

**Operation of Seafood Services
Australia
Product & Process Development**

Stephen Thrower



**FISHERIES
RESEARCH &
DEVELOPMENT
CORPORATION**



**Queensland
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Centre for **Food Technology**
Agency for **Food and Fibre Sciences**

Project 2000/400

Operation of Seafood Services Australia : Product and Process Development

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2000/400 Operation of Seafood Services Australia : Product and Process Development

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OBJECTIVES:

1. Provide management of existing Seafood Services Australia - Product and Process Development (SSA-PPD).
2. Common objective with Seafood Services Australia - Technical Information and Advice (SSA-TIA) Provide industry with networking to researchers, government agencies and other industry participants, and so identify areas where research is needed, and the people capable of doing that research to assist business objectives.
3. Common objective with Seafood Services Australia - Technical Information and Advice (SSA-TIA) Integrate and develop the services of SSA-PPD (initially National Seafood Centre NSC), Australian Seafood Extension and Advisory Service (AUSEAS) and SeaQual Australia) as a single point of contact delivering cost effective, appropriate and timely assistance to the seafood industry.

NON TECHNICAL SUMMARY

OUTCOMES ACHIEVED

Lessons Learned from the NSC Experience

For a modest amount of funding the NSC project supported a wide variety of projects, providing for the first time a dedicated post-harvest development focus. From this experience, several lessons can be learned. The following list is neither exhaustive nor arranged in order of priority.

1. To result in a positive outcome, short-term post-harvest research must address the immediate needs of the industry. The NSC succeeded to a good extent in addressing the need for fast solutions to urgent problems. The industry in Australia is very dynamic, constantly seeking new export opportunities. It cannot wait for the often-lengthy delays involved in traditional assessment processes for research funding.
2. Most improvements in productivity from existing fisheries will be incremental. Major improvements will come from the application of biotechnology in aquaculture, from waste utilisation, and from the development of novel (including non-food) uses for marine organisms.
3. Successful introduction of a new product into the market by a single company is a very complex and expensive process, well beyond the scope of the assistance available through FRDC, and is probably an inappropriate use of FRDC funds. Many of the NSC projects in product and process development were successful in technical terms, but factors outside the scope of the projects impeded their implementation.
4. Application of proven technologies from other food industries can lead to the effective development of successful new products and processes and may open doors to outcomes not envisaged in the original project.

5. The Australian industry is well behind the rest of the world in the technology it uses, yet very proactive in finding new export markets. The application of existing knowledge to newly encountered problems can, in many instances yield considerable benefit (*but see 6*).
6. Whilst many of the problems faced by Australian companies can be solved by the application of existing knowledge, it is important that a strategic post-harvest research effort be maintained to provide a knowledge bank for the future.
7. There is a lack of appropriate channels for the exchange of technical information within the seafood industry. The convening of seminars, workshops etc. aimed at the grassroots, not merely at industry leaders, is a worthwhile endeavour likely to achieve positive outcomes.
8. The amalgamation of disparate projects into Seafood Services Australia, and the formation of a national network with a node in each State, has achieved effective communication across Australia. This could be a model for other sectors.
9. The level of effectiveness in disseminating the results of NSC projects varied. Two reasons for this are the imposition of confidentiality agreements, and in some cases, the lack of experience and resources of investigators in writing and other forms of communication. An impressive array of final NSC reports is available. It is advisable to translate some of these into more user-friendly documents.
10. There is great value in having a person at the initial point of contact who has in depth knowledge of, and experience in food science and technology related to seafood, post-harvest research and development in Australia and overseas, and the operations of the Australian seafood processing sector. Such a person will have the knowledge and historical perspective to judge which proposals are worth proceeding with. It is as valuable to dissuade an applicant from proceeding with an ill-advised project as to encourage an applicant with a well-conceived project.

This report covers the activities of a series of FRDC projects operated by the Queensland Department of Primary Industries throughout the 1990's (1992/225.99, 1997/400, & 2000/400). For simplicity these will be collectively referred to as the "National Seafood Centre" or "NSC" in this report. The NSC projects were unusual, because they were set up to encourage Australian seafood companies to carry out research and development either alone, or in partnership with researchers. They did this by providing modest funding for suitable, small-scale projects. The projects chosen for funding were short-term, targeted at getting a commercial outcome within a relatively short space of time. Because they involved a high proportion of input from private sources, most projects were protected by a period of confidentiality after completion. This report gives an overview of the projects funded by NSC.

