VISITING EXPERT – KAI LORENZEN

FINAL REPORT

Dr ANTHONY HART

AUSTRALIAN SEAFOOD COOPERATIVE RESEARCH CENTRE

Project No. 2011/720

Government of **Western Australia**
Department of **Fisheries**

This project was conducted by the Department of Fisheries Western Australia
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Australian Government
Fisheries Research and Development Corporation

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NON-TECHNICAL SUMMARY

PROJECT NO: 2011/720 Visiting Expert – Kai Lorenzen

PRINCIPAL INVESTIGATOR: Dr Anthony Hart

ADDRESS: Western Australian Fisheries and Marine Research Laboratories
39 Northside Drive, Hillarys, WA, 6025

PROJECT OBJECTIVES OF THE RESEARCH VISITING EXPERT TRAVEL BURSARY:

1) Expert review and implementation of bioeconomic stock enhancement models for commercially important fisheries species around Australia.

2) Provision of CRC Master Classes to CRC members and interested parities on the use of fishery simulation software "EnhanceFish" for developing fisheries and stock enhancement policies and plans.

3) Review and recommendations for the Western Australian abalone and other marine species stock enhancement policies.

OBJECTIVES ACHIEVED TO DATE:

All project objectives have been achieved and are presented by this final report.

PROJECT OUTPUTS DEVELOPED AS RESULT OF THE RESEARCH VISITING EXPERT TRAVEL BURSARY:

1) Respective experts training and the subsequent optimisation of bioeconomic stock enhancement models for commercially important species around Australia.

2) Collaborative research papers initiated on stock enhancement research of greenlip abalone (WA), sea cucumbers (NT), rock lobster and giant crab (TAS).

4) CRC Master Classes conducted in Western Australia, Northern Territory and Tasmania with 15+ attendees at each and associated training and educational materials.

5) Consultation and direct input into draft stock enhancement policies, particularly the Draft Fisheries Enhancement Policy for the Department of Fisheries WA.

ABOUT THE PROJECT/ACTIVITY

BACKGROUND AND NEED

Professor Kai Lorenzen is a world-leading expert on sustainable and responsible stock enhancement in fisheries. He has written and produced a computer simulation software package ("EnhanceFish") that connects the biology and economics of stock enhancement. "EnhanceFish" allows for a comprehensive investigation into the complexities of merging aquaculture practices with harvest fisheries, and is an extremely advanced and useful tool. By simulation of effect of changes in size and density of animals released, and variation in growth, survival, and cost of aquaculture production against expected beach price, the industry can maximise the economic gains from their enhancement strategies.

Professor Lorenzen has also undertaken a major policy review of the future of stock enhancement in marine fisheries, known as the "Responsible Approach" (Lorenzen et. al., 2010). These two tools are both being utilised by the Department of Fisheries Western Australia, the WA wild abalone industry, and Tasmanian Seafoods Pty Ltd to progress their business and develop their current stock enhancement programmes. The economic practice of stock enhancement and relevant policies need to be closely linked, and Professor Lorenzen is the ideal candidate to review and optimise the bioeconomic analyses, and ensure that policy development is aligned with "world's best" principles and practice.

Lorenzen K, Leber KM, Blankenship HL (2010). Responsible approach to marine stock enhancement: An update. Reviews in Fisheries Science, 18(2): 189-210.

RESULTS

During this project Professor Lorenzen was able to work with government agencies, private companies and universities around Australia on various economically important fisheries that are developing stock enhancement and ranching practices. This work included presenting seminars, conducting "EnhanceFish" Master Classes, research collaboration and advising on fisheries enhancement policies.

Seminars

1) "Understanding and Managing Enhancement Fisheries Systems"
Western Australian Fisheries and Marine Research Laboratories.
22nd March 2012.

2) "Understanding and Managing Enhancement Fisheries Systems"
Institute for Marine and Antarctic Studies, University of Tasmania.
3rd April 2012.

EnhanceFish MasterClass

1) Western Australian Fisheries and Marine Research Laboratories.

23rd March 2012.

2) Northern Territory Department of Resources, Fisheries Division.
28th March 2012.

3) Institute for Marine and Antarctic Studies, University of Tasmania.
4th April 2012.

Research Collaboration

1) Western Australia: Bio-economic modelling of greenlip abalone, *Haliotis laevigata* enhancement. Draft model completed and analysed. Paper being drafted for submission by end of June 2012 (Anthony Hart and Lachlan Strain in the lead).

2) Northern Territory: Bio-economic modelling of sandfish (sea cucumbers) enhancement. Model drafted at "EnhanceFish" Master Class and the intention is to continue collaborative work in this direction.

