



Harvesting and Packaging Techniques for the Australian Native Oyster (*Ostrea Angasi*)



Andrew Baker

National ISS Institute Overseas Fellowship

Fellowship supported by the Department
of Education, Employment and Workplace
Relations, Australian Government



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Executive Summary

The purpose of the Fellowship was to undertake an overseas study program to France, Ireland and Hong Kong to gain:

- A comprehensive understanding of the harvesting and packaging techniques used for the European native oyster (*Ostrea edulis*) by farmers in those countries
- A further understanding of market requirements for packaged oysters
- A further understanding of harvesting techniques used for the *Ostrea edulis*

The Australian oyster Industry is currently concentrated in three states, namely New South Wales, Tasmania and South Australia. Annual production of oysters in Australia exceeds \$100 million (NSWDPI Annual Aquaculture Report, 2007). Sydney rock oysters (*Saccostrea glomerata*) have been produced in New South Wales for over 100 years. This industry has faced serious challenges over the last 20 years, but in recent times has seen a significant resurgence both in public demand for the product and in farmer reinvestment. Both South Australia and Tasmania have developed into vibrant and profitable Pacific oyster growing states. The past two decades have seen both regions producing quality oysters for sale domestically and for export.

The native Australian oyster (*Ostrea angasi*) grows in a wild state in southern Australian waters. This oyster is a close cousin to the European native (*Ostrea edulis*), the world's most expensive oyster. Baker believes the potential is there for Australian farmers to diversify into growing *Ostrea angasi* to meet high value markets in South East Asia and China.

The most critical factor in harvesting the *angasi* for market is meat condition. What qualities most suit the market? At what stages in the Australian season does the *angasi* meet these conditions? What water temperature and salinity levels influence meat quality? How are the *angasi* best harvested to prolong shelf life? Little knowledge of these market requirements appears obvious in Australia.

Addressing the Gap

Baker spent approximately three weeks travelling in Europe. The aim was to visit French and Irish oyster farmers to study harvest and packaging techniques.

The ultimate aim was to return and share knowledge with Australian farmers in regard to this skills gap. To achieve this aim a research trip was organised to La Tremblade in France. France's biggest oyster field day is held there annually. The opportunity to attend this field day to gain first hand knowledge of farming techniques, seed stock and packaging materials was critical in the Fellowship study trip.

Ifremer, France's leading Fisheries Research Institute, is situated in neighbouring La Rochelle. An opportunity to meet French scientists and tour Ifremer was invaluable in gaining further knowledge of disease issues in *Ostrea edulis*.

Further time was spent in Bretagne working on oyster farms and harvesting and packing *edulis*. This time also included meeting oyster buyers, processors and exporters.

Moving over to the west coast of Ireland included visits to BIM to discuss current attitudes and issues concerning *Ostrea edulis*. Working with several oyster farmers in harvesting *Ostrea edulis* gave the Fellow first hand experience of processes and techniques.

There appear to be two key points in the harvest and packing of the *Ostrea edulis* that relate to Australian native *Ostrea angasi*:

1. Meat condition (related to water temperature and salinity).
2. Training' the adductor muscle to enable shellfish to remain closed for a longer period of time to aid shelf life.

Executive Summary

Both these factors apply directly to Australian farmers. Having a better understanding of these practices should enable Australian farmers to better meet Australian and International market requirements with more confidence.

The following report provides an overview of the Fellowship experience and this is followed by a series of recommendations for Government, Industry, the Business sector, Professional Associations, Education and Training Providers, our Community and the ISS Institute. These recommendations also include suggestions for engaging in knowledge transfer activities.

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Abbreviations and Acronyms

AISC	Agri-Food Industry Skills Council
AQIS	Australian Quarantine and Inspection Service
ARAC	Aquaculture Research Advisory Commission
BIM	Bord Iascaigh Mhara
FRDC	Fisheries Research and Development Corporation
Ifremer	Institut français de recherche pour l'exploitation de la mer (French Research Institute for Exploitation of the Sea)
ISS Institute	International Specialised Skills Institute
NSWDPI	New South Wales Department of Primary Industries
NSWFA	New South Wales Farmers Association
O.e.	Ostrea edulis
O.a.	Ostrea angasi
POAG	Peak Oyster Advisory Group
SOCo	Select Oyster Company

Acknowledgments

Andrew Baker would like to thank the following individuals and organisations who gave generously of their time and their expertise to assist, advise and guide him throughout the Fellowship program.

Awarding Body - International Specialised Skills Institute (ISS Institute)

We know that Australia's economic future is reliant upon high level skills and knowledge, underpinned by design and innovation.

The International Specialised Skills Institute Inc (ISS Institute) is an independent, national organisation, which has a record of nearly twenty years of working with Australian industry and commerce to gain best-in-the-world skills and experience in traditional and leading-edge technology, design, innovation and management. The Institute has worked extensively with Government and non-Government organisations, firms, industry bodies, professional associations and education and training institutions.

The Patron in Chief is Sir James Gobbo AC, CVO. The ISS Institute Board of Management is Chaired by Noel Waite AO. The Board comprises Franco Fiorentini, John Iacovangelo, Lady Primrose Potter AC and David Wittner.

Through its CEO, Carolynne Bourne AM, the ISS Institute identifies and researches skill deficiencies and then meets the deficiency needs through its *Overseas Skill Acquisition Plan (Fellowship Program)*, its education and training activities, professional development events and consultancy services.

Under the Overseas Skill Acquisition Plan (Fellowship Program) Australians travel overseas or international experts travel to Australia. Participants then pass on what they have learnt through reports, education and training activities such as workshops, conferences, lectures, forums, seminars and events, therein ensuring that for each Fellowship undertaken many benefit.

As an outcome of its work, ISS Institute has gained a deep understanding of the nature and scope of a number of issues. Four clearly defined economic forces have emerged out of our nearly twenty years of research. The drivers have arisen out of research that has been induced rather than deduced and innovative, practical solutions created - it is about thinking and working differently.

A Global Perspective. 'Skills Deficiencies' + 'Skills Shortages'

Skill deficiencies address future needs. Skill shortages replicate the past and are focused on immediate needs.