In addition to funding projects, the NSC worked in conjunction with the Australian Seafood Extension and Advisory Service (AUSEAS) to disseminate information and advice and to encourage networking between companies, researchers, government agencies and other people with an interest in seafood production. This involved considerable travel to liaise with industry groups, government agencies, research institutes, and individual companies. Several key seminars and conferences were sponsored covering topics of immediate interest to the industry. These were intended to provide a snapshot of the current position of the industry and provide a window on the global scene.

One very imaginative initiative of the NSC was the "D" program. Companies were able to access small amounts of funding for very specific purposes to overcome impediments to their development without submitting a full funding proposal. This funded shelf life trials, analyses, consultancies and other limited activities.

KEYWORDS:

seafood; post harvest; product; process; value-added; commercial; research; development

ACKNOWLEDGEMENTS:

The NSC projects were an innovative approach to funding very applied research. From the outset, the NSC was a joint initiative supported by the FRDC and DPI Queensland. The project would not have continued without the strong support of *Peter Dundas-Smith*. Tribute must also be paid to the three commercial managers.

John McVeigh set up the original project and established an initial suite of projects. *Deon Mahoney* and *Ian Wells* continued this work, tirelessly travelling around the country fostering new projects, then returning home to manage them.

A strong vote of thanks must go to the members of the NSC Advisory Committee* who gave of their time freely to assess proposals, make suggestions, spread awareness of NSC, and encourage the Commercial Managers.

Finally, the companies and scientists who carried out the research must be acknowledged. As noted above, a number of these projects could have been abandoned mid-term due to changes in market conditions etc. without the commitment of companies to fulfil their in kind obligations, and the determination of the researchers to seeing projects through to completion.

**Membership of the NSCAC*

- ? *Chair Executive Director FRDC Peter Dundas-Smith*
- ? *Director of Centre for Food Technology, Peter White, Rosemary Clarkson, Peter Skarszewski*
- ? *George Costi, Seafood Retailer*
- ? *Roy Palmer, Seafood Retailer*
- ? *Helen Rapp*
- ? *Norm Grant, Consultant and Editor "Seafood Australia"*
- ? *Phillip Walsh, Consultant*

HISTORICAL BACKGROUND:

The National Seafood Centre had its genesis in a report entitled *Casting the Net* published by the Australian Science and Technology Council in 1989 after a review of the state of post-harvest technology in the Australian fishing industry. The following recommendation was made (recommendation 2):

That CSIRO establish the Seafood Technology Section of the CSIRO Division of Fisheries as a Seafood Technology Centre with national responsibilities for post-harvest research and development. Amongst its functions the centre would:

- ? *Undertake short and longer term research;*
- ? *Provide liaison, information and advisory services to government and industry;*
- ? *Establish and maintain a network of Australian researchers in fisheries post-harvest; and*
- ? *Provide placements for graduate students and industry nominees.*

To give effect to these recommendations, the then Fishing Industry Research & Development Council (FIDRC) provided funding for a workshop convened under the chairmanship of Mr Bernard Bowen, then Director of WA Fisheries and Chairman of FIDRC, at the University of Western Sydney. This meeting brought together representatives of all the stakeholders in post-harvest R&D in Australia. Participants were drawn from:

- ? CSIRO

- ? Universities of NSW, Western Sydney, and RMIT
- ? Processors from WA, Qld and Vic.
- ? Commonwealth Dept of Primary Industries & Energy
- ? QDPI
- ? FIRDC

As a result of this workshop, plans were made to establish a National Seafood Centre in the grounds of the University of Tasmania. Land would be provided by the University, funding support from DPIE, and technical and administrative support from CSIRO Division of Fisheries.