3) Tasmania: Bio-economic modelling of rock lobster and giant crab enhancement as climate change mitigation strategy. Draft models completed and partially analysed. Paper to be drafted for submission to a climate change journal by end of May (Caleb Gardner and Klaas Hartman in the lead).

Advising on Fisheries Enhancement Policies

1) Detailed comments and inputs to the Draft Fisheries Enhancement Policy, Department of Fisheries WA. Intention is to continue consultation as policy is finalised.

2) Some discussion on Northern Territory Ranching Policy and the possibility of developing a wider Fisheries Enhancement Policy, drawing in part on experience from WA. Intention is to continue consultation in this regard as desired by NT Fisheries and industry stakeholders.

PROJECT IMPACT

PROJECT OUTCOMES (THAT INITIATED CHANGE IN INDUSTRY)

The impact of the project 2011/720 was far reaching as it enabled Professor Lorenzen to have input into fisheries enhancement at different stages of development, on multiple species from around Australia. The outcomes from the seminars and particularly the "EnhanceFish" master classes allowed respective experts in these fisheries to receive hands on training and assistance in the development of stock enhancement and ranching practices. As part of this travel bursary, collaborative research within larger research projects has been established between Professor Lorenzen and the Department of Fisheries WA, Northern Territory Department of Resources and the Institute for Marine and Antarctic Studies. This collaboration has had major impacts on enhancement research and policy

development within Australia, which over time will initiate change in the respective fishing industries.

SUMMARY OF CHANGE IN INDUSTRY

Given the fisheries in question are all in their infancy of developing enhancement practices, the change to industries as a result of Professor Lorenzen's visit are not expected to be immediate. Rather, as the outcomes of this project work within larger research projects the changes to industries are likely to occur over a longer timeframe.

This project however, does have immediate impacts within the scientific and research community developing enhancement practices. Stock enhancement is a relatively new concept in Australian marine fisheries and subsequently expertises in this area are not as developed as in other parts of the world. This project has been able to significantly improve the understanding of fisheries enhancement around Australia and particularly how the "Responsible Approach" (Lorenzen et. al., 2010) can be applied to fisheries management. One immediate change has been in government policy in Western Australia with Professor Lorenzen having significantly contributed to the Draft Fisheries Enhancement Policy which is currently under review and once implemented will have significant impacts for the WA wild abalone industry and aquaculture industry.

WHAT FUTURE AND ONGOING CHANGES ARE EXPECTED?

Fisheries enhancement is generally a long-term prospect and this project has been able to impact and develop the stock enhancement and ranching programmes for greenlip abalone in WA, sea cucumbers in NT, rock lobster and giant crab in TAS. Given the reasons for these programmes vary depending on the fisheries, including stock enhancement as a fisheries management tool to increase the value of the WA greenlip abalone fishery, or developing a sea cucumber ranching industry in NT, or incorporating stock enhancement/reseeding as a climate change mitigation strategy for maintaining rock lobster and giant crab stock in TAS, the impact and changes from this project will be vastly different for each case.

For the greenlip abalone fishery in WA, this project has allowed Professor Lorenzen to review the bioeconomic modelling and subsequently a collaborative manuscript is being produced. This research forms part of the wider CRC project 2009/710 Bioeconomic evaluation of commercial scale stock enhancement in abalone and is currently being presented to the WA wild abalone industry with the purpose of developing commercial scale stock enhancement to increase the value of the WA greenlip abalone fishery. For the sea cucumber ranching industry this project has laid a foundation for private enterprise (Tasmanian Seafoods Pty Ltd) to progress their business and develop a profitable ranching industry. In Tasmania this projects future impact will be much more long term as enhancement is being considered as a climate change mitigation strategy. Rather than focusing on industry development, enhancement is being assessed as one of many tools to combat the effects of climate change on rock lobster and giant crab stocks. All of these fisheries are

looking at enhancement for different reasons and even though the impact of Professor Lorenzen's visit was immediate for researchers and managers the flow on to industry and the implementation of enhancement strategies will be long-term.

WHAT BARRIERS ARE THERE FOR CHANGES TO OCCUR?

The main barrier for all of the fisheries covered during the project, to implement various aspects of enhancement is getting industries to adapt and evolve to incorporate these changes. Given that enhancement programmes are a relatively new concept to Australian fisheries it may take longer for industry to accepted it as a viable fisheries management tool. In the WA abalone industry the wild sector has shown considerable interest in stock enhancement research over the years to the point of trying to commercialise the programme. However given external factors such as disease outbreaks and conflict between the wild abalone and aquaculture industries it has slowed the progress on greenlip abalone stock enhancement. Through this project and via Professor Lorenzen's involvement, it has allowed independently reviewed bioeconomic modelling and policy to be used positively in the promotion of stock enhancement within the WA greenlip abalone fishery.

