

New South Wales

First for aquaculture



Department of State and
Regional Development



NSW DEPARTMENT OF
PRIMARY INDUSTRIES



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- NSW Department of Primary Industries fisheries research centres and hatcheries
- NSW Department of State and Regional Development offices

Global context

The global demand for seafood has risen sharply in recent years, driven mainly by population growth and changing dietary habits. Human consumption of seafood has trebled over the past 30 years. Seafood now provides more than 15 per cent of the world's animal protein supplies. Around the world, about one billion people rely on fish as their main source of animal protein.

To satisfy this growing demand, global seafood production is currently the highest on record, and there is little doubt the growth trends of recent years will remain.

However, global production from wild fisheries has levelled out over the past 15 years, and the world is increasingly moving to aquaculture – the farming of aquatic plants and animals in controlled conditions – to fill the gap.

Global aquaculture production has grown from less than 10 million tonnes in the late 1980's to nearly 40 million tonnes valued at nearly US\$60 billion in 2001. Farmed products now hold 30 per cent of the global seafood market, compared to less than 4 per cent in 1970.

As the world's population continues to expand and fisheries stocks approach their biological limits, aquaculture production is predicted to expand at least two fold by 2025, to fill the gap between demand and the expected wild catch.

Aquaculture in Australia

The trends driving aquaculture internationally are also evident in Australia. Aquaculture is the nation's fastest growing primary industry, increasing in value by an average of 11 per cent per year since the early 1990's. In 2002-03, the gross value of aquaculture production was \$743 million. This represents 32 per cent of Australia's fisheries production, almost double the share it held in 1992-93.

The industry estimates its value, at first point of sale, to be now more than \$1 billion per annum.

More than 40 species are produced commercially throughout regional Australia, with five species – southern bluefin tuna from South Australia, pearls from Western Australia, salmon from Tasmania, prawns from Queensland and New South Wales, and oysters from NSW – currently accounting for around 90 per cent of the gross value of production.

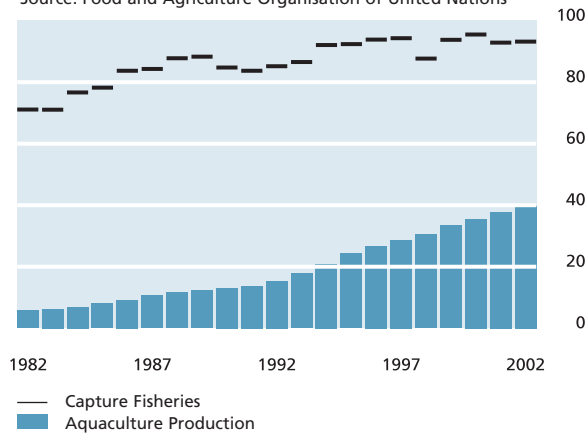
Other significant species in commercial production include trout, mussels, silver perch and barramundi.

The Australian aquaculture industry's vision is to treble the value of production to \$2.5 billion by 2010. The industry has a development strategy in place to achieve this target and believes it is achievable. The dollar figures are impressive. Atlantic salmon is projected to grow to \$1 billion per year; pearls to \$0.5 billion per year; tuna to \$0.3 billion per year; prawns to \$0.2 billion per year; abalone to \$0.15 billion per year; lobsters to \$0.1 billion per year; oysters to \$0.05 billion per year; and a range of other species to \$0.2 billion per year.

World Fisheries Production, 1982 – 2003

Production (million tonnes)

Source: Food and Agriculture Organisation of United Nations



Aquaculture is increasingly filling the gap between growing worldwide demand for seafood and static production from wild capture fisheries.

Aquaculture – a growth industry

Aquaculture in New South Wales

Aquaculture is a significant growth industry in NSW, with annual production increasing by 11 per cent in 2002-03 to \$50.7 million. Farmed produce now accounts for close to 35 per cent of the total value of seafood production in NSW.

Production of oysters at \$34.7 million and prawns at \$6.2 million, dominated the NSW industry in 2002-03, with silver perch production increasing by over 30 per cent to nearly \$3 million.

New South Wales is also a significant producer of trout, and has enjoyed impressive growth in the production of other species, including barramundi and mussels.

New South Wales, Australia's leading State for business, is poised to capture a significant proportion of the projected growth in Australian aquaculture production.

The NSW Department of Primary Industries (DPI) is confident the aquaculture industry in NSW could double in value to \$100 million by 2010.

This assessment is based on current levels of investor interest, and continuing development of improved farming systems and techniques. The assessment is backed up by research and development of emerging species within the State.

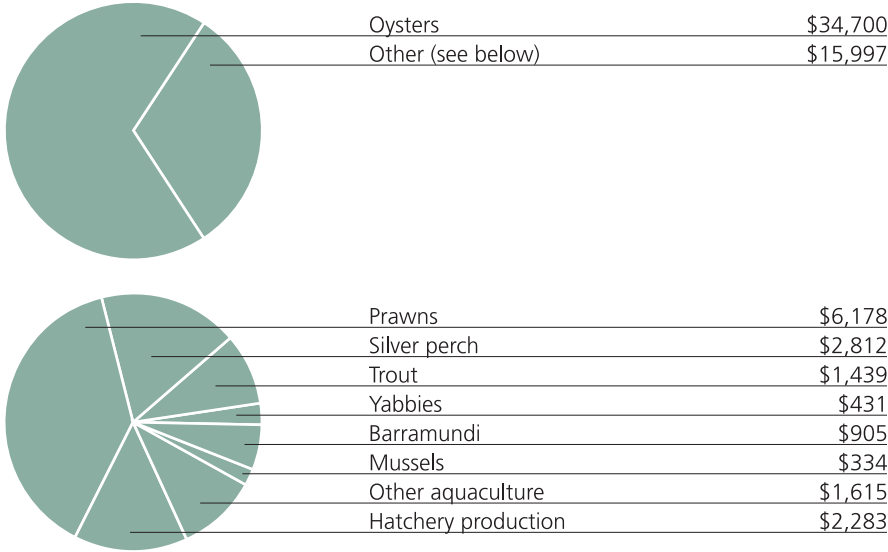
A growing number of viable aquaculture investment opportunities are being generated and implemented in NSW to satisfy increasing domestic and export demand.

These recognise the competitive advantages, both natural and man-made, that NSW offers to aquaculture investors.