The Centre would have a permanent staff of 10, with a further 10 post-graduate and post-doctoral researchers. Operational funding would come from several sources including FIRDC, CSIRO, the Australian Council for International Agricultural Research, the Food and Agriculture Organisation (UN), and agencies such as DANIDA (Danish Aid Agency) as well as tertiary institute sources and industry consultancies. A site was selected and preliminary plans for the building were drawn up.

Unfortunately the plan lapsed when CSIRO Fisheries encountered funding difficulties. It decided that post-harvest research was not in its area of core research, and retrenched the six staff of its Seafood Technology Section. QDPI decided to progress the concept, and recruited two key staff from CSIRO to join its Seafood R&D team in Hamilton, Queensland in 1990.

The formation of the Fisheries Research and Development Corporation (FRDC) provided a new stimulus in the area of post-harvest activities. Several large post-harvest research projects were approved and funding was provided in 1991 for a National Seafood Information Service (NSIS) to be run by the QDPI in Queensland.

It was decided to resurrect the concept of a national seafood centre to be run from QDPI, but by this time, funding was only available from QDPI and FRDC. The NSC was restricted to a single officer funding small (up to \$30,000, later increased to \$40,000) projects in near market R&D and operating from an office in Hamilton, with QDPI providing administrative and infrastructure support.

Thus by the mid-1990's there were two complementary FRDC post-harvest infrastructure projects at QDPI in Hamilton, the NSC and the Australian Seafood Extension and Advisory Service (AUSEAS, formerly the NSIS). This provided the Australian industry with access to the world's seafood R&D discoveries, and some capacity to carry out further research in response to identified deficiencies in knowledge.

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Seafood Centre NSC), Australian Seafood Extension and Advisory Service (AUSEAS) and SeaQual Australia) as a single point of contact

STRUCTURE AND OPERATION

The NSC consisted of a Commercial Manager and an advisory body called the National Seafood Centre Advisory Committee (NSCAC). The composition of the NSCAC varied, but it always included the Executive Director of the FRDC as Chair, and the Director of the Centre for Food Technology (CFT) of QDPI. In addition, secretarial assistance was provided from CFT and later from AUSEAS.

The method of operation of the NSC was for the Commercial Manager to develop proposals in consultation with potential applicants, and then present these to the NSCAC for evaluation and approval. The NSCAC met at regular intervals throughout the year, but were able to assess projects at any time via teleconferences. Members of the NSCAC also promoted the activities of the NSC and helped put the Commercial Manager in contact with potential applicants.

The Executive Director of FRDC approved “D” projects, which did not require a full application, after consultation with the Commercial Manager.

PROJECTS

The main function of the NSC has always been the encouragement of very applied research and development by the application of limited, targeted project funding. A list of the projects funded is provided in Appendix 1. Some of these projects cover more than one topic, but it is possible to summarise them thus:

Subject	Number of Projects
Product Development	17
Process Development	12
Waste Utilisation & By-products	13
Live Seafood	9
Handling & Processing	9
Packaging	6
Market Development	3
Food Safety and Quality Assurance	2

The main thrust of the NSC’s projects was near market research. It fostered a number of short-term projects involving tactical research aimed at achieving quick, commercial benefits. The emphasis was on product and process development, which sometimes meant “me too” projects aimed at copying products already in production overseas but using Australian species.

Other projects considered to be worthwhile were also funded such as live seafood workshops, an international seafood conference and development of an oyster grading machine. Success was judged on outputs, from the criterion of “successful products on shelves” as well as publications and changes in industry practices.

DISSEMINATION OF RESULTS

Unlike normal research projects, NSC work was often classified as “commercial in confidence” and covered by confidentiality agreements. This had the advantage of increasing industry participation, but also had disadvantages. By the time the confidentiality period had expired, the researchers were likely to have moved off on to another project, and so dissemination of results became more problematic unless specific provision had been made for dissemination. This might take the form, for example, of the conduct of a workshop, the writing of a handbook, or the making of a video presentation.

The final report was an important output from each research project. This was particularly true of NSC projects in which other forms of publication were often precluded by confidentiality agreements. These reports were not submitted for formal peer review in the same depth as a scientific journal article, a situation that brought both advantages and disadvantages. There may be some undetected deficiencies in method of analysis and in the conclusions reached. On the other hand, because of the freedom from space limitations, the authors were able to describe methods etc in considerable detail. There is now a range of reports on a wide variety of topics.