IF NOT ALREADY HAPPENING, WHEN WILL THE CHANGES OCCUR?

As mentioned above the project findings won't be adopted by specific businesses within definitive time-frames and therefore it is difficult for a deadline to be set for when these changes will occur. What the project has done is give fisheries researchers and managers a greater understanding of the bioeconomic models and policies associated with fisheries enhancement, which can then be taken to industry to either increase fisheries profitability, create new ranching industries or help in stock preservation due to environmental factors.

WHAT IS THE LIKELIHOOD THAT THESE CHANGES WILL OCCUR?

This depends on the industries ability to accept new fisheries management tools such as stock enhancement and overcome the barriers associated with wild fisheries and aquaculture co-development. In all three states considerable research is still required before significant changes will occur within these industries, however in the WA greenlip abalone fishery with the direction of the Department of Fisheries WA, the industry should be able to move towards commercial size research within the next few years.

WHAT BARRIERS ARE THERE TO ADOPTION OF THESE CHANGES AND WHAT ACTION COULD BE TAKEN TO OVERCOME THESE?

In the previous section on what barriers are there for these changes to occur, it discussed the industries willingness to adopt these changes and incorporate enhancement programmes into the fisheries. Professor Lorenzen's visit did allow researchers and managers significant exposure to the principles of enhancement

and put them in a better position to facilitate fishing industries incorporation of enhancement. Through an increase in discussions/meetings/group training the various industries will move closer to adopting the projects findings. To incorporate stock enhancement and ranching into these fisheries significant investment of additional capitol will be required to develop the fully functioning bioeconomic models and policies, while also providing the resources to run enhancement fisheries.

COMMUNICATION OF PROJECT/EXTENSION ACTIVITIES

WHAT IS THE OUTPUT THAT NEEDS TO BE COMMUNICATED?

The main output to be communicated will be that stock enhancement can be a positive fisheries management tool and that through constructive research utilizing the "Responsible Approach" (Lorenzen et. al., 2010), Australian fisheries can benefit significantly. Stock enhancement programmes don't have to be seen as alternatives to fisheries management but rather that they can work within existing frameworks to improve fisheries productivity and increase profitability. This project, through Professor Lorenzen's involvement was able to provide fisheries scientists and management with a greater understanding of stock enhancement principles enabling this main output to be succinctly conveyed to the target audiences.

WHO IS/ARE THE TARGET AUDIENCE/S?

Given the project worked closely with fisheries scientist and managers, focusing on the bioeconomic modelling and policy development for enhancement programmes in commercial fisheries the main target audience are the industry participants within these fisheries.

1) WA wild abalone industry and the WA abalone aquaculture industry.
2) NT sea cucumber industry.
3) Tasmanian rock lobster and giant crab industries.

The secondary target audience the project was aiming for includes the wider community of fishery scientists within Australia to try and expand the interest in stock enhancement programmes.

WHAT ARE THE KEY MESSAGES?

1) Stock enhancement can be utilized as a fishery management tool within a wider management plan and is not a stand-alone practice.

2) Stock enhancement programmes can be developed within a fishery for a range of reasons including as a management tool, develop a ranching industry or to help mitigate environmental pressures that could affect stocks.

3) Appropriate research into bioeconomic modeling and policy development must be completed to evaluate and direct the successful use of stock enhancement within an Australian fishery.

4) All parties involved including government agencies, the wild fishing industry and the aquaculture industry need to work collaboratively to ensure stock enhancement practices are successful.

WHAT IS THE CALL TO ACTION?

By communicating the key messages to the target audiences the associated industries will be able to work collaboratively with the fisheries scientists and managers to begin implementing stock enhancement programmes. Hopefully by fishing industries exposure to the outputs and key messages of this project stock enhancement will be looked upon with greater understanding towards its benefits and be seen as a positive fisheries management tool. This will allow industry to move towards commercialisation of stock enhancement and subsequently further increase the profitability of their fishery.

COMMUNICATION CHANNELS

Channel	*Who by*	*When*
Industry Meetings	Scientists and managers	ASAP
Publications	Scientists and managers	After appropriate research
Commercialisation	Industry and scientists	

LESSONS LEARNED AND RECOMMENDED IMPROVEMENTS

WHAT IS YOUR FEEDBACK?