Chart 1

NSW Aquaculture Production, 2002 – 2003

By species and value (\$,000)
Source: NSW Department of Primary Industries



New South Wales – first for business, first for aquaculture



Above: Sydney’s restaurant sector has built an international reputation on seafood, and this is driving much of the growth in consumption of farmed seafood in Australia

Right: NSW is at the forefront of Australian aquaculture research with facilities like the Port Stephens Fisheries Centre. Port Stephens is also an example of the excellent growing environment that NSW offers aquaculture projects

As the powerhouse of Australia’s economy and a major economic force within the Asia Pacific, NSW provides domestic and international firms with a superior base for business, trade and investment.

The State’s competitive advantages are impressive. New South Wales is strategically located, close to lucrative Asian markets. It is an open, democratic society, with well-established political and legal systems, and reliable and impartial government processes. It is one of the lowest risk business environments in the world, with an excellent record of economic performance and political and social stability.

It is a multicultural society with an impressive ethnic diversity. New South Wales is acknowledged around the world for its enviable quality of life, based on its climate, and the diversity of the cultures of its people. The State’s position as one of the Asia Pacific’s most dynamic business locations, is strengthened by the international exposure that was generated by major events such as the Olympic Games of 2000 and Rugby World Cup 2003.

New South Wales attracts more foreign investment than any other Australian State. It is the site of almost half of Australia and New Zealand’s top 500 companies. It has attracted almost two thirds of all regional headquarters of multinational companies in Australia. Nearly half of all business migrants to Australia live in NSW.

Besides its across-the-board advantages as a location for business investment, NSW has special strengths that make it the first choice for aquaculture investors seeking a competitive edge.

Diversity of species

New South Wales has over 75 types of fish, shellfish, crustaceans and aquatic plants suitable for culture. While edible oysters dominate aquaculture in NSW, an increasing range of species are in commercial production (See chart 1).

Investment is encouraged in proven species like oysters, prawns, trout, silver perch, mussels, freshwater crayfish (yabbies), barramundi, Murray cod, snapper, abalone and mullet.

This publication provides a number of case studies highlighting species that have proven commercial benefits.

All pass a number of key tests – they can be bred, they will grow in managed environments, the farming technology is readily available, and they enjoy market and consumer acceptance.

Beyond these demonstrated success stories, intensive research is currently being undertaken to overcome scientific and technical challenges to the commercial production in NSW of a range of other species.

The DPI is at the forefront of these research efforts. It is ideally placed to provide potential investors with quality information and advice on current, emerging and prospective commercial species, as well as technical aspects of production.



Range of growing conditions

The regions of NSW enjoy a rich variety of geography and climates, offering aquaculture investors the opportunity to select the optimal growing conditions for a particular species.

Located largely in a temperate zone, NSW is not subject to the climatic extremes of many tropical and sub-tropical regions. Its coastal waters are not normally subject to cyclonic conditions.

Most regions have appropriately zoned and serviced land available, at reasonable prices, to support aquaculture developments.

A clean green growing environment

Compared with many overseas locations, NSW offers a clean growing environment for most forms of aquaculture, whether coastal or land based.

Many diseases that have caused serious losses among overseas aquaculture industries are not prevalent in NSW. Strict national and State controls have been established to maintain the State's freedom from some of the worst exotic diseases.

Industry and Government are committed to ensuring that the development of the aquaculture industry in NSW proceeds in an ecologically sustainable manner. Both invest heavily in research, technology and management practices to provide for the sustainable growth of this sensitive industry, and to ensure the continuing high quality of its products.

Low cost aqua-feeds

As a major agricultural producer, NSW enjoys an abundant supply of meat and grain-based meals, often as by-products of its major food processing industries.

Researchers are making headway in using these materials to produce cost-effective alternatives to fishmeal in aquaculture feeds for a range of species, including silver perch, prawns and barramundi.

Largest domestic seafood market

Sydney is Australia's seafood capital. Its population of more than four million people includes ethnic communities whose culinary traditions are strongly influenced by seafood.

Sydney's populace has a relatively high disposable income. The city is host to a huge inflow of intrastate, interstate and international visitors. It is home to a thriving restaurant sector, which has built an international reputation on seafood.

Proximity to this market provides aquaculture enterprises based in NSW with a competitive edge, especially in terms of transport and handling costs, reliability of supply, and quality of product on delivery.

Chart 2

Scheduled International Aircraft Movements, 2002 – 2003

Source: AVSTATS, Department of Transport and Regional Services



Marketing and distribution

New South Wales is home to the Sydney Fish Market, the country's leading seafood wholesale and retail centre, and Australia's Seafood Centre of Excellence.

Aquaculture has brought significant changes to the operations of the Sydney Fish Market over the past few years, with the volume traded rising in the last financial year by more than 50 per cent.

The Sydney Fish Market also supports the aquaculture industry by offering its expertise in seafood marketing, promotion and food safety to suppliers.

Moreover, NSW enjoys a well-developed and efficient transport infrastructure. The State's extensive highway network makes road transport to market relatively inexpensive and reliable.

North Coast prawn farmers, for example, can truck fresh product to the Sydney market on the day of harvest.



Export markets

Sydney's airfreight capacity links the national and state economies to the global marketplace.

Sydney Airport is Australia's primary international gateway for both passengers and airfreight (See chart 2). It has by far the strongest air links of any Australian airport to Asia, which is the destination for nearly 90 per cent of Australia's seafood exports.

International air services out of Sydney carry over 150,000 tonnes of cargo each year, almost half of Australia's total airfreight exports. Sydney Airport is the shipment point for much of Australia's seafood and other temperature sensitive product exports.

Reliable power and water supplies

New South Wales has a sophisticated electricity generation, transmission and distribution network, providing reliable supplies of power for industrial and commercial use, at prices that are competitive by local and world standards.

A network of high-pressure gas mains ensures supply of natural gas to business users throughout the Sydney metropolitan area, and in most regional locations, at prices that are competitive on a world scale.

New South Wales has an extensive network of regulated and unregulated rivers and groundwater systems that provides land-based aquaculture operations with reliable supplies of quality water.

Major water reforms being implemented by the NSW Government will further enhance the prospects for aquaculture in the State, by ensuring the long-term health of rivers and groundwater systems, and by providing improved water access rights and a more efficient water market.

Skilled labour

The availability of well-trained, flexible and committed staff is a valuable resource for any prospective investor.

Employees in regional NSW are distinguished by their loyalty and low turnover rate compared with other business locations. The stability of staff is a factor that frequently attracts investors seeking savings in recruitment and training costs and improved productivity.