There is an opportunity for selected reports to be condensed into short communications in the "Seafood bytes" series published by SSA Ltd, and several of these have already been produced.

The commercial managers were very diligent in writing articles in industry magazines such as *Seafood Australia* and *R&D News* featuring not only NSC projects, but also other issues of special interest to seafood producers. Papers were also presented at a range of forums such as *World Aquaculture*, and at numerous workshops, seminars and conferences.

ASSESSMENT OF NSC'S EFFECTIVENESS

In 1996, a cost benefit analysis of four NSC projects was done by Fisheries Economic Research and Management Specialists (FERM) on four selected projects regarded as successful by the NSC Advisory Committee (NSCAC). The results for the Benefit/Cost ratio's (B/C) can be summarised thus:

1992/125.05 Development of a process to remove the skin from small fish.
B/C '94-'96 = 1.3 B/C '95-'00 = 3.2

1992/125.25 Australian canned sardines and canned sardine fillets
B/C '94-96 =2.2 B/C '94-'00 =7.8

1992/125.09 Improved packaging system for live rock lobster
B/C '94-'95 = 0.8

1992/125.17 Improved handling and marketing strategy for blue manna crabs
B/C '94-96 = 1.8

The FERM report concluded:

...the total estimated economic benefits from these four projects attributable to NSC funding amount to around \$276,000. This substantially exceeds the NSC expenditures on these projects of \$92,700, and represents a benefit cost ratio to NSC of 3.0.... to put this another way, almost the entire budget of the NSC in 1994 is justified on the basis of the results of these four projects alone.

From its inception, the NSC has had a wide scope of activities that extended beyond funding projects. Both NSC and AUSEAS had a networking role, forging linkages across the disparate elements of the post-harvest sector of the Australian seafood industry.

It is worth noting that these near market projects can often fail to produce outcomes despite the fact that they meet their immediate objectives. Two examples of this are:

? The pilchard skinning machine (Project 992/125.05) worked well and removed a blockage in the production line. Unfortunately the company lost access to the pilchard resource.

- ? The katsuobushi process (Project 1992/125.07) delivered very high quality product at a reasonable price. This was not continued because of an unfavourable change in exchange rates.

FOSTERING INDUSTRY FORUMS

For many years, there was no effective seafood technology forum in Australia. Discussion of seafood research was relegated to obscure timeslots in the programs of broader food conferences, which were dominated by dairy, meat, cereals etc. Alternatively there was the occasional “token gesture” allocation for a paper on a broad topic such as quality assurance or food safety at a conference dominated by fisheries management or biology.

That situation has changed dramatically. There are now a number of forums where post-harvest seafood discussions dominate. The reasons for this are several:

- ? The formation of a seafood interest group within the Australian Institute of Food Science and Technology (AIFST) in 1989 resulted in the inclusion of a full seafood session within the annual AIFST conventions from 1991 onwards.
- ? The QDPI assumed responsibility for organising three international seafood conferences as part of its commitment to post-harvest R&D. The establishment of the NSIS (the forerunner of AUSEAS) was accompanied by the holding of the inaugural International Seafood Conference and Exhibition at the Gold Coast in September 1992 (funded by FRDC). This was followed by two further international conferences in 1996 (*Making the Most of the Catch*) and 1999 (*Seafood Innovations '99*). These technical conferences served several purposes. They brought a wide range of the finest seafood research expertise to Australia, exposing our researchers and industry to the very latest R&D. They showcased our own achievements in an international forum. They formed global links between Australia, a minor player in post-harvest R&D, and world-class research institutes.
- ? The formation of the Australian and New Zealand Food Authority (now Food Standards Australia & New Zealand) with its emphasis on food safety and quality, provided the impetus for the establishment of SeaQual and ultimately the launch of SSA at *Seafood Directions 2000*. This combined the NSC, AUSEAS and SeaQual into one entity. This has resulted in the convening of a number of specialist interest groups on topics such as environmental management, as well as the more general SSA network and the continuing Seafood Directions conferences.
- ? In addition to these, a number of *ad hoc* targeted seminars on topics such as transport of live seafood have been held. Some of these arose out of research projects, whilst others were convened to address a perceived need.