This project experienced some logistical difficulties in organising multiple institutions from around Australia to coordinate and participate within this projects limited timeframe. Overall this had little effect on the quality research conducted during this project and subsequently there were very few difficulties experienced during the expert review and implementation of bioeconomic stock enhancement models and policies conducted by Professor Lorenzen on several commercially important fisheries.

The difficulties associated with research into stock enhancement on a broader scale were not part of the work Professor Lorenzen did with fisheries scientists and managers within this project. The barriers associated with the implementation of this research have been described above and now that this project has allowed Australian fisheries greater expose to stock enhancement principles and policies it

will hopefully be a simpler process to undertake further research in this area and provide industries with enhancements potential benefits.

FURTHER ACTION REQUIRED IN REGARDS TO COMMERCIALISATION?

The next step in utilising stock enhancement within Australia fisheries would be for the commercialisation of such a programme. To accommodate this more research with direct industry collaboration would allow for stock enhancement of various fisheries to be conducted on a semi-commercial scale with the focus of moving to utilising stock enhancement within fully functioning fisheries. This would require a significant investment in capital from industry and regulatory bodies but has the potential to significantly improve the particular fisheries value.

ACKNOWLEDGEMENTS

The Department of Fisheries Western Australia would like to acknowledge:

1) Australian Seafood Cooperative Research Centre
   For funding this visiting expert travel bursary and facilitating the project.

2) Professor Kai Lorenzen
   Taking part in this project and giving his time and significant professional expertise to all involved.

3) University of Florida
   Allowing Professor Lorenzen to visit Australia as part of this project.

4) Northern Territory Department of Resources, Fisheries Division
   Co-hosting Professor Lorenzen and the “EnhanceFish” master class.

5) Institute for Marine and Antarctic Studies, University of Tasmania
   Co-hosting Professor Lorenzen and the “EnhanceFish” master class.

APPENDIX

1) Professor Kai Lorenzen’s Seminar Abstract

Understanding and managing enhancement fisheries systems

Aquaculture-based fisheries enhancements are a set of management approaches involving the release of cultured organisms to enhance, conserve, or restore fisheries. Progress in aquaculture technologies and changes in fisheries governance towards systems that limit access and promote resource stewardship provide excellent opportunities for the development of fisheries enhancements. Yet, enhancement initiatives have a very mixed record and remain poorly integrated into fisheries management systems. I outline key approaches and methodologies for improving enhancement outcomes, including: (1) Population dynamics theory for the

quantitative assessment of enhancement outcomes; (2) an enhancement systems framework for exploring the role of governance and stakeholder behaviour in shaping enhancement outcomes; and (3) the 'Updated Responsible Approach', a science-based, stakeholder-participatory process for developing or reforming enhancements.

2) Professor Kai Lorenzen's "EnhanceFish" Master Class Flyer

Enhancefish

Enhance Fish—Decision Support Tool for Fisheries Enhancement

23 March 2012 - Perth, WA
4th April 2012 - Hobart, Tasmania

Overview

EnhanceFish is a decision support tool for the quantitative assessment of aquaculture-based fisheries enhancements.

It can be used for example to:

- Evaluate whether releases of hatchery fish are likely to increase yields in a fishery for which enhancement has been proposed
- Assess the likely impacts of releases on the wild stock of the target species (where one exists)
- Analyse data from release experiments to estimate population parameters
- Identify optimal release and harvesting regimes

EnhanceFish is designed for use by fisheries and other natural resources professionals including for example government officers, NGO staff or development consultants. Use of *EnhanceFish* requires understanding of basic concepts of fisheries stock assessment. It does not require specialist knowledge or mathematical skills.

Objectives

This one day course will train participants to conduct quantitative analyses and translate these into management advice.

Presenter

EnhanceFish was developed by Kai and Paul Medley. **Kai Lorenzen** carried out much of the research on population dynamics of enhancements that underlies ***EnhanceFish*** Paul Medley has developed and programmed the ***EnhanceFish*** software. Kai Lorenzen is a Professor in Integrative Fisheries Management at the University of University of Florida.

Course information

Location: Western Australian Fisheries and Marine Research Laboratories, Perth, Western Australia.
Contact: Lachlan Strain, Department of Fisheries, Email: lachlan.strain@fish.wa.gov.au
T: 08 92030230

Location: Institute of Marine and Antarctic Studies, University of Tasmania, Nubeena Avenue, Taroona, Hobart, Tasmania
Contact: Sophie Hall-Aspland, IMAS
E: sophie.hallaspland@utas.edu.au
T: 03 6227 7225
Cost: No charge *(includes, morning and afternoon teas, lunch and materials)*

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