The economic diversity of the State's regions, and particularly their major population centres, also means that ancillary services required by aquaculture operations such as information communications technology specialists, engineers, electrical and plumbing trades, earthmovers and feed suppliers are readily available.

Education and training

A well-developed network of education and training institutes extending across NSW caters for the skills and qualifications required by the State's growing aquaculture industry.

These institutions offer tertiary and vocational training programs of the highest standard. Course delivery is flexible, with part-time, distance education and workplace-based options increasingly available.

In particular, NSW hosts Australia's leading provider of technical training in aquaculture, the National Fishing Industry Education Centre at Grafton on the State's north coast.

The centre provides a diversity of courses on freshwater aquaculture production (fish and crayfish) at advanced certificate, diploma and statement of attainment level.

These courses emphasise practical experience in such operational aspects as site selection, stocking, feeding, sampling, water quality management and harvesting.



Above (top): Sydney Airport provides aquaculture exporters with unrivalled access to international markets, particularly in Asia

Above: Workforce productivity, flexibility and stability are factors that make NSW a first choice for aquaculture investors seeking a competitive edge

Right: The Department of Primary Industries' newest aquaculture research facility at Wakool in southern NSW is helping to accelerate utilisation of inland saline groundwater for the culture of such species as trout, prawns and mulloway



Research and development

New South Wales is at the forefront of applied research that is accelerating the development of the aquaculture industry in Australia. Current research projects in NSW include

- selective breeding techniques for faster growing Sydney rock oysters;
- breeding trials with snapper, mulloway and Australian bass;
- inland saline culture of trout, prawns and mulloway;
- aquaculture diet development;
- evaluation of anti-fouling compounds;
- the commissioning of an abalone hatchery;
- a study into pearl production in NSW; and
- the commercialisation of silver perch farming.

Much of this research is being undertaken or driven by DPI, in collaboration with commercial aquaculture operators and other research organisations.

DPI operates one of the largest and most productive aquatic research groups in Australia, including the Port Stephens Fisheries Centre, the Cronulla Fisheries Centre, the Grafton Aquaculture Centre, the Narrandera Fisheries Centre and the Inland Saline Aquaculture Research Centre (near Wakool).

Streamlined regulatory processes

The NSW Government has established an integrated development assessment process to encourage the continued development of a profitable, environmentally sustainable aquaculture industry across the State.

An aquaculture-specific State Environmental Planning Policy is in place, and a best practice Aquaculture Industry Development Plan is being developed for each of the State's bio-regions.

The result is a 'one-stop-shop' approval process for investors, with single development application and compliance reporting forms, under which only projects identified as high risk are required to lodge an Environmental Impact Statement.

In addition, the regional plans provide detailed guidelines on all aspects of aquaculture, including site selection, species selection and operational matters.

An oyster industry sustainable aquaculture strategy is also being prepared to identify priority areas for oyster growing in the State and industry best practice standards.

Aquaculture in action

“we are... providing a product that can last much longer from the date of purchase... and quality is guaranteed”

Aquabait marine worm farm – working to satisfy diverse market needs

In 1996, working against advice that what they were trying to do was impossible, the father and daughter team of Les and Milada Safarik established Aquabait Pty Ltd to provide a one-of-a-kind sustainable product that is highly sought after on the recreational fishing market – bait worms.

The Aquabait Marine Worm farm is positioned adjacent to the Eraring Power Station on Lake Macquarie, New South Wales. This position enables Aquabait to utilise the warm water from the power station’s outlet channel to create growth rates all year round, in turn increasing yield. Aquabait has achieved successful grow-out and is now entering its commercial stage.

“Last summer we sold 40-60 trays, each carrying around 150 live or specially preserved marine worms, each week. The market for imported worms from Queensland is worth around \$1 million each year and we hope to replace a share of that market,” Milada said.

Aquabait culture a species belonging to the beach worm family *Onuphidae*, commonly known as the ‘tube worm’ or ‘case worm’. Tube worms have the capacity to grow to one metre in length in the wild, although Aquabait grow them to a suitable size for threading onto a fishing hook – averaging around 23cm in length.

Aquabait supplies its farmed tube worms live to bait and tackle shops in NSW, Queensland and Victoria. The tube worms are kept alive within a recirculation system in the bait and tackle shops for the angler to buy fresh. The tube worms are kept in optimal condition from the farm gate to the angler’s hook by using methods that don’t cause stress.

“To be specific, the harvesting method used on our farm causes the worms to be sedated, therefore the worm has less stress which leads to very high quality bait,” Les said.

Food for aquaculture

The huge recreational fishing market is not the only market with an interest in this product. To remain sustainable and economically viable, this fast-growing aquaculture operation will need to develop other facets of its production – in this case, aquaculture feed.

“The development of marine worm aquaculture can provide marine finfish aquaculture farms with a live feed sustainably and affordably,” he said.

Marine worms are an important source of nutrients for larval fish by providing them with certain digestive enzymes and fatty acids that are essential for growth and survival. Recent research has found that marine worms are also important for the aquaculture of crustacea by providing a nutritionally correct balance of polyunsaturated fatty acids, which are needed for egg maturation in cultured prawns.

A ‘cleaning’ system

The Aquabait marine worm farm is a staged flow-through system in which water quality is continuously monitored. The ponds are structured to create a clean outflow of water from the farm by the add-on of settlement ponds and by the filtering system of the ponds themselves.

Specifically, each pond has a layer of sandy substrate which acts as a nutrient catchment and an ecosystem, thereby allowing the nutrients from the tube worm waste and leftover feed to be broken down within the pond before it leaves the facility.

This system creates a filtering effect allowing the water to escape back into Lake Macquarie ‘cleaner’ than when it entered the facility, with very low levels of suspended solids and insignificant traces of nutrients such as ammonia, nitrogen, phosphorous, nitrates and nitrites.





Achievements to date

Milada is studying for her Master in Marine Science qualification at the University of Newcastle, and is mainly responsible for the scientific research in the development of the marine worm farm.

Aquabait is constantly developing new techniques for the aquaculture of marine worms, as Milada says, “we are currently concentrating on providing a product that can last much longer from the date of purchase by preserving the tube worms in a specially developed non-toxic solution. This allows the worms to be stored in the freezer for up to six months which can be beneficial for the fisherman as bait can be accessed quickly – and quality is guaranteed”.

In recognition of her achievements, Milada was awarded the 2003 NSW Rural Women's Award, which was presented by the Premier of NSW Bob Carr.