These activities have been supported by QDPI, FRDC and NSC with the provision of funding and administrative support.

EXHIBITIONS, FAIRS AND FESTIVALS

There is an increasing awareness in the fishing industry of the need to project a higher public profile. One way of doing this is to mount displays at public events. In the mid 1990's NSC and AUSEAS took a display stand at *Fine Food* in Sydney, and this has since developed into regular appearances at *Fine Food* in Sydney, Melbourne, and Brisbane, and the *International Catering Fairs*. In addition, stands were taken at a number of seafood festivals and exhibitions. Since these activities have taken a fairly high level of resources, it is worth considering the evolution of this activity.

The first displays designed were intended to make the public aware of existence of NSC, AUSEAS and FRDC, and to attract potential clients. The main display material was the publications for sale, with a reliance on brochures and personal contact as promotional tools.

Publications remain a significant part of the display, but it has been broadened in later years to include demonstrations and samples of products developed from selected NSC projects. More recently individuals from the local SSA network have participated in manning of the stand.

The participation in these exhibitions has been accredited by the organisers, Australian Exhibition Services, with raising the profile of seafood in general at their Fine Food shows. At the first show in which we exhibited, there were only 3 stands covering Australian seafood, our own, Nally plastics and Craig Mostyn Pty Ltd. Today there is a whole "Seafood World" section, as well as numerous other stands that include seafood in their product range.

There is usually a high level of interest in the stand, and publication sales cover a significant part of the cost of mounting the display. Whilst many of our enquiries come from the passing crowds, most of the serious contacts are with other stand holders. Recognising this, we took to holding informal get togethers at the close of one evening based on an activity such as a book launch. This has provided a good opportunity for industry to network.

In addition, participation in the shows has provided an entre to the food service sector, which is a major player in value adding to seafood.

PROFILE OF THE NSC

Because the seafood industry is so scattered geographically, it has always proven difficult to make contact with potential clients. It was realised early on that personal contact was the best way to communicate with stakeholders, and the three Commercial Managers of the NSC made strenuous efforts to travel around the coast, trying to engage the industry, both through their associations and individually, in constructive decision making. This was backed up by active promotion of the NSC by some of the members of the NSCAC. Many of the projects funded by the NSC came about as a result of these efforts.

Surveys of industry members have always concluded that there was a low level of awareness of both the NSC and AUSEAS. This was inevitable given the limited staff time available for promotional activities, and also the essentially reactive stance taken by both NSC and AUSEAS.

With the advent of the SSA, the availability of a realistic promotion and communication budget and the formation of the State SSA networks, there is a new chance to raise the profile for SSA Ltd. By focussing on two issues of immediate threat to the industry, namely food safety and quality, and environmental management, SSA has been able to fill a gap and attract the industry's attention in the best way possible, namely answering an immediate need.

LONGER TERM OUTCOMES

In all, the National Seafood Centre funded 75 projects. A small survey was conducted to try to gauge some of the longer term results of the projects. A sample of ten projects was selected for the survey. A simple questionnaire (Appendix 2) was devised to stimulate discussion. This was sent to participants, either PI's or their commercial partners, then followed up with a telephone discussion. The questionnaire was used as a stimulus for discussion, not as a formal assessment tool. One deficiency that became apparent during this exercise was the lack of questions related to market conditions.

Often the comments from respondents ranged beyond the confines of the questionnaire. The positive response from Will Mure, Principal Investigator of project 97/413 on development of UHT seafood soups was typical of those resulting from a successful project, so it is instructive to look at this project in detail.

The project was initiated when Stephen Thrower and Ian Wells visited Mures Fish House in Hobart doing market research for design of the SeaQual quality chooser. The proprietor, George Mure mentioned that his restaurant was serving two seafood bisques made from the offcuts from fish used in their main courses. These were popular and he was interested in manufacturing them for retail sale as a shelf stable product.

These were fairly fluid products, which suggested to the two food technologists that UHT processing similar to that used in the dairy industry might be the way to go. There was an experienced research team with a pilot scale UHT setup at the Centre for Food Technology, and an under-utilised dairy processing plant in northern Tasmania that could be used for full scale production.

