC agreed to support the RLEAS for a further 3 years. In the first instance, the subprogram will continue to be managed by an expertise-based Steering Committee. Depending on the progress of existing and future research projects undertaken within this three year period, and interest from additional investors in the research program, the subprogram will continue to examine other options for management of the research and commercialization of the research outcomes. The RLEAS is currently fielding enquires from potential overseas research investors, and is maintaining close links with an Australian Centre for International Agricultural Research (ACIAR) program involving the CSIRO and research institutions in Vietnam.

This Subprogram is highly responsive to the views of industry and understands the need to accommodate both the research requirements of the future and the needs of the existing wild fisheries and aquaculture industries. To ensure that research conducted within the Subprogram is relevant and meets the above criteria, a Steering Committee has been established to:

- To establish and review strategic directions for the Subprogram;
- To review existing research directions within the guidelines of the FRDC contractual agreements;
- To prioritise new research proposals and develop a priority list that can be used by other funding agencies;
- To ensure that research outcomes are commercially focused where relevant;
- To coordinate industry and research provider involvement so as to maximise usage of available resources;
- To facilitate industry extension and technology transfer;
- To advise on flexible components of budget expenditure;
- The convening of regular meetings (6 monthly);
- To develop an appropriate and approved communications policy;
- Ensure efficient and effective reporting structures;
- To promote the Subprogram and its achievements so that it can become the focus for all research on rock lobster aquaculture and enhancement.

At a minimum Steering Committee members are expected to attend at least two Subprogram meetings per year (one meeting per year will include a Subprogram workshop). Members are also required to comment (out of session) on all written project progress reports, final reports and new project proposals. Sitting fees are not paid to Steering Committee members, but the Subprogram covers travel expenses associated with attendance at the two annual meetings. Subprogram meetings are held at various locations around Australia.

The Steering Committee is comprised of:

- Subprogram Leader;
- FRDC Representative;
- Eleven industry representatives;
- FRDC Rock Lobster Post-Harvest Subprogram Leader
- One Scientific Advisor.

The following should be noted in relation to membership:

- In general, Scientific Advisors will not have active research projects within the Subprogram.
- Proxies are not accepted for Steering Committee members who are unable to attend a particular meeting.
- Membership of the Steering Committee is expertise based.
- Periodically, the Subprogram Leader may invite relevant observers to Subprogram meetings, at his discretion.

Steering Committee members are selected to contribute expertise in one or more of the following areas:

- The marine aquaculture sector;
- The rock lobster wild capture fisheries;
- Seafood processing and marketing;
- Knowledge of the fishing industry and resource allocation;
- Research and development in marine science or aquaculture;
- Communication and technology transfer.

At present, the RLEAS Steering Committee members include:

- **Dr Robert van Barneveld (Chair)**
- **Dr Patrick Hone (FRDC)**
- **Pheroze Jungalwalla (TAS)**
- **Neil Stump (TAS)**
- **Andrew Ferguson (SA)**
- **Greg Ward (SA)**
- **Barry Spurrier (VIC)**

- **David Lucas (VIC)**
- **Jim Fogarty (QLD)**
- **Steven Gill (WA)**
- **John Newby (WA)**
- **Neil Dorrington (WA)**
- **Larnce Wichman (NZ)**
- **Dr Andrew Jeffs (Scientific Adviser)**
- **Dr Bruce Phillips (FRDC Rock Lobster Post-Harvest Subprogram Leader).**

Steering Committee Membership turnover: Since 2003, to ensure the RLEAS Steering Committee remains relevant, one third of the Steering Committee positions are declared vacant and then recalled. Existing or new members are reappointed as per the above guidelines at the discretion of FRDC.

Industry consultation and communication: The Subprogram Leader, Dr van Barneveld, promotes the activities of the RLEAS through a website, industry newsletters, and direct communication with industry organisations and representatives.

Strategic planning: Strategic planning for the RLEAS is based on outcomes from the existing research program and ongoing consultation between the Subprogram Leader and members of industry and researchers in Australia and New Zealand. The strategic plan is maintained and updated annually using CD-ROM and the web-site for distribution. The strategic planning process identifies those factors that represent restrictions to the initial establishment of rock lobster aquaculture (eg. propagation, nutrition) and enhancement (eg. monitoring survival, prevention of disease introduction to the wild fishery) processes, and then utilises a relative ranking score from the various rock lobster fisheries across Australia.

Communication with FRABS: Communication with FRAB's is via distribution of an annual operating plan for the RLEAS in December of each year combined with direct communications. The Subprogram Leader will also attend the annual FRDC FRAB workshop to promote the activities and objectives of the RLEAS.

Development of new research proposals: New research proposals are developed through the use of facilitated strategic planning meetings. Using priorities published in the RLEAS Strategic Plan, the Subprogram Leader convenes meetings with relevant researchers and research institutions to:

1. Define the planned outcomes of the new proposal;
2. Manage an indicative budget for the research as defined by the Steering Committee;

3. Identify which researchers/institutions are best placed to undertake the research;
4. Promote collaboration between researchers and institutions where appropriate;
5. Seek external expertise and inputs as required.
6. Ensure the new proposal meets the objectives of the subprogram and that the research remains relevant and focussed.

The Subprogram Leader ensures new research proposals are distributed to FRABS and the RLEAS Steering Committee for comment and ratification before submitting the proposals to FRDC on behalf of the lead agencies, or facilitating adjustments to the proposals prior to submission.

Coordination of research reports: The Subprogram Leader collates progress and final reports from projects within the Subprogram in March and September each year for delivery in a common format to FRDC. These reports are distributed to members of the Steering Committee for comment and review.

Review of research progress and direction: The RLEAS Steering Committee interviews the Principal Investigator of each project within the Subprogram at least once annually as part of the Steering Committee meeting. Principal Investigators are expected to report progress against contracted milestones, justify any changes in research direction, and demonstrate that the research program is making a valuable contribution towards the achievement of the Subprogram objectives. The Steering Committee makes recommendations to the FRDC Board in relation to potential changes to the objectives of the research program, or instances where project progress is unsatisfactory.

Coordination of research extension: A major function of the Subprogram Leader is the organisation and delivery of an annual research workshop to highlight the activities and outputs of the RLEAS. Workshops are convened with presentations from invited speakers and researchers aimed at delivering key messages to end-users for use in practical rock lobster aquaculture and enhancement systems.

The Subprogram Leader compiles a subprogram newsletter "Lob ReLEASe" at least annually or as required highlighting research outcomes, developments in rock lobster enhancement and aquaculture and events relevant to the RLEAS. The Subprogram Leader is also responsible for the approval of all media releases and scientific publications arising from research projects within the Subprogram using the RLEAS Steering Committee communication policy as a guide.

Collaboration with international partners: The Subprogram Leader has established a major international collaboration between researchers in Australia and New Zealand initially through project 98/301 and subsequent projects. This was achieved through direct interaction with researchers in New Zealand and involvement of these scientists in the RLEAS research program. There is further

opportunity to build on relationships initiated with Japanese researchers by AIMS, CSIRO and TAFI as the RLEAS continues to evolve. In all cases, international collaborations will be based on a two-way flow of information and where possible, research funds.

Identification and procurement of additional funding: Additional funding from sources such as the Public Good Science Fund in New Zealand and AUSIndustry in Australia will be sought with the assistance of the Subprogram Leader and relevant end-users. The Subprogram Leader is already involved with the development of AUSIndustry COMET proposals for the commercialisation of existing technology for rock lobster aquaculture. There are also opportunities for commercial investment in the development of technologies for rock lobster aquaculture in conjunction with the existing research program.

Liaison with FRDC: The Subprogram Leader is the conduit for communications between FRDC and subprogram participants in relation to project contracts, project reports, new submissions and general correspondence. The Subprogram Leader also represents the RLEAS at the annual FRDC FRAB and Subprogram meetings in Canberra.

How does the RLEAS communicate and extend results from research ?...

Annual workshop:

The workshop's primary aim is to deliver information on research outputs to industry stakeholders as it becomes available. It also serves to raise the public perception of the industry in the host state as a body of local media is encouraged to attend and report on the workshop and the development of the industry in that state.

Workshop proceedings:

The proceedings serve to deliver a summary report and research results available from component projects within the subprogram to date. The collection of past proceedings serves as an extensive and valuable resource of knowledge and technologies that can be accessed by the industry on a needs basis. Sales of proceedings are restricted to Australia. However, the Steering Committee may allow overseas sales of past proceedings if it is decided their content no longer provides a competitive advantage to the Australian industry.

Website:

The website serves to communicate current and past research outputs, subprogram activities, industry related events, information on the industry, to provide advice to current researchers, advice to research applicants and information on publications that are available. As such, it serves industry stakeholders, potential farmers and investors, the general public, and research providers. The website can be viewed at www.frdc.com.au/research/programs/rleas.

Newsletter:

The Subprogram publishes an annual/biannual newsletter called "Lob ReLEASe". The newsletter is the principal industry communication of the subprogram and has received good feedback from all sectors of the rock lobster industry. "Lob ReLEASe" communicates information on current and past projects, relevant research outputs, subprogram activities and industry events.

Media releases:

Media releases will be sent from the subprogram when key messages that contribute to public perception or public good arise. The annual workshop provides a key opportunity to achieve extensive media coverage of the industry, the subprogram and the FRDC.

Articles in magazines/newsletters:

Articles on research activities and outputs are regularly submitted to various magazines and newsletters, including the FRDC R&D News.

The RLEAS communications policy aims to facilitate the orderly release of information produced by research providers managed under the subprogram. This policy covers the publication of final reports and scientific papers and the release of media articles, unsolicited media inquiries/interviews and films. Release of information is based on the following criteria:

- Distribution of information must have a net benefit for the Australian industry.
- Dissemination of information to international partners will be approved when there is a two way flow of information.
- *Ad hoc* requests for results or information will not be accepted.
- Special cases for the supply of information will have to be approved by the Steering Committee and where appropriate, Memorandums of Understanding will be prepared.

A number publications are available or are pending from the Subprogram including:

- Proceedings of a lobster health workshop held in Perth in July, 1998.
- Proceedings of the Rock Lobster Propagation workshop held in Hobart in January, 1999.
- Proceedings of the first annual RLEAS workshop held in Geraldton in March, 1999.
- Proceedings of the second annual RLEAS workshop held in Hobart in February, 2000.
- Proceedings of the third annual RLEAS workshop held in New Zealand in April, 2001.
- Proceedings of the first RLEAS/RLPHS combined Workshop held in Cairns in May 2002.
- Proceedings of the second annual RLEAS/RLPHS combined Workshop held in Fremantle September 2003
- Final reports from completed projects.
- "Lob ReLEASe" Volume 1, Issues 1, 2 and 3.
- "Lob ReLEASe" Volume 2, Issue 3
- Scientific publications from completed and existing research projects.
- Proceedings of the third annual RLEAS/RLPHS combined Workshop held in Port Lincoln September 2004

Additional information on the Rock Lobster Enhancement and Aquaculture Subprogram including newsletters, annual operating plans and workshop proceedings can be accessed by visiting the web-site www.frdc.com.au/research/programs/rleas or by contacting the Subprogram Leader:

Rock Lobster Enhancement and Aquaculture Subprogram

Annual Operating Plan - 2006

Prepared by **Dr Robert van Barneveld**
Subprogram Leader

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Purpose of this document...

This annual operating plan has been prepared to provide a concise snapshot of the planned activities of the Rock Lobster Enhancement and Aquaculture Subprogram (RLEAS) for 2006. It is to be used a guide by fisheries research advisory bodies, research providers, industry stakeholders and potential investors in rock lobster enhancement and aquaculture when assessing:

iv) the relevance and potential of rock lobster aquaculture to their specific industry sector or organisational goals,
v) when making decisions in relation to pending projects relevant to rock lobster aquaculture that may impact on their return on research investment, and;
vi) for information on the role undertaken by the RLEAS in relation to research management and industry liaison.

If information additional information is required and extends beyond the scope of this document, it can be obtained from the RLEAS website (www.frdc.com.au/research/programs/rleas) or the Subprogram Leader, Dr Robert van Barneveld (Ph: 07 3290 6600 or rob@barneveld.com.au). The website also contains a full list of publications generated by the Subprogram or research undertaken within the Subprogram and a copy of the strategic plan.

Why are we investing in rock lobster enhancement and aquaculture research ?...

- The commercial rock lobster fishery is one of the most valuable of all Australian fisheries.
- The rock lobster fishery exhibits the strongest trade balance of any Australian fishery (figure 2).
- If the quantity of rock lobster sold from Australia is to increase, then regardless of species, rock lobster enhancement or aquaculture will be required to either bolster wild stocks or provide an alternative source of product.
- Rock lobster aquaculture potentially represents the most valuable form of any aquaculture based on the ratio of value relative to quantity (Figure 2).

Why invest through a Subprogram ?...

- There was a "market failure" in relation to rock lobster aquaculture research. Existing wild capture sectors were not embracing the opportunity while supporters of aquaculture were not giving due consideration to the wild capture sector.
- There was technical significant overlap between research proposals with the only difference in many cases being the target lobster species.
- There is significant worldwide interest in rock lobster aquaculture, and unless viewed as a national research priority, Australia may be left without the technical potential to compete with other countries in the future.
- Research into rock lobster enhancement and aquaculture is long term, high cost research and involves multiple disciplines. A Subprogram is the most efficient way to manage this investment.

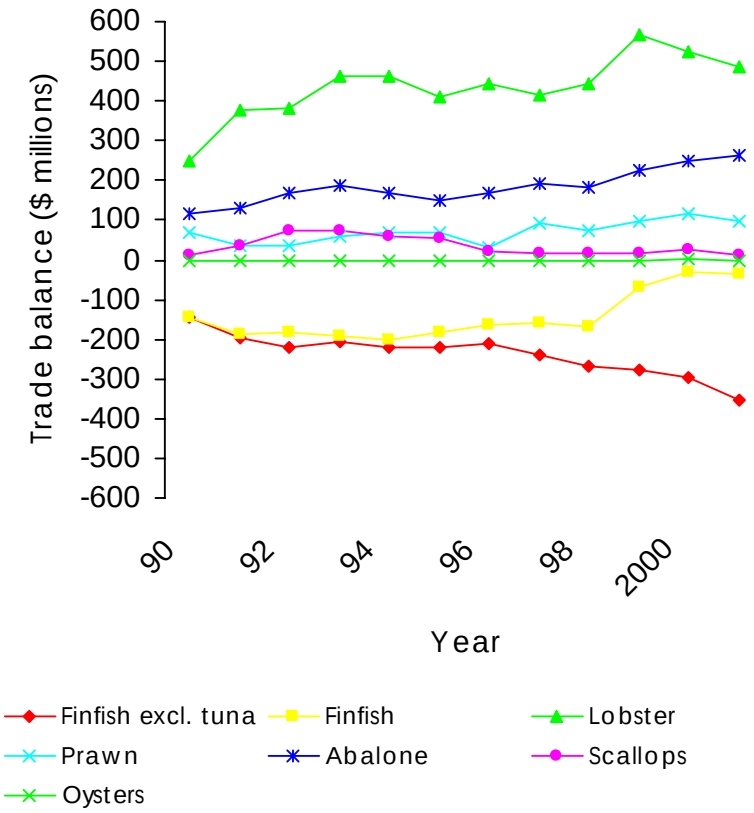

Figure 1. *Trade balance of key Australian fisheries 1990-2001 (Source ABARE).*

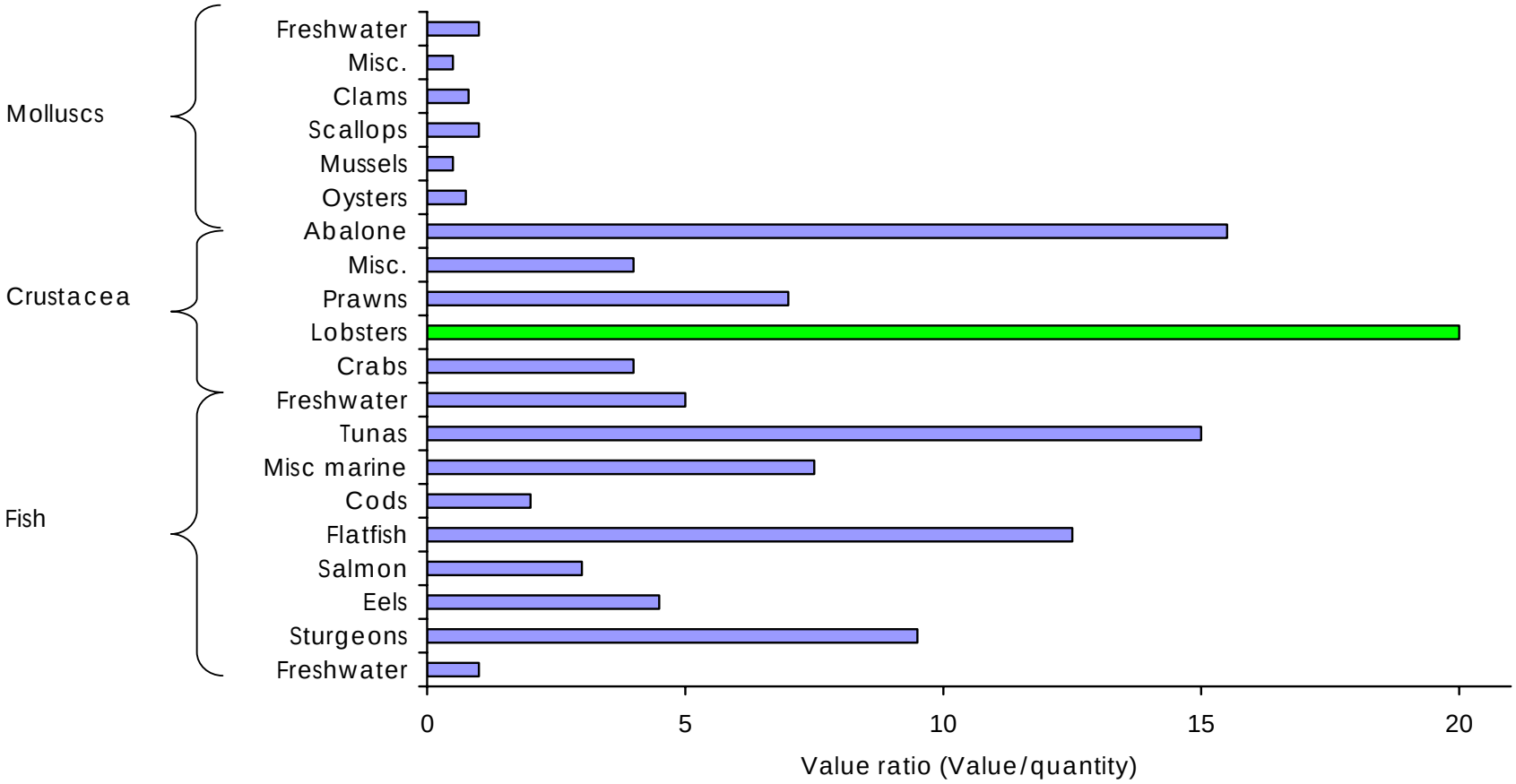

Figure 2. *Comparative value of worldwide aquaculture enterprises relative to potential volume of production (Source FAO).*

How much have we invested in rock lobster enhancement and aquaculture research so far ?...

Between 1998 and 2006, research investment exceeding $17.1 million will have been contributed towards more than 22 projects undertaken within the RLEAS (Table 1).

Table 1. *Investment in rock lobster enhancement and aquaculture research 1998-2006.*

Project	Research area	FRDC ($)	Applicant ($)	Other ($)
1998/300	Propagation workshop	76,797	10,400	53,000
1998/301	Subprogram management	283,000	30,000	-
1998/302	Biological neutrality	539,075	315,701	28,125
1998/303	Nutrition	135,028	295,404	8,000
1998/304	Health	19,999	38,391	15,000
1998/305	Adult and juvenile grow-out	247,084	190,000	759,651
1999/314	Enhancement	57,064	187,252	-
1999/315	Propagation feasibility	149,889	86,815	242,340
2000/185	Enhancement	264,734	365,113	200,000
2000/211	Health	87,292	19,600	64,223
2000/212	Nutrition	242,420	333,040	29,105
2000/214	Propagation	583,671	449,776	1,052,846
2000/263	Propagation	180,838	770,689	-
2001/211	Subprogram management	320,708	41,033	-
2001/094	Health	77,631	87,659	22,000
2002/045	Enhancement	275,523	62,731	-
2003/211	Propagation	1,334,380	449,725	1,930,419
2003/212	Propagation	771,494	2,321,976	90,000
2003/213	Grow-out	494,149	265,046	-
2004/239	Subprogram management	340,000	50,000	-
2005/217	Translocation feasibility	10,000	-	-
2005/239(addition)	Torres Strait grow-out	20,000	-	-

WHAT HAVE WE ACHIEVED WITH THIS INVESTMENT?...

Outcomes from investment in rock lobster enhancement and aquaculture have been significant. Initial research covered a broad range of research areas, but this has become increasingly focused over time. At this point in time, the research program has provided:

1. Evidence that high natural mortalities far exceed our capacity to collect rock lobster puerulus from the wild for use in aquaculture systems and as a consequence, in a carefully managed fishery, collection of reasonable quantities of puerulus from the wild is unlikely to impact on wild stocks.
2. Technical and practical capacity to collect rock lobster puerulus from the wild for on-growing;
3. Basic manufactured diets for use in rock lobster aquaculture and evidence that acceptable growth rates and product quality can be achieved with manufactured diets;
4. Basic assessments of the health of aquaculture-reared rock lobsters;
5. Assessment of rock lobster grow-out capacity in sea cages and land-based systems as well as technical advances in systems design and management;
6. A clear demonstration that aquaculture-reared juveniles can be successfully returned to the wild with a net benefit for overall rock lobster stocks;
7. Demonstration that the hormones triggering moults in *P.ornatus* are similar to those involved in the moult cycles of insects.
8. Investigations into the capacity to enhance natural settlement of western rock lobsters using artificial substrates.

In short, the research program to date has demonstrated that as an aquaculture species spiny lobsters are robust. The technical information derived from research within the RLEAS to date could be successfully applied in commercial rock lobster aquaculture systems.

Despite these advances, it is clear that the future of rock lobster aquaculture in Australia on a large scale depends on the supply of puerulus. With the exception of high settlement years in Western Australia, and collection of juveniles in the Torres Strait, collection of puerulus or juveniles from the wild is highly unlikely to form the basis of a rock lobster aquaculture industry in Australia. In terms of international competition, however, Australia needs to be cognizant of the fact that countries such as Vietnam have a well established industry based on collection of juveniles from the wild.

With the above in mind, the primary research focus of the RLEAS is on closure of the lifecycle of spiny lobsters. Research being undertaken by the Tasmanian Aquaculture and Fisheries Institute and the National Institute of Water and Atmospheric research in NZ has made significant progress, particularly in the maintenance of puerulus health. Well ahead of schedule, TAFI have progressed a Stage 11 phyllosoma through metamorphosis to a puerulus and it is poised to moult to a juvenile. They also have more than 50 Stage XI

phyllosoma poised to settle as puerulus, a remarkable achievement given the current focus of the research is to produce large quantities of phyllosoma as required to Stage V. Most importantly, all of this has been achieved in less than 300 days compared with an estimated 450 days for the larval phases in the wild. The outcomes from this research to date provide strong evidence that culture of southern rock lobsters may be a commercial possibility in the not too distant future.

Similar progress is being made by the Queensland Department of Primary Industries, MG Kailis and the Australian Institute of Marine Science, who are working together to culture *P.ornatus*. Research underway in Townsville, Cairns and Broome has fine-tuned broodstock conditioning, and significant numbers of Stage V phyllosoma can be cultured as required.

While commercial investment exists within the RLEAS research program, a substantial, dedicated commercial rock lobster aquaculture enterprise is yet to be established.

What are our current research priorities?...

Full details of RLEAS research priorities can be found in the Subprogram strategic plan on the RLEAS website. In summary, the RLEAS priority research portfolios are:

- Broodstock conditioning and propagation.
- On-growing from puerulus to market size focussing on nutrition, health and system design.
- Adult enhancement.
- Wild fishery enhancement with aquaculture reared lobsters.

Future investment considerations...

Based on progress within the RLEAS to date, there are a number of issues that need to be carefully considered by prospective investors in terms of how research should progress in the future and how this research will be funded, particularly in the highest priority research area of rock lobster propagation. These include:

1. *Propagation is a long term research initiative.*

   - While we have technical capacity to on-grow spiny lobsters, commercial rock lobster aquaculture is largely dependent on closure of the life cycle.

   - We have made good progress to date in propagation research, but we have invested in a "staged" research program. The consequence of this is that without further investment, and significant investment, the research undertaken to date is unlikely to contribute to a commercial outcome. By June 2006, we will be part way through Phase II of the proposed research program (and to date, we have no significant evidence to justify major changes to this approach).