“We have had continued support from the DPI who have provided valuable advice and contacts with scientists and other aquaculture operators. Thanks also to the NSW Department of State and Regional Development (DSRD) for seeing a potential industry in marine worm farming and helping Aquabait with start-up funding, and the University of Newcastle for supporting our research scientist,” Les said.

Aquabait has developed its technology of spawning mechanisms, settlement and grow-out through trial and error alongside scientific research in controlled laboratory conditions and its technological advances have paved the way for other marine worm farms to develop.

Marine worms (above) for the recreational fishing market are produced by Aquabait using a staged flow-through system (top) that enables water to leave the facility cleaner than when it entered

Clearwater Mulloway™ – inland saline aquaculture

In the mid 1990s Anthony O'Donohue drilled a bore on his turf farm at Millers Forest, in the Hunter Valley near Maitland, NSW. Anthony was hoping to access fresh water for irrigation purposes. What occurred was something quite different.

“One thing I’ve learnt is that nothing’s impossible. I’ve been able to jump all the hurdles that have come along so far”

“We found salt water and were originally disappointed. Given that we’d spent money on digging the bore, we began to consider other options,” Anthony said.

The water was tested and found to be excellent quality saline water – very suitable for growing marine fish.

“We trialed several different species – trout, silver perch, bream, snapper, mulloway and yabbies – before finally deciding on mulloway due to their high survival and growth rates,” he said.

Although the DPI provided technical support and advice, progress has been on a trial and error basis.

“One thing I’ve learnt is that nothing’s impossible. I’ve been able to jump all the hurdles that have come along so far.”

“We started with one pond and purchased fingerlings for grow-out. We soon had trouble getting supplies of fingerlings so we decided to establish a hatchery, which is when we became involved with DPI,” Anthony said.

Inland saline water has a slightly different chemistry to oceanic saline water. This meant that Anthony had to adapt his breeding techniques to achieve adequate survival rates in the larval stages. To assist in the development and maintenance of these breeding techniques Anthony employed Luke Dutney, who has a degree in biology and aquaculture from the University of Queensland.

“Luke is qualified and came highly recommended, but he still has to shovel sand sometimes!” Anthony said.

Anthony’s main business, O’Donohue’s Filter Sand, supplies sand to various industries for water filtration purposes. The capital for the development of the fish farm and hatchery comes from the main business.

Current operations

There are currently 10 ponds on the property, with a total water surface area of 1.4 hectares. Each pond varies in size and shape but most are around 0.1 hectares with a depth range of 1.8 to 2 metres. The eventual plan is to convert around half the 16 hectare property to production ponds.

Managing water on the farm requires a mixture of experience and science. “We keep an eye on the condition and behaviour of the fish, but also measure water quality.” The management system involves stripping nutrients by producing algae, rotifers and copepods for larval rearing. By staging the production of larvae and grow-out for bass and mulloway, the water requirements for both can be managed together.

Top-up water from the bore comes in at a constant 20°C with a salinity of 28 ppt. This is right in the optimal range for mulloway of between 15 and 26 degrees. “Our pond temperatures can drop to 8 degrees in winter, but we have learnt how to manage these extreme temperatures”.





The close attention paid to water quality management means that the farm has a closed water cycle, and a discharge back to the environment is not required.

Anthony has created a new market in plate-sized mulloway (300 – 800 grams) and currently supplies many local restaurants in Newcastle and Port Stephens. Future prospects for new markets include the Asian banquet size fish of between 800 grams and two kilograms.

The future

“We are looking at producing around 10 tonnes of plate-sized mulloway and 200,000 fingerlings this year. The 200,000 fingerlings will be mainly used for grow-out in sea cages,” Anthony said.

“Our future plans are to upscale and upgrade the hatchery and we have also successfully completed some initial trials in oyster spat production so we’ll be looking into that as well,” he said.

Anthony says he would like to see some research carried out to determine the levels of supply of saline water in the area and whether it can sustain an expanded local industry. Other farmers in the area have been interested, and are watching Anthony’s progress closely.

Above (top): Earthen ponds are filled with underground saline water and used for fish culture

Above: Harvesting of live mulloway from grow-out ponds, for transport to local markets

Manton's Black Pearl Oysters – Indigenous enterprise in aquaculture

The Manton family, a very old and respected Indigenous family, has made lifelong contributions to the NSW oyster industry. Since relocating to Eden on the far south coast of New South Wales, Terry and wife Olga turned their hands on experience and knowledge to starting their own oyster business, and they are now established as one of the leading oyster farmers in the region.

"Our aim is to provide a successful and profitable Indigenous business model that can be copied."

The Indigenous family enterprise

The Manton's started their own oyster business in 1981 by purchasing prime growing leases in the pristine waters of Wonboyn Lake, about 40 minutes drive south of Eden. Wonboyn Lake, says Terry, "produces the best and tastiest oysters that my family and I have ever seen and eaten. The pristine environment and harsh cold climate has a lot to do with the unique flavour of the oysters here".

Terry and Olga's vision was to establish a uniquely Indigenous family business. Kinship loyalty is not only a powerful ingredient and a great strength, but also a critical factor in seeing successful participation of aborigines in the workforce. "Kinship loyalties to 'family' and 'clan' have untapped potential for aboriginal development and motivation", says Terry.

During 1995, Terry and Olga formed a family partnership, refocused their energies and renamed their business Manton's Black Pearl Oysters.

"My son Brett suggested the name because of the brilliant black colour of the rim on the inside of the oyster shell", Terry explains.

"The brand name suggests a very special product produced by special people", added Brett. "We have been highly successful with the new brand name in the market place and have found niche markets for our products".

The business is currently located at Jigamy Farm, between the townships of Eden and Pambula, and currently operates 11 oyster leases covering almost 8 hectares in the Pambula and Wonboyn Rivers.

Manton's Black Pearl Oysters received a grant through the NSW Government's Indigenous Fisheries Strategy (IFS) to expand its oyster farming business. Manton's used the funds to upgrade existing oyster leases, materials and equipment, and to buy floating bags and single seed oyster spat.

"The IFS grant helped us buy an initial 1,500 floating bags, and we are currently looking to order a further 1,500 floating bags".

There are plans to relocate to a more suitable premise that has room for the business to grow.

"We are very keen to expand the business, and our priority at the moment is to acquire more lease space in other areas. Ideally, we would like to access oyster leases in Bateman's Bay - a good area for oyster growth and harvesting. It also makes good business sense to have several lease areas in case something goes wrong," Brett said.