Eventually, the research was done on the full-scale plant because of the logistical difficulties in using the CFT facility. This resulted in fairly costly expenditure on raw material. The outcome was the development of a line of successful value-added products. George Mure presented the results of this project at several conferences including *Aquafest 2000*. Will Mure's responses to the questionnaire were as follows:

- ? The project was classified as product and process development
- ? The application process was clear and straightforward
- ? The results of the project were changes in work practices and purchase of a lot of new equipment, entry into the processed food market, and further development of a range of products not previously considered.
- ? The project would never have been attempted without the support and funding from the NSC. The exercise was considered very worthwhile, and they would be keen to participate in further projects.

It is worth noting that the participants in this project, despite giving excellent oral presentations on this project, experienced difficulty in writing a final report, and finally the Commercial Manager wrote a report based on the presentations.

Another project (No. 98/417) on development of a shelf-stable marinated jellyfish product was also instructive. A product that met the required specifications was developed, and an article published on this project led to a large number of enquiries. Commercialisation did not occur, however, because the process was too labour intensive, and a machine to strip the "bells" would need to be developed. Also the price that could be paid was too low to persuade fishers to catch the jellyfish.

This project was worthwhile despite the fact that it did not result in a good commercial outcome, and it highlights several points:

- ? The value of a good economic feasibility study
- ? The need for technological follow up
- ? The importance of effective dissemination of results.

There was, of course, some negative feedback in the survey. Most respondents found the application process excessively complex and bureaucratic. Many claimed that without the assistance of the Commercial managers they would have abandoned the proposal.

A few disputes arose between the participants in some projects, usually when the Principal Investigators were scientists at research institutes. These disputes resulted from personality differences between industry players who wanted to do the research as quickly as possible and get on with production, and scientists who appreciated what was needed to achieve a valid set of results. Typical causes of dispute were:

- ? The need to do a large enough experiment and take enough samples for a statistically valid result.
- ? Changes made to variables during the experiment without reference to the scientist.
- ? The interruptions caused to production when an experimental line was being run.
- ? An unwillingness to commit valuable raw material and finished product to experimental analysis.
- ? The responsibility for writing up the final report.
- ? Abandonment of an experiment half way through if a revenue generating opportunity came up.

Despite these disputes, a considerable amount of good research was done, and the interactions between researchers and industry were probably a valuable learning experience.

APPENDIX 1

PROJECTS FUNDED BY NSC 1992-2000

Project ID	Project Title	Organisation Name
1992/125.01	FRDC Expenditure on NSC – Secretariat file	Fisheries Research & Development Corporation
1992/125.02	Value added beche-de-mer products	QDPI/CFT
1992/125.03	Value added eel/rice products	QDPI/CFT
1992/125.04	Utilisation of octopus and European car;: Phase 1 – Analysis of potential markets	Anton Kriz and Associates
1992/125.05	Development of a process to remove skin from small fish	Breaksea Holdings Pty Ltd
1992/125.06	Improving the stability and nutritional value of frozen small fish for tuna feed	QDPI/CFT
1992/125.07	Pilot production of katsuobushi in Australia	Katsuobushi Australia
1992/125.08	Fish meal production using by-products of commercial fisheries (pilot study)	Curtin University of Technology
1992/125.09	Airfreight of live seafood: An improved packaging system for live western rock lobster	Western Rock Lobster Development Association Inc
1992/125.10	Waste fish and fish waste – a study of NSW and Qld bycatch and by-product availability	Ruello & Associates Pty Ltd
1992/125.11	Development of a process to manufacture powdered shark cartilage	QDPI/CFT
1992/125.12	Australian canned sardines and canned sardine fillets	Fremantle Sardine Company
1992/125.13	A Model Quality Assurance Program for Red Spot Whiting based on the Clarence River Fishermen's Co-operative facilities	NSW Fishing Industry Training Council
1992/125.14	Live Fish Handling Workshop	Fisheries Research & Development Corporation
1992/125.15	Studies on the physiological responses of wrasse <i>Pseudolabrus tetricus</i> , and the horseshoe leatherjacket, <i>Meuschenia hippocrepis</i> , to capture and transport	University of Tasmania
1992/125.16	Processing and packaging of king crab	FAC Enterprises Pty Ltd
1992/125.17	Improvement in post harvest handling and marketing strategy for blue manna crabs	Cockburn Sound Professional Fisherman's Association
1992/125.18	The manufacture of powdered fish collagen for use as a findings agent by the brewing industry	QDPI/CFT
1992/125.19	Fish silage: can it be used in Australian aquaculture?	Agricultural Consultant Services
1992/125.20	Development of an automated oyster grading the counting line	Seafood Technologies Pty Ltd
1992/125.21	Silver perch industry development: development of a model marketing plan and critical path to facilitate a strategic	Pacific Seafood Management consulting Group Pty Ltd