2. *Propagation research is expensive*

   - Current estimates suggest that up to an additional $3 million will be required over the next 5 years to make any significant progress towards the commercial culture of rock lobster. This investment by FRDC needs to be considered against other research priorities, but at the same time it needs to be realised that without this investment, we are unlikely to gain any benefit as a result of the research conducted to date.

   - There is a need to identify ways to seek and manage additional investment in the short term.

   - There is a need for a more effective way of attracting additional investment.

3. *Long term research programs need to be carefully managed*

   - Long term research programs can generate complacency if adequate incentives are not provided to produce outcomes.

   - Long term research programs generally consist of a range of small components that in their own right may not represent significant intellectual property, but when combined represent significant IP. Because of this, it is not uncommon for the components to be published as the research progresses to the point that there is no capacity to protect the sum components when the research program is finalised.

4. *Significant institutional and commercial investment needs to be maintained*

- Because of the research momentum generated by the RLEAS, we now have in place significant research infrastructure for on-going rock lobster research. If we were to interrupt this research program, it is unlikely we would regain this infrastructure or momentum.

5. *Industry leadership is required*

- Because of the lack of an existing industry, varying views from the wild capture sector and overlapping priorities relating to different rock lobster species there is a need for leadership from FRDC in this research area.

- It is clear that no single commercial organisation or research provider has the capacity to make significant progress in this research area independently. A collaborative, multi-institutional framework is required.

6. *This research investment is consistent with FRDC objectives.*

Investing for tomorrow's fish – the FRDC's Research and Development Plan 2000-2005 details under Challenge 2 ("Increasing Production through Aquaculture") the relevance of this research program, namely:

- Currently, more than 70 species are in various stages of development for aquaculture. The number will probably decline to fewer than 20 in the next decade as a result of commercial pressures and a trend to "focussing on winners". The aquaculture sector will aim at the premium end of the market because high production costs will militate against high tonnage, low value production.

- Development of biotechnologies is particularly relevant to aquaculture. Closing of life cycles (being able to grow fish from hatchery produced feedstock rather than from wild caught juvenile specimens) is a high priority. Success with Southern Bluefin tuna and rock lobster in particular should pay high dividends, because they have very high value. Genetic modification technologies may also have wide application.

7. Other research priorities relevant to rock lobster enhancement and aquaculture exist

- Within the RLEAS, we need to maintain a balance between "Enhancement" and "Aquaculture". The wild fishery sectors in all states are now supportive of the RLEAS model and its outputs, and recognise that we are dealing with national as well as state or species-based issues. While propagation is a priority from an aquaculture perspective, enhancement of wild stocks with aquaculture-reared juveniles and translocation of adult lobsters are high priorities for the wild capture sectors. In the past, the RLEAS has been criticised for not responding to these additional priorities.

- IN ADDITION TO PROPAGATION RESEARCH, THE FRDC BOARD HAS ALLOCATED FUNDS THIS FINANCIAL YEAR FOR A DESKTOP STUDY INTO THE ECONOMIC FEASIBILITY OF TRANSLOCATING SOUTHERN ROCK LOBSTERS (2005/217: OVERCOMING SPATIAL DIFFERENCES IN THE BIOLOGY OF ROCK LOBSTERS TO EXPAND THE TASMANIAN FISHER-CALEB GARDNER, TAFI - $10,000) AND FOR AN ECONOMIC ASSESSMENT OF SEA CAGE AQUACULTURE IN THE TORRES STRAIT (2005/215: SEA-CAGE AQUACULTURE OF WILD CAUGHT *PANULIRUS* JUVENILES IN TORRES STRAIT - MATT KENWAY, AIMS - $20,000).

How does the RLEAS Steering Committee view current research proposals ?...

Full proposals are currently being considered by the RLEAS Steering Committee. The following represents the Subprogram Leaders comments in addition to comments from the Steering Committee on preliminary research proposals:

2006/218: TROPICAL ROCK LOBSTER PUERULUS PRODUCTION (JAMES FOGARTY, MG KAILIS)
Relevant FRAB's: All

The Steering Committee **endorses** this proposal subject to further development in conjunction with project 2006/219. This project and project 2006/219 address the most significant impediment to the development of a rock lobster aquaculture industry in Australia and must be supported to realise benefits from investments made to date:

The following points should be noted:

- This proposal must be intimately linked to project 2006/219 if optimal research efficiency is to be achieved and outcomes are to be achieved within the specified timeframe. Further integration is required before these proposals are acceptable.

- A five year investment is required to provide the best possible evidence that commercial propagation of rock lobsters is in fact achievable.
- There is strong industry support for this research.
- There are current discussions that will progress in parallel with the evolution of this project that address the ongoing management of rock lobsters propagation research and the capacity to attract additional investment and commercialise the outcomes.

2006/219: HATCHERY PRODUCTION OF JUVENILE SOUTHERN ROCK LOBSTER SEEDSTOCK FOR AQUACULTURE AND ENHANCEMENT (ARTHUR RITAR, TAFI)
Relevant FRAB's: All

The Steering Committee **endorses** this proposal subject to further development in conjunction with project 2006/218. This project and project 2006/218 address the most significant impediment to the development of a rock lobster aquaculture industry in Australia and must be supported to realise benefits from investments made to date:

The following points should be noted:

- This proposal must be intimately linked to project 2006/218 if optimal research efficiency is to be achieved and outcomes are to be achieved within the specified timeframe. Further integration is required before these proposals are acceptable.
- A five year investment is required to provide the best possible evidence that commercial propagation of rock lobsters is in fact achievable.
- There is strong industry support for this research.
- There are current discussions that will progress in parallel with the evolution of this project that address the ongoing management of rock lobsters propagation research and the capacity to attract additional investment and commercialise the outcomes.

2006/220: IMPROVING SPATIAL MANAGEMENT OF SOUTHERN ROCK LOBSTER FISHERIES TO IMPROVE YIELD, VALUE AND SUSTAINABILITY(CALEB GARDNER, TAFI).
Relevant FRAB's: All

The Steering Committee **endorses** this proposal and recognises the value to the Tasmanian rock lobster fishery and other rock lobster fisheries in Australia:

The following points should be noted:

- The preliminary desk top study is encouraging and supports the conduct of this research.
- There appears to be significant economic benefit if the outcomes from this project are realised.

2006-221: PRELIMINARY ASSESSMENT OF THE WILD JUVENILE RESOURCE OF PANILIRUS ORNATUS FOR AQUACULTURE DEVELOPMENT IN THE TORRES STRAIT. (MATT KENWAY, AIMS)
RELEVANT FRAB'S: QUEENSLAND, COMMFRAB

This proposal encompasses the development of rock lobster aquaculture systems in the Torres Strait in conjunction with indigenous communities. This is a reduced proposal from one submitted in 2005/06 that addresses assumptions that have been made in a preliminary economic assessment.

The Steering Committee **endorses** this proposal subject to further information from the economic analysis currently being undertaken. It is relevant to the RLEAS priorities and represents an excellent opportunity to initiate rock lobster aquaculture in Australia.

The following points should be noted.

- A draft economic assessment of the feasibility of on-growing rock lobsters in the Torres Strait in conjunction with indigenous community will be available in December, 2005.
- A sensitivity analysis need to be included in the economic analysis, particularly in the area of catch rates. If catch rates exceed existing capacity then there is little point investing in this project further.
- There is strong support for this type of development in the Torres Strait from the Federal government and local indiginous communities.
- The bulk of the budget covers travel costs to the TS, which are comparatively expensive. Given the operating environment there is a need for Matt and Clive to maintain an active and regular involvement in the project conduct to ensure it reaches the intended end points.
- The proposed term of the project is from July 2006 to November 2008. The term of this project minimizes risk. The project is to cover 2 recruitment cycles (ie 06/07 and 07/08) which can be argued is the bare minimum given the potential of variable recruitment patterns. If they get good results in year 1 the risk still remains that this may not be true over the years. It is essential to know if one can move forward with confidence that a certain harvest target could be met on a recurring annual basis. At this stage there is too limited information, temporal or spacial, on the recruitment patterns of *P.ornatus* in Australia to make any prediction with confidence. Predictable recruitment is essential to the development of sustainable fisheries (or ranching aquaculture).

- Catch rates of fish and crustacea are considered on a species by species basis. Lobsters are as diverse in their life history as fish. Moreover, populations of even the same species from one geographical area to another are not necessarily the same, as oceanographic conditions at each typically have a major influence. In the case of oceanic free living planktonic larvae (phyllosomas) of rock lobsters, oceanographic conditions are dominant. These conditions are very different in the 'eg' examples. In WA, it is regulated by a major upwelling system with a nearly globally unique concentrated settlement pattern. In Tas it is regulated by currents that stretch to New Zealand with dispersed settlement. In Queensland/Torres Strait, settlement back into reef areas is regulated by an oceanographic gyre and oceanic influx through the barrier reef. As the P. ornatus fishery harvest is fairly robust (approx 1,100T this year), there has to be good recruitment but the question is where are the 'hot spots'. These are unknown for P. ornatus and studies from other rock species do not add any useful information. With respect to P. ornatus in another geographical area, the Vietnam situation is also very different from the TS. Along the central region of Vietnam there are now probably more artificial collectors than natural substrate for P. ornatus to settle on. As you know locals monitor their collectors continuously because of the high value of juveniles (1=average weekly wage). In the TS and along the Cape York EC there is abundant inshore reefal habitat and it is unknown whether collectors will be successful in attracting P. ornatus juveniles, against the background of natural habitat. As a result the collectors that work in Vietnam may not be as effective in TS. In addition it will not be possible to monitor collectors continuously in the TS due to changing inshore turbidity as a result of tidal currents (divers are typically limited to the neaps). Basically, collectors need to be evaluated in the TS to establish whether they can be used for harvesting P. ornatus juveniles in this region.
- Whereas collection studies of pueruli have an established history in Australia and overseas, the valuable information is only useful on a species by species basis. The analogy again would be that recruitment studies for finfish use basically the same techniques. There is not a pressing need to be innovative for its own sake. AIMS are proposing to use robust, tried and tested collection methodology for spiny lobster larvae. It would be taking a significant risk to seek innovative approaches that have a probability of failure since they are just that – innovative but perhaps not practical. Most innovations are not successful or succeed into practical usage.
- The investment is justified by the potential value of the industry to Australia. We are faced with a situation where we have invested heavily in rock lobster aquaculture and this represents an opportunity to fast track industry development (at least on the grow-out side). There is also the issue of the Vietnam industry being developed without this information and the fact that it is now in danger of collapse. As the main export market for *P. ornatus* is China (which has now developed a healthy appetite for this species) the timing of this project could not be better – to begin with ranching aquaculture for *P. ornatus*, to develop the technology, for the eventual evolution to true closed life cycle aquaculture once the propagation sector takes off. There is the real possibility that Australia can capitalize on its sustainable fisheries/aquaculture approach, and take economic advantage out of Vietnam 'mistakes'.

2006/222: OPTIMISING HUSBANDRY TECHNIQUES AND FEED ATTRACTIVENESS FOR WESTERN ROCK LOBSTER AQUACULTURE (ROY MELVILLE-SMITH, WA FISHERIES)

Relevant FRAB's: WA.

This project represents a follow on from an existing FRDC project (2003-213).
The Steering Committee **does not endorse** this proposal for the following reasons:

- It is a very expensive project relative to the nominated outcomes.
- The objectives of the project do not represent significant impediments to the development of rock lobster grow-out systems in Western Australia.
- Western Australian rock lobster license holders would like further clarification in relation to property rights prior to additional investment in rock lobster grow-out.

How does the RLEAS operate ?...

In July 2004, the FRDC agreed to support the RLEAS for a further 3 years. In the first instance, the subprogram will continue to be managed by an expertise-based Steering Committee. Depending on the progress of existing and future research projects undertaken within this three year period, and interest from additional investors in the research program, the subprogram will continue to examine other options for management of the research and commercialization of the research outcomes. The RLEAS is currently fielding enquires from potential overseas research investors, and is maintaining close links with an Australian Centre for International Agricultural Research (ACIAR) program involving the CSIRO and research institutions in Vietnam.

This Subprogram is highly responsive to the views of industry and understands the need to accommodate both the research requirements of the future and the needs of the existing wild fisheries and aquaculture industries. To ensure that research conducted within the Subprogram is relevant and meets the above criteria, a Steering Committee has been established to:

- To establish and review strategic directions for the Subprogram;
- To review existing research directions within the guidelines of the FRDC contractual agreements;
- To prioritise new research proposals and develop a priority list that can be used by other funding agencies;
- To ensure that research outcomes are commercially focused where relevant;
- To coordinate industry and research provider involvement so as to maximise usage of available resources;
- To facilitate industry extension and technology transfer;
- To advise on flexible components of budget expenditure;
- The convening of regular meetings (6 monthly);
- To develop an appropriate and approved communications policy;
- Ensure efficient and effective reporting structures;

- To promote the Subprogram and its achievements so that it can become the focus for all research on rock lobster aquaculture and enhancement.

At a minimum Steering Committee members are expected to attend at least two Subprogram meetings per year (one meeting per year will include a Subprogram workshop). Members are also required to comment (out of session) on all written project progress reports, final reports and new project proposals. Sitting fees are not paid to Steering Committee members, but the Subprogram covers travel expenses associated with attendance at the two annual meetings. Subprogram meetings are held at various locations around Australia.

The Steering Committee is comprised of:

- Subprogram Leader;
- FRDC Representative;
- Eleven industry representatives;
- Two Scientific Advisors.

The following should be noted in relation to membership:

- In general, Scientific Advisors will not have active research projects within the Subprogram.
- Proxies are not accepted for Steering Committee members who are unable to attend a particular meeting.
- Membership of the Steering Committee is expertise based.
- Periodically, the Subprogram Leader may invite relevant observers to Subprogram meetings, at his discretion.

Steering Committee members are selected to contribute expertise in one or more of the following areas:

- The marine aquaculture sector;
- The rock lobster wild capture fisheries;
- Seafood processing and marketing;
- Knowledge of the fishing industry and resource allocation;
- Research and development in marine science or aquaculture;
- Communication and technology transfer.

At present, the RLEAS Steering Committee members include:

- **Dr Robert van Barneveld (Chair)**
- **Crispian Ashby (FRDC)**
- **Pheroze Jungalwalla (TAS)**
- **Neil Stump (TAS)**
- **Andrew Ferguson (SA)**
- **Greg Ward (SA)**
- **Barry Spurrier (VIC)**
- **David Lucas (VIC)**
- **Jim Fogarty (QLD)**
- **Steven Gill (WA)**
- **John Newby (WA)**
- **Neil Dorrington (WA)**
- **Trevor Burkhart (NZ)**
- **Dr Andrew Jeffs (Scientific Adviser)**
- **Dr Bruce Phillips (FRDC Rock Lobster Post-Harvest Subprogram Leader).**

Steering Committee Membership turnover: Since 2003, to ensure the RLEAS Steering Committee remains relevant, one third of the Steering Committee positions are declared vacant and then recalled. Existing or new members are reappointed as per the above guidelines at the discretion of FRDC.

Industry consultation and communication: The Subprogram Leader, Dr van Barneveld, promotes the activities of the RLEAS through a website, industry newsletters, and direct communication with industry organisations and representatives.

Strategic planning: Strategic planning for the RLEAS is based on outcomes from the existing research program and ongoing consultation between the Subprogram Leader and members of industry and researchers in Australia and New Zealand. The strategic plan is maintained and updated annually using CD-ROM and the web-site for distribution. The strategic planning process identifies those factors that represent restrictions to the initial establishment of rock lobster aquaculture (eg. propagation, nutrition) and enhancement (eg. monitoring survival, prevention of disease introduction to the wild fishery) processes, and then utilises a relative ranking score from the various rock lobster fisheries across Australia.

Communication with FRABS: Communication with FRAB's is via distribution of an annual operating plan for the RLEAS in December of each year combined with direct communications. The Subprogram Leader will also attend the annual FRDC FRAB workshop to promote the activities and objectives of the RLEAS.

Development of new research proposals: New research proposals are developed through the use of facilitated strategic planning meetings. Using priorities published in the RLEAS Strategic Plan, the Subprogram Leader convenes meetings with relevant researchers and research institutions to:

1. Define the planned outcomes of the new proposal;
2. Manage an indicative budget for the research as defined by the Steering Committee;
3. Identify which researchers/institutions are best placed to undertake the research;
4. Promote collaboration between researchers and institutions where appropriate;
5. Seek external expertise and inputs as required.
6. Ensure the new proposal meets the objectives of the subprogram and that the research remains relevant and focussed.

The Subprogram Leader ensures new research proposals are distributed to FRABS and the RLEAS Steering Committee for comment and ratification before submitting the proposals to FRDC on behalf of the lead agencies, or facilitating adjustments to the proposals prior to submission.

Coordination of research reports: The Subprogram Leader collates progress and final reports from projects within the Subprogram in March and September each year for delivery in a common format to FRDC. These reports are distributed to members of the Steering Committee for comment and review.

Review of research progress and direction: The RLEAS Steering Committee interviews the Principal Investigator of each project within the Subprogram at least once annually as part of the Steering Committee meeting. Principal Investigators are expected to report progress against contracted milestones, justify any changes in research direction, and demonstrate that the research program is making a valuable contribution towards the achievement of the Subprogram objectives. The Steering Committee makes recommendations to the FRDC Board in relation to potential changes to the objectives of the research program, or instances where project progress is unsatisfactory.

Coordination of research extension: A major function of the Subprogram Leader is the organisation and delivery of an annual research workshop to highlight the activities and outputs of the RLEAS. Workshops are convened with presentations from invited speakers and researchers aimed at delivering key messages to end-users for use in practical rock lobster aquaculture and enhancement systems.

The Subprogram Leader compiles a subprogram newsletter "Lob ReLEASe" at least annually or as required highlighting research outcomes, developments in rock lobster enhancement and aquaculture and events relevant to the RLEAS. The Subprogram Leader is also responsible for the approval of all media releases and scientific publications arising from research projects within the Subprogram using the RLEAS Steering Committee communication policy as a guide.

Collaboration with international partners: The Subprogram Leader has established a major international collaboration between researchers in Australia and New Zealand initially through project 98/301 and subsequent projects. This was achieved through direct interaction with researchers in New Zealand and involvement of these scientists in the RLEAS research program. There is further opportunity to build on relationships initiated with Japanese researchers by AIMS, CSIRO and TAFI as the RLEAS continues to evolve. In all cases, international collaborations will be based on a two-way flow of information and where possible, research funds.

Identification and procurement of additional funding: Additional funding from sources such as the Public Good Science Fund in New Zealand and AUSIndustry in Australia will be sought with the assistance of the Subprogram Leader and relevant end-users. The Subprogram Leader is already involved with the development of AUSIndustry COMET proposals for the commercialisation of existing technology for rock lobster aquaculture. There are also opportunities for commercial investment in the development of technologies for rock lobster aquaculture in conjunction with the existing research program.

Liaison with FRDC: The Subprogram Leader is the conduit for communications between FRDC and subprogram participants in relation to project contracts, project reports, new submissions and general correspondence. The Subprogram Leader also represents the RLEAS at the annual FRDC FRAB and Subprogram meetings in Canberra.

How does the RLEAS communicate and extend results from research ?...

Annual workshop:

The workshop's primary aim is to deliver information on research outputs to industry stakeholders as it becomes available. It also serves to raise the public perception of the industry in the host state as a body of local media is encouraged to attend and report on the workshop and the development of the industry in that state.

Workshop proceedings:

The proceedings serve to deliver a summary report and research results available from component projects within the subprogram to date. The collection of past proceedings serves as an extensive and valuable resource of knowledge and technologies that can be accessed by the industry on a needs basis. Sales of proceedings are restricted to Australia. However, the Steering Committee may allow overseas sales of past proceedings if it is decided their content no longer provides a competitive advantage to the Australian industry.

Website:

The website serves to communicate current and past research outputs, subprogram activities, industry related events, information on the industry, to provide advice to current researchers, advice to research applicants and information on publications that are available. As such, it serves industry stakeholders, potential farmers and investors, the general public, and research providers. The website can be viewed at www.frdc.com.au/research/programs/rleas.

Newsletter:

The Subprogram publishes an annual/biannual newsletter called "Lob ReLEASe". The newsletter is the principal industry communication of the subprogram and has received good feedback from all sectors of the rock lobster industry. "Lob ReLEASe" communicates information on current and past projects, relevant research outputs, subprogram activities and industry events.

Media releases:

Media releases will be sent from the subprogram when key messages that contribute to public perception or public good arise. The annual workshop provides a key opportunity to achieve extensive media coverage of the industry, the subprogram and the FRDC.

Articles in magazines/newsletters:

Articles on research activities and outputs are regularly submitted to various magazines and newsletters, including the FRDC R&D News.

The RLEAS communications policy aims to facilitate the orderly release of information produced by research providers managed under the subprogram. This policy covers the publication of final reports and scientific papers and the release of media articles, unsolicited media inquiries/interviews and films. Release of information is based on the following criteria:

- Distribution of information must have a net benefit for the Australian industry.
- Dissemination of information to international partners will be approved when there is a two way flow of information.
- *Ad hoc* requests for results or information will not be accepted.
- Special cases for the supply of information will have to be approved by the Steering Committee and where appropriate, Memorandums of Understanding will be prepared.

A number publications are available or are pending from the Subprogram including:

- Proceedings of a lobster health workshop held in Perth in July, 1998.
- Proceedings of the Rock Lobster Propagation workshop held in Hobart in January, 1999.
- Proceedings of the first annual RLEAS workshop held in Geraldton in March, 1999.
- Proceedings of the second annual RLEAS workshop held in Hobart in February, 2000.
- Proceedings of the third annual RLEAS workshop held in New Zealand in April, 2001.
- Proceedings of the first RLEAS/RLPHS combined Workshop held in Cairns in May 2002.
- Proceedings of the second annual RLEAS/RLPHS combined Workshop held in Fremantle September 03
- Final reports from completed projects.
- "Lob ReLEASe" Volume 1, Issues 1, 2 and 3.
- "Lob ReLEASe" Volume 2, Issue 3
- Scientific publications from completed and existing research projects.
- Proceedings of the third annual RLEAS/RLPHS combined Workshop held in Port Lincoln September 04

Additional information on the Rock Lobster Enhancement and Aquaculture Subprogram including newsletters, annual operating plans and workshop proceedings can be accessed by visiting the web-site www.frdc.com.au/research/programs/rleas or by contacting the Subprogram Leader:

Appendix IX – Steering Committee Meeting Minutes

FRDC Rock Lobster Enhancement and Aquaculture Subprogram

Steering Committee Meeting # 15 Minutes

Date: October 11, 2005, 8.30am
Venue: Hobart, Tasmania

Present: Robert van Barneveld (Chair), Steven Gill, Greg Ward, David Lucas, Bruce Phillips, Neil Dorrington, Pheroze Jungalwalla, Crispian Ashby, Larnce Wichman, Jim Fogarty, Barry Spurrier

Apologies: Andrew Jeffs, John Newby, Andrew Ferguson, Neil Stump
Observers: Roger Edwards, Colin Buxton, (9.15am – 11.45am)
David Johnson (10.50am -)

NOTE: These minutes are for the exclusive use of the Rock Lobster Enhancement and Aquaculture Subprogram Steering Committee and should be treated accordingly given the sensitive nature of some of the topics discussed at these meetings (ie research proposals). The main outcomes from these Steering Committee meetings will be distributed to industry and others involved in the Subprogram via newsletters and workshops, or where appropriate, direct contact will be made.

Item1 Welcome, introduction, apologies and meeting objectives:

- Andrew Jeffs, John Newby, Andrew Ferguson and Neil Stump's apologies were tabled.
- Robert van Barneveld table correspondence received from Roger Cotton, Southern Rocklobster Limited.

Item 2 Business arising from previous minutes

Page 3 Pheroze Jungalwalla asked that "a lot of research is not patentable." Be replaced with: "Aquaculture research may be commercially valuable but not patentable."
Page 5 Steven Gill stated that the Committees concerns re. 'puerulus caught/ tanked' have been disregarded. (Project 2003/213).
Page 7 Pheroze Jungalwalla identified broodstock priority missing from table.

Robert van Barneveld advised the Committee of the status/completion of ACTIONS arising from previous minutes:

- **Translocation project**: Caleb Gardner has submitted the first draft final report for the desk top study he undertook. The Non-technical summary was then distributed to the Committee. Discussion ensued because it was brought to the Committees' attention that Caleb Gardner has submitted a proposal to the TASFRAB but the application has not been submitted to the RLEAS SC.
- **Sea-cage culture – wild caught tropical species**: Initial project submitted to FRDC was not approved. Instead $20,000 was allocated to undertake an economic study of aquaculture option. FRDC drafted a terms of reference for the work. Bill Johnston from the QDPI has drafted an economic model for the report based on the terms of reference.
- **Future research proposals**: Propagation, translocation and sea-cage proposals will all been submitted to FRDC in the coming round. The RLEAS needs to be strategic on how all of these proposals are presented to FRDC or there will be a high failure rate.