"Our aim is to employ at least six local Indigenous family members full-time."



Indigenous employment and training

Manton's Black Pearl Oysters is totally committed to training Indigenous people in every aspect of farming the unique Sydney rock oyster.

"An Indigenous product grown by Indigenous people for Australia has a nice ring to it, hasn't it? We believe that Indigenous Australians have much to contribute to the health and wealth of this great country", says Olga.

"The NSW oyster industry owes much to the highly skilled Indigenous workforce that has worked the leases over the years. Our aim is to provide a successful and profitable Indigenous business model that can be copied.

"We also aim to use our highly developed skills and special knowledge to train other local Indigenous people so that our trainees can start their own businesses or hold managerial positions in existing oyster farming business", she said.

Summing up, Brett says "our business aims to produce with profitability, manage with direction, and market with vision the Manton Black Pearl Oyster as Australia's premium gourmet oyster."



Harvesting of Sydney rock oysters, produced by the Manton family on NSW's far south coast

NSW Indigenous Fisheries Strategy

The Indigenous Fisheries Strategy (IFS) is a NSW Government program that helps Aboriginal communities identify and pursue business opportunities in commercial fishing, ecotourism and aquaculture.

Initiatives taken by the Department of Primary Industries to promote aquaculture under the IFS have included workshops and field days. These were designed to encourage the expansion of aquaculture business ideas and opportunities, and were undertaken in conjunction with the NSW Department of State and Regional Development.

Other IFS initiatives have included business development grants of up to \$5,000, feasibility studies in areas where communities are committed to aquaculture, and training for Indigenous students to provide technical skills in aquaculture.

Namoi Valley Aquafarming – multiplying prospects for success
Practical experience in cotton farming and the construction/earth moving industries have contributed to one of the most successful aquaculture ventures in the north west of New South Wales.

“The diversification opportunities that aquaculture offers the irrigation industry... are mind boggling”

Steve Grammer and Dean Von Harten have been actively involved in the aquaculture industry for the past 10 years, since they bought a property previously used for fish farming. It was licensed, and had approval for 80 ponds. It also had a water storage pond, six culture ponds and two bores, one of which is licensed in perpetuity. This meant there was security of water, a vital element that gave the operation reliability.

Both Steve and Dean came from an earth moving background. Steve owns his own company, working in all aspects of road, channel and dam construction and maintenance, but his transition to aquaculture has increasingly occupied more and more of his time. Steve previously also worked in the cotton irrigation industry, from farm hand through to farm management, and his experience and knowledge of the cotton farming industry has been instrumental in forging Namoi Valley Aquafarming's direction.

Five years ago, Dean encouraged his father Ron to also join Namoi Valley Aquafarming, and together, the three partners now farm yabbies, Murray cod, golden perch, silver perch and eel-tailed catfish.

Today, Namoi Valley Aquafarming has some 50 ponds near Narrabri with a total surface water area of just under nine hectares. It is one of the biggest native fish farms in NSW.

Diversity is the key

From the outset, Steve paid attention to failed farming ventures, and became convinced aquaculture could be profitable.

“Aquaculture is not just about filling a dam full of water, stocking it with fish, and then looking after them. A good understanding of the fish and their habits is vital,” Steve said.

So in order to acquire requisite knowledge, Steve started working with a mentor, scientist Stuart Rowland from the NSW Department of Primary Industries, who was extremely helpful with breeding cycles and hatchery techniques required to farm native fish.

“From the start, we went into a breeding program so that we could supply ourselves with seed stock and be self-sufficient,” Steve said. Namoi Valley Aquafarming's hatchery currently produces enough golden perch, silver perch and Murray cod fingerlings to supply all its grow-out operations. It also produces seed yabbies – more than 15,000 in any given week – from a series of dams reserved specifically for breeders.

Mindful of the need to conserve water, a water recycling system was set up that enables water fed into storage ponds to be distributed through aquaculture operations before being used on field crops. This varied use of water allows Namoi Valley Aquafarming to grow out fish and crayfish, a process which is managed using stringent environmental measures.



“Fresh water aquaculture is still quite young in Australia, and industry leaders and government are working to accelerate development of the industry. I have no doubt that it will grow into a major Australian industry. It has and will continue to benefit from the growing expertise of those who work in it.”

The move to multi-site operations

Early in 2003, Namoi Valley Aquafarming took up a Class E licence which allows the farming of fish at multiple sites or farms. Arrangements have been made with various landholders to use their water storages for the cultivation of fish and yabbies, and this has increased the water surface area that Namoi Valley Aquafarming has available to around 150 hectares.

Namoi Valley Aquafarming has a long list of other cotton growers and landholders prepared to work with them and Steve estimates that ultimately, more than 2,500 hectares could potentially be used for fish farming in the north west region.

“The diversification opportunities that aquaculture offers the irrigation industry today under this multi-site program are mind boggling to those of us in the aquaculture industry that have a good understanding of water bodies and eco-systems.”

According to Steve, the irrigated farming industry is becoming more aware of water management issues, and the need to take advantage of diversification and water use opportunities.

The company has initiated a pilot program using multiple sites to produce Murray cod, golden perch and yabbies. While current drought conditions have interfered with the timing of the trial, initial results are very positive. Ron expects that with better seasons, production from these sites will significantly increase.



The future

Steve hopes to build a bridge between cotton and aquaculture. He sees untapped potential in the cotton irrigation industry, because of the first water use available from storage dams.

Steve's vision for the multi-site licence is to expand the area currently under production with “fish being naturally fed through ecosystems existing within the storage ponds.”

The business has plans to upgrade its hatchery facilities, which will increase production capacity to 1.5 million golden perch and 1 million Murray cod fingerlings. Silver perch fingerlings will also be produced on demand in the hatchery.

Keys to success

“Knowledge is a must! Subscribe and read any materials that can influence you in your proposed operations. Do your homework well. Talk to other growers who are willing to give their advice... and listen to them!

“Look at all factors that impact on the operation you are considering and the region you are contemplating. Have a diversification plan on species and programs, eg grow out, starter stocking.

“Aquaculture is something that you spend a lot of money on. You need to have patience and a positive outlook, and look for the long-term return”, Steve said.

“Better returns are not too far way,” he added, a sentiment Dean and Ron wholeheartedly agree with.



Namoi Valley Aquafarming operates hatchery and grow-out facilities covering a range of species including Murray cod (above left) and yabbies (above)

Silver perch – realising its potential as a major freshwater species

The silver perch (*Bidyanus bidyanus*) is a freshwater fish native to the Murray Darling Basin. Over the years, habitat destruction and over-fishing led to the species being listed as 'vulnerable'. Scientists at the Grafton Aquaculture Centre, took up the challenge and during the early 1990's, developed techniques for the production of silver perch in ponds.

“One benefit is more consistent cash flow throughout the year, compared with other farming enterprises” Silver perch are well suited to ponds, and... under optimal conditions, silver perch can be grown to market size within 18 months.”



Commercial operators have since taken up and extended these techniques. Their desire to work together for mutual benefit encouraged a number of growers to form the NSW Silver Perch Growers Association about 10 years ago. It has since become one of the State's peak aquaculture groups.

Its role includes:

- representation on government and industry bodies;
- implementation of market development and research initiatives; and
- dissemination of information among grower members.

Ian Charles, Association president, member of the NSW Advisory Council on Aquaculture, and a member of the Department of Primary Industries' (DPI) Research Advisory Body, is passionate about silver perch.

Ian and wife Michelle grow silver perch for the domestic market, and produce their own fingerlings. They grow approximately 25 tonnes per year and the yield is increasing.

The Charles' aquaculture business, which they have developed over eight years, consists of 24 ponds covering an area of four hectares, but like any business, Ian Charles urges caution.

“Firstly aquaculture should be looked on as a separate business,” Ian said.

“Nobody should enter the aquaculture industry with the sole intention of diversifying.

“In other words I am a mixed farmer. I grow cereal grains, oilseeds, prime lambs and cattle.

“My other business is aquaculture.

“Aquaculture is a technically challenging business. It also requires large amounts of capital to enter at a level where you will be financially viable.

“One benefit is more consistent cash flow throughout the year compared with other farming enterprises,” Ian said.

Intensive culture

Silver perch enjoy biological characteristics that are suited to the type of intensive culture used by Ian and Michelle.

The species has an ability to tolerate high densities, an overall general hardiness, a willingness to accept artificial feeds, a non-cannibalistic nature, as well as excellent eating qualities, and an omnivorous diet.

Silver perch are well suited to ponds, and current trials investigating culture in intensive recirculation systems and cage systems are all positive.

The optimal region for production is northern NSW given the warmer water temperatures, however silver perch are grown across the State.



Under optimal conditions, silver perch can be grown to market size (up to 800 grams) within 18 months. The industry average, however, is more like two years for a silver perch to average this size.

There were 48 silver perch farms in NSW producing market-sized fish in the 2002/03 financial year. Production is growing steadily.

Research has shown silver perch can be grown at densities of 10 tonne per hectare.

The hard work by farmers such as Ian and Michelle Charles, and the advocacy of the NSW Silver Perch Growers Association have made silver perch one of the most valuable freshwater aquaculture products in NSW.

Ian and Michelle have a dual source of water on their farm at Grong Grong, near Narandera in the Riverina – the Murrumbidgee River and bore water.

“Our used water is normally recycled through the fish ponds or can be irrigated onto pasture, after growing a crop of fish,” Ian said.

What type of marketing will attract consumers to silver perch?

“There would need to be a broad based education and marketing plan implemented to bring silver perch up to this level of recognition. This would require significant funding. I do not feel the industry is ready for this now.

“At this stage a gradual campaign at the individual grower level, or growers together in groups to increase market share, is required as production increases. In other words, we need to expand the market at the same speed as we increase production.

Industry change

“The most significant change in the profile of the silver perch industry over the last few years has been that a lot of smaller growers have left the industry, but a core group of medium to larger growers have and are increasing their production and subsequent level of investment.

What does the future hold?

“Our plans are for a steady increase in production of approximately two to three tonnes per year for the next five years. At the end of this period we will assess where the industry is positioned and what our future production level may be increased to,” Ian said.

Silver perch: a highly regarded freshwater fish species cultured across NSW. The NSW silver perch industry is focussed on producing quality fish for the live and chilled seafood market

Tailor Made –
 a blend of skills and innovative thinking
 When a company manages to build a seawater facility for Macquarie University in Sydney, and supplies 3,000 barramundi fillets for a lunch at the Sydney Convention Centre, it's a fair bet the business is tailor made for success. The company in question is Tailor Made, situated on 17 hectares of land at Port Stephens, two and a half hours north of Sydney.

"I am convinced that innovation is the key to future sales"



As well as working with one of Australia's best universities and providing a superb product, several other features set Tailor Made apart from the rest.

The first is its corporate structure, the second its willingness to diversify.

Tailor Made has two builders, two marine biologists, a veterinarian, a marketing manager, an electrician, and a project engineer, as well as 14 shareholders.

The company very wisely uses its nutrient rich fish farm outflows to grow hydroponic lettuces and herbs, which it sells to retail outlets across the Hunter Region.

In Nick Arena and Rocky De Nys, Tailor Made benefits from an ideal management combination – a point not lost on the researchers at Macquarie University who used their expertise in both the design and construction of ground-breaking aquaculture facilities.

Nick chose to leave a successful home renovation business to manage Tailor Made's day-to-day operations. And Rocky brought his academic experience to help Nick develop a business that is now the toast of NSW aquaculture.

Nick Arena, a licensed electrician and builder, very quickly discovered that a career managing a fish farm meant a major lifestyle change.

"I saw fish farming as an opportunity to apply my skills to a new venture in an industry with clear development potential," he said.

Rocky De Nys, a serious-minded academic keen to apply his knowledge to practical projects, also grasped the industry's potential.

"I like to think I have ideas that Nick can turn into reality, or has the common sense and practical skills to completely ignore!" he said.

With the help of the other partners, Nick and Rocky designed, built and now operate a world-class recirculation system, with a high, cost effective production capacity. Tailor Made's success story prompts as many questions as answers.

What are some of the operational details?

"The facility's tanks hold 300,000 litres of water. We developed and designed our own equipment, and can grow barramundi at a stocking density of 60 kilograms per 1,000 litres, says Rocky.

"Our current annual production is 30 tonnes, and we plan to scale up to 135 tonnes by April 2006."

Why grow hydroponic vegetables?

"Because it's a profitable cost centre in its own right."

"All our waste water goes into a 22,000 point hydroponic system and we have zero discharge.

"I'll continue to fine tune the water management side of both the fish and the hydroponics.

"Down the track, I'll be interested in looking harder at the other species for which we're licensed – eels, golden and silver perch, catfish, snapper and greenback flounder.

"Our hydroponic business will continue to expand in line with the fish culture.

"Hydroponics provides profitability, as well as a strong environmental platform to allow growth to take place within regulatory requirements.



“Our farm is fully quarantined and meets all NSW Department of Primary Industries’ guidelines for exotic species. For those who didn’t realise it, barramundi does not occur naturally in NSW.

“While our major market is for live fish to Sydney, we plan to expand to other markets as output increases,” Rocky said.

What sets Tailor Made apart from others?

Nick says, “An acceptance of innovation as part of normal business practice. For example, we recently sold our first full-scale system to a company based in Melbourne who, to date, have experienced a very smooth transition into aquaculture.

“And now that we are in a profitable position, we want to establish our own hatchery. Besides producing fingerlings for our current facility, we want to try spawning new species.

“We would also like to carry out viability trials on species like barramundi cod and coral trout, which have particular appeal to markets in Asia.

“I am convinced that innovation is the key to future sales.

“The expansion in our capacity will open opportunities for new partners and collaborators to join us in the production side of our business and in marketing our products.

“Our technology and equipment is now proven through full commercial production and we are now supplying complete grow out systems to the aquaculture industry.

“In the not-too-distant future, we will offer access to our technological advances as we develop them, and provide consultancy services as a part of the deal.

“We believe that meeting challenges will be both personally and financially rewarding,” Nick said.

What does the future hold?

Rocky thinks tourism.

“We’ll examine the operation’s tourism potential in the future, because we’ve already got a number of visitors calling in on the facility.

“This means we need to plan for improved amenities such as better viewing access and a well thought-out communication strategy of interpretation.

“But to maximise these types of opportunities we will need even more investment in infrastructure,” he said.

Nick also sees potential in export of the system. At the time of going to press, Tailor Made was fielding an enquiry from New Zealand:

“Your hydroponics setup using barra looks great. My wife loves the idea of growing her veggies in fish poo, and I’ve always wanted to farm barra.

“I know some people who have been looking to invest in aquaculture for some time now, but they were relying on me to find a process which would provide sufficient ROI. I think your system is pretty close to what I have been looking for.”

Above left: Hydroponic lettuces and herbs are being grown by Tailor Made using its nutrient-rich fish farm water outflows

Above right: Tailor Made’s recirculating technology and systems in use at Sydney’s Macquarie University to support ground breaking marine and freshwater biological research

Tathra Oysters – promotion the key

Diners in some of Australia's finest restaurants regularly enjoy plates of plump, sweet Tathra Oysters. For Tathra Oysters' owner Gary Rodely, placing his oysters in world class restaurants is light years away from the first negative response he received to his product 18 years ago. Then, the virtually unknown oysters were dismissed sight unseen, with the comment that, 'oysters from down there aren't any good'. Smarting from this initial rejection, Gary and business partner Peter Holdsworth decided to start their own processing business, marketing oysters directly to restaurants.

How things changed! Tathra Oysters are now found on the menus of Sydney's finest restaurants including Quay, Rockpool, Fishface, and Fish at the Rocks, and Melbourne's famous eatery, Bacash.

Medal winning success

What's more, over the last few years, Tathra Oysters has won six Oyster Farmers Association Champion exhibitor shields, four Royal Easter Show championship ribbons, 12 Royal Agricultural Society Fine Food gold medals, and in 2004, for the first time in the history of the Fine Food event, an award for "Outstanding Excellence".

Not only did Tathra Oysters' medal tally in 2004 give them the best overall results in the oyster category, it also gave them the most gold medals for any exhibitor in the aquaculture section.

A medal tally of this size is a perfect opportunity for producers to build brand awareness and stimulate consumer demand for their products. It also provides customers with an assurance that they are buying quality products.

Talk it up

These days Gary and Peter never miss an opportunity to promote their own product and the exceptional oyster growing region of Tathra, near Bega on the New South Wales far south coast.

"This year we have had tremendous media interest – a big story in the Food and Wine segment of the Daily Telegraph and a double page spread in The Land newspaper, as well as numerous 'down on the farm' style radio interviews with the ABC and a 30 minute live on-air oyster tasting on 2GB radio, Sydney," Gary said.

Pointers to success

Gary attributes the success of Tathra Oysters to three main elements.

"The wonderful pristine waters of Nelsons Lake where we are fortunate enough to be farming, the tremendous array of environmentally friendly long-life oyster growing products now available to farmers, and lots and lots of hard work.

"We have only ever grown single seed oysters, and are very strong supporters of the new plastic products that are providing a real benefit to oyster growing."





“The wonderful pristine waters... where we are... farming, the tremendous array of environmentally friendly long-life oyster growing products now available to farmers, and lots and lots of hard work.”



Prime Sydney rock oysters:
a uniquely Australian gourmet product

“The Stanway oyster rotation cage, available from Bell Plastics enables us to get the round cup-shaped oysters that the restaurants and the oyster openers presently favour.

“When we need to, we make our own mesh cages using Tapex mesh. It has the strength and durability to withstand tough treatment while allowing the maximum amount of food through for oysters.

“We attribute the successful finishing off of our oysters to using Tooltech trays. The Tooltech trays are very low profile and allow a good flow of food but are strong enough for the rigour of life on the farm.”

The future

The future is bright for Tathra Oysters with further expansion and investment expected this year.

Gary Rodely and Peter Holdsworth are committed to maintaining their focus on quality of product, rather than quantity.

With this philosophy the gourmands of Sydney and Melbourne, and perhaps other Australian cities, can be assured that they will happily dine on creamy Tathra Oysters for many years to come.

A full list of companies that can supply plastic oyster farming equipment and materials is available from the Oyster Farmers Association of NSW (www.oysterfarmers.asn.au) and the NSW Farmers Association (www.nswfarmers.org.au/policy/oysters). Details of suppliers of products and services to the aquaculture industry in NSW are available in a complementary publication, NSW First for Aquaculture – Industry Directory 2004. This directory is provided as a service to the aquaculture industry and is available from DSRD and DPI.

The NSW Government does not endorse the products/services of any particular suppliers to the aquaculture industry.

Recognising the enormous potential for further development of aquaculture in NSW, the State Government provides significant support to existing and prospective investors through two key agencies, the NSW Department of State and Regional Development (DSRD) and the NSW Department of Primary Industries (DPI).

New South Wales Government support

NSW Department of State and Regional Development

DSRD is the NSW Government's principal economic development agency. It is the first point of contact within Government for companies wishing to establish or expand their business operations in NSW. With offices in Sydney and the State's major regional centres, DSRD is committed to working with potential aquaculture investors by:

- assisting with site location, project feasibility and other investigations;
- coordinating the necessary regulatory and approvals processes;
- facilitating discussions with suppliers of key services such as electricity, water and transport;
- providing introductions to potential business and financial partners;
- helping companies develop new domestic and export markets;
- providing advice and assistance in areas such as business planning, marketing, exporting, and transport and logistics; and
- providing tailored financial assistance packages for particular investment projects.

NSW Department of Primary Industries

DPI is the main NSW Government agency responsible for developing and implementing progressive policies to encourage development of ecologically sustainable aquaculture in NSW.

DPI has developed technology that has enabled many of the aquaculture industries in NSW, and other parts of Australia, to proceed.

Examples include the development of techniques for native fish breeding and culture such as silver perch, scallop farming, prawn farming and Sydney rock oyster breeding.

Technology is developed through applied scientific research at the Port Stephens Fisheries Centre, the Grafton Aquaculture Centre, the Inland Saline Aquaculture Research Centre, the Cronulla Fisheries Centre and the Narrandera Fisheries Centre.

Research priorities and departmental strategies are identified through close consultation with aquaculture industry associations and farmers.

DPI also provides advice to existing and potential aquaculturists on technical matters. These include site selection, production systems, breeding and genetics, stocking densities, diets and feeding, disease management, quality assurance, packaging, and transport and handling techniques.

The Department's role includes formulating policy and regulations, and ensuring operator compliance.

"NSW aquaculture products have a multitude of advantages for our two restaurants, Coast and Manta Ray, and our catering operation, Woolloomooloo Catering Company.

We use a number of different products – live oysters, barramundi, trout, silver perch and mussels, just to name a few. Our group knows we can rely on NSW aquaculture products for availability, size, taste and quality. Their product is always consistent and this makes menu planning much simpler.

"For catering, all of the above are very important for a successful function. It makes ordering, portioning, costing and organising easier and helps relieve some of these pressures. We have even been able to have our barramundi from Port Stephens tailored to size and taste needs."

Phil Waddington
Executive Chef of the Nautilus Group
Coast, Manta Ray and
Woolloomooloo Catering Company

"Aquaculture is Australia's fastest growing primary industry. Future investment in aquaculture, including R&D investment, should focus on high value species where Australia is strong (southern bluefin tuna, pearl oysters, Atlantic salmon, prawns and edible oysters) and other species or technology that have significant commercial potential, such as abalone and rock lobster.

There is also potential to significantly meet Australia's likely seafood deficit, for example, through the utilisation of existing inland saline water sources."

Peter Dundas-Smith
Executive Director,
Fisheries Research and
Development Corporation

"As Australia's population ages, health and diet is assuming a greater importance in peoples' lives. Seafood is seen as a cornerstone for a balanced diet and a healthy lifestyle. Given that production from Australia's wild caught fisheries is stable, new supply of fresh seafood can only come from aquaculture.

"This affords opportunities for enterprising people to plan and invest in sustainable forms of aquaculture with some certainty of demand and of a consuming public that has confidence in the product itself and how it is produced. The choice for consumers will become greater as new varieties are added to retailers' counters as this investment kicks in."

John Roach
Chair, Master Fish Merchants
Association of Australia

"Aquaculture continues to play an increasingly important role in Sydney Fish Market's (SFM) product mix, with aquaculture species now being sourced from throughout Australia and overseas. While a large portion of this farmed product is sold on the Auction floor, the trend towards satisfying increasing demands for farmed product through SFM's Internet based trading system – SFMlive – is a constant reminder of where the industry is headed.

"SFM shares the vision for a strong and sustainable aquaculture industry."
Grahame Turk
Chief Executive Officer
Sydney Fish Markets Pty Ltd

Aquaculture from different perspectives

"Without doubt, as the demand worldwide for seafood grows, and wild stocks continue to be under stress, so the opportunity for aquaculture grows exponentially. With high production costs and the tyranny of distance to global markets, Australian aquaculturists face a unique challenge – to produce seafoods that can be competitive in any market.

"Using the success of the Australian wine industry as a benchmark, Australian aquaculturists must have a quality focus which elevates their product above the norm – our unique selling proposition must be that we produce "best in class". Production which delivers above contemporary global expectations, including the moral and culinary capability of a seafood, must be the focus of the industry.

"Producing a fish alone is not enough! An intimate understanding of consumer needs and opportunities, combined with sophisticated and savvy marketing is the difference between being 'in the zone' and 'on target' with an aquaculture product."

John Susman
Marketing Consultant
Steve Costi Seafoods

"Aquaculture is the way of the future for Australia. With the old ways of agriculture increasingly challenged, and sea harvesting affected by both supply and weather, aquaculture offers an attractive alternative form of sustainable agriculture for the Australian farmer. With learnings from overseas and in Australia, it can be clean and green, run alongside crops allowing farming diversity, with the further potential of its water being recycled. Fish is the most efficient converter of food in the world, some species converting 1.5 kilos of dry feed to 1 kilo of flesh, so it is economically viable. Seafood produced by aquaculture is ever increasing in quality and diversity.

"Keeping an eye to environmental sustainability, aquaculture can make us again, the lucky country."

Lyndey Milan
Food Director,
The Australian Women's Weekly;
Co-host, "Fresh – Cooking with
The Australian Women's Weekly",
The Nine Network Australia;
Councillor, Royal Agricultural Society
and Chair, Fine Food Committee

"The more I look at the world of food and wine, the more I realize that aquaculture is going to be the way of the future for all lovers of fish, molluscs and crustaceans.

"Restaurateurs love it because of its assured availability and the assurance that the aqua-item will be to their specification of size, weight and so on... oh, and it will taste great. Consumers will love aquaculture produce because of its availability and regular retail price.

"I support aquaculture products not only for their culinary value but also because they are invariably regional businesses, which means increased employment within that area.

"Another great plus for aquaculture produce/products is they go so well with wines and that is a heaven sent answer to any culinary conundrum".

Peter Howard
President, Food Media Club Australia

Further Information

Further information about aquaculture opportunities in NSW, and on the case studies featured in this brochure, can be obtained from DPI and DSRD. Contact details for the businesses featured in the case studies are included in a complementary publication, NSW First for Aquaculture – Industry Directory 2004. This publication provides details of suppliers of farmed seafood and of related products and services in NSW. The directory is available upon request from DSRD and DPI.

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