Project ID	Project Title	Organisation Name
	approach to the marketing of silver perch	
1992/125.22	Potential pharmaceutical products from Australian beche-de-mer	University of Queensland
1992/125.23	Effect of pre-harvest fasting and modifications to post-harvest handling on the quality of farmed SBT	Emily Kristina Pty Ltd
1992/125.24	Maximising economic returns in the NT Spanish mackerel fishery	Northern Territory Dept of Primary Industry and Fisheries
1992/125.25	Seafood container standards program	Mojo Australia Pty Limited
1992/125.26	Live Seafood Handling – Strategies for Development	Pacific Seafood Management Consulting Group Pty Ltd
1992/125.27	Reducing post-capture mortality when storing tropical rock lobsters for live export	Freshway Seafoods Pty Ltd
1992/125.28	Evaluating re-usable containerised systems for airfreighting live fish using bottled oxygen	SEA Foods International Pty Ltd
1992/125.30	Making the most of the catch: a forum for Industry	QDPI/CFT
1992/125.31	Post-harvest and value-adding techniques for jellyfish	Natural Resources and Environment
1992/125.32	Improving packaging technology, survival and market options for kuruma prawns	QDPI/CFT
1992/125.33	Handling and value-adding farmed barramundi	Ruello & Associates Pty Ltd
1992/125.34	Improvement in quality of meat from frozen reject trawl-caught blue crabs	Food Centre of Western Australia (Inc)
1992/125.35	Investigation of the processing methods required to produce fermented seafood sauces for the export market into Asia	Seito Ocean Products Pty Ltd
1992/125.99	Funding of the National Seafood Centre	QDPI/CFT
1997/400	Maintenance and operation of the National Seafood Centre	QDPI/CFT
1997/401	Seafood airfreight packaging strategy: a series of consultative forums	Pacific Seafood Management Consulting Group Pty Ltd
1997/402	Value-adding for squid processing in the Geelong region	Agricultural Consultant Services
1997/403	Study of the production of nuclei for pearl culture using Western Australian mother-of-pearl shell	Southsea Nucleus Supplies
1997/404	New product development: reformed fish products from fish processing waste	Connectica International (Qsun Foods)
1997/405	Development of value-added prawn products through assessing and refining the cold chain and freezing techniques of brine immersion freezers	Gold Coast Marine Hatchery & Taylor Refrigeration
1997/406	Development and test-marketing of value-added tuna products	Smokin' Joe's Seafood Delicacies Pty Ltd
1997/407	Development of transport systems for	Live Tech Pty Ltd