- ACIAR meeting held in Vietnam in April (26th-28th)2005. Comments made by Robert van Barneveld:
    - Australia will get something valuable from the ACIAR project in terms of research that enhances our existing program.
    - Some ethical issues exist, for example, where are the juveniles coming from?
    - James Fogarty will be attending the next ACIAR meeting to be held in Brisbane.
    - One benefit to Australia is that some of the R&D is being undertaken in Australia.
- **Japanese workshop**: Since March, Satoshi Mikami and some colleagues in Japan have received funding for a Japanese workshop. They have invited Clive Jones, Mike Hall and Arthur Ritar to a workshop in Japan that will focus on propagation. Robert van Barneveld advised that he spoke them about his concerns that there is no formal structure to this workshop, he asked for the workshop to have more structure and asked if he and James Fogarty could attend. FRDC has refused attendance. Andrew Jeffs and Kevin Williams will be attending.
- **Raceway patent**: Australian Fresh have a patent on some of the raceways being used in RLEAS research programs. Need to investigate any infringements – PI's have been asked to confirm that they are not infringing the patent.
- **Propagation management paper**: Pheroze Jungalwalla asked what the FRDC board's feedback was. Robert van Barneveld advised feedback was positive, the Board has asked for a SWOT analysis.
- **Bruce Phillips**: Submitted the final report for project 2002/045. Bruce has also submitted a paper that was an outcome of the project.

Business arising from previous minutes concluded at 9.18am, Observers were then invited to join the meeting.

Item 3 Future propagation research management model

Robert van Barneveld addressed the Committee regarding the need to effectively manage propagation research in Australia, highlighting the following issues:

- Two proposals have been submitted, one from TAFI and the other from MG Kailis, 2 species are represented in these proposals (Southern and Tropical).
- Previous research has resulted in 'double – ups' occurring, the RLEAS should now be in a position to correct any duplications.
- Priorities – propagation research has been the number 1 priority.
- Confident that '5,000 stage 5 per annum' will be routine by the end of June 2006, when current projects are complete.

The next step is to consider the current proposals which propose routine culture to Stage 8 as the outcome. Discussion ensued with these comments/points tabled:

- Colin Buxton would like to debate if Stage 8 is the 'right' stage - perhaps attaining Stage 11is the outcome to strive for.
- Robert van Barneveld stated the need to be proactive now about the management of this propagation research, keeping in mind industry leadership – there exists different views from different sectors.
- Roger Edwards addressed the SC regarding the letter from SRL that was earlier tabled and his (SRL's) concerns regarding aquaculture impacts on the fishery. He advised that SRL acts on behalf of license holders and the position of the SRL Board is managing the livelihood of its constituents. SRL wants to be active in propagation research.
    - Pheroze Jungalwalla commented on the letter, highlighting concerns over claims made in relation to ownership of IP.

- Robert van Barneveld identified the need to address this issue of the claim of ownership via levies etc.
- Colin Buxton pointed out the need to distinguish between IP ownership and commercialisation – who commercialises it.

ACTION

- SRL letter to be discussed further.

Future propagation research management model – cont.

Points raised during discussion:

- The model is consistent with FRDC objectives (page 8);
- Other priorities do exist within rock lobster enhancement;
- We have a number of proposals put forward this round;
- Political issues exist with the Torres Strait proposal. There are also indigenous interests to consider;
- TAFI has good government support, Neil Dorrington voiced his concern that a change in Government can also mean a change in views/support for fisheries, as happened in WA.
- Recommendations:
    - Recommendation 1: Pursue additional funding for propagation research for the next 3-5 years. Robert van Barneveld stated that procuring additional funds can mean difficulties in managing projects and funds so an alternative approach to management should be considered.
    - Recommendation 2: Strive to produce puerulus by the end of the next research phase.
    - Points to note regarding the incorporation of an entity to manage propagation research included.:
        - Colin Buxton advised that TAFI would have issues with the model presented, but he emphasised that these issues could be resolved.
        - Roger Edwards stated that this entity would provide certainty in industry, open investment opportunities and create partnerships.
        - The entity would be needed well before commercialisation is realised in order to manage research and obtain additional funding
        - The new entity would have the stakeholders clearly defined.
        - Crispian Ashby informed the SC of the SEF Subprograms' commercial entity and how it operates.
        - The research needs to be managed effectively – under the current model, once a project is running introducing new partners is currently difficult.

The Committee discussed the adequacy of the current system of submitting independent research proposals. The committee agreed that the current system had short falls with the following points raised:

- No security of knowing there is long term backing – researcher providers need long term certainty;
- Concern regarding the differing agendas of FRDC Boards;
- Is a commercial entity a viable alternative – what other options exist?

Robert van Barneveld stated that we are not in a position to create a new entity/company right now however, James Fogarty has provided an example for a "rock lobster trust":

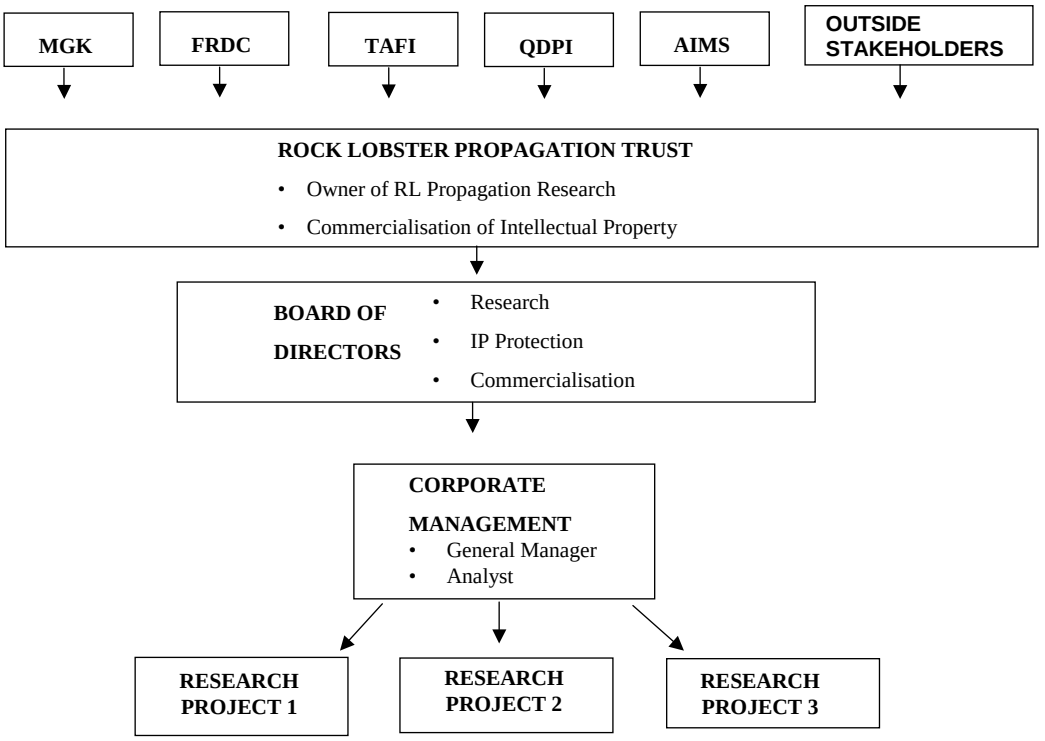

***Figure1**. Rock lobster trust model*

The Committee discussed this model at length considering the pros and cons of current arrangements versus a more commercial approach. The views and needs of different stakeholders were presented. It was suggested that FRDC will require presentation of a new model within the next 12 months.

ACTION

Robert van Barneveld to actively progress these discussions using the trust model as a starting point.

Item 5 Principal Investigator Project Progress Reports

Project 2004-239 *Strategic planning, project development, and facilitation of research and extension towards establishment and maintenance of commercial rock lobster aquaculture and enhancement systems in Australia - Robert van Barneveld*

Robert van Barneveld presented his progress report and tabled draft final report reviews for projects 2000/214, 2000/263 and 2001/094:

2001/094: This report has not achieved basic numbers to make report statistically valid.

ACTIONS:

- Robert van Barneveld to advise Judith Handlinger that the report is to be re-submitted – not acceptable in current form. Colin Buxton suggested the report be rejected and no payment made as yet – set a new date.
- Kylie Franzmann to send a copy of the report to Colin Buxton.

2000/214: Arthur Ritar did a great job in pulling all of the components of this project together. Recommend that this report be accepted.

ACTIONS:

- Robert van Barneveld to advise Arthur Ritar that report has been accepted and an embargo placed on it for 12 months against widespread distribution as there exists value in the compilation.

2000/263: Very technical report. A very good non-technical summary has been provided. A peer review publication might be appropriate to rate the science.

ACTIONS:

- Robert van Barneveld to discuss peer review with Mike Hall.

2005/217: Robert advised the Committee that a draft final report was submitted by Caleb Gardner on October 3, 2005.

OUTCOME

- Progress report accepted.

Project 2003-212 *Propagation of southern rock lobster in Tasmania – Arthur Ritar*

Tabled by Arthur Ritar, who addressed the Committee providing an overview of activity undertaken to date. A question and answer session ensued regarding stages and survival rates. Arthur advised the Committee that they are achieving a 60% survival to stage 5.

Variations were tabled and discussed:

- Abandon nutrition - endorsed
- Infection / fungal work – next project - endorsed
- Revise milestones - endorsed
- Drop *J.vereauii* – not endorsed

ACTION

Robert van Barneveld to seek recommendations from Andrew Jeffs regarding these variations.

Project 2003-213 *Establishing port-pueruli growout data for western rock lobsters to assess economic viability - Dr Roy Melville-Smith & Danielle Johnston*

Roy Melville-Smith tabled this progress report and provided an overview of progress to date. A question and answer session followed. There were no variations requested.

OUTCOME

- Report accepted subject to supply :
  1 Graph of ambient temperatures ;
  2 Record of 2 week mortality;
  3 Document methods for post puerulus handling.

ACTION

- Robert van Barneveld to write to Roy Melville-Smith regarding these requests.

Project 2003-211 *Advancing hatchery propagation of tropical rock lobsters – James Fogarty*

Clive Jones, Mike Hall and James Fogarty addressed the Committee, tabling their progress report. Clive Jones provided a brief overview of progress to date highlighting the following:

- Met all milestones
- Achieved outcomes within budget
- Multiple systems are all up and running

Mike Hall then provided an overview of AIMS progress to date.

James Fogarty addressed the committee and advised that Kailis (Roger Barnard) have gone through to stage 4 without using ozone, research is on track.

OUTCOME

- Variation approved.

ACTION

- Clive Jones to obtain assurance that research is not infringing on the Australian Fresh raceway patent.

Item 5 Proposals

1 Torres Strait, Lobster Growout
Principal Investigators: Matt Kenway & Clive Jones pre-proposal.

OUTCOME

The Committee supports to full proposal.

2 Optimising husbandry techniques and nutrition for the commercialisation of western rock lobster aquaculture
Principal Investigator: Roy Melville-Smith, full proposal.

Discussion ensued, with following points noted:

- Asking for $700,000 over 3 yrs to match $300,000 contribution from WA.
- Steven Gill advised that it is not supported by the West Australian commercial fishing sector, that it is more important to finalise puerulus access arrangements before public policy issues are determined.
- Optimising pellet size has already been done by K Williams.
- The attractant component of the research is unlikely to yield results.
- This type of research is more suited to a internal commercial research.

OUTCOME

Not supported.

2005/217 Principal Investigator: Caleb Gardner

The Committee had not seen this proposal.

OUTCOME

To be review out of session

Propagation proposals Principal Investigators: Arthur Ritar, James Fogarty

OUTCOME

These are to be discussed in a meeting scheduled for Thursday, October 13th, 2005.

Item 6 Next Steering Committee Meeting & Workshop 2006

Next meeting: March 2006 in Adelaide. A date is yet to be determined.

Next Workshop: Christchurch, New Zealand in September has been proposed.

Meeting closed 4.50 pm.

Dr Robert van Barneveld
Subprogram Leader

FRDC Rock Lobster Enhancement and Aquaculture Subprogram

Steering Committee Meeting # 17 Minutes

Date: August 27 2006, 11am – 6pm
Venue: Adelaide, South Australia

Present:	Robert van Barneveld (Chair)	Andrew Ferguson
	Steven Gill	Crispian Ashby
	Greg Ward	Larnce Wichman
	David Lucas	Jim Fogarty
	Neil Stump	Neil Dorrington
	Bruce Phillips	John Newby

Apologies: Andrew Jeffs, Pheroze Jungalwalla, Barry Spurrier
Observers: Patrick Hone, Alex Kailis, Colin Buxton, John Kenny & Karen Grumley (Kenny & CO)

NOTE: These minutes are for the exclusive use of the Rock Lobster Enhancement and Aquaculture Subprogram Steering Committee and should be treated accordingly given the sensitive nature of some of the topics discussed at these meetings (ie research proposals). The main outcomes from these Steering Committee meetings will be distributed to industry and others involved in the Subprogram via newsletters and workshops, or where appropriate, direct contact will be made.

Item1 Welcome, introduction, apologies and meeting objectives:

- Robert van Barneveld opened the meeting and introduced the observers.
- He then advised the Committee of the 9am-11am propagation meeting held earlier and the outcomes achieved at that meeting.
- Robert also advised the SC of how the propagation research proposal had evolved over the last few months, into a project that the FRDC Board would accept.
- Robert also advised the SC that MG Kailis has cultured *P. ornatus* and the TAFI has successfully culture *Jasus Verauxii* in 7 months.

A brief discussion ensued regarding *verauxii* and whether is should be included in propagation research, it's saleability and larval phase time. Patrick Hone stated the FRDC is keen for a business model to be developed for southern and western groups and asked if the SC can explore a southern temperate component.

Robert van Barneveld introduced John Kenny, who then gave the SC a brief outline of the IP issues addressed at the propagation meeting and the steps required to move from the R&D phase to the commercialisation phase.

John Kenny mentioned the stakeholders in the process, the SC asked who there were. Robert van Barneveld clarified this as being those who have invested in propagation research to date.

OUTCOMES

- The primary species will be *P. ornatus*.
- THE SC agreed to explore the opportunity of including *Jasus Verauxii* in current project – providing it does not affect the goals of the current project.

Item 2 Business arising from previous minutes

Page 2 Item 4 – what ppercentage of budget is SSA – P Hone advise it is 3.4%.
Page 7 Propagation newsletter – David Lucas would like a monthly newsletter on overall progress of the RLEAS and SC avtivities that can be released to a wider audience (ie the fishers).

ACTION

Robert van Barneveld to investigate possibility of reinstating the LobRLEAS.

Item 3 Progress Reports

Project 2003-212 *Propagation of southern rock lobster in Tasmania – Arthur Ritar*

Tabled by Arthur Ritar, who addressed the Committee providing an overview of activity undertaken to date.

- Cultivated *J. Edwardsii* through to puerulus again this year.
- Biggest animal one and a half years old.
- 6 months to breeding size.
- *Verauxii* – produced puerulus in this last week – in 7 months – less than half the time for Edwardsii.
- Preparing for new *ornatus* research, developing a quarantine facility.
- Improving water treatment work – which is critical to success.
- Have prepared a paper for publication, which is with Robert van Barneveld for review.
- Scaling back on *Edwardsii* stock.
- Proposing a variation – removing probiotic work – no clear benefits shown to date.
- Hatchery manual to be revised – revised date: Nov 30 2006.
- Greg Smith no longer working on the project.

Arthur answered questions fielded by the SC including the departure of Greg Smith and any detrimental affect this will have on the project. Arthur stated that he departure does have some impact but he sees no threat to the project.

ACTION

- Arthur Ritar to advise SC of a replacement for Greg Smith.

OUTCOMES

- Progress report accepted.
- Robert van Barneveld advised that Draft Final Report has been approved.
- Variations approved: Cease work on probiotics;
  Hatchery manual revision date – Nov 30 2006;
  Final report date due Nov 30 2006.

Project 2003-211 *Advancing hatchery propagation of tropical rock lobsters – James Fogarty*

Clive Jones and Mike Hall provided the SC with an update of activity:

Clive Jones / QDPI component

- Project completed June 30 2006.

- June 30 milestones yet to be submitted – all three experiments have been completed, have been waiting on AIMS component (Mike Hall has now submitted this).
- QDPI is ready to move on to the new project, emphasis will be on diet and systems development.
- We have a diet that we can use for the new project.

Discussion ensued regarding the IP generated by this project, along with 3 publications that have gone through to the ARC which the RLEAS has yet to see and the possibility of embargoing any IP in .phd student's work.

Discussion regarding patentability of IP followed. John Kenny spoke the SC advising them that of the 7 kinds of IP, in this environment the SC is dealing with 3: copyright, patents and secrets. He advised the SC that they would need to consult with a patent attorney to determine what may be patentable.

The SC questioned Clive about ozonation, its transferability and chemical compositions of water between QLD and TAS and any possible detrimental affects on the project. Clive Jones said he thought there would be none. Mike Hall responded by advising the SC that that is what AIMS has been investigating – organics are always changing and the goal is to make the water as clean as possible at a set temperature.

OUTCOMES

- Crispian Ashby advised that FRDC is happy to place embargos on hatchery manual and final report.
- A workshop to develop IP protocols would be appropriate.

Mike Hall / AIMS component

- Final report due November 06
- Experiment 3.3 is ongoing – need to achieve more data.
- Mocrobial community – tried antibiotics – made it worse – 70% of strains have resistant to antibiotics.
- Experiment 4.10 delayed due to staff issues – it will be done when some breeding stock come into the system.

James Fogarty advised that MG Kailis do not use antibiotics in puerulus production.

Bruce Phillips asked about the Japanese analysis, mentioned at the previous SC meeting, and his preference for left over money to be rolled into that.

OUTCOMES

- Report approved and accepted.
- Variations approved: Protocols for broodstock – new date 30/11/06
  Clean sea water new date 30/11/06
  Experiment 5.1 – binders, rolled into to Experiment 4.12

ACTIONS

- Mike Hall to approach Japanese to do analysis
- James Fogarty to amend invoice to reflect variations
- Robert van Barneveld to circulate milestone report out of session

Project 2004-239 *Strategic planning, project development, and facilitation of research and extension towards establishment and maintenance of commercial*

rock lobster aquaculture and enhancement systems in Australia - Robert van Barneveld

Robert van Barneveld addressed the SC with the following noted:

- Activity within the subprogram since March 2006.
- Provided an ACIAR (Vietnam)project update. Kevin Williams to present at the RLEAS Workshop 28/9/6.
- King Island Marine is still around – they have had discussions with TAFI and Robert van Barneveld that have lead to nothing. They have approached the Federal Minister asking why FRDC was not funding them – this was addressed by Robert van Barneveld.
- ASA Conference – updated the SC on rock lobster aquaculture presented at this conference.
- Andrew Jeffs and Daredin still keen to tilk – September 26 meeting planned.

OUTCOME

- Progress report accepted.

ACTION

- Robert van Barneveld to copy and circulate ACIAR booklet to the SC.

Project 2006-220 *Caleb Gardner*

Robert van Barneveld tabled documents available and briefed the SC on activities within this project to date. The SC was advised that this project will be rolled into the Seafood CRC if it gets funded.

ACTIONS

- FRDC to provide full application to RLEAS for distribution to the SC.
- FRDC to send approved letter to RLEAS for distribution to the SC
- Robert van Barneveld to distribute revised proposal to SC members.
- Robert van Barneveld to provide the following feedback to Caleb Gardener:
    - (Greg Ward) November is no the appropriate month – lot of vermin in the water in November. April/May is better as if they are left over winter and then bring them up they will change colour.
    - (Neil Stump)Advised that he is bamboozled by part so f this project: Para 2, page 1of mins provided – this part has not been discussed with industry. There are items there that were not part of the original project.
    - (David Lucas) Page 4 last para: seeking clarification regarding Victorian component – will it be done or not?

OUTCOME

- Report accepted.

Project 2003-213 *Establishing port-pueruli growout data for western rock lobsters to assess economic viability - Dr Roy Melville-Smith & Danielle Johnston*

Roy Melville-Smith and Danielle Johnston tabled this progress report.

A Question and answer session followed with the following points noted:

- There is a need for a proper Cygnus diet to be developed
- Survival aspects need to be approved
- Histology showed no signs of disease after 12 months – our animals were less stressed that wild caught animals.
- Moult mortalities: no grading was done in this trial, had it been there may have been fewer mortalities.
- Received funding through ABC to do cost analysis – yet to publish report.
- At 23^0 it takes $2^{1/2}$ years to legal size.
- A taste test was done at Curtin – there proved no significant difference between cultured and wild.

ACTION

- Roy Melville-Smith will investigate the possibility of distributing the taste testing report to the RLEAS.

OUTCOME

- Report accepted

Item 4 Future arrangements for RLEAS beyond June 2007

Robert van Barneveld addressed the SC regarding the current status of the RLEAS and the effect of propagation research on the current RLEAS form, stating the current form will need to change.

Patrick Hone addressed the SC stating that there is a need to change as we move from the 'public good' phase to the commercial phase'.

General discussion ensued regarding the current and future structure of the SC will the following point tabled:

- Steven Gill feels this SC is the model needed to complete the IP phase over the next 12-18 months and then it would become redundant in its current form.

The SC digressed onto the issues of propagation, the meeting earlier today and the associated IP issues, with the following tabled:

- Where will the funding for the IP plan come from – the RLEAS or FRDC?
- Concern that the IP plan may be completed in 3-6 months – before the next SC meeting, without any input from the SC.
- Concern voiced (again) over who the stakeholders would be. Robert van Barneveld answered stating that the stakeholders are those who have invested in propagation research – they will be asked to sign documents that bind them and put them into a formal structure.

In an effort to steer the Committee back to the issue of the structure of the RLEAS, Patrick Hone announced: FRDC has a funding paper out and are keen to change their business model (our industry model is working well) in order to be more flexible and meet the needs of business and industry.

- Steven Gill stated that there are two issues to be discussed: protection of IP and licensing of IP. How is production (when commercialised) going to effect industry? Will the business case to protect the IP? Robert van Barneveld answered, yes.
- Steven Gill asked how will we (RLEAS?) manage production?
- There is a need to maximise advantage to Australia.

- The property rights aspect is not part of the IP plan – it is so far beyond this group and the IP Plan.
- Robert van Barneveld advised: SRL want to be the MG Kailis of the temperate species.
- Patrick Hone advised: SRL want to take control of and manage any technology that applies to them.
- Neil Stump asked: Can we maintain "Fortress Australia": even with the IP plan?
- Patrick Hone: We need to be able to control the industry and the supply chain.
- John Newby advised the SC that there is an application pending in WA to collect 250 puerulus and ongrowing them – if this goes ahead then industry in WA could change completely – if this collection goes ahead where willit fit in the IP plan. Robert van Barneveld answered that it won't.

Robert asked the whole Committee: Do you think the Steering Committee should renew after June 2007 and why?

- John Newby: We have been approached, that if the collection of puerulus is allowed will we do it – as a collective, of course we would. Now we've got the level the MG Kailis are at, we could have a substantial amount of product hitting the market at the same time, which will impact on the wild fishery.
- David Lucas: SRL would view the group as IP protectors, managers and licensers.
- Larnce Wichman: Sees that group as the marketers of the IP property rights.
- David Lucas: If there is an ongoing research, then you need a group like this to manage that research.
- Patrick Hone: Need to SC to continue to define the rules and develop mechanisms that are appropriate in the development of the product.
- Robert van Barneveld asked the SC: Are you saying that the Steering Committee's role is in no way diminished by the IP Plan and propagation research? The response was a unanimous YES.
- Robert van Barneveld then asked: The Steering Committee still has relevance? Andrew Ferguson stated that he would need to see how the IP framework develops to answer that question.

OUTCOME

The Steering Committee agreed that this group needs to be involved in the development of the IP Plan.

Item 5 Revisit Jasus Verauxii

- Neil Stump stated that TAFI will be inclined to pursue *Verauxii* no matter what happens with the propagation IP plan.
- Robert van Barneveld: There has to be changes to existing proposal – some aspects will need to be reviewed.
- Robert van Barneveld: regarding money and gaps – there is potentially a bigger pool based on gaps in contributions and levy gaps. ARC publications will bring this to the table and claim as background IP.
- There is a need to keep the propagation team together.
- James Fogarty asked Neil Stump: Arthur Ritar said that the Board has approved $46,000 for the P2 (quarantine) facility – that seems like a waste of scarce resources if they were to do V*erauxii* anyway? Neil Stump responded by stating that there is a need to investigate this quickly.

Meeting closed 6.00pm.

Dr Robert van Barneveld
Subprogram Leader

FRDC Rock Lobster Enhancement and Aquaculture Subprogram

Steering Committee Meeting # 17 Minutes

Date: August 27 2006, 11am – 6pm
Venue: Adelaide, South Australia

Present:	Robert van Barneveld (Chair)	Andrew Ferguson
	Steven Gill	Crispian Ashby
	Greg Ward	Larnce Wichman
	David Lucas	Jim Fogarty
	Neil Stump	Neil Dorrington
	Bruce Phillips	John Newby

Apologies: Andrew Jeffs, Pheroze Jungalwalla, Barry Spurrier
Observers: Patrick Hone, Alex Kailis, Colin Buxton, John Kenny & Karen Grumley (Kenny & CO – IP Solicitors)

NOTE: These minutes are for the exclusive use of the Rock Lobster Enhancement and Aquaculture Subprogram Steering Committee and should be treated accordingly given the sensitive nature of some of the topics discussed at these meetings (ie research proposals). The main outcomes from these Steering Committee meetings will be distributed to industry and others involved in the Subprogram via newsletters and workshops, or where appropriate, direct contact will be made.

Item1 Welcome, introduction, apologies and meeting objectives:

- Robert van Barneveld opened the meeting and introduced the observers.
- He then advised the Committee of the 9am-11am propagation meeting held earlier and the outcomes achieved at that meeting.
- Robert also advised the SC of how the propagation research proposal had evolved over the last few months, into a project that the FRDC Board would accept.
- Robert also advised the SC that MG Kailis has cultured *P. ornatus* and the TAFI has successfully culture *J.. verreauxi* in 7 months.

A brief discussion ensued regarding *J.verreauxi* and whether is should be included in propagation research, it's saleability and larval phase time. Patrick Hone stated the FRDC is keen for a business model to be developed for southern and western groups and asked if the SC can explore a southern temperate component.

Robert van Barneveld introduced John Kenny, who then gave the SC a brief outline of the IP issues addressed at the propagation meeting and the steps required to move from the R&D phase to the commercialisation phase.

John Kenny mentioned the stakeholders in the process, the SC asked who they were. Robert van Barneveld clarified this as being those who have invested in propagation research to date.

OUTCOMES

- The primary species for propagation research will remain *P. ornatus*.
- THE SC agreed to explore the opportunity of including *J. verreauxi* in the current project – providing it does not affect the goals of the current project.

Item 2 Business arising from previous minutes

Page 2 Item 4 – what percentage of budget is SSA – P Hone advise it is 3.4%.
Page 7 Propagation newsletter – David Lucas would like a monthly newsletter on overall progress of the RLEAS and SC activities that can be released to a wider audience (ie the fishers).

ACTION

Robert van Barneveld to investigate possibility of reinstating the LobReLEASe.

Item 3 Progress Reports

Project 2003-212 *Propagation of southern rock lobster in Tasmania – Arthur Ritar*

Tabled by Arthur Ritar, who addressed the Committee providing an overview of activity undertaken to date.

- Cultivated *J. edwardsii* through to puerulus again this year.
- Biggest animal one and a half years old.
- 6 months to breeding size.
- *J. verreauxi* – produced puerulus in this last week – in 7 months – less than half the time for *J. edwardsii*.
- Preparing for new *P. ornatus* research, developing a quarantine facility.
- Improving water treatment work – which is critical to success.
- Have prepared a paper for publication, which is with Robert van Barneveld for review.
- Scaling back on J. e*dwardsii* stock.
- Proposing a variation – removing probiotic work – no clear benefits shown to date.
- Hatchery manual to be revised – revised date: November 30 2006.
- Greg Smith no longer working on the project.

Arthur answered questions fielded by the SC including the departure of Greg Smith and any detrimental affect this will have on the project. Arthur stated that the departure does have some impact but he sees no threat to the project.

OUTCOMES

- Progress report accepted.
- Robert van Barneveld advised that Draft Final Report has been approved.
- Variations approved: Cease work on probiotics;
  Hatchery manual revision date – November 30 2006;
  Final report date due November 30 2006.

ACTION

- Arthur Ritar to advise SC of a replacement for Greg Smith.
- Robert van Barneveld to write to FRDC advising acceptance of progress report.

Project 2003-211 *Advancing hatchery propagation of tropical rock lobsters – James Fogarty*

Clive Jones and Mike Hall provided the SC with an update of activity:

Clive Jones / QDPI component

- Project completed June 30 2006.
- June 30 milestones yet to be submitted – all three experiments have been completed, have been waiting on AIMS component (Mike Hall has now submitted this).
- QDPI is ready to move on to the new project, emphasis will be on diet and systems development.
- We have a diet that we can use for the new project.

Discussion ensued regarding the IP generated by this project, along with 3 publications arising from ARC research which the RLEAS has yet to see and the possibility of embargoing any IP in PhD student's work.

Discussion regarding patentability of IP followed. John Kenny spoke to the SC advising them that of the 7 kinds of IP, in this environment the SC is dealing with 3: copyright, patents and secrets. He advised the SC that they would need to consult with a patent attorney to determine what may be patentable.

The SC questioned Clive Jones about ozonation, its transferability and chemical compositions of water between QLD and TAS and any possible detrimental affects on the project. Clive Jones said he thought there would be none. Mike Hall responded by advising the SC that that is what AIMS has been investigating – organics are always changing and the goal is to make the water as clean as possible at a set temperature.

OUTCOMES

- Crispian Ashby advised that FRDC is happy to place embargos on hatchery manual and final report.
- A workshop to develop IP protocols would be appropriate.

Mike Hall / AIMS component

- Final report due November 06.
- Experiment 3.3 is ongoing – need to achieve more data.
- Microbial community – tried antibiotics – made it worse – 70% of strains have resistant to antibiotics.
- Experiment 4.10 delayed due to staff issues – it will be done when some breeding stock come into the system.

James Fogarty advised that MG Kailis do not use antibiotics in puerulus production.

Bruce Phillips asked about the Japanese analysis, mentioned at the previous SC meeting, and his preference for left over money to be rolled into that.

OUTCOMES

- Report approved and accepted.
- Variations approved: Protocols for broodstock – new date 30 November 06
  Clean sea water new date 30 November 06
  Experiment 5.1 – binders, rolled into to Experiment 4.12

ACTIONS

- Mike Hall to approach Japanese to do analysis.
- James Fogarty to amend invoice to reflect variations.
- Robert van Barneveld to circulate milestone report out of session.
- Robert van Barneveld to write to FRDC advising acceptance of progress report.

Project 2004-239 *Strategic planning, project development, and facilitation of research and extension towards establishment and maintenance of commercial rock lobster aquaculture and enhancement systems in Australia - Robert van Barneveld*

Robert van Barneveld addressed the SC:

- Gave an update on activity within the subprogram since March 2006.
- Provided an ACIAR (Vietnam) project update. Kevin Williams to present at the RLEAS Workshop 28/9/6.
- King Island Marine is still around – they have had discussions with TAFI and Robert van Barneveld that have lead to nothing. They have approached the Federal Minister asking why FRDC was not funding them – this was addressed by Robert van Barneveld.
- ASA Conference – updated the SC on rock lobster aquaculture presented at this conference.
- Andrew Jeffs and Darden still keen to talk – September 26 2006 meeting planned.

OUTCOME

- Progress report accepted.

ACTION

- Robert van Barneveld to copy and circulate ACIAR booklet to the SC.
- Robert van Barneveld to write to FRDC advising acceptance of progress report.

Project 2006-220 *Caleb Gardner*

Robert van Barneveld tabled documents available and briefed the SC on activities within this project to date. The SC was advised that this project will be rolled into the Seafood CRC if it gets funded.

ACTIONS

- FRDC to provide full application to RLEAS for distribution to the SC.
- FRDC to send approved letter to RLEAS for distribution to the SC.
- Robert van Barneveld to distribute revised proposal to SC members.
- Robert van Barneveld to provide the following feedback to Caleb Gardener:
    - It was suggested that November is not the appropriate month for collection due to the large amount of vermin in the water. April/May was suggested as a better time due to the fact that if left over winter they will change colour when re-collected.
    - (Referring to the minutes, it was suggested that this project has not been discussed by the Tasmanian industry as suggested.
    - Clarification is required over whether the proposed Victorian component of the research will proceed or not.

OUTCOME

- Report accepted.

Project 2003-213 *Establishing port-pueruli growout data for western rock lobsters to assess economic viability - Dr Roy Melville-Smith & Danielle Johnston*

Roy Melville-Smith and Danielle Johnston tabled this progress report.

A Question and answer session followed with the following points noted:

- There is a need for a proper *P. cygnus* diet to be developed.
- Survival aspects need to be approved.
- Histology showed no signs of disease after 12 months – our animals were less stressed that wild caught animals.
- Moult mortalities: no grading was done in this trial, had it been there may have been fewer mortalities.
- Received funding through ABC to do cost analysis – yet to publish report.
- At 23° it takes 2 1/2 years to legal size.
- A taste test was done at Curtin – there proved no significant difference between cultured and wild.

OUTCOME

- Report accepted.

ACTION

- Roy Melville-Smith will investigate the possibility of distributing the taste testing report to the RLEAS.
- Robert van Barneveld to write to FRDC advising acceptance of progress report.

Item 4 Future arrangements for RLEAS beyond June 2007

Robert van Barneveld addressed the SC regarding the current status of the RLEAS and the effect of propagation research on the current RLEAS form, stating the current form will need to change.

Patrick Hone addressed the SC stating that there is a need to change as we move from the 'public good' phase to the 'commercial phase'.

General discussion ensued regarding the current and future structure of the SC with the following point tabled:

- Steven Gill feels this SC is the model needed to complete the IP phase over the next 12-18 months and then it would become redundant in its current form.

The SC digressed onto the issues of propagation, the meeting earlier today and the associated IP issues, with the following tabled:

- Where will the funding for the IP plan come from – the RLEAS or FRDC?
- Concern that the IP plan may be completed in 3-6 months – before the next SC meeting, without any input from the SC.
- Concern voiced (again) over who the stakeholders would be. Robert van Barneveld answered stating that the stakeholders are those who have invested in propagation research – they will be asked to sign documents that bind them and put them into a formal structure.

(In an effort to steer the Committee back to the issue of the structure of the RLEAS), Patrick Hone announced that FRDC has a funding paper out and are keen to change their FRDC business model (our industry model is working well) in order to be more flexible and meet the needs of business and industry.

- Steven Gill stated that there are two issues to be discussed: protection of IP and licensing of IP. How is production (when commercialised) going to effect industry? Will the business case to protect the IP?
- Steven Gill asked how will Australia manage production of aquaculture reared product?
- There is a need to maximise advantage to Australia.
- The property rights aspect is not part of the IP plan – far beyond this group and the IP Plan.
- Robert van Barneveld advised: SRL want to be the MG Kailis of the temperate species.
- Patrick Hone advised: SRL want to take control of and manage any technology that applies to them.
- Neil Stump asked: Can we maintain "Fortress Australia": even with the IP plan?
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Robert asked the whole Committee: Do you think the Steering Committee should renew after June 2007 and why?

- John Newby: We have been approached, that if the collection of puerulus is allowed will we do it – as a collective, of course we would. Now we've got the level the MG Kailis are at, we could have a substantial amount of product hitting the market at the same time, which will impact on the wild fishery.
- David Lucas: SRL would view the group as IP protectors, managers and licensers.
- Larnce Wichman: Sees the group as the marketers of the IP property rights.
- David Lucas: If there is ongoing research, then you need a group like this to manage that research.
- Patrick Hone: Need the SC to continue to define the rules and develop mechanisms that are appropriate in the development of the product.
- Robert van Barneveld asked the SC: Are you saying that the Steering Committee's role is in no way diminished by the IP Plan and propagation research? The response was a unanimous YES.

OUTCOME

The Steering Committee agreed that this group needs to be involved in the development of the IP Plan.

Item 5 Revisit J. verreauxi

- Neil Stump stated that TAFI will be inclined to pursue *J. verreauxi* no matter what happens with the propagation IP plan.
- Robert van Barneveld: There has to be changes to existing proposal – some aspects will need to be reviewed.
- Robert van Barneveld: regarding money and gaps – there is potentially a bigger pool based on gaps in contributions and levy gaps.
- There is a need to keep the propagation team together.
- James Fogarty asked Neil Stump: Arthur Ritar said that the Board has approved $46,000 for the P2 (quarantine) facility – that seems like a waste of scarce resources if they were to do *J. verrauxii* anyway? Neil Stump responded by stating that there is a need to investigate this quickly.

Robert van Barneveld asked the SC what contact they want with the propagation review and project to create the IP plan?

OUTCOME

- The Steering Committee wants feedback and to be kept informed on both issues out of session.

Item 6 Other business

- David Lucas would like an electronic copy of a generic newsletter for distribution fishers.

- Neil Stump would like to see the minutes of SC meetings within 5 days of the date of the meeting.

- Coastal Tour: 20-23 October 2006 – Robert van Barneveld to attend.

- Workshop 2007: Bruce Phillips and James Fogarty suggested Cairns 13/14 August 2007.

- Next Steering Committee Meeting: March 2007, New Zealand or Melbourne – Kylie Franzmann to check dates for Easter 2007 and advise Committee of possible dates.

Meeting closed 6.00pm.

Dr Robert van Barneveld
Subprogram Leader

FRDC Rock Lobster Enhancement and Aquaculture Subprogram

Steering Committee Meeting # 18 Minutes

Date: April 12 2006, 9am – 5pm
Venue: Melbourne, Victoria
Date: August 27 2006, 11am – 6pm
Venue: Adelaide, South Australia

Present: Robert van Barneveld (Chair), Steven Gill, Greg Ward, Jim Fogarty, David Lucas, Neil Stump, Andrew Ferguson, Crispian Ashby, Larnce Wichman, John Newby, Bruce Phillips

Apologies: Neil Dorrington, Andrew Ferguson, Patrick Hone
Observers: Daryl Sykes, Roger Edwards, Colin Buxton, John Hargreaves, Clive Jones,

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Item1 Welcome, introduction, apologies and meeting objectives:

- Robert van Barneveld opened the meeting, introduced the observers and outlined today's objectives including:
- Crispian Ashby to address the Steering Committee regarding the subprogram
- Contract delays / propagation.
- Discuss a way forward with the propagation proposal.
- Update on Caleb Gardner's project.

Item 2 Business arising from Previous minutes

Page 6 Item Bullet point 9 – should read 250,000 puerulus – not 250.
Page 7 David Lucas stressed the need for communication / newsletter.
Page 7 Steven Gill told the Committee of Robert van Barneveld's participation in the Coastal Tour and how well he was received.

OUTCOME

- Minutes accepted as true and correct.

Item 3 Progress Reports – update from previous minutes

Project 2003-212 *Propagation of southern rock lobster in Tasmania – Arthur Ritar*

No Progress report was submitted An update, via email was provided (see SC papers). No replacement as yet for Greg Smith.

Project 2003-211 *Advancing hatchery propagation of tropical rock lobsters – James Fogarty*

No progress report submitted. James Fogarty and Clive Jones updated the Committee:

- Japanese analysis did not happen (Mike Hall was to arrange this).
- AIMS have been experiencing delays due to broodstock issues.
- Delays from AIMS are causing delay in production of Final Report for this project. July will be the earliest AIMS contribution to the Final Report can be expected.

Project 2003-213 *Establishing port-pueruli growout data for western rock lobsters to assess economic viability - Dr Roy Melville-Smith & Danielle Johnston*

Robert van Barneveld advised the Committee that the Draft Final Report has been approved and returned to Roy Melville-smith for publication.

Item 4 New Subprogram

Robert van Barneveld addressed the SC and advised them that the new proposal (Rvb001) has been circulated to the FRABS.

Crispian Ashby addressed the Committee advising:

- The FRDC Board has met to consider the proposal.
- Ratified decisions are due next week.
- The budget is excessive – it needs to be reduced – the budget will be halved.
- The focus of the subprogram should be propagation with other projects (under enhancement) will move to the FRDC for management. Enhancement will become part of the FRDC portfolio with the SRL to assist.
- Propagation component will be the Subprogram's function – working towards propagation commercialisation.
- The FRDC Board will ask for the proposal to be revised to reflect propagation focus.

David Lucas asked Crispian: If separating propagation from everything else don't you run the risk of disenfranchising the financial contributors? Crispian responded that FRDC are keen to decreased reliance on FRDC funds.

Steven Gill and David Lucas reiterated the need for communication and engagement with industry to remain. David stated that the wild fishery in Victoria does not have an interest in propagation and reseeding. He feels they will see splitting the subprogram as a problem.

ACTION

Robert van Barneveld: The Committee will revisit the application later in this meeting – when discussing propagation management.

Item 5 Propagation Project (application Rvb002)

Robert van Barneveld addressed the meeting:

- Delays in signing a contract have resulted in Colin Buxton, John Hargreaves and Ian Poiner being invited to this meeting (Ian Poiner was unable to attend) to discuss this issues causing the delays.
- Lawyers have raised concerns over FRDC Standard contract re IP: 1% to FRDC, remainder to 'parties'. Advice is that this position would compromise parties down the track. Changes were made to the IP component and make it a 'multi party agreement'.
- The revised contract has been distributed to the parties concerned. Today, we need to get on to the table the issues that are delaying the signing.

- Robert van Barneveld has asked that Colin Buxton outline for the Committee how the ARC grant is impacted by the project.

Robert van Barneveld suggested that before the Committee considers the project the Committee needs to consider where the current projects stand:

Clive Jones addressed the Committee giving an update on activities in the last eight months and provided the Committee with a document detailing these activities. Points noted:

- QDPI have started work on the new project (commenced 01/07/06) – we decide to take the risk and are, as yet to receive any funds, we did this because we did not want to lose staff or momentum.
- The budget is insufficient to meet costs.
- We have been unable to recruit full time staff but have managed to retain staff to this point.
- Need to get a contract signed – John Hargreaves further emphasised the pressure they (DPI) are under to get the project contract signed.

Robert van Barneveld suggested a way forward for QDPI via adjusted milestones once the contract is signed – Submit a milestone report outlining all of 1st year milestones that have been completed in order for payment to be made and then offer suggestions on how the last year gap may be filled.

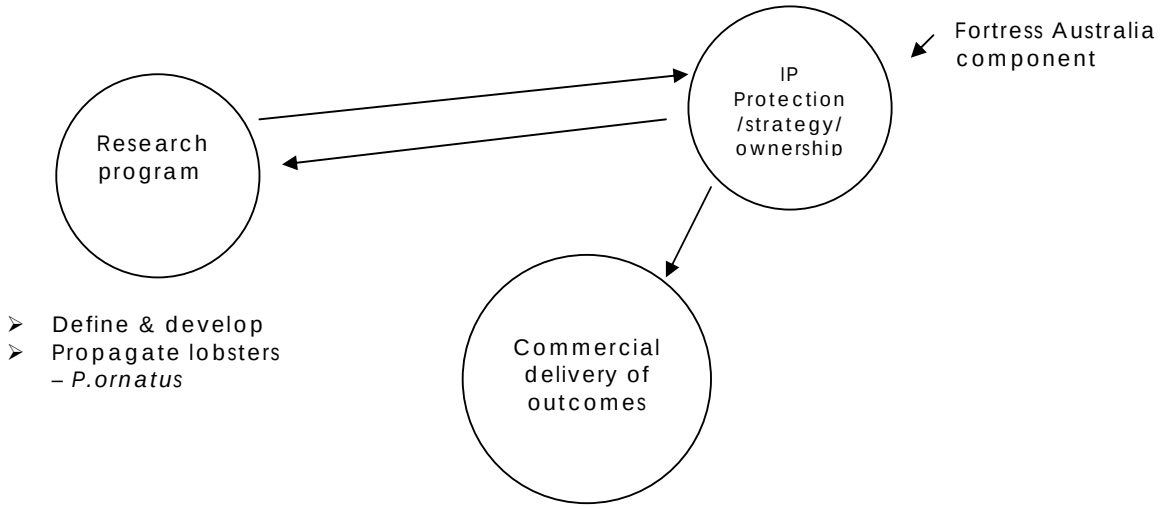
Discussion ensued regarding impediments to signing:

- Colin Buxton commented: 'We (TAFI) can't progress this document (the contract) without considering IP – it is void of details – no clarity is offered in a number of schedules in the contract. This agreement states that the commercial agreement will take precedent over future IP.'
- James Fogarty stated that Kailis has the same position as TAFI.
- Robert van Barneveld stated that these comments change how we proceed – original intent was to get a project in place and then we do all the commercialisation and IP to-ing and fro-ing – now we need to get the commercialisation and IP sorted before the project will be signed.
- Colin Buxton feels we need to use the FRDC IP contract as the basis of the contract.
- Pheroze Jungalwalla pointed out that page 7 of the application (Rvb02) outlines three different IP categories.
- Roger Edwards Stated the Fortress Australia will be created and he sees this proposal as 'locking them out' from the IP generated by the project.
- Crispian Ashby stated that this agreement is ONLY related to the project. The commercialisation process could alter the project.
- Colin Buxton: The IP component using the FRDC standard agreement clarifies the IP to some degree – the project agreement is lacking clarity on this issue and would leave the University (TAS) in a difficult position.

10.00am Daryl Sykes arrived, offered apology for late arrival.

- John Hargreaves agreed with Colin Buxton, if it was a standard FRDC agreement QPDI would find it acceptable.
- Crispian stated that the IP wording is weaker in the old (FRDC agreement) compared to the new agreement that has been circulated to the parties. At this stage IP would still be kept confidential and protected within the project. This would be reviewed when the commercialisation model was developed.

Whiteboard discussion ensued with links defined:



- Roger Edwards is uncomfortable with all IP being claimed by research providers – a number of the people at the meeting stated that this is not the way it is.
- Robert van Barneveld asked the Committee if the agreed that it now appears that the IP and commercialisation cannot be mutually exclusive. There was general agreement. Crispian Ashby advised the Committee that an agreement can be drafted to incorporate the two issues but it would not be in place for at least 12-15 months from now.
- Robert van Barneveld reiterated that we need to get a strategy today in order to get funding for the project and to take stapes forward.

10.25 – 10.50am Break for morning tea

Robert van Barneveld resumed the meeting with an overview of the situation – the current agreement, as it stands is unacceptable to all parties on the basis that there is insufficient details regarding the IP and commercialisation process.

PRIORITY: Is to get the project application in place or we lose research capacity.

OUTCOME

FRDC Standard contract not strong enough re. IP – it needs to be protected via an amended agreement.

Crispian Ashby told the meeting that he needs to know the IP requirements of each party in order to amend the agreement and get it signed.

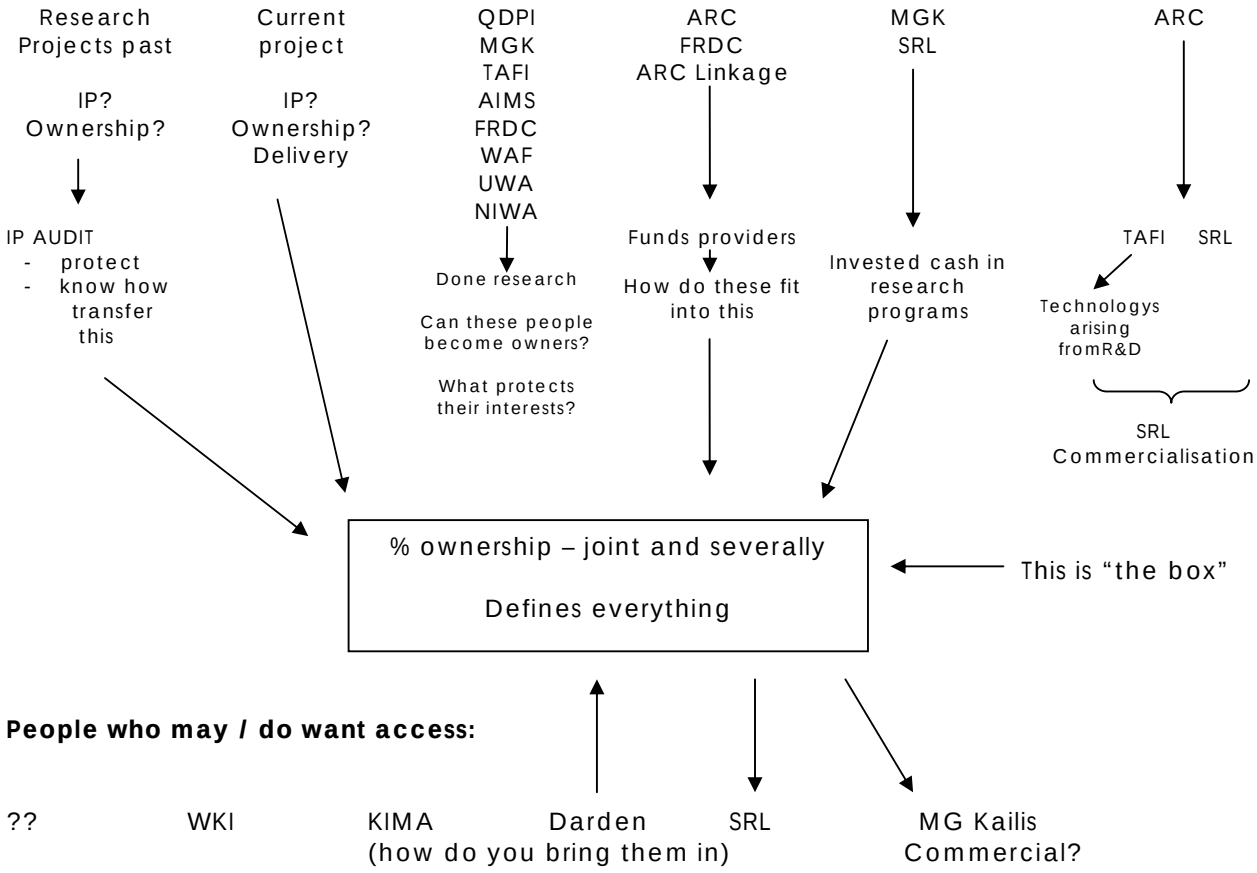
- Cluase 22 was considered (IP ownership & Tenants in common). James Fogarty stated (from a selfish point of view) the all IP should be vested in Kailis because Kailis don't believe all IP generated by TAFI, QDPI and AIMS can be retained – he asked if there should be on way traffic of IP to Kailis?
- John Hargreaves answered saying that Kailis would be the industry representative – if IP was developed than it would be available to anyone (for a fee or otherwise).
- Colin Buxton stressed the need to clarify differentiate between IP ACCESS & IP OWNERSHIP.
- James Fogarty: Kailis would want exclusive access to IP.
- Colin Buxton: We would provide the IP access 'exclusive' for a period – this is not a problem.
- Robert van Barneveld pointed out that the current agreement does not make any provision for access to technology to Kailis. James Fogarty suggested we have the standard agreement and another agreement that provides for exclusive access.

- Colin Buxton pointed out that the ARC gives exclusive access for a defined period of time. He feels there is no need to move away from the current agreement – there is just a need to clarify access and ownership and outline terms of exclusive access to Kailis.

The Committee was asked to consider the Public Sector component – what gives anybody a right to give exclusive access to Kailis?

- Pheroze Jungalwalla felt there should be no royalty stream to participants.
- James Fogarty made this statement: We (Kaliis) believe we are very close to commercialisation of *P. ornatus* and we believe we are in front of anybody else: we do not want to reduce the current advantage we have. We believe if we enter into an agreement with three entities they may expect us to share the IP we have – we would prefer one-way traffic with IP.
- Colin Buxton voiced TAFI's concern with one-way traffic as TAFI is a collaborative organisation. We would want healthy feedback and sharing with Kailis with an amendment stating that we would not use the IP in any way to the detriment of Kailis.

Robert van Barneveld outlined (via a whiteboard discussion) all points to be considered:



Points raised during this discussion:

- Daryl Sykes feels the Committee needs to separate out commercial development from IP.
- Pheroze Jungalwalla and Daryl Sykes discussed relevance of % ownership of IP – shouldn't the focus be on IP access – not ownership?

- Robert van Barneveld asked Colin Buxton: What does FRDC need to write to TAFI Legal Dept. to go forward? Colin replied that FRDC do not need to write to TAFI – TAFI will write to FRDC. No longer see IP as being the issue – now see 'sharing' as the issue.
- James Fogarty stated: If we (Kailis) could be convinced that IP could be protected from leakage we would not have taken that point of view – we remain unconvinced, with so many people involved, that leakage won't happen.

ARC Project discussion:

- Roger Edwards asked how are the outcomes of this project going to affect the ARC project? He stated that SRL would need to be acknowledged as a participant. Colin Buxton advised that this would be done in the 'Background IP' box of the application – can see the ARG agreement and the RLEAS projects having issues when attempting to roll it in. Roger Edwards reiterated that he wants to be acknowledged as a participant through his (SRL's) investment in the ARC – if the Arc project is linked with this project.
- Colin Buxton stated that this agreement does not define the relationships of the parties – the agreement is full of holes where Kailis is concerned – it does not provide access for the IP – the ARC's industry partner has absolute access ie. 1st use for 12 months – this project needs the same clause in its agreement.
- Robert van Barneveld asked the group what is needed to be done to get the project running? Colin Buxton suggested that parties need to all get together, share positions and concerns.

ACTIONS

- Each party to supply in writing its concerns with and recommendations for the Project Agreement.
- Robert van Barneveld to contact AIMS for their concerns with the project agreement.
- Comments from parties (TAFI, QDPI & AIMS) to be submitted to the Subprogram before 23rd April and distributed.
- FRDC to provide assurance to Kaliis re. leakage.
- AMIS, QDPI and TAFI to meet in Canberra on 23rd April. To collectively look at feedback. Robert van Barneveld to facilitate meeting.
- FRDC will take outcomes from this meeting to provide basis of assurance to Kailis.

1pm – break for lunch – after lunch discussion on 'the box' (see page 5) will begin.

Commercialisation

Robert van Barneveld opened the discussion referring to 'the box' stating that we now need to discuss the steps (document tabled by Robert van Barneveld: "Proposed Steps for Rock Lobster Research Management and Commercialisation").

The Committee perused and discussed this document with the following noted:

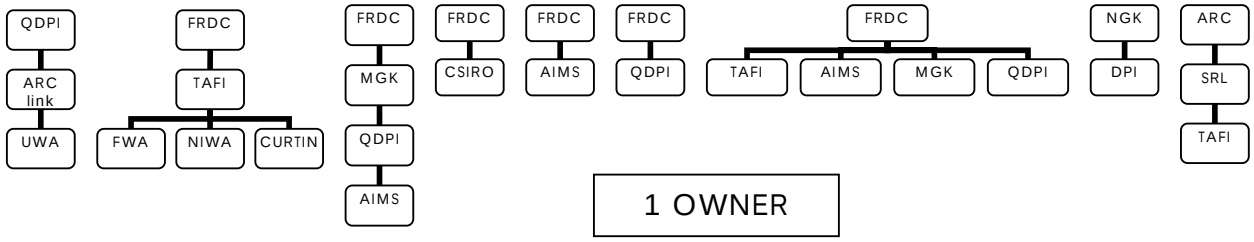
- Robert van Barneveld addressed the Committee stating that the document is based on a CRC model – if we develop a process similar to this we are likely to achieve our objectives. The document has listed three steps required and outlines management and ownership of various forms of IP. Section 3 of this document covers issues discussed this morning.
- Steven Gill raised his concern regarding WA as an initial party who could have participated in propagation but WA didn't pursue propagation because of other species more suitable. To be excluded on the basis of participation is unfair – WA has contributed funds to this research.
- Pheroze Jungalwalla stated the need to address access of IP. Robert van Barneveld advised that Item 1 of the document tabled addresses this issue – with reference to the black box – IP we generate we commercialise.

Questions raised:

1. Who are the parties in the black box?
2. How to define initial owner of legal entity – legal entity would own the IP.
3. How to define entry to the 'program'?
4. Part 3: If other interested will they need to go through the process? If MG Kailis get exclusive access there will be no other parties?

Whiteboard discussion addressing above questions ensued:

Parties / links:



Robert van Barneveld asked the committee:

How do you define who goes in 'the box' – all of these have contributed to an 'end point'? AND: Can you bring all of these current owners of IP / know how together to form 1 owner?

Points noted from the discussion:

- Crispian Ashby: FRDC is at the table on behalf of the industry.
- Pheroze Jungalwalla stated that we should make provision for 'others' to get access to this IP.
- Crispian Ashby suggested that FRDC would manage it on behalf of each sector in the industry.
- Daryl Sykes asked if there were legal consequences for 'restraint of trade' used to stop technology being bought and taken overseas? Crispian Ashby responded that agreement would state that the technology would not go or be used offshore.
- James Fogarty asked: If after doing the costs, you decide you can't do it in Australia then what's stopping you taking it overseas? Robert van Barneveld responded: At present, nothing.
- Colin Buxton stated the need to draw a line in the sand – in going forward, you need to recognize Background IP (ie. Creation of a hatchery manual) that can be built on as we go forward.
- Steven Gill mentioned WA's contribution and possibility of becoming one of the owners with Steven Gill and Bruce Phillips outlining WA's involvement in past research and funds contribution.

Robert van Barneveld asked: If you go forward with this model ("Proposed Steps for Rock Lobster Research Management and Commercialisation") does it meet everyone's needs – including SRL's?

- It was decided during this discussion that in the process of putting this forward an IP audit will need to be undertaken to ensure we don't overlook anything. The IP audit will identify what the IP is and assign a value to it.
- Put together a prospectus around this 'company', what it does and how much it costs to get it.
- Colin Buxton stated that we want to be opening the gates and letting it all out after the 12 moth period.
- James Fogarty: Need to take section 3 (page 2) out of the document.

OUTCOMES

- Need to have a "Terms & Conditions" drafted if MGK are to get exclusive access for 12 months, then making it available to others.
- Need to determine how 'others' will have access to IP.
- A mechanism to control the output is required.
- Going forward with this model using current participant as a starting point.

Robert van Barneveld advised the Committee that this would be how the subprogram will be replacing the Steering Committee. Neil Stump asked what is the plan with our current application (RvB01)? Robert advised the Committee that he is waiting on advice from FRDC Board. The company that will be created will be supported by funds that were used to support the Subprogram, ie. The new subprogram ill be supporting the 'company'.

Pending feedback from FRDC the Subprogram application is to be revised. We would then be looking at getting core players together to start the consultation process for the prospectus. Colin Buxton: Need to identify the group who will put this forward along with a core group of stakeholders – that group would include WA, Southern and others in the rock lobster industry, and major research providers.

ACTIONS

- In going forward, there will meetings in Canberra on 23rd and 24th April which will act on today's discussions regarding current contract.
- Circulate to Steering Committee comments from FRDC Board on current subprogram application.

Item 6 Progress Reports

Project 2004-239 *Strategic planning, project development, and facilitation of research and extension towards establishment and maintenance of commercial rock lobster aquaculture and enhancement systems in Australia - Robert van Barneveld*

Robert van Barneveld tabled a milestone progress report for this project.

OUTCOME

- Progress report accepted.

ACTION

Robert van Barneveld to circulate Darden letter to Steering Committee.

Project 2006-220 *Caleb Gardner*

No progress report supplied. First milestone fell due March 31, 2007. Colin Buxton advised that the project is progressing.

Item 7 Other business

- Rocklobster Congress: James Fogarty advised the Committee of Congress Activity:
    - Programs being printed and posted in the coming week.
    - All sponsorship has been finalised.

- Hoping for a budget surplus.
- Kevin Williams not keen to speak as nothing new to report – Clive Jones will speak in his place.

- Crispian Ashby addressed the Committee thanking them for their contributions to the Subprogram.

ACTIONS

- Kylie Franzmann to contact Matt Kenway re. speaking at the Congress.
- Robert van Barneveld to call Kevin Williams regarding Congress presentation.

Meeting closed 4.00pm.

Dr Robert van Barneveld
Subprogram Leader

Appendix X – Propagation Newsletters

Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 1: December 2004

This update is provided on a monthly basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar
Phone: 61 3 6227 7294, Facsimile: 61 3 6227 8035
Email: Arthur.Ritar@dpiwe.tas.gov.au

- Of about 40 Stage XI phyllosoma (hatched 9 Oct 2003) surviving to Oct 2004, 5 metamorphosed to pueruli. Of these, only the most recent one, christened "Peter the Puerulus", survived more than 48 h and has received wide media attention. He is 13 days old, in the non-feeding phase and expected to moult to a post-puerulus within days. Others are expected to metamorphose shortly.
- We attribute high survival throughout larval development to the benefits of ozonation of seawater. However, larvae became increasingly sensitive to ozonation by-products resulting in typical deformities at moult, which prevented feeding and respiration, leading to inevitable death. We believe these deformities are due to ozonation by-products interacting with moulting physiology but are not sure they are the same ones that reduce pathogens and are beneficial to health. We are keen to pursue funding (e.g. Australian Research Council Linkage Scheme) for further research on this topic.
- There are ≈300 animals moulting from Stage VII to VIII. These are from out-of-season Aug hatch and from which we achieved our best survivals (>70%, >2,000 Stage V), attributable mainly to use of ozonation. New monitoring equipment improved our understanding of phyllosoma tolerance to ozone. However, as was the problem last year, increasing sensitivity of larvae to ozonation by-products resulted in many deformities at Stages VI-VII. Remaining animals will be reared in water with lower levels of ozonation in an attempt to maximise survival and minimise deformities.
- We are repeating an experiment on Stage I phyllosoma examining larval density (10 or 40/l), water flow rate (2.5 or 5 turnovers/h) and water entry (top or bottom via jet) in 1.6 l jugs. This will hopefully provide an efficacious small-scale model when using flow-through ozonated water, allowing high replication when testing other parameters (e.g. food type, feeding rate, bacterial pathogens, probiotics) instead of using less representative alternatives (e.g. antibiotics in static culture) or large flow-through tanks.
- Broodstock at ambient light and temperature completed hatch-out in Oct-Nov, while animals on ambient light but low temperature (12°C) will hatch until mid Dec. Other groups on altered light/temperature will hatch in Feb, June and Aug each year, providing us with several options for larval rearing.
- This year, fungal infections of egg bundles saw many captive females strip all eggs prior to hatch. We first thought this problem to be nutritional and confined to our animals in captivity, but some wild females around Tasmania also had fungal infections, so the it appears to occur naturally.
- We held large broodstock from the wild in our tanks at MRL since Feb 2004. Large males (>3 kg) suffered high mortalities from mid winter onwards whereas smaller animals appeared normal. We attributed the problem to large animals suffering high stress in the relatively confined space of our holding tanks.
- Dr Greg Smith (MRL) will be visiting Dr Clive Jones and team (Cairns) in Feb 2005 to assist in transfer of technology between lobster propagation researchers.
- Experimental work has delayed the preparation of the final report for FRDC 2000/214.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones
Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703
Email: clive.jones@dpi.qld.gov.au

QDPI Rock Lobster Aquaculture

- Larval density trial run. Results clear – indicate that the stocking levels for big up-welling systems result in higher survival rates between 10-20 larvae per litre. After 4 weeks survival resulted in similar numbers of animal left per litre across all treatments. This has implications on further experiments within these systems.
- Completion of draft manual for broodstock.
- Set-up and stocking of non- experimental broodstock systems. Incorporation of new/test broodstock management plan outlined in broodstock manual.

- Design and manufacture of small scale raceway system for larvae. Small Mk IV version of raceway put into use with good results.
- Set-up of Broodstock experimentation system. System stocked encompassing a social factor experiment which aims to examine and compare the breeding success of males of different sizes within cohorts.
- Long term Blood protein analysis experiment begun with animals stocked into broodstock system. Results encouraging but not complete as need more numbers of animals in sample groups.
- Set-up of larval incubation experiment system.
- System running and holding correct temperatures in readiness for berried females from broodstock experiment.
- Continued development of stress test. Incorporation of a short "litmus paper" style test as an extension of "activity" style larval competency testing.
- The full development of this test will be incorporated as an extension to the current broodstock and upcoming larval incubation experiments.
- Fleshing out of larval analysis i.e. Fatty acid and calorimetric analysis techniques for use as confirmation/support of both larval stress test and incubation experiments.
- Design and manufacture of Large (i.e. 4.5M) raceway.
- Including stands, filtration etc. This system to carry large numbers of larvae with a view to producing our first pueruli through 2005.
- Set-up of Juvenile grow-out facilities completed 16x individual, full scale grow-out tanks set-up
- Two attempts at collection of juvenile lobsters within Cairns inlet. Numbers quite low – very hard to get especially later in the year.
- Beginning system preparation for next larval run.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall
Phone: 07 4753 4308, Facsimile: 07 4772 5852
Email: m.hall@aims.gov.au

AIMS Tropical Rock Lobster Propagation

- Broodstock – Spawnings have been obtained from the third broodstock group. The 3 groups being 1) natural daylength group, 2) May/June group and 3) Sept/Oct group. Some of the females dumped their fully developed eggs immediately before spawning, the reason for which remains unclear.
- Larval Rearing – A set of 12 new raceway-like larval rearing tanks being installed in addition to the 5 tonne, kreisel, upwellers and 50L tub tanks.
- Microbiology – Scanning electron microscopy (SEM) of larval rearing tank biofilm revealed increasing complexity of microbial community over time.
- Microbiology – Molecular analysis towards the identification of the microbial community of tank biofilms underway.
- Microbiology – Molecular analysis towards the identification of the microbial community of aretmia underway.
- Microbiology – Development of real time polymerase chain reaction (RT PCR) being developed for some of the key putative pathogenic Vibrio species in the larval rearing system to allow early detection of potential problems.
- Microbiology – Examination of biofilm and phyllosomas for quorum sensing molecules. Quorum sensing is a bacterial intercommunication system that controls the expression of pathogenic genes. Results demonstrate that quorum sensing is operational in the larval rearing system and is particularly strong during a mass mortality event.
- Phyllosoma feed – Second Coral Sea cruise to collect early stage phyllosomas of *P. ornatus* to be undertaken in mid-February 2005.

This newsletter is a communication of the Rock Lobster Enhancement and Aquaculture Subprogram (RLEAS) coordinated by the Fisheries Research and Development Corporation.

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Rock Lobster Enhancement and Aquaculture Subprogram
Propagation Research Update

Volume 1, Issue 2: January 2005

This update is provided on a monthly basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar
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Email: Arthur.Ritar@dpiwe.tas.gov.au

- Of the 8 phyllosoma that metamorphosed to pueruli, we have two juveniles (Peter and Buzz) that moulted to post-puerulus and are feeding and growing well. It is unlikely that any of the remaining few phyllosoma from the same batch will make it through to puerulus.
- Another batch of 200 phyllosoma are at stage IX and at least 6 months away from metamorphosis. These animals are receiving ozonated seawater. We are comparing growth and survival of larvae fed a diet of Artemia (~10mm) supplemented with chopped mussel alone or chopped mussel + squid. This comparison is being undertaken because even though larvae feed well on squid, our Japanese colleagues believe that squid in the diet could be harmful to animals during metamorphosis (mechanism unknown).
- Our small-scale experiment (using ozonated seawater) on larval density and water flow indicated that, at Stage I-III, densities should be no more than 40/L and that water flow should be no less than 5 times/h.
- A collaborative experiment was conducted between TAFI and NIWA in December using the NIWA probiotic formulation to examine whether it was incorporated into Artemia. The most suitable method will be used to deliver probiotics into phyllosoma to determine whether there are benefits in larval growth and survival.
- Out-of-season broodstock are expected to hatch Feb-March. The larvae from these will be used to examine probiotics in phyllosoma and other larval experiments.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones
Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703
Email: clive.jones@dpi.qld.gov.au

- An egg incubation experiment was initiated in December to examine the effects of temperature on incubation duration, egg morphology, and larval quantity and quality. Berried females were stocked in a series of temperature controlled tanks. The first of the larval hatches has begun. Preliminary results suggest larval quality best when incubated between 26-28^0 degrees Celsius.
- Additional competency testing of larvae has been trialled, with further modification and improvement of a salinity test. The fine-tuning of the test will require generation of a database over time to test the efficacy of this method
- A broodstock experiment was completed which examined breeding success of males of different sizes within cohorts. Synchronised breeding of animals was achieved en mass, producing large numbers of berried females. At this point in the analysis the results are inconclusive.
- A large raceway-style tank was designed, built and installed for mass rearing of larvae. Its recirculation system has now stabilised, and it will be stocked in January.
- Three broodstock populations are maintained at Cairns. In December, population #2 was in full production, population #1 was decommissioned after successful spawnings through early summer, and population #3 is now being prepared for breeding to start at end of February.
- Next larval experiment begins January 31, examining photoperiod effects on larvae. System modifications have been planned, the necessary light equipment purchased, and installation and testing will occur in January.

From the Australian Institute of Marine Research
Key Contact: Dr Michael Hall
Phone: 07 4753 4308, Facsimile: 07 4772 5852
Email: m.hall@aims.gov.au

- Broodstock – Spawnings occurring in natural daylength group.
- Larval Rearing – New 15-30 litre raceway-like larval rearing tanks installed and presently contain Stage 3 phyllosomas.
- Larval Rearing – Trial underway using flow through 0.22 micron filtered (sterile) seawater underway.
- Microbiology – construction of clone libraries from healthy phyllosomas and moribund phyllosomas at point of mass mortality.
- Microbiology – Preliminary DGGE analysis of total microbial community of biofilm
- Microbiology – Successful development of methods for total microbial staining of fouled phyllosomas using SYBR green.
- Microbiology – Successful development of FISH methods for investigating microbial fouling of Phyllosomas
- Microbiology – Development of real time polymerase chain reaction (RT PCR) continues for some of the key putative pathogenic Vibrio species in the larval rearing system.
- Microbiology – Colony numbers have been determined by culturable techniques for four Artemia diets (Newly Hatched, Algae-enriched, Super-Selco enriched and Protein-Selco enriched) both pre- and post-"clean-up" treatment.
- Microbiology – 16S sequence analysis has been performed on representative colonies isolated from the four different Artemia diets immediately prior to addition to the larval rearing tanks (ie post "clean-up" treatment). Analysis of sequencing results yet to be completed.
- Microbiology – Quorum sensing molecules found in phyllosomas, as well as in biofilm, indicating presence of pathogenic gram-negative, probably Vibrio spp. within the larvae themselves
- Phyllosoma natural feed – final preparations for Coral Sea cruise to collect early stage phyllosomas of *P. ornatus* to be undertaken in 4-15 February 2005.

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Rock Lobster Enhancement and Aquaculture Subprogram
Propagation Research Update

Volume 1, Issue 3: April 2005

This update is provided on a monthly basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar
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Email: Arthur.Ritar@dpiwe.tas.gov.au

- The two hatchery-reared juveniles have moulted 5-6 times since metamorphosis from phyllosoma at intervals of 18-39 days, are growing rapidly and are physically hardy.
- Of the new batch of phyllosoma hatched 27 August 2004, about 100 are at Stage 10-11. Surprisingly, one larva from this group just metamorphosed to puerulus on Day 250 (8.5 months old), much earlier than the first one from the previous batch on day 376 (i.e. 33% faster). We are yet to see whether this is an aberration but in any case, the larvae are considerably larger at the same age than the previous batch. This appears to be due to improved treatment of culture water, disinfection procedures and feeding regime. These larvae are from female that hatched out of season (on ambient photoperiod but on constant 15°C).
- However, larval cultures have still encountered diseases, notably "black leg" which was intercepted before fatalities occurred with disinfection but probably delayed moulting, as well as diseases of the digestive tract causing some mortalities.
- Out of season broodstock were expected to hatch in March but succumbed to the recurrent problem of fungal infections of egg bundles, causing complete loss of eggs before hatch. Some females in subsequent groups have also suffered the same problem but strict disinfection and hygiene procedures appear now to have reduced the problem.
- Larvae from the next hatch in June will be used to examine the use of ozonation, larger tank design and probiotics.
- We have had tentative discussions with a potential industry partner for collaboration in future research.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones
Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703
Email: clive.jones@dpi.qld.gov.au

- Egg incubation experiment completed. Data from all 15 broods collected. Differences in incubation duration were established and linked with variations in larval quality. Preliminary statistical analyses confirm 26-28 degree incubation temperature to be optimal for the generation of higher quality larvae. Further analysis of physiological and morphological characteristics of larvae currently underway.
- Still further modification and improvement to competency testing with the addition on data from more broods. Test is now at the point where it is beginning to show promise as a useful practical tool for determining larval quality.
- Broodstock experiment analysed finding breeding success to not necessarily improved by the addition males significantly large than broodstock females. Additionally, cohorts with very large males showed and increase in aggression and in turn deaths within these cohorts. Cohorts which included males of a similar size to females showed equally high breeding success rates with a lower mortality rate
- Raceway-style tank stocked with larvae. These larvae are at stage 5 and are surviving well
- Three broodstock populations are maintained in Cairns. Population #2 has been decommissioned after successful spawning. Population #3 is now in breeding condition and supplying larvae for experimentation.
- Larval experiment examining the effect of photoperiod on survival and moult stage experiment run and data collected. Analysis now in progress with preliminary results with 12 light:12 dark light regime having the highest rate of survival though this is to be confirmed statistically. Moult interval data is also currently being analysed.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall
Phone: 07 4753 4308, Facsimile: 07 4772 5852
Email: m.hall@aims.gov.au

- Broodstock – Spawnings have been obtained from the outdoor broodstock population.
- Broodstock – A fire in early February adjacent to the larval rearing facility impacted on operations by temporary shut-down.
- Broodstock – 'Egg dumping' by berried female of immediately pre-hatching eggs occurring in approximately half of females. May be related to oxygen depletion. Under investigation.
- Larval Rearing – An additional set of 16 new raceway larval rearing tanks installed in addition to 12 installed in January.
- Larval Rearing – Experiment 3.3a using commercial grade probiotics undertaken. Tested 2 commercial preparations; neither demonstrated improved survival in phyllosomas.
- Microbiology – Scanning electron microscopy (SEM) of phyllosomas revealing extent of external fouling by putative filamentous bacteria Thiothrix sp. Clearly interferes with feeding capability late in each molt cycle (developmental stage).
- Microbiology – Demonstration of quorum sensing mechanism occurring in larval rearing system indicating the activation of pathogenic mechanisms in the bacterial community of larval rearing system.
- Phyllosoma feed – Phyllosoma collection cruise completed 4-15 February. Cruise concentrated on eastern edge of Ribbon Reefs. 404 Scyllaridae and 12 P. ornatus phyllosomas caught.
- Tropical Rock Lobster Aquaculture Workshop (21-22 February 2005) – fruitful discussions and exchange of comparative information of technical difficulties between J. edwardsii and *P.ornatus*
- Greg Smith (TAFI) visited AIMS (Cape Ferguson) 23rd – 25th February.
- Primary laboratory research assistant with project went on extended leave in mid-February. Replacement advertised.

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Rock Lobster Enhancement and Aquaculture Subprogram
Propagation Research Update

Volume 1, Issue 4: May 2005

This update is provided on a monthly basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar
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Email: Arthur.Ritar@dpiwe.tas.gov.au

- Out-of-season broodstock are expected to hatch in early-mid June and the larvae will be used in several experiments for which preparations have been completed.
- One experiment will examine 6 treatments (each with 5 replicates in 1.6 l vessels containing 64 larvae / replicate) comparing unozonated (Control) culture water with various types of ozonation. The experiment will continue until Stage 5 or until significant differences are apparent.
- Another experiment will examine feed intake from hatch until Stage 5 for larvae subjected to different water dynamics. Larvae will be fed daily with Artemia (1.5-2 mm) at 1.5 ml^{-1} into 1.6 l vessels and the number remaining after 24 h will be counted to estimate intake. The turnover of ozonated water will be either 2.5 or 5 times h^{-1} producing low or high turbulence.
- The efficient production of more larvae to Stage 5 will be examined by comparing our standard 10 l vessels with large (50 l) culture tanks receiving pulsating water flow. Animals will be stocked into tanks at 20 l^{-1}. Tanks will receive ozonated water and Artemia (1.5-2 mm) at 1.5 ml^{-1}.
- The 90 phyllosoma at Stage 11 are continuing to develop at a rate faster than the previous year and we are hopeful of some reaching puerulus stage.
- A preproposal is being prepared for FRDC support of further propagation research into the period 2006-2009 with collaboration of institutional and private partners.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones
Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703
Email: clive.jones@dpi.qld.gov.au

- Of the three broodstock populations maintained in Cairns two have been destocked, and the third has produced several broods and is still breeding. The final two spawnings for this season are anticipated in early June. The broodstock systems will then be emptied, cleaned and dried. New broodstock will be introduced in August.
- All incubation experiments have been completed for this season. Additional incubation experiments are planned for next season (i.e. after system dryout through July) to examine relative quality of larvae from sequential spawnings.
- Larval competency testing protocols have continued to be developed on recent hatchings. Test is now consistently useful as a simple and practical tool for determining larval quality.
- Approximately 5,000 early stage larvae are being maintained in upwellers, prior to transfer to raceways for growout. They are being used to test the efficacy of large, on-grown (9 day old) Artemia.
- Approximately 20 instar 12 larvae are being maintained in a small raceway system. Mortality over recent weeks has been 1 to 3 per week.
- All mid-stage larvae in a large raceway tank died, shortly after a tank cleaning and formalin bath. This stimulated a formalin toxicity experiment to improve future formalin treatments.
- A formalin toxicity experiment has been completed to fine-tune our prophylactic formalin treatments.
- A series of morphometric measurements have been recorded from larvae preserved from previous experiments. Data will be analysed to determine subtle effects of treatments in photoperiod and incubation temperature experiments completed recently.
- Matthew Johnstone PhD student from University of WA recently departed after 3 months at Northern Fisheries Centre examining the efficacy of formulated diets for early stage larvae, as part of the associated ARC project.
- The associated ACIAR lobster growout project has formally begun.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall
Phone: 07 4753 4308, Facsimile: 07 4772 5852
Email: m.hall@aims.gov.au

- Broodstock – Final spawnings occurring from the outdoor broodstock population.
- Broodstock – Breeding activity is being observed in the first of two out-of-season broodstock populations. The females are expected to be spawning in June/July.
- Larval Rearing – Data from third probiotic test in Experiment 3.3a analysed and did not improve survival in phyllosomas.
- Microbiology – Specific bacterial species isolated that have the capacity to produce strong protease activity as well as being haemolytic. It is believed these species may be a source of exo-toxins and cause mortalities in the phyllosomas.
- Microbiology – External fouling bacteria on phyllosomas identified as Thiothrix and not Leucothrix. May be indicative of strong sulfur cycling in the larval rearing system and not due to poor nutrient rich water quality but rather the opposite.
- Microbiology – Scanning electron microscopy (SEM) reveals fouling of mouthparts within 3 days of moulting by Thitorix which progresses over the inter-moult period.
- Microbiology – Fluorescent in situ hybridisation (FISH) results demonstrate high diversity of bacterial fauna on and in phyllosomas. Strong Vibrio signals being obtained from hepatopancreas lumen.
- Microbiology – FISH demonstrating strong Vibrio signals in all compartments of larval rearing system – water column, biofilm, live feed and phyllosomas.
- Phyllosomas – collection cruise to Osprey Reef took place 21-29 May. Strong winds limited working area but over 60 phyllosomas and putative prey collected. One phyllosoma was immediately pre-puerulus. Phyllosoma have a high diversity in bacteria but limited numbers based on culturable species. Wild phyllosomas collected for microbiology, FISH, SEM and DNA extraction.

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 5: June 2005

This update is provided on a monthly basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar
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- A phyllosoma which metamorphosed to puerulus on Day 281 will probably not survive because of poor water flow in the holding tank. However, contrary to last season, this animal had no problems in extricating itself from the moult, probably due to better nutrition and husbandry conditions. More phyllosoma are expected to metamorphose in the coming two months.
- Experiment on feeding of phyllosoma to Stage III demonstrated that Artemia intake is affected by water turbulence.
- Preliminary data on different water ozonation treatments for phyllosoma culture was inconclusive and the experiment will be run again when new larvae hatch in early July.
- Large 50 L culture vessels are being tested in which we have 7,000 Stage II larvae and 1,000 Stage III larvae and that are planned to run these to Stage V.
- The broodstock fungal problem has reappeared in recently extruded egg bundles. We are bathing animals fortnightly in disinfectants which appear to stop fungal proliferation if treated early enough. More research is needed on effective doses and combinations of disinfectants as well as adverse effects on subsequent larvae.
- A new probe was purchased to monitor bromine by-products of ozonation of seawater.
- The preproposal for FRDC support of further propagation research is being finalized for the July 25 submission date.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones
Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703
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- Cairns broodstock populations have been de-stocked for system dry-out, maintenance and refit. New broodstock will be introduced in August.
- Broodstock experimental system under annual maintenance & being re-fitted in readiness for September restocking.
- Approximately 3,000 stage IV larvae are being maintained in upwellers, prior to transfer to raceways for growout. They have responded well to diet of large, on-grown (5-7 day old) Artemia.
- Of the batch of advanced larvae only 10 at instar 15 are left in a small raceway system. Mortality over recent weeks has been 1 to 3 per week.
- A formalin toxicity experiment almost completed to fine-tune our prophylactic formalin treatments has determined that repeated exposure between 15 - 30ppt can be beneficial to survival.
- A new mezzanine is under construction which has disrupted our larval work. When finished it will expand our larval and Artemia rearing capacity by 100%.
- Analysis has begun on morphometric data from incubation and photoperiod experiments

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall
Phone: 07 4753 4308, Facsimile: 07 4772 5852
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- Broodstock – Several females died from the May/July out-of-season breeding population. This population may fail this year. Cause of deaths is unknown.
- Broodstock – Females from the September/October out-of-season have tar patches.

- Microbiology – Fluorescent in situ hybridization (FISH) experiments on biofilm on-going. Analysis of biofilm over the first three weeks of larval rearing exhibits little change in the proportion of bacterial types. However, signal from Vibrios progressively increases.
- Microbiology - Sequencing of DGGE-bands (partial 16S rRNA gene) from biofilm experiment and analysis of retrieved sequences.
- Microbiology - Extracted DNA from isolates of the Vibrionaceae group isolated from biofilm experiment for sequencing of 16S rRNA genes.
- Microbiology - Optimization of extraction and purification of DNA from bacteria associated with Artemia for subsequent PCR amplification.
- Microbiology - Extracted and purified DNA from bacteria associated with post-hatched and enriched Artemia. Triplicate samples of Artemia before and after formalin/antibiotics treatment for newly hatched and enriched Artemia.
- Microbiology - Amplification of partial 16S rRNA genes from bacteria associated with post-hatched and enriched Artemia for subsequent DGGE-analysis.
- Microbiology - Harvested bacterial isolates from phyllosomas, seawater and potential prey collected during Cruise 3755 for DNA extraction and storage on glycerol.

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Rock Lobster Enhancement and Aquaculture Subprogram
Propagation Research Update

Volume 1, Issue 6: August 2005

This update is provided on a monthly basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar
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- In addition to the final stage phyllosoma that metamorphosed to puerulus on Days 250 and 281, several others have also metamorphosed but none yet have survived to post puerulus. However, contrary to last season, some of these animals had no problems in extricating themselves from the moult, probably due to better husbandry conditions. More phyllosoma are expected to metamorphose in the coming two months.
- The number of phyllosoma cultured to Stage V in the 12 months to Aug 2005 was 5,250. Of these, 2,500 Stage V larvae were produced in Aug 2005 in 4 x 50 L tanks. These tanks have a radically novel design incorporating an intermittent pulse action to keep larvae in suspension but with gentle motion. These tanks will be tested for their suitability for later stage larvae and larger tanks of similar design will also be examined.
- Experiment on feeding of phyllosoma to Stage III demonstrated that Artemia intake is affected by water turbulence.
- Experiments on different water ozonation treatments for phyllosoma culture were run in early June-August.
- Broodstock continue to be afflicted with fungal infections of egg bundles in some females from all phototherm-manipulated groups, even with regular disinfections. There is a need to investigate this further because of the possibility that the problem may be widespread in around Tasmanian waters.
- The two lobsters produced in Nov and Dec 2004 weighed (number of moults since metamorphosis) 21.1 g (9 moults) and 6.9 g (8 moults), respectively, on 26 Aug 2005. The intermoult duration has increased from 18-21 days soon after metamorphosis to 43-58 days more recently. They have now been weaned onto a diet of kuruma prawn pellets supplemented with half mussels.
- A new probe was purchased to monitor bromine by-products of ozonation of seawater.
- There were scientific exchanges in July/August: Mr. Nik Sachlikidis (QDPIF) visited TAFI, Mr Matt Salmon (AIMS) visited TAFI and Dr Arthur Ritar (TAFI) visited AIMS.
- The preproposal for FRDC support of further propagation research was given approval by TasFRAB to proceed to full proposal stage for consideration at their next meeting on 3 October.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones
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- Cairns broodstock populations have been de-stocked for system dry-out, maintenance and refit. New broodstock have started to be introduced and will be completely stocked by September.
- Broodstock experimental system under annual maintenance & being re-fitted in readiness for September restocking.
- New Large Scale *Artemia* rearing system under construction.
- Larval rearing recirculating system refitted/ rebuilt to accommodate different water treatment methods, including enhanced ozone capacity.
- A formaldehyde toxicity experiment completed to fine-tune our prophylactic formalin treatments has determined that repeated exposure between 15 - 30ppt can be beneficial to survival.
- New mezzanine is complete. Construction and expansion of *Artemia* and larval systems on this new area underway, including larger scale larval production tanks.
- Analysis mostly completed for egg incubation and larval photoperiod experiments with good, practical results generated.
- Milestone Report #5 compiled and submitted on time.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall
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- Visits – Matt Salmon visited QDPI Northern Fisheries and TAFI in August to exchange information and operational details.
- Methods – ozone water treatment method of TAFI being implemented at AIMS to examine if this approach improves survival of phyllosomas held at tropical seawater temperatures where microbial activity is significantly accelerated compared to temperate/cold seawater.
- Methods – continuous algal culture unit in production, producing 4-6 species of micro-algae continuously for enrichment of Artemia.
- Broodstock – Only one female survived in the May/July out-of-season breeding population. She spawned once.
- Broodstock – Females from the September/October out-of-season have made their pre-reproductive moult.
- Microbiology - DGGE-band (partial 16S rRNA gene) sequencing from biofilm experiment completed.
- Microbiology – developed species specific muli-plex PCR technique which targets collagenase genes of Vibrio alginolyticus and Vibrio parahaemolyticus and Vibrio bacterial isolate collection screened.
- Microbiology – collagenase PCR was tested with DNA extracted directly from Artemia samples to evaluate potential for real time PCR as early warning detection system (tool).
- Microbiology – screened Vibrio isolates with PCR targeting hemolysin genes (tl, trh, tdh) and toxR gene.
- Microbiology - DGGE-analysis of Artemia, either newly hatched or enriched with either micro-algae or Selco, completed.
- Microbiology – First small scale trials underway to identify which isolated Vibrio bacterial strains are pathogenic or probiotic in nature.

From MG Kailis

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- Requests for contributions to this newsletter were made but no information has been supplied. The RLEAS will continue in its attempts to obtain an update for the next newsletter.

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 7: November 2005 – January 2006

This update is provided on a regular basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

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- In Oct-Nov 2005, 5,000 larvae were mass-reared to Stage 5 with 4,000 in the new 500 l tipper tank and 1,000 larvae in the 100 l kreisel tank.
- Of the larvae hatched in June 2005, approximately 400 are now at Stage 9-10.
- From hatch out in August 2004, 10 phyllosoma progressed to puerulus at ages 250-458 days post-hatch (compared to 8 pueruli over a period 377-437 days in the previous year) but all died at or shortly after metamorphosis.
- Constructed another six 50 l surge tanks to increase our larval rearing capacity.
- Phyllosoma hatchery and Artemia room dried out and refitted for 4 weeks in January.
- Outdoor mass rearing (6 000l tanks) of algae and Artemia increased production during summer, with large numbers of adult Artemia cultured using minimal husbandry. This will be further examined over cooler months.
- Initial filtration, ozonation and storage of water (in 120,000 flow-through raceway) prior to further hatchery treatment appears to increase larval survival.
- A series of small-scale experiments were undertaken on disinfection treatments of newly-hatched larvae in which survival, growth and microbiology were investigated.
- NIWA Probiotic experiments suggest limited uptake by phyllosoma and biofilms (of culture vessels) of the probiotics with no appreciable effect on larval health.
- All broodstock carrying eggs and due to hatch in Feb-March 2006 were infected with fungus on their egg bundles. These females stripped their eggs prior to hatch even with repeated disinfection. Preliminary attempts will be made in the near future to examine alternative therapeutants, including ozone, for broodstock.
- The June-July broodstock are now mostly ovigerous with no fungal problems so far.
- A verbal report from Satoshi Mikami indicated that the Japan workshop on larval rearing was successful. Attendees included Andrew Jeffs and Phil James from NIWA and Kevin Williams from CSIRO, as well as prominent Japanese scientists. In Japan, researchers are currently producing ~200 pueruli/juveniles annually but are looking toward production of commercial quantities with the large increase in funding commitment from the National Fisheries Agency. Andrew is expected to provide a full report to RLEAS on his attendance.
- The application for a new FRDC propagation project was submitted in November and will probably need further re-writing before it is considered by the Board.
- Julia Hunter commenced as technical officer to replace Ed Smith.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones

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- Cairns broodstock populations have been re-established with new, wild caught lobsters, and their photo-period environments set to enable sequential spawning over the next 9 months. Mating activity and spawnings have occurred in the first population, and high quality larvae produced.
- A broodstock management experiment was initiated in September to examine social factors, and their impact on mating success. This experiment examines the effect of number of males on mating within fixed populations of five females.
- A refurbished *Artemia* rearing system, including improved micro-algae production, increased capacity (to 3 million 7-day old Artemia per day), and enhanced operational efficiency is now in operation, to support increased larval rearing capacity.
- Larval rearing recirculation system was rebuilt to accommodate different water treatment methods, including enhanced ozone capacity, and is now in operation. Ozone measurement and control via an in-line bromine/chlorine probe is a major feature which will enable more accurate measurement and targeted application of ozone treated water as a microbial prophylactic.
- 8,000 newly hatched larvae were stocked to two raceways for puerulus production. Best practice rearing methodology as generated from the experimental program and general experience will be applied to nurture these phyllosomae.
- Two new larval experimental systems have been established and are now operational. They add to the mini-upweller and upweller systems already in use. The first consists of 16 x 20L raceways, particularly well suited to nutrition/feeding experimentation, and to experiments on advanced stage larvae. The second consisting of 28 x 2L jugs (modelled on the TAFI approach), is suitable for various husbandry experiments, and is advantaged by its small resource demand for water, food and maintenance. Experiments will be initiated in these in February 06.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall

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- Mike Hall is currently on leave and will return in February 2006.

From MG Kailis

Key contact: Roger Barnard

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- Last season (20004/05) we reared 5 batches of *P.ornatus* phyllosoma at the MG Kailis hatchery in Exmouth, with the best result being 51% survival at day 53 by which time the larvae were at instar 11&12.
- We terminated the Tropical Rock Lobster (TRL) larval rearing trials in May 2005, due to a maintenance / building period

- We have carried over three female and one male *P.ornatus* broodstock from last season, which have yet to berry up.
- Within the next few weeks we intend to collect some more wild ornatus broodstock for propagation and to build on our TRL larval rearing trial results from last year.
- First batch of TRL phyllosoma are currently being reared at Exmouth.
- A total of 3,500 phyllos stocked into 4 x 50 litre upwellers.
- Still trying to collect more broodstock for further TRL larval trials.
- Larvae are currently 6 days old and Stage 1.

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 8: February 2006

This update is provided on a regular basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar

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- Of the larvae hatched in June 2005, approximately 300 are now at Stage 10-11 in 50 l tipper tanks.
- *Artemia* production recommenced after dry-out. This consists of 4-6 tanks (each 650 l) stocked with newly-hatched *Artemia* @ 7/ml on a staggered schedule and on-grown on a diet of live algae (*Chaetoceros muelleri*, T. *Iso*., *Pavlova lutheri*) and algal paste (*Dunaliella*), rice pollard and Vitamin C. *Artemia* are harvested at 2-4 weeks old (6-12mm) for feeding to phyllosoma on Monday, Wednesday and Friday each week.
- July broodstock group extruded eggs in February with no fungal problems so far.
- The loss of eggs from all broodstock in the previous February group due to fungal infection means that further larval experiments will be undertaken only when the next group hatches out. This would normally be in July but a few ovigerous females will be held in warmer water (at 16C) to hatch earlier in May.
- A manuscript on water treatment for larval rearing was submitted to the journal Aquaculture Research. Another manuscript on larval studies from late 2005 is with the RLEAS Leader for review before submission to the journal Aquaculture. A third manuscript on larval studies is at the advanced draft stage.
- The TAFI labs have just completed a major upgrade of the seawater intake lines at a cost of $350,000. The line was extended further into the Derwent River from an initial length of 100m at a depth of 6m and is now 300m long and sits at a depth of 12m. This has resulted in an immediate improvement in water quality, increasing the salinity to over 34ppt from the previously typical 32ppt. This should hopefully provide more consistent water quality for phyllosoma rearing.
- The 120,000 l water storage tank was refitted to improve sedimentation of solids after initial filtration and ozonation, which should result in even better water quality.

From the Queensland Department of Primary Industries

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- All prior milestones to date met.
- February 28, 2006 milestone has two experiments due. i) broodstock management experiment and ii) larval rearing system development. They have been completed.
- Excellent progress, and project performing strongly.
- Multiple larval systems now well established and operating optimally.

- 2,000 stage V larvae in large raceways are going strong. Now 6 weeks old. Fed enriched *Artemia* for first 4 weeks and then mixture of *Artemia* and pipi flesh since. Indications are they are about to moult to stage VI.
- Raceway trial (as above) achieved 60% survival of larvae to stage IV, confirming that this can now be done routinely.
- Improved larval hygiene due to:

  Ultra clean *Artemia* production,

  Fine-tuning of recirculation system and

  Fine-tuning of application and measurement of ozone.
- Batch broodstock approach working very well. An excess of high quality larvae are being produced.
- At least one more major larval rearing experiment will be completed before end of current project.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall

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- Successful larval rearing of rock lobster larvae (phyllosomas) on a commercial scale is poised to become a reality if larval attrition can be significantly reduced from what is presently being achieved. With a larval phase spanning several to many months the mortality rate of phyllosomas must be reduced as much as possible and ideally less than 20% per month for the production of sufficient quantities of post-larvae to supply a commercial grow-out facility. The underlying bottleneck is larval attrition that exceeds that of commercial necessity. Project 2003/211 is comprised of five objectives which are targeted to improving overall production efficiency in phyllosoma supply and successful larval rearing. AIMS has had involvement in three of five objectives (Objectives 1, 3, and 4) over the past 6 months.

- Broodstock populations of *Panulirus ornatus* have been held at both the QDPI Northern Fisheries Centre (NFC), Cairns and at AIMS, Townsville. Broodstock research at the NFC has focussed on the short-term (months) holding and precise triggering of spawning in specific females to meet research requirements. The broodstock has focussed on long term (years) holding at AIMS to have 3 populations of out-of-phase annual cycles to obtain spawning females in each month of the year. Both efforts are producing valuable information on the production of phyllosomas at anytime of the year.

- The two of the three broodstock populations at AIMS are held indoors and have been photoperiodically manipulated to have breeding seasons starting in May, August and one natural breeding season from a population held in outdoor tanks. In 2005 the May group only produced 2 spawnings from a population of 5 females. As has been repeatedly observed there can be high mortality in females during or at the end of the expected breeding season which was especially the case in this group. The August group produced 12 spawnings from a population of 5 females. As of mid-February 2006 the outdoor group is just coming into breeding, with several females having mated and bearing tar patches (spermatophores).

- It is generally believed that the primary mortality factors for phyllosomas include disease and sub-optimal nutritional status. A significant proportion of larval mortalities may be attributed to bacterial infections. A particular problem that is specific for the tropical rock lobster is that of water temperature. The optimal temperatures for tropical rock lobsters (26-29 C) are particularly favourable for bacterial growth in general and Vibrios (some of which are pathogenic).

- Experiments have focussed on the identification of the overall microbial community by examining the larval rearing system as four interconnected compartments – the water column, the larval feed, the biofilm and the phyllosomas themselves. Several bacterial strains have been isolated from the system that are potential pathogens and others that are potential probiotic strains. Research in the last 6 months has focussed on the complexity of the microbial community within the biofilm and the

- pathogenic strains within it. Briefly, the microbial community is a dynamic one with the appearance of Vibrio species early on in larval rearing and these are known to comprise pathogenic forms.

- Experiments are presently underway in which populations of phyllosomas are exposed to specific isolated strains to identify those that are either pathogenic or demonstrate probiotic properties. The next step is to develop real time rapid and *in situ* diagnostic monitoring of the pathogenic microbial community within the larval system. Such tools will enable rapid identification of when the microbial community becomes deleterious to phyllosoma health allowing measures for controlling this community to be taken.

- External fouling, especially that around the mouthparts and maxillipeds, is consistently observed in larval rearing. Such fouling appears to have a profound detrimental impact on overall larval quality. Phyllosomas have been collected throughout two larval phase periods, from Stage 1 to 2 and 3 to 4, and are being examined for progression in external fouling over time. Large numbers (approximately 300) of wild phyllosomas have also been collected from a recent cruise in the Coral Sea and these will be examined by scanning electron microscopy (SEM) for external fouling and compared to that seen in captivity.

- Further improvements in the optimisation of phyllosoma rearing conditions have been made. An ozone generation unit, based on information obtained on the unit developed by TAFI, has been constructed and commissioned at AIMS. Further improvements in Artemia production and grow-out has also been made to include 4 x 400L production at a density of 5-20 Artemia naups/mL as well as 2 x 1000L tanks at a density of 0.5-5 naups/mL. An additional 10 tonne tank system is being constructed for further production and longer grow-out periods.

- Over the past 6 months a bank of additional larval rearing tanks have been designed and built at AIMS. These include a raceway design and turbulent flow surge design. These tank designs will be used together with a previously designed U-shaped upwelling design and that used by DPI Northern Fisheries Center to meet the requirements of Experiment 4.11.

- Further improvements in a large scale Neuston plankton collection net has been made and was successful in the collection of several hundred phyllosomas in the Coral Sea. Phyllosomas were collected and sorted based on the volume of gut content containing food. This collection may allow for the DNA analysis of gut content for the identification of the wild diet of phyllosomas to contribute to the future development of artificial feeds for hatchery production of phyllosomas.

From MG Kailis

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- We had a TRL (*P.ornatus*) hatching in early February, our first of the season.
- At instar 2, day 8, the average survival was 96%.
- At instar 4, day 20, the average survival was 75%, with 96% survival in one tank being the highest.
- For instar 4 the average carapace length was 1.798mm and carapace width 1.327mm.
- The phyllosoma began moulting through to instar 5 at day 25.

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 9: March 2006

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From the Tasmanian Aquaculture and Fisheries Institute

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- The first of the Jasus edwardsii larvae hatched in June 2005 metamorphosed to puerulus at Day 286. Approximately 200 are now at Stage 11 in 50 L tanks.
- J. verreauxi broodstock, which were on-grown at TAFI since puerulus, hatched out their eggs in January 2006. At 64 days after hatch, approximately 800 phyllosoma are at Stage 7-8. This is 35% earlier than for J. edwardsii and indicates that they develop considerably more rapidly through each stage. For the first 5 stages, larvae moulted every 6-7 days, after which intermoult intervals became slightly longer. The larvae are cultured in warmer water (23 C) in larger (500 L) tanks but otherwise culture conditions are similar (feeding regime, lighting, seawater ozonation).
- The July J. edwardsii broodstock, which extruded eggs in February, still have no fungal problems so far and are due to hatch in July except for a few ovigerous females held in warmer water (at 16C) to hatch earlier in May.

From the Queensland Department of Primary Industries

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- Cairns broodstock populations have been spawning readily. The first population generated 10 successful hatchings, and has now been decommissioned. The second population, controlled for a peak in spawning over Feb/Mar, has generated 6 hatchings to date, and all larvae produced have been of high quality.
- A broodstock management experiment initiated in September 2005 to examine social factors, and their impact on mating success was completed. This experiment examined the effect of number of males on mating within fixed populations of five females. Mating success was consistently high with one male, and inconsistent with two males. Our recommendation is that one male be placed within populations of five females.
- The refurbished *Artemia* rearing system, is currently generating between 1 and 3 million 7-day old Artemia per day. We've determined that the maintenance and management of the algae and *Artemia* system requires 1.0 FTE on a continuous basis.
- Ozone measurement and control via an in-line bromine/chlorine probe is performing well giving us considerably more accurate control over system disinfection. Initial inconsistencies with bromine measurements relative to the ozone generator settings and to ORP readings have now been overcome.
- Recent larval runs have focussed on the establishment and fine-tuning of large (250L) raceway tanks, of which two are now in operation. Data for the initial runs consists of:
    - 4,000 stage I larvae stocked to each raceway.

- For raceway #1, 50% survival was achieved to instar 4-5 over 30 days; 10 days later they crashed out.
- Raceway #2 achieved poorer survival (20%) through to day 20 after which mortality significantly decreased. Daily mortality was low but consistent to around instar 8-10 over 74 days, at which time the remaining larvae were discarded.
- 4,000 larvae were again stocked into raceway #1, with significant losses from days 12-20 leaving only 1000 animals remaining. Mortality has now settled with only minimal losses to date (day 35, instar 5).

- Initial teething problems with the large raceways have been clarified and resolved. However we are of the opinion that such raceways are unsuitable for very young phyllosoma, to instar 4. In contrast, stage IV+ perform strongly in the raceways, and they are likely to provide a good environment for mid to later stage larvae.

- A new mass rearing tank for phyllosoma has been developed and is currently being trialled with encouraging results. The first run consisted of 4,000 larvae in a 250L tank reaching instar 4-6 over 35 days at approximately 75% survival. Further development of this tank will be pursued with several potential improvements have been flagged.

From the Australian Institute of Marine Research

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- Natural photoperiod broodstock population spawning, with 5 females producing 9 spawnings.
- Three cohorts going through larval rearing: Cohort 1: 150 phyllosomas Instar 8 progressing well, Cohort 2: 1,000 phyllosomas Instar 3-4, Cohort 3: 800 phyllosomas Instar 2.
- Further improvements made to larval rearing tanks in preparation for experiment to trial 4 different tank designs.
- Artemia production further improved with 3 x 800 L tanks producing 2.5 naups/mL.
- Ozone system optimised and running, producing 40,000 L /day.
- Cruise 3979 on RV Lady Basten scheduled for 21 April – 6 May to collect late stage P. ornatus phyllosomas.
- Probiotic tests with bacteria isolates from previous larval rearing attempts being trialled.
- Completed analysis of biofilm microbial community by scanning electron microscopy (SEM).
- Construction of $1.28 million AIMS@JCU environmental control marine facility nearing completion – parts of this facility are targeted for use in rock lobster broodstock holding and larval rearing and AIMS@JCU PhD students.

From MG Kailis

Key contact: Roger Barnard

Phone: 08 9949 2508

Email: rogerbarnard@kailis.com.au

- We have a batch of phyllosoma at 57 days old with survival of 65%.
- The larvae range from instar 8 through to instar 11 (stage 6).

- The phyllosoma mean carapace width at instar 11 is 3.64mm and the mean carapace length is 5.54mm.
- The larvae are progressing through their instars at a far more rapid rate than literature from a couple of years ago would suggest. Instar 11 has been reached in 60% of the time that was taken to reach the same stage three years ago. We are starting to doubt the original estimates of a 180-200 day larval cycle for ornatus and becoming more confident that it will be closer to 120-140 days to puerulus.
- We believe that these big advances in ornatus larviculture that have taken place in only 3 years (which are also being experienced by QDPI) are mainly due to improved nutrition (quality and variety) alongside improvements to fundamental husbandry such as removal of excess feed, improved water quality management, correct feed size and timing of feeds, and optimum culture temperatures.
- Roger Barnard and Tim Quick of MG Kailis visited AIMS and QDPI in March for a technology transfer visit. We were impressed with the significant scaling-up of the TRL larval rearing system, the innovations in tank design at both facilities and the teams' enthusiasm for the project and the confidence we all now feel for its chances of success.

This newsletter is a communication of the Rock Lobster Enhancement and Aquaculture Subprogram (RLEAS) coordinated by the Fisheries Research and Development Corporation.

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 10: April / May 2006

This update is provided on a regular basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar

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Email: Arthur.Ritar@utas.edu

- An experiment was undertaken to determine the toxicity of seawater ozonation, as assessed by ionized bromine (Br) content, on *Jasus edwardsii* phyllosoma. Broodstock (held under controlled phototherm conditions) hatched high quality larvae, as determined by the salinity challenge test, for use in the study. The survival of the larvae to Stage II was not significantly different in the control (0 Br) treatment and 1 ppm Br (as measured in the effluent water), and similarly there was no difference in moulting pattern. However, at 3 ppm and 10 ppm, larvae died at the moult or showed the typical abnormalities of excess ozonation. Further, at progressive increases in Br content, mortalities became increasingly acute, with all larvae dying within 24 h of exposure (i.e. within 24 h of hatch) at the highest Br content of 810 ppm. The results provide a framework within which larvae may be cultured with short or long term exposure to various levels of "safe" and toxic levels of ozonated seawater.
- The first of the *J. edwardsii* larvae that hatched in June 2005 and metamorphosed to puerulus after 286 days has since moulted twice and is an actively feeding juvenile. Approximately 100 larvae from the same cohort are at or close to the last instar of Stage 11 before metamorphosis.
- *J. verreauxi* phyllosoma (n=300) hatched in late January 2006 are up to Stage 10 at 140 days after hatch and feeding well on large *Artemia* and chopped mussels.
- Of the out-of-season *J. edwardsii* broodstock, which extruded eggs in February, some have a fungal infection of the eggs but appear to be responding to anti-fungal treatment and most are due to hatch in July.
- The ambient *J. edwardsii* broodstock have been split into two tanks, one receiving previously ozonated water and one in unozonated water, to determine whether this treatment will alleviate the problem of fungal infection.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones

Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703

Email: clive.jones@dpi.qld.gov.au

- The last of the Cairns broodstock populations have spawned readily producing high quality larvae. This final population has now been de-stocked with restocking to be carried out in July.
- Significant increases (increase from 3 to around 4 million ongrown per unit) in *Artemia* production have been achieved through further improvements in algal cultures.
- Larval experimentation has focused on the enrichment of on-grown *Artemia*. More specifically, the focus has been on tissue enrichment of the *Artemia* with various (including commercially available) products. Results of the 1 month pilot study suggest that enrichment could be significantly beneficial to larval survival. Repeated examination of this result is currently underway with no significant trends to date (16 days in).
- Recent larval runs have focused on the establishment of four large (250L) Pulse tanks, of which two are now in operation. Two cohorts of larvae are current with data from these runs consisting of:

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- Cohort 1
  - 6,000 stage I larvae stocked (24/L).
  - 87% survival (n = 5220) to instars 4-6 in 30 days.
  - Still good survival to this point at higher densities than previously tried.
- Cohort 2
  - 2x 250L tanks.
  - Tank 1 used for enzyme sampling within the first 12 days with 7 deaths recorded from an initial stocking n=6000 within this time.
  - Tank 2 stocked at 28/L (n=7000). Currently 16 days old with survival in excess of 95% (28 deaths recorded to date – 0.4%).

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall

Phone: 07 4753 4308, Facsimile: 07 4772 5852

Email: m.hall@aims.gov.au

April 2006

- Natural photoperiod broodstock population terminated spawning.
- Two cohorts going through larval rearing: Cohort 1: 93 phyllosomas, 75 days old, Instar 8 progressing well, Cohort 2: 246 phyllosomas, 29 days old, Instar 4-6.
- Cruise 3979 on RV Lady Basten took place for 21 April – 6 May. Over 400 phyllosomas collected, 124 *P. ornatus*. Collections also made of putative live prey.
- Due to staff departures and long term maternity leave some research activities are delayed.

May 2006

- Out-of-season broodstock population have undergone their pre-reproductive moult.
- Two cohorts going through larval rearing: Cohort 1: 54 phyllosomas, 95 days old, Instar 10 progressing well, Cohort 2: 151 phyllosomas, 59 days old, Instar 7-8.
- Improved pre-filtration of water supply to 0.5 micron.
- Further improvements to mass Artemia grow-out at 2.5 naups/mL.
- Participated in RLEAS Workshop, Sydney, 18-19 May.
- Marine microbiologist position associated with the project advertised.

From MG Kailis

Key contact: Roger Barnard

Phone: 08 9949 2508

Email: rogerbarnard@kailis.com.au

- No submission supplied.

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 11: June 2006

This update is provided on a regular basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar

Phone: 61 3 6227 7294, Facsimile: 61 3 6227 8035

Email: Arthur.Ritar@utas.edu

- No submission supplied - Arthur is currently on leave and will return early August 2006.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones

Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703

Email: clive.jones@dpi.qld.gov.au

- All experimental work for the current project has now been finalised and all milestone experiments have been successfully completed. With confirmation of a new propagation project now received, our work for the next 3 months will focus on adjustments to the facility to accommodate new objectives and experiments. In particular this will include dismantling of the broodstock experimental facility, to accommodate expanded larval production, increased live food production capacity, expansion of broodstock populations from 3 to five, construction of a permanent, large-scale hatching tank, and establishment of a manufactured feed laboratory for production of formulated larval diets.

- Only one broodstock population has been retained to enable spawning as early as September if necessary. New broodstock will be introduced in August. Broodstock management has been one of the outstanding successes of the current project, with regular spawning of lobsters now routine, and production of high quality larvae on demand. This broodstock management technology has been successfully transferred to Kailis, and preparations have been made for transfer of technology to TAFI in support of the new project involving larval production of *P. ornatus* at the TAFI facility. Dr Arthur Ritar visited the Cairns facility in early July to initiate this transfer.

- *Artemia* production during June was significantly diminished due to cool ambient conditions (< 20°C). Minor capital works funding has been allocated to enable temperature control of the rearing system, for consistent production year-round of up to 4 million, 7-day old *Artemia* per day.

- Two larval rearing experiments were completed examining *Artemia* enrichments, and their impact on survival and growth of early stage larvae (hatch to stage 4). Results were variable, and it is questionable whether any of the enrichments are beneficial.

- Recent larval runs have focussed on the establishment and fine-tuning of large (250L), vertical flow pulse tanks. Excellent survival (> 90%) of large numbers (6000 per tank) to 4 weeks age have been consistently achieved, although mortality then increases significantly, resulting in survival of around 50% to late stage 4 / stage 5. This bottleneck will be a focus of the new project.

Australian Government
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From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall

Phone: 07 4753 4308, Facsimile: 07 4772 5852

Email: m.hall@aims.gov.au

- No submission supplied.

From MG Kailis

Key contact: Roger Barnard

Phone: 08 9949 2508

Email: rogerbarnard@kailis.com.au

- N June 2006 we got our first *P.ornatus* puerulus through successfully at our facility in Exmouth.
- We now have 7 puerulus through, with more expected in the coming weeks.
- There were 23 instars to reach puerulus.
- The first transition to puerulus occurred after 139 days.
- We currently have 280 late-stage phyllosoma approaching the puerulus moult left from this batch of larvae, originating from one tank of 1,000 larvae.
- There have been some inconsistencies in the moult cycle of the larvae as they reach the final stages.
- The latest information we received from wild-caught phyllosoma indicated there were 12 stages. There appears to be one more well-defined stage (or instar), "Stage 13", before the metamorphosis to puerulus.
- Some phyllosoma (approx. 30) have attempted to moult through from "Stage 12" straight through to puerulus, missing the final "Stage". These larvae have been unsuccessful in making the transition.
- There may be some temperature cues for successful transition to puerulus (such as diurnal variation experienced from their migration through the water column in the wild). There could also be photoperiod / light intensity cues involved.

First *P.ornatus* puerulus 23/06/06

P.ornatus puerulus 29/06/06

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 12: July 2006

This update is provided on a regular basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar

Phone: 61 3 6227 7294, Facsimile: 61 3 6227 8035

Email: Arthur.Ritar@utas.edu

- Of the *Jasus edwardsii* phyllosoma hatched in 2005, two are now healthy juveniles, having progressed without assistance through to puerulus and post-puerulus. Several others died shortly after metamorphosis. More final stage phyllosoma are expected to metamorphose shortly.
- Of the *J. verreauxi* phyllosoma hatched in early 2006, 214 are now (early August) at Stage XI with the largest ≥ 35 mm long and expected to metamorphose soon. All larvae are feeding aggressively on large *Artemia* and chopped mussels.
- The number of *J. edwardsii* broodstock have been rationalised as the current FRDC project comes to an end.
- Preparations are underway for the new FRDC project on propagation research of *Panulirus ornatus*. Funding of approximately $46,000 has been approved by the University of Tasmania Science Faculty for quarantine containment facilities of *P. ornatus* broodstock and larvae. These funds will be used for refurbishment of a room to PC2 standard.
- Water pre-treatment for eventual use in the hatchery is now better controlled with sand filtration followed by ozonation during foam fractionation using an improved ORP controller, before settlement of the water for 24 h. This produces more consistent and higher water quality prior to further ozonation of the water used for hatchery rearing.
- An accurate correlation was determined between ORP levels and bromine concentration at ORP levels of between 400 to 600 mV.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones

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Email: clive.jones@dpi.qld.gov.au

- No submission supplied – all experiments in current project are now complete.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall

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Email: m.hall@aims.gov.au

- Out-of-season broodstock populations have been moved into new environmental controlled facility.
- Out-of-season broodstock July/September population have undergone their pre-reproductive moult and exhibiting reproductive behaviour. However, as yet females have no tar patches.

- Phyllosomas of Cohort 1 (n=10) are now over 180 days of age at Instar 20.
- Phyllosomas of Cohort 2 (n=30) are now over 120 days at Instar 18.
- Marine microbiologist position (made vacant for several months by staff maternity leave/resignation) associated with project has been appointed.

From MG Kailis

Key contact: Roger Barnard

Phone: 08 9949 2508

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- No submission supplied

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 13: August 2006

This update is provided on a regular basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar

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- Of the *J. verreauxi* phyllosoma hatched in early 2006, 50 have metamorphosed to puerulus and the first few of these recently moulted to post-puerulus. Interestingly, just before this moult, they developed a strong red-orange colouration which intensified after the moult. Approximately 140 late-stage phyllosoma are still to metamorphose.
- Although there has been no confirmation of a new FRDC RLEAS propagation project, work has already commenced on a Physical Containment 2 (PC2) room for the prospective research on *P. ornatus*.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones

Phone: 61 07 4035 0182, Facsimile: 61 07 4035 6703

Email: clive.jones@dpi.qld.gov.au

- All experimental work for the current project has now been finalised and all milestone experiments have been successfully completed. Due to uncertainty of on-going funding, one of two FRDC funded staff has been let go.
- Broodstock experimental facility dismantled to accommodate expanded larval production. The room will now be setup with 8 pulse tanks.
- Broodstock population tanks increased from 3 to five, and connected with dedicated recirculation system to facilitate both photoperiod and temperature control
- Minor capital works funding allocated to enable temperature control of the rearing system, for consistent production year-round of up to 4 million, 7-day old *Artemia* per day. Job has been contracted, and materials ordered.

From the Australian Institute of Marine Research

Key Contact: Dr Michael Hall

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- Out-of-season broodstock July/September with 1 berried female. However, no apparent tar patch and may be infertile.
- Outstanding milestones dependent on several successful high quality hatches.

- Phyllosomas of Cohort 1 developed deformities and with further mortalities there are no survivors.
- Phyllosomas of Cohort 2 (n=5) are now over 220 days at Instar 20 but also exhibiting signs of deformities.
- Presentation give on microbiology of wild and captive reared phyllosomas at Australian Aquaculture, 27-30 August, Adelaide.

From MG Kailis

Key contact: Roger Barnard

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- There are 47 *P.ornatus* hatchery-reared juveniles at our Exmouth facility, after losing 10-12 puerulus and juveniles to cannibalism.
- The largest juveniles have moulted three times post-puerulus and are now weighing 2.6 g.
- An expansion of the R & D facility at Exmouth is planned for the next few months, with no TRL larval runs expected until December or January.

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Rock Lobster Enhancement and Aquaculture Subprogram

Propagation Research Update

Volume 1, Issue 14: March 2007

This update is provided on a regular basis to improve communication between research groups from around Australia who are actively working towards closure of the spiny lobster life cycle.

From the Tasmanian Aquaculture and Fisheries Institute

Key Contact: Dr Arthur Ritar

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The delay in finalizing the FRDC contract has obviously delayed the research on rock lobster propagation and the collaboration between partner organizations. The proposed research (such as experimentation on ozonation) has not yet been done and the post-doc scientist position formerly occupied by Greg Smith has not been filled. There has also been a concern in retaining other contract staff and the inability to buy the required equipment and consumables. Consequently, there has been some loss in momentum established from the preceding FRDC projects that terminated in June 2006.

However, at TAFI, we have still continued to work on eastern rock lobster, as follows:

- Produced 139 pueruli in 2006. Of these, juveniles have now moulted up to 9 times since metamorphosis and are the subject of an initial comparison of growth rates at 15, 18 and 21°C.
- Larvae hatched in late January 2007 have now moulted up to 8 times in culture.
- Testing continues on tank designs and sizes, as well as water flows.
- More accurate control of levels of ozonation.

The draft final report for 2003/212 is in preparation and will be submitted shortly.

The contract for the 3-year ARC grant has just been signed and we will commence research immediately with the appointment of staff and purchase of materials.

From the Queensland Department of Primary Industries

Key Contact: Dr Clive Jones

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Project 2003/211

All contracted milestone experiments were completed in 2006, and reported in previous milestone reports, with the exception of Experiment 1.11 'Preparation of a broodstock manual'. QDPI is awaiting AIMS input to finalise the document. The draft final report (QDPI sections only) has been prepared, but a complete draft report is unable to be submitted due to the delays in completion of AIMS experiments. Our understanding is that these will be completed by May 2007, and reported soon after. My expectation is that it may be July or after that a draft report can be submitted.

New Project 2006/235

QDPI has committed to a full research program as per the submitted application for this project, and received several affirmations from RLEAS / FRDC that allocation of funds (as per the approved budget) would be forthcoming, once contracts were signed. The uncertainty of the project (due to lack of signed contract) has

impacted on capacity to undertake the research, particularly in regard to the initial recruitment and ongoing security of key technical staff who have been on rolling short-term contracts. Nevertheless, the contracted year 1 milestone experiments in regard to Objectives 1. Nutrition (3 experiments) and 3. Benchmarking puerulus production (1 run through to late stage larvae), are being executed. The first of 3 nutrition experiments is currently underway, to assess commercial crustacean formulated diets. Several puerulus benchmarking runs have been initiated although none to date have been continued beyond stage 4 larvae due to poor survival. This is attributed to various technical issues with new, large scale rearing systems developed specifically for this work. We're confident that a successful larval run involving relatively high survival to late stage larvae will be achieved by June 30.

From the Australian Institute of Marine Research

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Project 2003/211

We are still experiencing delays in completing Experiments 4.10 and 4.11. Major delays have been incurred due to construction and upgrading associated with expansion of the hatchery area at AIMS.

The experiments are expected to be completed in May.

Pending Project TAFI/AIMS/QDPI&F/MGKAILIS

There has been no research activity associated with this project. Until contracts are signed this remains a pending project. AIMS, however, continues to have appropriation funded research activity in tropical rock lobster propagation.

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Appendix XI – Subprogram Publication List

Rock Lobster Enhancement and Aquaculture Subprogram
Papers Published as at May 2007

Contact	Publication / Reference
Caleb Gardner University of Tasmania PO Box 252-01 Hobart, Tas 7000 Phone: 03 6227 7233 Projects: 2000/185, 1999/314	Mills, D. and B. Crear (in press). "Developing a cost-effective puerulus collector for the southern rock lobster (Jasus edwardsii) aquaculture industry." Aquacultural engineering. Gardner, C. (2003). Southern rock lobster aquaculture. Hatchery International: 12-13. Gardner, C. (2003). Southern rock lobster culture makes progress. Austasia Aquaculture. 17: 49-52. Gardner, C. Mills, D. Ibbott, S. Wilcox, S. Crear, B. (2000). Preliminary investigation towards ongrowing puerulus to enhance rock lobster stocks while providing animals for commercial culture. Tasmanian Aquaculture and Fisheries Institute Report 13. Gardner, C. Mills, D. MacDiarmid, A. Oliver, M. Stewart, R. (2001). Opportunities for the rock lobster industry through re-seeding. 2nd National Lobster Congress, Geelong Victoria. Mills, D. 1998. Rock Lobster puerulus for aquaculture? Fishing Today. 11: 9-11. Mills, D. 2001. Lobster puerulus collection information. Fishing Today 14(3): 21. Mills, D. 2002. Gem of an idea for rock lobsters. The Mercury. Hobart: 3. Mills, D. Gardner, C. Ibbott, S. Willcox, S. (1999). Acoustic tracking of small-scale movement in juvenile southern rock lobster (*Jasus edwardsii*). Fish Movement and Migration, Bendigo, Victoria, Australian Society for Fish Biology. Mills, D. Gardner, C. Ibbott, S., (in press). Behaviour of ongrown juvenile Jasus edwardsii after reseeding to coastal reef. Stock Enhancement and Sea Ranching: Developments, Pitfalls and Opportunities. K. M. Leber, J. Kitada, H. L. Blackenship and T. Svåsand. London, Blackwell Scientific: 576. Mills, D. Gardner, C. Oliver, M. (2002). Lobster survival assessment turns to high-tech surveillance. Fishing Today. 15: 22-23. Oliver, M. Gardner, C. Mills, D. MacDiarmid, A. (2003). The high-tech world of lobster surveillance. Water and Atmosphere. 11: 5. Oliver, M. Stewart, R. MacDiarmid, A. Gardner, C. Mills, D. (2001). Lobsters in captivity: house angel or street devil? Seafood New Zealand. 9: 24-26. Oliver, M. Stewart, R. MacDiarmid, A. Gardner, C. Mills, D. (2002). Lobsters in captivity: house angel or street devil? Fishing Today. 15: 34-35. Oliver, M. Stewart, R. MacDiarmid, A. Gardner, C. Mills, D. (2002). Behaviour of Jasus edwardsii reared in captivity. The Lobster Newsletter 15(1): 9-11.
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Clive Jones Department of Primary Industries Northern Fisheries Centre PO Box 5396 , Cairns Q 4870 Ph 07 40350182 Project: 1998/305, 2003/211	Jones, C.M., Linton, L., Horton, D. & Bowman, W. (2001) Effect of density on growth and survival of ornate rock lobster, *Panulirus ornatus* (Fabricius, 1798), in a flow-through raceway system. Marine and Freshwater Research, 52, 1425-1429. Sachlikidis, N.G., Jones, C.M., Seymour, J.E. (2005) Reproductive cues in Panulirus ornatus., New Zealand Journal of Marine and Freshwater Research 39 305-310
Dr Arthur Ritar Tasmanian Aquaculture and Fisheries Institute University of Tasmania Marine Research Laboratories Nubeen Cresent Taroon, Tas 7053 Phone: 03 6227 7295 Projects: 2003/211, 2001/094, 2000/214, 1998/303	Bermudes, M. and Ritar, A.J. (2004). The ontogeny of physiological response to temperature in early stage spiny lobster (*Jasus edwardsii*) larvae. Comparative Biochemistry and Physiology Part A 138, 161-168. Bermudes, M. and Ritar, A.J. (2005). Development and metabolic rate of stage I spiny lobster (*Jasus edwardsii*) larvae under constant and fluctuating salinities. New Zealand Journal of Marine and Freshwater Research 39, 243-249. Cox, S.L. and Johnston, D.J. (2003). Feeding biology of spiny lobster larvae and implications for culture. Reviews in Fisheries Science, 11, 89-106. Crear, B., Hart, P., Thomas, C. and Barclay, M. (2002). Evaluation of commercial shrimp growout pellets as diets for juvenile southern rock lobsters, *Jasus edwardsii*: Influence on growth, survival, colour and biochemical composition. Journal of Applied Aquaculture 12,43-57 Crear, B., Thomas, C., Hart. P. and Carter, C. (2000). Growth of juvenile southern rock lobsters, *Jasus edwardsii*, influenced by diet and temperature, whilst survival is influenced by diet and tank environment. Aquaculture 190, 169-182. Crear, B.J. and Forteath, G.N.R. (2000). The effect of extrinsic and intrinsic factors on oxygen consumption by the southern rock lobster, *Jasus edwardsii*. Journal of Experimental Marine Biology and Ecology, 252, 129-147. Crear, B.J. and Forteath, G.N.R. (2001). Flow rate requirements of captive western rock lobsters (*Panulirus cygnus*): effects of body weight, temperature, activity, emersion, daily rhythm, feeding and oxygen tension on oxygen consumption. Marine and Freshwater Research 52, 763-771. Crear, B.J. and Forteath, G.N.R. (2001). Recovery of the western rock lobster, *Panulirus cygnus*,

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Roy Melville-Smith Rock Lobster and Crab Research WA Marine Research Laboratories P.O. Box 20, North Beach, WA6020 Phone: +61 (08) 92468406 Project: 1998/302	Phillips, B.F. and Melville-Smith, R. Biological neutrality and catching pueruli in the Western Rock Lobster Fishery. Brochure Submitted February 2007 Johnston, D., Melville-Smith, R., Hendricks, B. Survival and growth of western rock lobster Panulirus Cygnus (George) fed formulated diets with and without fresh mussel supplement Submitted January 2007 Johnston, D., Melville-Smith, R., Hendricks, B., Phillips, B. Growth rates and survival of western rock lobeter (Panulirus Cygnus) at two temperatures (ambient and 23ºC) and two feeding frequencies

RLEAS Workshop Publications

Title	Editors	Date published
RLEAS Publication No. 9 Developments in Lobster Enhancement, Aquaculture and Post Harvest Practices (RLEAS/RLPHS Workshop 2004)	Dr Robert van Barneveld & Dr Bruce Phillips	October 2004
RLEAS Publication No. 10 Developments in Lobster Enhancement, Aquaculture and Post Harvest Practices (RLEAS/RLPHS Workshop 2005)	Dr Robert van Barneveld & Dr Bruce Phillips	October 2005
RLEAS Publication No. 11 Developments in Lobster Enhancement, Aquaculture and Post Harvest Practices (RLEAS Workshop 2006)	Dr Robert van Barneveld	September 2006

Appendix XII – American Soybean Association Paper on Rock Lobster Aquaculture in Australia

Development of Spiny Lobster Aquaculture Systems in Australasia

Dr Robert van Barneveld

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Background

The commercial rock lobster fishery is one of the most valuable of all Australian fisheries and it exhibits the strongest trade balance of any Australian fishery (Figure 1). If the quantity of rock lobster sold from Australia is to increase, then regardless of species, rock lobster enhancement or aquaculture will be required to either bolster wild stocks or provide an alternative source of product. In addition, rock lobster aquaculture potentially represents the most valuable form of any aquaculture based on the ratio of value relative to quantity.

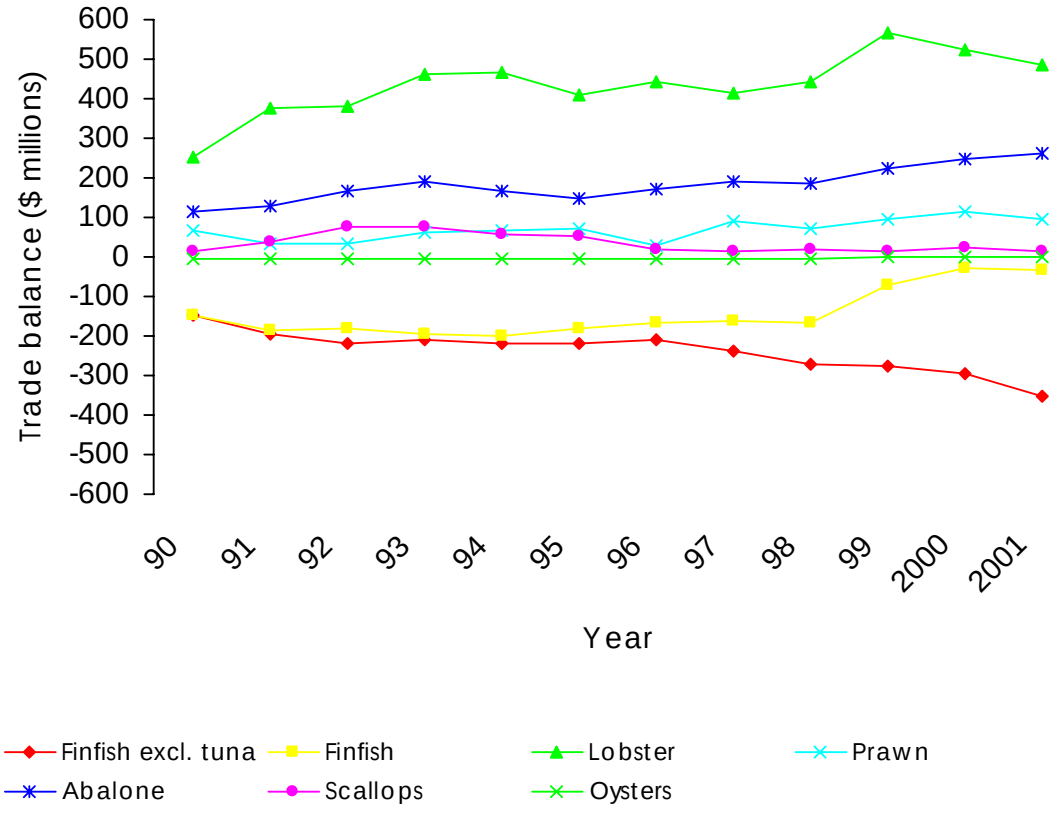


Figure 1. *Trade balance of key Australian fisheries 1990-2001 (Source ABARE).*

Past and present spiny lobster aquaculture activity in Australasia

There is growing interest around the world in aquaculture of spiny lobsters and this has extended to Australia. A number of States are investigating rock lobster aquaculture potential in various forms, the dominant methods including:

1. On-growing of adults through a moult to increase weight whilst allowing sale at periods of peak demand/ value,
2. On-growing of wild-caught puerulus (newly-settled juveniles) to a market size;
3. Culture of phyllosoma from eggs through the 11 larval stages to puerulus and subsequent on-growing to market size.

In addition, the potential exists through improved survival rates, for aquaculture to provide stock for reseeding and enhancement of the wild fishery.

There is currently no commercial aquaculture of rock lobster in Australia. Despite this, there is considerable interest across Australia in the establishment of rock lobster aquaculture enterprises particularly in light of the growing spiny lobster aquaculture sector in Vietnam, which in 2005 produced more than 4,000 tonnes of *P.ornatus* for the Chinese export market.

To date a range of aquaculture options have been investigated in Australia including:

Puerulus collection from the wild

Collection of puerulus from the wild and on-growing to a marketable size has been trialled in Tasmania. This form of aquaculture and enhancement is based on high mortality of wild puerulus in their first year post settlement (anywhere from 75-97%) compared with animals brought ashore and ongrown in tanks where the mortality is minimal (2% in Tasmania). This gives rise to the theory aquaculturists can ongrow the 'excess' that would have died in the wild. In 2001, 7 licences were issued in Tasmania for the collection of 50,000 puerulus each. The licences were for an initial 12 month period. The licences were issued at a cost of $5,000 each and a condition of use is that approximately 25% of the total number of puerulus collected are re-seeded into the wild fishery as juveniles at 1 year. The development of conditions associated with the issuing of licences was in full consultation with the existing wild capture sector. The trial failed to yield sufficient quantities of puerulus for aquaculture and all licenses have since lapsed.

On-growing adult caught lobsters

Aquaculture activities in South Australia have focussed on on-growing and value adding to adult wild-caught lobsters. In the past, pontoons have been used to hold and feed lobsters prior to sale facilitating more control over the market the lobsters are sold into and the timing of the sale. There is the potential to achieve weight gains of around 20% by growing the animals through the annual moult, representing a 60% return on investment. Some difficulties have been encountered with the renewal of leases for sea cages in South Australia, and hence interest in this form of aquaculture is changing focus to land-based raceway systems. Current activities

include investigations into the holding and feeding of lobsters in land-based tanks using both existing flow through systems and infrastructure or recirculation systems.

Quota buy-back

Rock lobster aquaculture based on quota buy-out schemes in return for puerulus collection licenses (in the order of 1 tonne of quota in return for 40,000 puerulus) has been in place in New Zealand for some years. The success of these ventures has been variable.

Future development of rock lobster aquaculture in Australasia

Development of a rock lobster aquaculture industry in Australia is dependent on our capacity to secure reliable sources of seed stock in the form of puerulus or juveniles. This represents a significant impediment given the task of rearing of large numbers of rock lobster larvae to metamorphosis at will and is undoubtedly one of the greatest challenges in aquaculture today.

Propagation of rock lobsters represents the primary technical bottleneck to the development of a rock lobster aquaculture sector in Australia.

To date, outcomes from investment (>$AUD20 million) in rock lobster enhancement and aquaculture research have been significant. Initial research covered a broad range of research areas, but this has become increasingly focused over time. At this point in time, the research program has provided:

1. Evidence that high natural mortalities far exceed our capacity to collect rock lobster puerulus from the wild for use in aquaculture systems and as a consequence, in a carefully managed fishery, collection of reasonable quantities of puerulus from the wild is unlikely to impact on wild stocks.
2. Technical and practical capacity to collect rock lobster puerulus from the wild for on-growing.
3. Basic manufactured diets for use in rock lobster aquaculture and evidence that acceptable growth rates and product quality can be achieved with manufactured diets;
4. Capacity to manipulate rock lobster appearance and quality through nutrition.
5. Basic assessments of the health of aquaculture-reared rock lobsters;
6. Assessment of rock lobster grow-out capacity in sea cages and land-based systems as well as technical advances in systems design and management;
7. A clear demonstration that aquaculture-reared juveniles can be successfully returned to the wild with a net benefit for overall rock lobster stocks;
8. Demonstration that the hormones triggering moults in *P.ornatus* are similar to those involved in the moult cycles of insects.
9. Investigations into the capacity to enhance natural settlement of western rock lobsters using artificial substrates.

In short, the research program to date has demonstrated that as an aquaculture species spiny lobsters are robust. The technical information derived from research could be successfully applied to commercially rear rock lobsters in aquaculture systems if a relaible source of puerulus or juveniles could be identified. With the exception of high settlement years in Western Australia, and collection of juveniles in

the Torres Strait by indigenous communities, collection of puerulus or juveniles from the wild is highly unlikely to form the basis of a rock lobster aquaculture industry in Australia. Consultation with the wild capture sectors has made it clear that while collection of puerulus from the wild may be technically feasible, issues surrounding property rights, access and variation in puerulus settlement from year to year will ensure that this is a very shaky basis on which to establish an industry. In terms of international competition, however, Australia needs to be cognizant of the fact that countries such as Vietnam have a well established industry based on collection of juveniles from the wild.

Propagation of spiny lobsters

Japanese researchers have been experimenting with culture of spiny lobsters (*P.japonicus*) for the past 20 years. The first successful attempt to obtain a puerulus in the laboratory was achieved in 1988, and 21 pueruli were produced in the1997-98 season. However, these culture methods are based largely on small-scale production systems (Figure 2) and a significant amount of research is required to make them commercially viable.

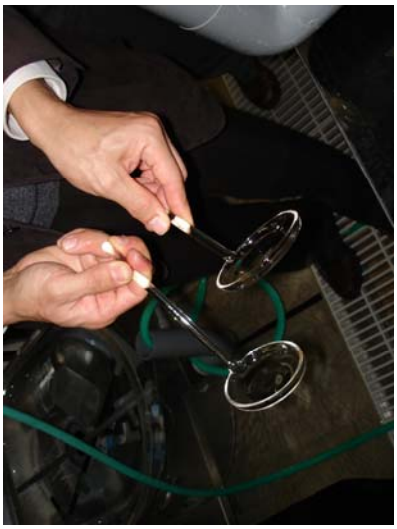


Figure 2. *Static culture systems employed in Japan for the culture of P.japonicus.*

Culture of spiny lobsters will become a commercial reality in Australia based on very promising research results. To date, Australian scientists have produced puerulus from eggs of both temperate (*J.edwardsii*) and tropical (*P. ornatus*) spiny lobster species. In 2004 a *J.edwardsii* Stage 11phyllosoma was progressed through metamorphosis to the puerulus stage that subsequently moulted to a juvenile. This was achieved in 300 days compared with an estimated 450 days for larval phases of this species in the wild. It should be noted, however, that the larval rearing time for rock lobsters is significantly longer than any other aquaculture reared crustacean species and may influence the approach to make this form of aquaculture commercially viable. In 2006, a commercial Australian company was also successful in rearing *P.ornatus* puerulus from eggs in less than 150 days following very high survival of phyllosoma to Stage X and XI (Figure 3).

Figure 3. *Production of* P. ornatus *puerulus from eggs represents the most promising avenue for commercial rock lobster aquaculture in Australia*

Conclusions

Aquaculture of spiny lobsters in Australasia will develop in parallel with our capacity to culture puerulus and juveniles from eggs. Research undertaken to date has clearly demonstrated that spiny lobsters are robust aquaculture species with seed supply representing the primary limitation to the development of aquaculture systems. Recent progress in the propagation of both temperate and tropical spiny lobster species suggests that this may be a commercial reality within the next 5 years.

Appendix XI – FRDC Board Report

Rock Lobster Enhancement and Aquaculture

- Research Management and Investment

Dr Robert van Barneveld

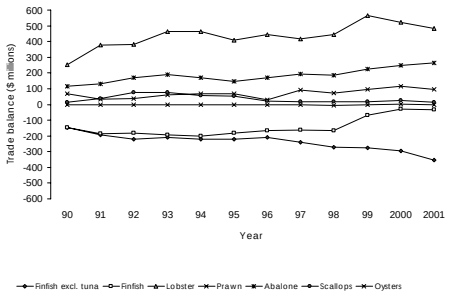
Leader, FRDC Rock Lobster Enhancement and Aquaculture Subprogram

Summary

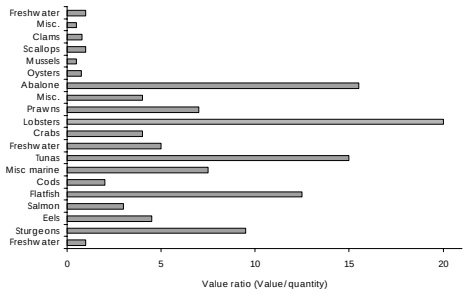
- Subprogram investment and outcomes
- Priorities and issues
- Recommendations

Why rock lobster aquaculture and enhancement ?

Trade balance of Australian fisheries



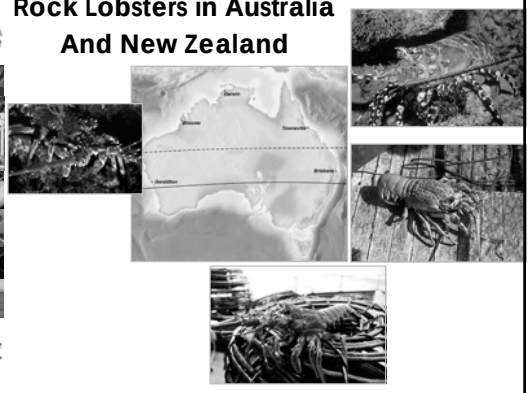
Value ratio of worldwide aquaculture enterprises



Why does the RLEAS exist ?

- Area of market failure
- Multiple species
- Similar objectives, but different logistics
- Different locations
- High cost, long term research
- National priority

Rock Lobsters in Australia And New Zealand



Project	FRDC ($)	Applicant ($)	Other ($)
1998/300	76,797	10,400	53,000
1998/301	283.000	30.000	-
1998/302			
1998/303			
1998/304	19,999	38,391	15,000
1998/305			
1999/314			
1999/315	149,889	86,815	242,340
2000			
2000			
2000/212	242,420	333,040	29,105
2000/214			
2000/263			
2001/211	320,708	41,033	-
2001/094	77,631	87,659	22,000
2002/045	275,523	62,731	-
2003/211	1,334,380	449,725	1,930,419
2003/212	771,494	2,321,976	90,000
2003/213	494,149	265,046	-
2004/239	340,000	50,000	-

TOTAL $17,345,836 (98-07)

FRDC $6,480,776 (98-07)

Applicants: $6,370,351 (98-07)

Other: $4,494,709 (98-07)

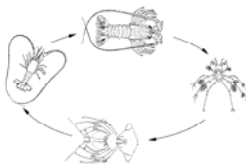
Progress

Outputs

- Significant progress towards development of technologies that facilitate rock lobster enhancement and aquaculture
- 82+ scientific publications arising from RLEAS research
- 100+ workshop, popular press and other publications and presentations

Biological neutrality

- Regional study completed
- Collections unlikely to influence wild capture fishery



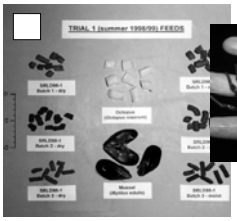
Puerulus collection

- Collector types examined
- Suitable technology available in WA and Tasmania

On-growing of juveniles and system design

Nutrition

- **Manufactured feeds developed for grow-out**
- **Focus on survival and growth rate from puerulus to year 1**

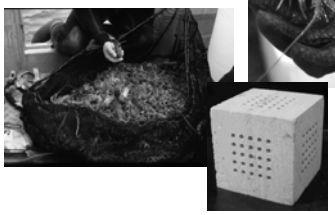


Health

- Tail fan necrosis
- Health monitoring for reseeding

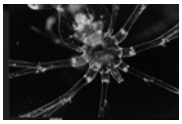
Enhancement

- Survival and behaviour of reseeded juveniles
- Release protocols
- Habitat requirements
- Enhancing settlement

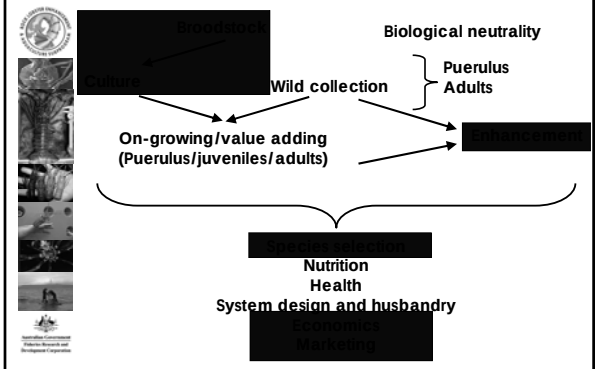


Propagation

- **Nutrition**
- **System design**
- **Health**
- **Broodstock conditioning**
- **Hormonal manipulation of larval phases**



Gaps



Priorities

- **Propagation**
  - **Research area difficult to pursue in isolation**
  - **Long term investment**
- **Propagation has been considered a strategic "public good" research area within the RLEAS/FRDC portfolio**
- **Examining opportunities to commercialise the propagation research program.**
- **Other immediate species based priorities – more resource allocation required to provide a balanced portfolio**

Issues

- Propagation is a long term research initiative
- Propagation research is expensive
- Long term research programs need to be carefully managed
- Significant institutional and commercial investment needs to be maintained.

Issues

- Industry leadership is required
- This research investment is consistent with FRDC strategies
- Other research priorities relevant to rock lobster enhancement and aquaculture exist

Recommendations

Consultation

- Southern Rock Lobster Ltd Board.
- QDPI Business Manager, Dan Cloonan
- RLEAS Steering Committee
- TAFI (Colin Buxton, Stephen Batteglene, Arthur Ritar), FRDC (John Wilson) and Southern Rock Lobster Ltd (David Lucas, Rodney Treloggan)
- QDPI (Clive Jones), AIMS (Mike Hall, Matt Kenway, Commecialisation Manager), and MG Kailis (James Fogarty).

Recommendation 1

The FRDC Board maintain an investment in rock lobster propagation for at least 3 years with further review pending outcomes and commercial developments.

Recommendation 2

That an incorporated entity be formed, with FRDC as a member, to manage rock lobster propagation research, protect intellectual property and make decisions relating to commercialisation of the outcomes.

Recommendation 3

That a range of entity structures and operational options be assembled in the form of a prospectus and this be distributed to potential stakeholders to establish likely levels of investment and entity members.

Recommendation 4

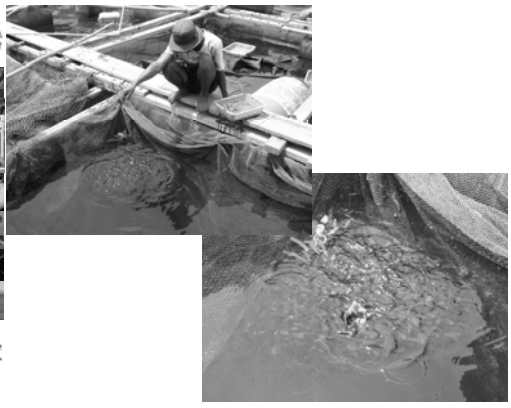
That a proportion of existing RLEAS Management funds be used to support the establishment and initial maintenance of this incorporated entity.

Recommendation 5

That the RLEAS be maintained at a reduced level for on-going management of relevant non-propagation research into rock lobster enhancement and aquaculture.

Other Issues

- Japanese scientist exchange proposal
- ACIAR research program in Vietnam



Subprogram Operations

- Management via a industry-based steering committee (12 members + 1 advisor)
- Expertise-based
- Turnover mechanism
- Outcomes from Steering Committee meetings communicated to all peak bodies and FRABs

Linkages

- ACIAR/CSIRO/MG Kailis
- Overseas investors
- RLPHS
- Southern Rocklobster Inc.
- Japan/DIST linkage program
- NIWA/NZ industry

Scope

Approaches to Enhancement and Aquaculture

Puerulus
↓
Collection
↓
On-growing
↓
Market Re-seeding

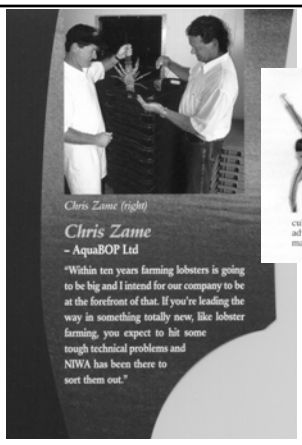
- Biological neutrality
- Collection methods
- Systems design, nutrition, management for on-growing
- Health monitoring
- Survival of re-seeded juveniles
- Marketing and economics

Tasmania

- 7 licenses issued in 2001
- 50 000 puerulus each
- ~25% returned to the wild at 1 year
- $AUD5,000/license
- Trial period expired
- Limited progress towards establishment of aquaculture systems

International - New Zealand

- Collection of wild-caught puerulus and subsequent on-growing
- Associated with existing mussel aquaculture infrastructure
- Quota trade-off scheme
- 1 tonne = 40,000 puerulus
- Variable success
- 1-2 active commercial groups



International - Vietnam

Approaches to Enhancement and Aquaculture

Adult
↓
Collection
↓
On-growing/ value-adding
↓
Market

- Collection methods
- Systems design, nutrition, management for on-growing
- Maintaining health
- Product development
- Marketing and economics
- Translocation

South Australia

- On-growing in pontoons
- No new leases

Approaches to Enhancement and Aquaculture

Broodstock
↓
Culture
↓
On-growing
↓
Market **Re-seeding**

- Species selection
- Broodstock maintenance and conditioning
- Life cycle closure
- Systems design, nutrition, management for on-growing
- Maintaining and monitoring health
- Survival of reseeded juveniles
- Marketing and economics