Skill deficiency is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas. This is the focus of the work of ISS Institute.

There may be individuals or firms that have these capabilities. However, individuals in the main do not share their capabilities, but rather keep the IP to themselves; and over time they retire and pass way. Firms likewise come and go. If Australia is to create, build and sustain Industries, knowledge/skills/understandings must be accessible trans-generationally through nationally accredited courses and not be reliant on individuals.

Our international competitors have these capabilities as well as the education and training infrastructure to underpin them.

Addressing skill shortages, however, is merely delivering more of what we already know and can do to meet current market demands. Australia needs to address the **dual** challenge – skill deficiencies and skill shortages.

Acknowledgments

Identifying and closing skills deficiencies is vital to long-term economic prospects in order to sustain sectors that are at risk of disappearing, not being developed or leaving our shores to be taken up by our competitors. The only prudent option is to achieve a high skill, high value-added economy in order to build a significant future in the local and international marketplace.

The Trades

The ISS Institute views the trades as the backbone of our economy. Yet, they are often unseen and, in the main, have no direct voice as to issues which are in their domain of expertise. The trades are equal, but different to professions.

The ISS Institute has the way forward through its 'Master Artisan Framework for Excellence. A New Model for Skilling the Trades', December 2004. The Federal Government, DEEWR commissioned ISS Institute to write an Australian Master Artisan School, Feasibility Plan.

In 2006, ISS Institute Inc. set up a new ISS advisory body, the **Trades Advisory Council**. Members are Ivan Deveson AO; Martin Ferguson AM, MP, Federal Labor Member for Batman; Geoff Masters, CEO, Australian Council of Educational Research; Simon McKeon, Executive Chairman, Macquarie Bank, Melbourne Office; Richard Pratt, Chairman, Visy Industries and Julius Roe, National President Australian Manufacturing Workers' Union.

Think and Work in an Holistic Approach along the Supply Chain - Collaboration and Communication

Our experience has shown that most perceive that lack of skills is the principal factor related to quality and productivity. We believe that attitudes are often the constraint to turning ideas into product and a successful business; the ability to think laterally, to work and communicate across disciplines and industry sectors, to be able to take risks and think outside the familiar, to share – to turn competitors into partners.

Australia needs to change to thinking and working holistically along the entire Supply Chain; to collaborate and communicate across industries and occupations - designers with master artisans, trades men and women, Government agencies, manufacturers, engineers, farmers, retailers, suppliers to name a few in the Chain.

'Design' has to be seen as more than 'Art' discipline – it is a fundamental economic and business tool for the 21st Century

Design is crucial to the economic future of our nation. Australia needs to understand and learn the value of design, the benefits of good design and for it to become part of everyday language, decision making and choice.

Design is as important to the child exploring the possibilities of the world, as it is to the architect developing new concepts, and as it is to the electrician placing power points or the furniture designer working with a cabinet-maker and manufacturer. As such, design is vested in every member of our community and touches every aspect of our lives.

Our holistic approach takes us to working across occupations and industry sectors and building bridges along the way. The result has been highly effective in the creation of new business, the development of existing business and the return of lost skills and knowledge to our workforce, thus creating jobs - whereby individuals gain; industry and business gain; the Australian community gains economically, educationally and culturally.

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Fellowship Sponsor

This Fellowship has been supported by the Department of Education, Employment and Workplace Relations (DEEWR), Australian Government.

The Australian Government's Department of Education, Employment and Workplace Relations (DEEWR) implements Government policies and programs to provide education and training opportunities for all Australians, to increase employment participation and to ensure fair and productive workplaces. Education, training and workforce participation are central to our goal of building a productive and socially inclusive nation, one which values diversity and provides opportunities for all Australians to build rewarding social and economic lives. Andrew Baker would like to thank them for providing funding support for this Fellowship.

Fellowship Supporters

In Australia

- NSW Department of Primary Industries (NSWDPI)
Dr Wayne O'Connor, Senior Research Scientist (Port Stephen)
- Select Oyster Company (SOCo)
Ray Tynan, Director
- Sydney Fish Market
Graham Turk, Managing Director
- NSW Farmers Association
Rachel King, Oyster Section

In France

- Ifremer (Institut français de recherche pour l'exploitation de la mer)
Dr Sylvie Lapegue and Dr Rene Robert

In Ireland

- BIM (Bord Iascaigh Mhara)
Mary Hannan, Senior Field Officer

In Singapore

- Culina Pty Ltd
Aldo Molinaro, Purchasing Agent for Oceania Region

In Hong Kong

- Wholesun Foods
Joel Chu, Managing Director

Peak Bodies Impacted by the Fellowship

Federal Government

- Fisheries Research & Development Corporation (FRDC)
Contact: Dr Patrick Hone
- Australian Quarantine and Inspection Service (AQIS)
Contact: Dr Eileen Gosling

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Contact: Arthur Blewitt
- National Aquaculture Council (NAC)
Contact: Mr Simon Bennison

State Government

- NSW Department of Primary Industries
- NSW Food Authority
Contact: Bruce Neland
- Department of State and Regional Development
Contact: Malcolm Lemaire

Local Government

- Local Water Catchment Management
- Shire Water and Sewerage Officers
- Town Planners / Local Council

Businesses

- Sydney Fish Market
- Melbourne Fish Market
- Tasea Pty Ltd

Education/Training Institutions

- Australian TAFE Institutes
- Marine / Aquaculture College, Tasmania and Queensland
- Australian Maritime College, Tasmania

Industry / Professional Associations

- NSW Farmers Association (NSWFA)
- Select Oyster Company (SOCo)
- Peak Oyster Advisory Group (POAG)
- Aquaculture Research Advisory Commission (ARAC)

Media

- Austasia Aquaculture Magazine

Other

A listing of other bodies can be found in 'Australian Seafood Industry Directory'. Version: 23 April 2008 at <http://www.seafood.net.au/directory>

About The Fellow



Name: Andrew J Baker

Qualifications

- Diploma of Teaching, Victoria College, 1989 (Music/Science Majors)

Related Qualifications

- National Leadership in Seafood Program 2006
- Justice of the Peace
- Secretary Pambula River Shellfish Program 2005

Over the past 14 years Andrew Baker has owned and operated Pambula Rock Oysters on the far South Coast of NSW. During this time he has expanded his farm to include the successful and profitable farming of Sydney rock oysters but also associated species such as the Australia native oyster. Trials of new farming techniques and infrastructure see Baker is committed to trialling new farming techniques and infrastructure and is willing to use evolving ideas to adapt and develop existing successful farming techniques.

With a passion for aquaculture, Baker has extensive contacts with his peers throughout Australia. Through his network Baker is able to keep abreast with new ideas and theories that may assist in the greater success of aquaculture throughout each State. In 2005 Baker seized upon an opportunity to apply for an export licence to enable live Sydney rock oysters to be shipped to overseas markets. Working closely with AQIS, Baker created the first Approved Arrangement in Australia, allowing him to commit to overseas markets in South East Asia, Hong Kong and Dubai.

Currently Baker is interested in furthering the export of Sydney rock oysters and is promoting his experiences throughout NSW. In addition to the Sydney rock oyster he believes there is great potential for the farming of the Australian native oyster (angasi) with significant demand for the product overseas. Baker believes that the Sydney rock oyster industry in NSW can be worth three times its current \$35 million value (NSWDPI Annual Aquaculture Report, 2007) with increased production and export marketing. He firmly believes there is potential to diversify into other complementary species on farm such as the Australian native oyster.

Away from this, Baker is married with three children and is passionate about fly fishing, reading, surfing and motorbike riding.

The Fellowship Program

The purpose of the Fellowship was to undertake an overseas study program to France and the West Coast of Ireland to gain a comprehensive understanding of the harvesting and packaging techniques used for the European native oyster (*Ostrea edulis*) by farmers in those regions to meet market requirements both domestically and internationally.

Aim of the Fellowship

To undertake an overseas study program to gain first-hand knowledge of farming, harvesting and packing techniques of the European native oyster, a close cousin of the Australian native oyster, to assist Australian farmers in better meeting market requirements.

This includes:

- Farming techniques to cope with 'fresh' water incidents, ie: heavy rainfall
- Point of harvest 'decision making', ie: when meat condition is best suitable for harvest
- Packaging and storing techniques to meet domestic and international standards

Skills and Knowledge Gaps

The Australian native oyster - the *Ostrea angasi* (ann-gar-zee) is an existing species of oyster growing wild in the southern states of Australia. In recent years attempts have been made to harvest wild oysters to meet strong demand, particularly from South East Asia. Over the last 10 years the NSW Department of Primary Industries has made great progress in producing commercial quantities of juvenile oysters for farmers to grow out.

NSW farmers have been on-growing these oysters successfully for several seasons now. Many oysters are now at the point of harvest.

Skill Gaps to be Investigated

Development of 'best practice' farming techniques in order to meet growing export demands. A critical problem that faces our farmers now is one of suitable meat condition.

At what point in the season is the optimum time to harvest this oyster?

- How is this affected by water temperature?
- How is this affected by salinity levels in harvest area?
- What is the optimum shell size/meat condition ratio?

At what point in the season is the optimum time to market this oyster?

- Who is the target market? ie chefs, importers, domestic wholesalers

At what point in the season is the optimum time to sell this oyster?

- How do we compete with existing product?
- How do we complement product from other areas using the natural advantage of Northern/Southern Hemisphere seasonal differences?
- What is the best method of matching meat condition and shell size to the market requirements?

The Australian native oyster is a very close cousin (if not identical) to the European native oyster (*Ostrea edulis*). The *edulis* fetches a very high price throughout the world. French and Irish farmers have been growing, harvesting and packing the *edulis* for generations. Their knowledge of the oyster is profound.

The Fellowship Program

Given the similarity between the two species, there was an exciting opportunity to consult with French and Irish farmers to gain knowledge of farming techniques and, most importantly, harvest techniques. The *edulis* is grown extensively on the West Coasts of France and Ireland. The opportunity to visit these regions enabled Baker to gain first hand experience of all farming practices currently undertaken.

The Australian Context

Oyster farming in Australia has developed dramatically over the last two decades into one of the most commercially important aquaculture industries. Farmed oyster sales in excess of \$100 million nationally demonstrate the significance of this industry (NSWDPI Annual Aquaculture Report, 2007). Significant numbers of Pacific oysters are exported both from South Australia and Tasmania, with NSW (and the Sydney rock oyster) just beginning to develop overseas markets.

The Sydney rock oyster has been farmed commercially in NSW for over 120 years. They are grown predominantly in NSW and are found naturally occurring from Wonboyn Lake in the far South Coast to Moreton Bay in the North. Some \$35 million were produced in 2006/2007. There are over 300 permit holders throughout the state producing Sydney rock oysters (NSWDPI Annual Aquaculture Report 2007).



Re-grading Sydney rock oysters on Pambula Lake Opened angasi oysters - Pambula Lake

The Sydney rock oyster has an excellent reputation. It is regarded as one of the finest oysters in the world and fetches a premium in markets both domestically and internationally. Demand for the Sydney rock oyster has increased over recent years and production levels are also rising to meet this welcome pressure.

Over the last few decades, both South Australia and Tasmania have developed vibrant, profitable oyster industries. The growing of oysters for pearl production in Northern Australia is also a large industry. To complement this increased growth, both State and Federal Governments are developing programs aimed at selective breeding of oysters for increased growth rates, better survival rates and disease resistance, with great results.

Quite clearly a major natural advantage Australia has is clean, suitable water for oyster production. Water quality (the primary factor in oyster production for human consumption) in Australia is first class, from the pristine estuaries on the far South Coast of NSW to the vast oceanic bays of South Australia. Therefore, investment from both Government and the private sector in oyster production and aquaculture generally should continue to grow.

Farming techniques in NSW have changed dramatically in recent years. Traditionally, Sydney rock oysters have been grown on sticks, then placed in trays for finishing. However, disease, Pacific oyster infestation and leading techniques in South Australia and NSW have prompted NSW farmers to adapt their methods. Farmers now are moving away from stick culture toward single seed oysters. Seed oyster production enables farmers to take oysters as individual units at a very young stage. There are advantages for the farmer here. As 'single' units, it is possible to have far greater knowledge of exactly how many oysters are being produced. Seed oysters are also able to be farmed to encourage a more desirable shape that has a clear advantage in the market with processors able to open seed oysters more easily than stick oyster production, and chefs preferring the more uniform shape of each individual oyster.

The Australian Context

Hatchery produced, selectively bred oysters are now becoming available, being produced both by the public and private sectors and are being taken up by farmers. Growing techniques have also changed with floating culture becoming more prevalent. This is where oysters are suspended in the top 100mm of the surface of the water in bags with floats. This method is becoming increasingly popular for several reasons.

Firstly, as the oyster is suspended in the water it is able to feed constantly and the results are showing two major benefits:

- (a) faster growth rates;
- (b) oyster meat condition stays better for longer.

Secondly, the floating bags have enabled farmers to utilise lease areas where traditional farming techniques were unsuitable, such as shallow water or very exposed areas.

Farmers are showing a great willingness to adapt and Baker believes this is the key to the industry's survival and profitability.

Government support and input at Local, State and National levels in the oyster industry is vital. Government research into disease resistant oysters has been very welcome. Scientists at the NSW Department of Primary Industries have also been invaluable in directly assisting both Sydney rock oysters and pearl farmers through research into selective breeding programs for oysters, testing to find the optimum temperature for storing oysters and producing disease resistant oysters.

For the oyster industry to continue to grow into the future several issues need to be addressed. Perhaps the most important of these is land use in catchment areas. There has been a huge population shift, or expansion over the last decade as people seek a 'sea-change'. Small coastal villages and towns have seen massive growth and development. Such activity is often welcomed by local councils eager for the income, however, the potential for conflict between industries is increased. Striking a balance between land clearing for housing development and ensuring sewerage and storm-water runoff do not impact on traditional oyster producing areas is vital. In some areas a good balance has been struck, but in many areas development has seen the demise of oyster production.

A more controversial area for Government to deal with is that of property rights. Currently oyster farmers in NSW operate under a lease arrangement with the State Government. Leases have a 15 year life then must be renewed under application. Would there be more security in the industry if freehold was given over these areas of water? Businesses would have the opportunity to raise capital against their 'land'. Re-investment and access to cash to expand or diversify business is a problem for all in the industry. Freehold title may encourage investment in the oyster industry.

Many significant issues face the Australian oyster industry both locally and nationally. It is the Fellow's belief that industries that do not show growth, vision or leadership are in danger of disappearing and NSW oyster farmers are under great pressure. We must be looking at ways to increase production and profitability.

There occurs in Australia a species of oyster called the Australian native oyster (*Ostrea angasi*). This oyster was the first oyster fished out by early Europeans as it is a close cousin to the European native oyster (*Ostrea edulis*). Much work has been done by the NSW DPI in recent decades to produce juvenile stock for farmers to grow. Several farmers in Southern NSW have grown crops of angasis to harvest size in two years. Farming techniques for growing angasis differ only slightly from Sydney rock oysters.

The Australian Context

There exists the opportunity for farmers to produce angasis concurrently alongside species such as the Sydney rock oyster. Such diversification has two benefits:

- (a) spreads risk associated with a single crop failure and;
- (b) value adds to the farm's inherent worth as the farmer has more than one choice of crop to grow. The ability for farmers to diversify at reduced risk is critical to successful farm practice.

As farmers increase production of a more refined product, wholesale and retail outlets are subsequently able to offer a broader choice to the consumer. Consequently, restaurants, supermarkets and other food outlets become more sophisticated in their range. Consumers are the ultimate driver of food products. If farmers have greater knowledge of market requirements, using their skills to meet that market in producing better quality oysters should follow.

Further to the farmer-consumer relationship there is the critical role that research and development plays in successful aquaculture industries. The production of juvenile oysters, selected breeding lines, triploid or disease resistant species all enable farmers to produce an oyster more profitably. A successful aquaculture industry relies heavily on a thriving, healthy research and development body.

Therefore, encouraging farmers to consider growing an already existing native oyster that has high export potential alongside their current product has the potential to add great value to the Australian oyster industry as a whole.

Education and Training

Aquaculture Qualifications in SFI04 Seafood Industry Training Package

Code	Title	AQF Level	Job Activities	Audience
SFI10104	Certificate I in Seafood Industry (Aquaculture)	1	Operational	New entrants to the industry
SFI20104	Certificate II in Seafood Industry (Aquaculture)	2		Employees under close supervision
SFI30104	Certificate III in Seafood Industry (Aquaculture)	3		Employees under minimal supervision
SFI40104	Certificate IV in Seafood Industry (Aquaculture)	4	Management	Employees with coordination duties
SFI50104	Diploma of Seafood Industry (Aquaculture)	5		Owners and managers of an enterprise

The International Experience

The following table provides an overview of the Fellowship destinations and identifies the key issues addressed within each region.

Destination	Key Issues/Site Visits
France La Tremblade	<ul style="list-style-type: none"> • Attend La Tremblade Oyster Field Day • Visit Ifremer (leading French research Institute) • Meet local oyster farmers - discuss harvest/packaging techniques • Visit Marennes Oyster Museum • Tour local 'Claire's' (dam-like water areas used for finishing oysters) • Tour local oyster markets
France Bretagne	<ul style="list-style-type: none"> • Meet with SDAB – Fish/oyster importer/exporter • Visit local oyster farmer Alain Morlain. Tour harvest areas. Discuss harvest and packaging techniques used for edulis. Discuss salinity/water temperature conditions at point of harvest. • Working day with Morlain at Roscoff.
France Paris	<ul style="list-style-type: none"> • Visit city fish mongers. Edulis at €35/doz retail
Ireland Westport	<ul style="list-style-type: none"> • Meet Mary Hannan, Senior Field Officer, BIM. Discussion of oyster growing areas/issues facing local industry. • Meet Sean O'Grady, Clew Bay oyster farmer. Visit farming areas. Discuss harvest techniques, water quality issues, packaging techniques for export of live edulis. • Discuss 'training' edulis to remain closed. • Size of oyster i.e. + 75cm then weight 70 – 90 100 etc
Ireland Galway	<p>Meeting with Michael/Diarmuid Kelly</p> <ul style="list-style-type: none"> • Packaging/techniques for harvest • 'Training' oysters to remain closed. • Depreciation/transport • Destinations of edulis = France / Hong Kong • Price ranges \$1 – \$2 AUD/pc • Size = 75cm then weight
Hong Kong	<p>Meeting with Joel Chu, Manager Wholesun Foods</p> <ul style="list-style-type: none"> • Discuss: market requirements/distribution of oysters in Hong Kong • Current oyster imports • Visit Wholesun warehouse

The International Experience

Site Visit: France

In light of the perceived skills gaps in angasi harvest and packaging techniques in Australia, a visit to the Marennes-Oleron region of France was organised. The La Tremblade area is where the main oyster production occurs with a winter temperature of 14°C through to summers of 22°C. It was anticipated that useful technical information would be obtained from within the Olvon region of France. A key activity included attending the La Tremblade oyster field day, meeting the Ifremer CEO and exploring the Marennes Oyster Museum.



Oyster farmers at work - La Tremblade



'Claire' - La Tremblade. These ponds are used for finishing oysters.



La Tremblade Charente Maritime - 100,00 tonnes of oysters produced annually.

La Tremblade Field Day

This annual event is the largest oyster industry field day in France. 150 stalls are present and all areas of the oyster industry are represented. Information regarding oyster spat¹, grading machines, farm insurance, boats and engines, and everything in between is on display. Given the enormous presence of oyster farms in the region the size and scope of this festival is justified.

Of particular interest in the context of this Fellowship were the grading machines and packaging and labelling stalls on display. The standard measure for all oyster grades in Europe is weight. There are many sophisticated machines available in the market for industry use. Weight is seen as the most reliable and easiest characteristic to grade oysters. There are several established grades that both producers and farmers recognise and price accordingly. It is important to note that it was common to see farmers give a final 'hand grade' of some product to ensure even grades by removing the occasional blemished or undersized oyster.

Packaging techniques for all species of oysters in France are quite different to those in Australia excluding the transportation of bulk oysters whereby they are moved from region to region, or farmer to farmer via large wire bins or hessian bags. Oysters for market are packed in small 1-2kg wooden boxes with the region/farmer's label displayed. French food authorities currently believe that as the oyster is closed no further contamination of the product is possible. Farmers also believe that wood is more aesthetically pleasing and far more suitable to transport a live oyster than polystyrene cartons. Therefore, issues of branding, marketing and packaging/recycling are important within the context of value adding. French farmers export product to other European countries and more significantly, into Asia in these wooden boxes. This technique is prohibited by AQIS here in Australia where oysters for export must be packed in polystyrene cartons to comply with Australian Health regulations.

In summary, the Fellow saw little in the way of packaging and transportation that were not already present in Australia. What was of significance however was the field day. The Australian oyster Industry could benefit from such a field day, with the sharing of ideas, genetics, machinery and oyster products available being a tremendous resource for the industry.

¹ 'Spat' is the term used for juvenile oysters that have formed a single, individual shell. ie. more advanced than the larval stage.

The International Experience

Marennes Oyster Museum - Research and Education Facility

Established alongside the Charente River is the Marennes Oyster Museum. This building has been set up by the French Government. Its purpose is to provide an education facility where the public can learn about oyster history, production and research techniques and oyster farming lifestyles. All aspects of the industry are covered.

A conference room is available for meetings and educational use. Interactive computers provide visitors with clear and concise copies of information as seen at the museum. Six individual buildings show 5-10 minute films regarding different aspects of oyster farming and production where visitors are shown everything from Casanova's fascination with oysters (and his eating 50 per day) to the latest Ifremer research findings regarding triploid oyster production and disease resistant technology.

An excellent restaurant and souvenir shop also cater for internal and external needs. This facility has proved to be a huge success with incredible numbers of visitors passing through every year. Such a high tech, interactive facility also further encourages the positive portrayal of the oyster industry and the important role it plays in French culture.

Ifremer

Ifremer is the leading research body in France working on shellfish biology, production and reproduction techniques and disease impact. Dr Sylvie Lapegue, a genetic engineer, was Baker's host at Ifremer. Her role at the station is in studying disease impact on shellfish and potential techniques for producing more disease resistant, faster growing shellfish.

Ifremer has a strong emphasis on disease and virus identification and selective breeding programmes for disease resistance in shellfish. There is a real push for triploid oysters from French farmers who believe the faster growth rates achieved and resistance to disease will give them a more profitable farming advantage over wild-caught oysters. Researchers at Ifremer are responding to this demand from industry.

Physiology/Biology: The angasi and edulis are what is termed 'brood oysters'. This simply means the larvae develop within the mantle of the adult female. Just prior to the larvae settlement stage, they are released into the environment where they may drift around for a couple of days. This allows the juvenile oysters to disperse. Understanding this biology is important to farmers, as when the angasi/edulis is producing it is unsuitable for the marketplace. The larvae move through three stages in the adult female – ie. 1. white sick 2. grey sick 3. black sick². In NSW this reproductive stage appears to begin as water temperature increases in late spring (November). Angasi are likely to reproduce in Australia over the warm water months of November through to March. Harvest for market during this period is not recommended as the presence of larvae in mature female angasi is to be expected.

A point of interest here is the different behaviour of 'broadcast' oysters such as the glomerata and gigas. Both these species release spawn into the water where fertilisation takes place outside the oyster. This effectively means that as long as the remaining meat condition of the oyster is suitable for market standards, there is no reason to stop harvest.

Summary Of Ifremer: Work on producing disease resistant edulis at Ifremer is ongoing. It is Baker's belief that Australian oyster farmers and researchers would benefit from the results of such work. Australia has worked closely with Ifremer in the past. Dr Wayne O'Conner from NSW DPI has worked closely with Ifremer and is highly respected by French researchers. As the two species of oyster (edulis and angasi) are so similar, results of research may well be able to be shared and applied.

² 'Sick' is the term used for the larvae that are held within the mantle of brood oysters such as angasi and edulis. The colour reflects the maturity of the larvae with white the youngest and black the most mature and nearest to spawning.

The International Experience

A general comment made by Dr Lapegue was that French farmers do not readily take to new advances in science and research. Australian farmers were praised for being more receptive to innovation. Is this due to the relatively 'young' state of Australia oyster industry compared to the old, established European industry? Whatever the reason, close collaboration between research and farmer should be actively encouraged to exploit any new knowledge which may give industry an advantage.

Point of Harvest

Edulis are all wild, caught in both France and Ireland. This means they are dredged up off the bottom where they have been growing in a wild (not farmed) state. In the Bretagne region of France where most edulis are produced, the water temperature ranges from 7°C in winter to approx 18°C in summer. Salinity levels at Carantec, Morlaix range up to 1026 maximum.

As the edulis has been submerged during its life to this point, the adductor muscle is quite weak. This muscle is used to keep the oyster closed. To increase the shelf life of the edulis (which will open within 24 hours otherwise) farmers 'train' the oyster by placing them at levels in the sea water where they are only submerged for 4-6 hours per day. They will leave the oysters in this state for 1-2 weeks to strengthen the adductor muscle and therefore increase the shelf life of the oyster. After this 'training' period, edulis will keep up to 7 days out of the water.

Site Visit: Ireland – Harvest and Packaging Techniques/Salinity/Fresh Water etc



Clew Bay - Major oyster producing on the West Coast of Ireland



Preparing to re-stock oysters in Clew Bay

A visit to the West Coast of Ireland revealed a vibrant sophisticated oyster industry similar in production levels to the NSW oyster industry. Irish farmers produce predominantly gigas, but also a significant amount of edulis. There is a very close connection between the French and Irish shellfish industries with shared farming techniques, stock movements between the two countries and nearly 100% of edulis caught and produced in Ireland sold to France.

Edulis in Ireland are fished for by oyster 'fishermen', not oyster farmers. These fisherman are licensed to fish known areas where wild edulis are prevalent, on designated days of the year, using small 1-1.5m dredges trolled behind a boat. Thus, all edulis are wild-caught in Ireland as in France.

When emptying a dredge, the oyster fisherman uses a plastic gauge with a 75mm circle cut in the centre to crudely grade each oyster for length. Any oyster that passes through this circle is thrown back into the water. Those oysters that are above this minimum size are then taken back for further processing.

The International Experience



European native oysters
- Galway Bay

Sean McCready (Murrisk Shellfish, Clew Bay) is one such oyster fisherman operating in Clew Bay, Westport. Oysters that are brought back to the premises are then graded simply by weight (total shell and meat weight) using a grading machine. Oysters were weighed out into 3 grades:

- a. 70-90 grams
- b. 90-110 grams
- c. 110+ grams

These graded oysters are then immediately returned to water, as they are very fragile in this state (recently caught). As previously mentioned, this 'fragility' is because wild edulis are bottom dwellers, always submerged and open to feed almost constantly. Therefore, the adductor muscle (the main muscle responsible for opening and shutting the oyster) is very weak as it is not overly used. Returning the graded oyster to the water as soon as possible allows the animal to recover from any stress endured during harvest and grading. Oysters are so fragile when first caught they are normally worked in one day, ie. dredged, graded, weighed and returned to water within 12 hours.

Training Oysters

A key point of learning seen in France and reinforced in Ireland, was the 'training' technique used to promote shelf life in the edulis. As mentioned earlier, wild edulis are not able to stay shut for any length of time outside the water. This obviously makes their delivery to market 'live' virtually impossible. To overcome this problem, the wild edulis undergoes a 'training' period of between 1-2 weeks. Wild oysters are graded and at point of harvest are placed in baskets and kept at a height where they are only submerged for 4-6 hours per day. This effectively forces the animal to work at strengthening its adductor muscle through strenuous use daily. By training the oyster in this way for the given length of time, the farmer/fisherman/exporter is able to profoundly increase the shelf life of the oyster up to 7-10 days allowing a more reliable supply of shellfish both locally and internationally.

Season and Salinity

Edulis fishermen in the Westport and Galway regions of Ireland fish for shellfish during the cooler months of September to December. There are several reasons for this. Firstly, the Christmas period is one of huge shellfish demand throughout Europe (the French consume 40% of their entire crop over two weeks of the Christmas period). Secondly, oyster fisherman believe that cooler water and air temperatures make handling and transporting the fragile edulis more suitable. Cooler conditions appear to stress the edulis less, therefore mortality rates are lower. The third reason is meat quality. As mentioned earlier, the edulis (and angasi) is a brood oyster that matures its young within the shell. This breeding stage is usually related to warmer water temperatures and is unlikely to occur in the cooler months. Therefore, harvesting edulis during the Europe winter ensures meat condition is most appropriate for market expectation.

Salinity levels at point of harvest are critical. The edulis (like our angasi) do not cope with sudden changes in salinity levels. Areas visited in Ireland typically had salinity levels of 22-24 parts/1,000.

Drastically changing salinity levels at point of harvest may kill the edulis. Irish and French farmers use large holding tanks of stored sea water to hold wild-caught edulis during the main harvest period. Oysters can be kept in these controlled tanks prior to being graded to enable large numbers of shellfish to be held and worked on. Oysters are at little risk of sudden salinity changes and are able to return to the water quickly after the grading process to reduce stress.

The International Experience

Summary

Harvesting techniques used for gathering wild edulis in both France and Ireland were similar. In both countries the edulis are wild-caught using dredges. They are graded using firstly a minimum shell size of 75mm then simply by total shell and meat weight. The most consistent grades offered were 70-90 grams, 90-110 grams and 110+ grams.

Prior to harvest for market all edulis were 'trained' to strengthen their adductor muscle. This exercise is done simply by forcing the oyster to remain shut for 18 hours per day for a period of 1-2 weeks. Using this simple technique improved the shelf life of the oyster from 24 hours to up to 7 days.

The major harvest period for the edulis occurs during the colder months where the presence of larvae within the oyster is unlikely, the meat condition is suitable for market expectations and the cooler air temperature is conducive to longer shelf life.

The salinity levels at point of harvest were between 1022-1026. Understanding that the edulis is unable to cope with drastic changes in salinity affects the oyster fisherman's decision as to when to harvest. In periods of anticipated high rainfall events, fishing for and handling edulis was not undertaken.

Water temperature in Bretagne and the west coast of Ireland ranged between winter lows of 6-7°C to summer highs of 18-20°C. It seems that most harvesting of edulis occurs in the cooler water temperature months of September to December. This decision is based on market demand and oyster meat suitability.

Packaging techniques used in both France and Ireland for presenting the edulis to market are very different from those permitted in Australia. Edulis oysters are packed in wooden boxes and covered in seaweed to prevent the oysters shifting. Although this packing technique is traditional, quaint and aesthetically pleasing, farmers and exporters believe health authorities are reviewing the suitability of this practice (Irish exporter Diarmuid Kelly believes it is unsuitable and that the practice will be phased out and replaced with polystyrene boxes, predominately for public health issues).

Site Visit: Hong Kong

The final stage of the Fellowship program was to visit potential shellfish buyers in Hong Kong who import the edulis and have experience in meeting consumer expectations. Talking with these importers is imperative as they are the crucial link between the farmer and the consumer. The better importers are careful (prudent) about where they source shellfish from and most significantly, who they on-sell to. It is possible to lose a good reputation by supplying to customers who do not handle shellfish products with care.

By far the most sought after seafood, and that which commands the highest price, is the 'live' product. High quality, high value species such as abalone and lobster fetch astronomical prices in Hong Kong. Live shellfish are also keenly sought after.

The oyster market in Hong Kong is very price competitive and oysters are imported from all points of the globe. Those shellfish that do not meet importing requirements, such as meat quality, mortality rate or uncompetitive pricing, are quickly discarded and replaced by oysters sourced elsewhere. As Australia produces oysters from many regions there should be potential to source product from different regions at different times of the year ensuring the supply of oysters of the highest quality. Sydney rock, Pacific and Australian native oysters are all produced in Australia. We are in the enviable position of being able to offer different species of shellfish at different times of the year, which should help meet any quality issues that may be faced.

The International Experience

Production costs of oysters in Australia are comparable with European farmers. However, oysters are produced far more cheaply throughout Asia in countries such as the Philippines and China. Both these countries produce huge quantities of oysters. Against this backdrop of cheap price and high volume, the issue of water quality and fitness for human consumption must be raised. Conversely, Australia has very strict water monitoring programs in place and a well regulated oyster harvest protocol. Our reputation for food safety is well regarded internationally and should rightly be reflected when demanding higher prices for shellfish.

A point of interest during a conversation with a Hong Kong importer was the use of rubber bands placed around the edulis to keep them closed to improve shelf life. This technique was found to be unsuccessful as unfortunately the oyster could still die, but the importer may be unaware as the oyster is still closed giving the appearance that it is alive. Selling 'dead' oysters to the markets quickly ensures customer dissatisfaction. Therefore, the preferred method of buying live edulis (and angasi) is in their natural shape with no external restrictions upon the shell which may prevent detection of stressed animals.

Culina Pty Ltd, in Singapore, imports live edulis from Brittany (France). These oysters have been packed in traditional wooden boxes. They are kept within a temperature range of 4-6°C. Their expected shelf life upon arrival in Singapore is 5 days. Close collaboration with both farmer and restaurant by Culina ensures that live edulis are ordered 'on demand'. That is, Culina will import live edulis that have been pre-ordered by restaurants. There is little room for wasted product, particularly when they are so expensive.

Key Findings

The key aim of this Fellowship was to gain further knowledge of harvest conditions and packaging techniques used by edulis farmers that may be adopted in Australia by angasi farmers. The critical areas studied while overseas included salinity levels at point of harvest, 'training' techniques to increase the shelf life of the oyster, grading techniques and market expectations re meat quality and shell size. These findings now need to be presented to key industry stakeholders domestically.

Key Findings (Skill/Knowledge Gaps):

1. Salinity

Angasi/edulis risk mortality if exposed to drastic changes in salinity levels. Farmers need to ensure that angasi can find reasonable salinity levels in every tide (ie. 1024+) Farmers need to be able to 'move angasi' to deeper water with higher salinity in times of fresh water events.

2. Point of Harvest

- a) Meat condition: harvest of angasi should occur in the cooler water temperature months of April to September. This should ensure that any spawning oyster is not selected for harvest (spawn is present in warmer months). There is also a marketing window at this time as the Europeans are not harvesting.
- b) Shelf life: angasi should be 'trained' for 1-2 weeks prior to harvest. Oysters should be placed on high racks enabling them only to be submerged for brief periods in every tide (ie 4 to 6 hours/day). By forcing the angasi to stay shut for longer periods the adductor muscle becomes strengthened. This technique should enable the angasi to remain shut for 7 days – a reasonable length of time to arrive in the market.

The International Experience

3. Grading

All angasi destined for market should be greater than 75 mm in length. Oysters should simply be passed through a ring 75mm in diameter. Smaller oysters should be returned to the water for on-growing.

Oysters above 75mm should then be graded by WEIGHT. Three grades are recommended:

70-90 grams	Standard
90-110 grams	Large
110+ grams	Supreme

4. Packaging

Angasi oysters are very fragile. They should be handled like eggs. Oysters should be packed in a padded polystyrene carton with the cup side down. They should be placed snugly together to prevent excess movement in transit and it should be ensured that there is no space at the top of the box ie keep packaging and oysters packed tightly. A FRAGILE sticker on the box encourages proper handling of product.

Knowledge Transfer

Education and further learning are essential for individuals, business and industry to grow. Being open to new ideas that challenge established ways, or being able to incorporate the latest techniques into existing structures can be the difference between industry success and failure. Similarly, the opportunity to undertake this Fellowship provided a 'once in a lifetime' experience, and one that demands to be shared. As a current exporter of live oysters Baker has been able to utilise his findings immediately into his current business practices by offering angasi oysters to new markets and providing growers with information regarding processes such as harvesting techniques.

When assessing the current state of the oyster industry, Baker believes that three key areas are critical to future success: (1) Government (2) Producers (3) Wholesale/Retailers. To maximise the outcomes, Baker believes that it is essential that all knowledge transfer activities be targeted to these three sectors.

Additional activities undertaken by the Fellow:

1. Baker was invited to present a seminar on angasi production techniques to a seafood leadership group, held in the ACT on the 12th of September 2007. This seminar provided an opportunity to promote diversification in aquaculture, focussing upon the inclusion of angasi oysters.
2. Baker proposes to conduct a seminar on angasi harvest and packaging techniques at the NSW DPI Fisheries Research Centre at Port Stephens. This opportunity will allow Baker to share Fellowship findings with both fisheries management and research staff; both of whom have a critical role in oyster production in the state.
3. Baker intends to provide an edited summary of his Fellowship to peak oyster bodies throughout Australia for inclusion in Industry newsletters and related media. By providing a summary of details of harvest/packaging techniques and further contact details through such media, a wider audience may be reached. Baker expects interested parties to contact him for further information.
4. By attending the Victorian Fine Food Show in Melbourne Baker hopes to facilitate opportunities for individual and group discussion with both seafood importers/exporters and domestic retailers. Attending such a function with edited literature regarding Fellowship findings provides a great opportunity to raise the profile of the angasi oyster with potential consumer markets.

Recommendations

Government

As identified in this report, it is critical that trials be undertaken to determine the potential of Australian estuaries to identify suitable sites for ongoing commercial angasi farming. Both Federal and State Government support should be garnered in supporting such initiatives.

Federal Government

- Fund a trial program of angasi oyster potential in key Australian estuaries to investigate areas most suitable for commercial angasi farming.

State Government

- By supporting trial crops of angasi in new areas farmers are able to view results with little initial personal risk. Positive growth results in these areas will help the adoption of the angasi as a viable additional crop.
- Provide juvenile spat to selected farmers in key areas free for two years to encourage uptake of the new species of oyster.

Further to the above point, Ray Tynan recommends that an integrated program be established to encompass:

- Marketing the product flowing from that stock by organising, or subsidising the organising of a presentation, or launch of this little known product onto the market.

One series of presentations could be to a selected audience of chefs, restaurateurs, processors/seafood distributors, food writers, members of gourmet food societies, etc. It is anticipated that the Sydney Fish Market would be interested in being involved in such a presentation.

A further series could also include presentations to farmers in estuaries where the stock has grown well or has the potential to grow well; small, more intimate encounters such as single estuary meetings are usually more effective than distributing informed papers. There are not many other opportunities to raise farmers' knowledge of new species or techniques, but industry annual field days do present opportunities.³

Industry

There is currently no formal grading system in place for the angasi oyster. Inconsistent grades are offered to the marketplace which can only lead to consumer dissatisfaction. It is highly recommended that the industry adopt a single standard grade using weight as the base. The name of each grade should also be uniform. For example; angasi grading:

- STANDARD: 70-90 grams
- LARGE: 90-110 grams
- SUPREME: 110 + grams

Providing a clear, consistent and uniform grade enables producers to supply markets with product that consumers are able to recognise and demand.

³ Ray Tynan provided Andrew Baker with a 'Letter of Support' for Baker's Fellowship application. Tynan did so in his capacity as a member of the NSW Fisheries Research Advisory Board and owner Pambula River Oysters. Tynan read Baker's Report. In his response letter, dated 1 December 2008, Tynan suggests for inclusion the items as indicated above.

Recommendations

There is also a clear need to promote the availability of the angasi to markets both domestic and international. Many neighbouring countries are unaware of the 'Australian native' angasi oyster. It is recommended that Industry fund trial shipments of oysters to international markets such as Hong Kong, Japan and Vietnam to promote the product. Raising the oyster's profile should lead to increased sales and further demand.

Growers

Farmers have much experience in recognising the best season to provide oysters to the market. Providing a steady supply of oysters is critical as buyers need certainty in both quantity and quality. Therefore, it is important that farmers liaise with each other as well as key shellfish buyers about the seasonal availability of angasis, packing requirements, meat quality standards and common grades and names. By adopting the above-mentioned grading system, growers (and regions) can complement each other by providing oysters when each region is in prime condition.

Professional Associations

The fundamental aim of this Fellowship is to provide further information that contributes to growth within the Australian oyster industry. Linking to peak industry associations that distribute regular newsletters about new innovations is an effective avenue for disseminating information regarding the growing of angasi and related harvesting requirements. By utilising related industry media outlets, information about Baker's Fellowship can be disseminated.

Education and Training

As mentioned earlier in this report, oyster farmers face the very real threat of deteriorating water quality and urban development in many areas of Australia. A key way to tackle these issues is to provide further education about this vibrant, sustainable industry. Baker recommends the following three initiatives:

1. Make the report and its findings available to the Agri-Food Industry Skills Council. The Fellow welcomes the opportunity to speak to the AISC regarding the development of appropriate training courses
2. Encourage local schools to 'adopt' an oyster farm in their local area. Such a program would involve children growing oysters to market point, selling the product and returning profit to the school.
3. Include farming techniques for angasi oysters in an appropriate marine syllabus at university and TAFE level.

Community

Understanding the oyster life-cycle and its importance in our waterways is one vital way of increasing community support for the oyster industry.

As stated earlier, raising public awareness of issues such as water quality and land development and their impact on the oyster industry, is critical. Oyster festivals and field days are an effective way to promote the industry, its history and importance in regional areas of Australia in a less confronting style with events that include the wider community.

Recommendations

ISS Institute

The ISS Institute is a unique body in a wonderful position to promote and enhance Australian aquaculture. By providing non-biased, professional support for Fellows the ISS Institute can present participants to the world, and bring international students to Australia. Baker sees this support as essential to promote ongoing, sustainable industries such as aquaculture. There are two clear avenues:

1. Liaise with new and developing aquaculture industries such as pearl farming in Broken Bay, NSW or seahorse farming on the east coast of Tasmania. Both these enterprises are recent developments with massive potential for growth. There exists the opportunity for people involved in such new and innovative industries to work with the ISS Institute to explore ways of broadening their knowledge.
2. As Australia has such rich, diverse areas for aquaculture, and leads the world in many new aquaculture industries, the ISS Institute may 'advertise' itself overseas to encourage international interest to Australia. Baker believes that this Fellowship would particularly benefit people from developing countries, where participants could study at many of Australia's leading institutions, or work in the many, varied aquaculture ventures.

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