Project ID	Project Title	Organisation Name
	abalone	
1997/409	Beche-de-mer Konawata product development	Beach Gold Pty Ltd
1997/410	Development of value-adding products and preliminary marketing trails for jack mackerel (<i>Trachurus declivis</i>)	Australian Maritime College
1997/411	Development of a chilled pasteurised prawn loaf range in retail packs	Aquatic Food Marketing Pty Ltd
1997/412	SeaQual Pack 1: seafood safety framework development	Seafood Industry Victoria Inc
1997/413	Development of five UHT seafood soups using waste and under-utilised species	Mures Fishing Pty Ltd
1997/414	Shelf-stable carp-based smallgoods	Cranfoods Services Pty Ltd
1997/415	Canned crab production and canned crab market development	Grandax Crab Pty Ltd
1997/416	Development of a smoked karasume and karasumi in sauce	QDPI/CFT
1997/480	"D" program NSC steering committee expenditure	Fisheries Research & Development Corporation
1997/481	An investigation into the shelf life of two marinated octopus products	QDPI/CFT
1997/482	Effects of stabilised chlorine dioxide on rate of seafood spoilage	Quantum Control Pty Ltd
1997/483	Production of publication "Cephalopods of commercial importance in Australian Fisheries"	CSIRO Division of Marine Research
1997/484	Product development of smoked trevally roe pate	Australian Abalone Exports Pty Ltd
1997/485	Evaluation of cooking times on yield recovery of aquaculturally reared black tiger prawns	A. Raptis and Sons
1997/486	Do changes in aeration efficiency of "airwick" diffusers explain recent high mortalities during transport of live fish in bulk bins?	QDPI/CFT
1998/417	Creating a shelf stable marinated jelly fish product from the underutilised species (<i>Catostylus mosaicus</i>)	QDPI/CFT
1998/418	'99 Innovations for seafood – an international conference	QDPI/CFT
1998/419	An investigation into the feasibility of producing a commercially acceptable prawn stock from the discarded heads of commercially processed prawns	Department of Primary Industries, Queensland
1998/420	Value Adding Silver Warehou – basic handling and sensory analyses studies	Southland Fish Supplies Pty Ltd
1998/482	Extending the high quality shelf life of scallop products – modified atmosphere packaging trials	Department of Primary Industries, Queensland
1998/483	Shelf life evaluation of semi-dried vacuumed pack mullet	Food Centre of Western Australia (Inc)
1998/484	Investigation into processing and development of a tuna kebab	De Brett Seafood Pty Ltd

Project ID	Project Title	Organisation Name
1999/421	Development of an automated oyster grader	Stainless Engineering and Design Pty Ltd
1999/422	Developing methods for live export of western king prawns	South Australian Research and Development Institute
1999/423	Processing of redclaw crayfish for improvement of quality and shelf-life – adding value	Capricorn Crayfish Farmers Association Inc
1999/424	Value adding to fish processing waste through aquafeed development	Natural Resources and Environment
1999/425	Lobster steaming	Fremantle Fishermen's Co-operative Society Limited
2000/400	Operation of Seafood Services Australia: product & process development	QDPI/CFT
2000/401	A code of practice for the on-board handling of shark from Western Australian demersal gillnet and demersal longline fishery	Western Australian Fishing Industry Council
200/480	Preliminary study on the development of value added products from an under utilised shellfish resource	Australian Maritime College
2000/481	Improved packaging for smoked Australian salmon and herring	Allerton Seafoods
200/482	New food service and table products for bonito, swordfish and tuna species for domestic Asian consumers and new markets overseas	Ocean Quest Seafoods
2000/483	Prawn allergen identification and purification	Elisa Systems
2000/484	Handling and processing of spotted mackerel for export	Urangan Fisheries

APPENDIX 2

FEEDBACK QUESTIONNAIRE

This questionnaire is a follow up to determine the longer term effectiveness of projects funded under the National Seafood Centre over the period 1992-2000. We would appreciate it if you could devote a little time to give us your assessment of the experience.

How would you classify the project?

1. product development
2. process development
3. trouble shooting
4. shelf life determination
5. other (please specify) _____

How would you describe the application and evaluation process?

1. clear and straight forward
2. helpful in defining the project
3. complex
4. bureaucratic
5. slow
6. other (please specify) _____

How have you applied the results of the project?

1. changed work practices or equipment
2. accessed a new market
3. decided not to proceed
4. other (please specify) _____

If you have not applied the results of the project, why not?

1. the results were negative
2. application of the results was too costly
3. the market conditions changed
4. the changes needed were not appropriate (please specify) _____

How were the results of the project disseminated?

1. paper in magazine
2. pamphlet or handbook
3. CD or video
4. workshop
5. other (please specify) _____

Would you participate in a similar project again?

1. yes, it was worthwhile
2. no, it was not worth the effort
3. no, the funding was inadequate
4. yes, but with some qualifications (please specify) _____

Other Comments: