AQUACULTURE INDUSTRY ACTION AGENDA

NATIONAL AQUACULTURE DEVELOPMENT COMMITTEE'S REPORT TO GOVERNMENT AND INDUSTRY

2002

Acknowledgments
This report was prepared by Brian Jeffriess, Simon Bennison, Russ Neal, Craig Foster, Sally Tonkin, John Jenkin, Peter Shelley, Bruce Zippel, Paul Trevethan, Glenn Hurry and Martin Breen, of the National Aquaculture Development Committee, with comments and assistance from Dillon Sothinathan, of the Aboriginal and Torres Strait Islander Commission, State and Territory Government aquaculture managers, in particular Greg Paust of Fisheries WA, and Matthew Dadswell, of AFFA's Aquaculture Action Agenda Taskforce.

ISBN

Disclaimer
This report provides recommendations to government and industry on how to increase the sustainable growth of the Australian aquaculture industry. The views and opinions expressed in this report do not necessarily reflect those of the Commonwealth Government, Ministers or their Departments.

For further information contact:

Aquaculture Action Agenda Taskforce
Fisheries and Aquaculture
Department of Agriculture, Fisheries and Forestry – Australia
GPO Box 858
CANBERRA ACT 2601
Phone: 02 6272 5918
Fax: 02 6272 4875
E-mail: fisheries@affa.gov.au

This paper and other information can be accessed from the Aquaculture Action Agenda website at: http://www.affa.gov.au/aquaculture

Printed copies of the report may be requested by contacting the Aquaculture Action Agenda Taskforce.

Contents

Foreword

This report is a blueprint for the future growth of the Australian aquaculture industry. It contains practical and cost-effective recommendations from the National Aquaculture Development Committee for increasing the sustainable growth and competitiveness of the Australian industry and its contribution to national and regional prosperity.

The National Aquaculture Development Committee is confident that by implementing the initiatives and recommendations it has proposed, the industry will be able to achieve its vision of $2.5 billion in yearly sales by 2010, and deliver benefits to the Australian economy and regional areas.

On behalf of the National Aquaculture Development Committee, I present this report to government and industry.

BRIAN JEFFRIESS
Chair
National Aquaculture Development Committee

July 2002

1 Executive Summary

Aquaculture is the fastest growing primary industry in Australia, increasing in value by an average of 13 per cent a year since 1990. In 2000-01, the gross value of Australian aquaculture production was $746 million, about 30 per cent of Australia's fisheries production. Major aquaculture products are southern bluefin tuna, pearls, Atlantic salmon, oysters, prawns, trout, mussels, silver perch and barramundi.

The industry directly employs more than 7,000 people and indirectly more than 20,000 people. During the past four years employment in aquaculture has grown by 260 per cent. It is Australia's sixth fastest growing occupation and the fastest growing occupation within primary industries.

Exports account for more than 60 per cent of the value of Australian aquaculture. Pearls and southern bluefin tuna are the main exports. Asia is Australia's major market for fisheries and aquaculture exports.

The aquaculture industry is largely based in regional Australia, and makes a significant and positive contribution to regional development. Aquaculture adds diversity to a region's economic base and creates demand for educational and training services, extension services, infrastructure and locally produced goods.

Aquaculture is a new global industry that is growing by 11 per cent a year. Driving the growth has been increasing world demand for fisheries products that the world's wild fisheries are increasingly unable to meet.

To capitalise on the rising demand for aquaculture products, Australian producers need to exploit their competitive advantages such as:

- our established international reputation as a supplier of high-quality fisheries and aquaculture products;
- our unique native species;
- our clean environment;
- our closeness to major Asian markets;
- our ecologically sustainable management systems and regulations; and
- our ability to farm a large variety of aquatic animals from cold and tropical regions.

The Australian aquaculture industry has estimated that it could triple its yearly sales to $2.5 billion by 2010 if it could successfully exploit its competitive advantages to meet increasing domestic and global demand for fisheries and aquaculture products. This estimate provides the foundation for the industry's vision and mission to 2010.

Vision

By 2010 a sustainable, vibrant and rapidly growing Australian aquaculture industry will achieve at least $2.5 billion in annual sales[1] by being the world's most globally competitive aquaculture producer.

Mission

Total commitment to economic, social and environmental benefits from aquaculture.

[1] Last point of sale for primary producer.

The Aquaculture Industry Action Agenda provides the framework to achieve this vision. An essential element of the framework is a strategic partnership between the aquaculture industry and the Commonwealth Government that can identify and act on growth opportunities for Australia and the industry.

A high-level steering group, the National Aquaculture Development Committee (NADC), was formed to assist industry and government identify and turn growth opportunities into dollars.

The NADC has proposed eight key initiatives to drive future industry growth and provide the starting point for an extended program of cooperation between industry and government:

1) Making a National Aquaculture Policy Statement
2) Implementing an industry driven action agenda
3) Growing the industry within an ecologically sustainable framework
4) Investing for growth
5) Promoting aquaculture products in Australia and globally
6) Tackling the research and innovation challenges
7) Making the most of education, training and workplace opportunities
8) Creating an industry for all Australians

2 Introduction

The Aquaculture Industry Action Agenda will enable the industry to move to a higher and sustainable growth path. Achieving it will depend on industry and government building a dynamic partnership that can identify and act on growth opportunities for Australia and the aquaculture industry.

An Aquaculture Industry Action Agenda was first raised at a national aquaculture workshop in Canberra in August 1999. Industry participants identified a vision for the industry, and some of the impediments and opportunities that would have to be addressed to achieve it.

In 2000, the Commonwealth Government announced it would work with the industry to achieve its vision through an action agenda program. An expert, mainly industry-based, National Aquaculture Development Committee (NADC) was established to assist the industry and the Commonwealth Government develop the agenda. This report from the NADC puts forward a number of initiatives for government and industry to implement.

3 A new global industry

Aquaculture is the world's fastest growing food producing sector, contributing about 30 per cent of global fisheries production. Global aquaculture production by volume is increasing by 11 per cent a year. Few other global industries enjoy the same level of growth. In 1999, 180 countries produced commercial quantities of more than 350 species through aquaculture practices (FAO 2000).

The top 10 aquaculture-producing countries in the world are in Asia, which dominates global production. China produces more than 60 per cent of the total. More than half of global production is from freshwater, often as part of integrated agriculture-aquaculture food production systems. This contrasts with Australia where more than 95 per cent of production is from marine waters.

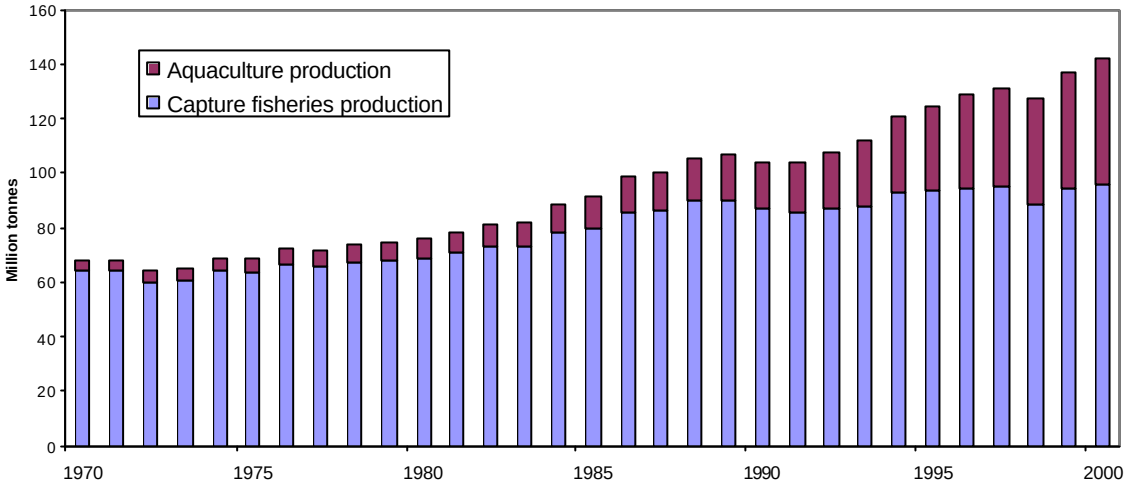
The two key drivers of global aquaculture development are:

- a widening gap between wild-caught fisheries production and the increasing demand for high-volume, low-value seafood; and
- a widening gap between wild-caught fisheries production and the increasing demand for high-value aquatic products from limited production, such as pearls, Atlantic salmon and tuna.

Seafood accounts for between 13.8 per cent and 16.5 per cent of the animal protein intake of the human population. Worldwide, about 1 billion people rely on fish as their main source of animal protein (FAO 2000).

Global population, per capita meat consumption and gross domestic product are all estimated to increase over the next 10-15 years. At the same time as demand for fisheries products increases, wild-capture from global marine and inland fisheries has levelled (Fig. A).

Fig. A: World capture fisheries and aquaculture production 1970 – 2000



Source: *FAO Statistics 1970 – 2000*

This levelling off of the total catch follows the general trend of most of the world's fishing areas, which have apparently reached their maximum potential for capture fisheries production, with the majority of stocks being fully exploited. It is therefore very unlikely that substantial increases in total catch will be obtained. In contrast, growth in aquaculture production has shown the opposite tendency (FAO 1999).

World catches from wild fisheries of key species such as cod are down however consumer demand is increasing. Ten years ago, the aquaculture potential of cod was not being taken seriously. Yet, in 2002 commercial farming of cod has begun.

In little more than 10 years, for example, farmed salmon has increased its share of world salmon production by 2000 from one fifth to more than half.

The Future…

Fish farming will overtake cattle ranching as a food source by 2010. Aquaculture has been the fastest-growing sector of the world food economy over the past decade, while beef production has stagnated (World Futurist Society 2001).

Within the next fifty years, fish farming may change us from hunters and gatherers on the seas into "marine pastoralists" — just as a similar innovation some 10,000 years ago changed our ancestors from hunters and gatherers on the land into agriculturists and pastoralists (Drucker, P 1999).

By the year 2030, aquaculture will dominate fish supplies and less than half of the fish consumed is likely to originate in capture fisheries. Aquaculture will have expanded geographically, in terms of species cultured and technologies used (FAO 1999).

Domestic demand for seafood is increasing in Australia. In the late 1930s, Australian seafood consumption was 4.9 kilograms per person. In 1998-99, annual per capita consumption had more than doubled to 10.9 kilograms, or about 10 per cent of total unprocessed meat intake (ABS 2000). Unfortunately, Australian fish accounted for only about half of seafood consumption (5.1 kilograms).

In addition to the rise in seafood demand, increasing affluence in countries such as China will see stronger demand for non-edible fisheries and aquaculture products such as pearls, crocodiles and ornamental fish.

4 Australia's competitive advantages

Australian producers have a number of competitive advantages, which they must exploit to capitalise on the increasing global and domestic demand for aquaculture products.

Australia's biggest competitive advantage is its international and domestic reputation as a supplier of premium-quality, clean and green fisheries and aquaculture products. We farm our aquaculture products in some of the cleanest waters in the world, using innovative, ecologically sustainable production and management technologies. Australia's relatively disease-free status compared with that of our competitors delivers benefits in terms of improved productivity and quality.

Asian buyers, in a recent survey (Australian Business Ltd 2001), considered Australia to be a supplier of premium-quality wild-caught and farmed fisheries and aquaculture products, out-competing many of our trade competitors on quality and food safety. Some buyers regarded Australian fisheries and aquaculture products as the best in the world!

Australian pearl producers, for example, using a combination of clean and green growing conditions and modern production techniques, can produce a high-quality natural product that commands a price premium about 30 per cent above that of our main competitors.

The survey also confirmed the value of another competitive advantage — Australia's closeness to major Asian markets. Asian buyers cited proximity and relationships as the best part of doing business with Australia. Australia was also seen as a strong performer in relation to logistics, an important element given the need to deliver fresh seafood and quality aquaculture products. Asia bought two-thirds of the 93.9 million tonnes of seafood product available worldwide for consumption in 1997 (FAO 2000). In 2000-01, three-quarters of Australia's aquaculture and fisheries exports went to Asia (ABARE 2002).

Australia also has a competitive advantage in its ability to produce a wide range of warm and cold-water species, enabling us to access a wide range of niche markets. As a small producer by world standards, Australia relies on being able to target niche, high-value markets with a wide range of premium-quality produce.

Countries like Norway and the United Kingdom are limited to producing cold-water species such as Atlantic salmon. But, in Australia, we can add farmed warm-water species, such as prawns, barramundi and pearls, to our production of Atlantic salmon. Our extensive range of native species multiplies our capacity to establish new niche markets.

Supporting the above competitive advantages are a positive business environment, stable government, a strong regulatory framework for ecologically sustainable development, fish health, a highly skilled workforce, and world-class scientists and educational institutions.

5 $2.5 billion by 2010 — A vision for sustainable growth and competitiveness

The Australian aquaculture industry has estimated it could triple sales to $2.5 billion a year by 2010 if it could successfully exploit its competitive advantages. The 2010 estimate depends largely on growth in five major sectors — southern bluefin tuna, pearls, Atlantic salmon, oysters and prawns. The industry expects the five sectors to grow collectively from about $693 million in 2000-01 to $2.05 billion by 2010. It sees other and emerging species making up the remaining $450 million.

This estimate is the foundation for the industry's vision and mission to 2010.

Vision

By 2010 a sustainable, vibrant and rapidly growing Australian aquaculture industry will achieve at least $2.5 billion in annual sales[2] by being the world's most globally competitive aquaculture producer.

Mission

Total commitment to economic, social and environmental benefits from aquaculture.

The initiatives in this report provide the basis for government and industry to work together to achieve this vision.

6 Australia's aquaculture industry

6.1 A diverse industry

The aquaculture industry in Australia encompasses producers, processors, marketers and support services, such as equipment manufacturers, suppliers and feed manufacturers. Its production involves breeding, hatching, rearing and processing for sale aquatic organisms, including fish, molluscs, crustaceans, reptiles and aquatic plants.

The industry is highly diversified in its makeup. It is a major seafood producer (Atlantic salmon, southern bluefin tuna, oysters, prawns, native fish, crayfish). But it also produces jewellery (pearls), food additives (beta carotene), personal accessories (crocodile skins) and pets (ornamental fish) and adds to tourism (freshwater trout, crocodile and seahorse). The industry farms and releases a wide range of aquatic organisms into wild-capture fisheries for environmental, recreational and commercial purposes.

Production technologies vary significantly between species. Prawn farming within earthen ponds, for example, requires totally different technology from southern bluefin tuna farming in floating sea cages. Products are farmed in a wide range of environments and use a variety of natural resources including coastal, inland freshwater and inland saline water.

[2] Last point of sale for primary producer.

There are more than 3,200 aquaculture licences held in Australia. The majority of the industry comprises small-scale operations, often owner-operated with one or two employees. About 60 per cent of aquaculture licences held are for land-based, freshwater aquaculture. However, freshwater aquaculture accounts for only 4 per cent ($29 million) of Australia's gross value of aquaculture production.

The number of licences and production reflect the different forms of land ownership in Australia. Most of inland Australia is freehold land, available through private purchase. Coastal marine resources are mostly publicly owned and managed by governments. The process for allocating access to public resources often involves extensive community consultation. Governments attach a range of environmental, social and economic conditions as part of the approvals to access public resources. The simpler access arrangements to freehold land allow many people to undertake aquaculture as a hobby or as a minor supplement to household income. The complex access arrangements to coastal marine resources discourage small-scale aquaculture in these areas.

There are fewer than 100 large-scale, commercial aquaculture producers in Australia. They farm almost entirely marine-based species and, together, account for more than 90 per cent of the gross value of Australian aquaculture production.

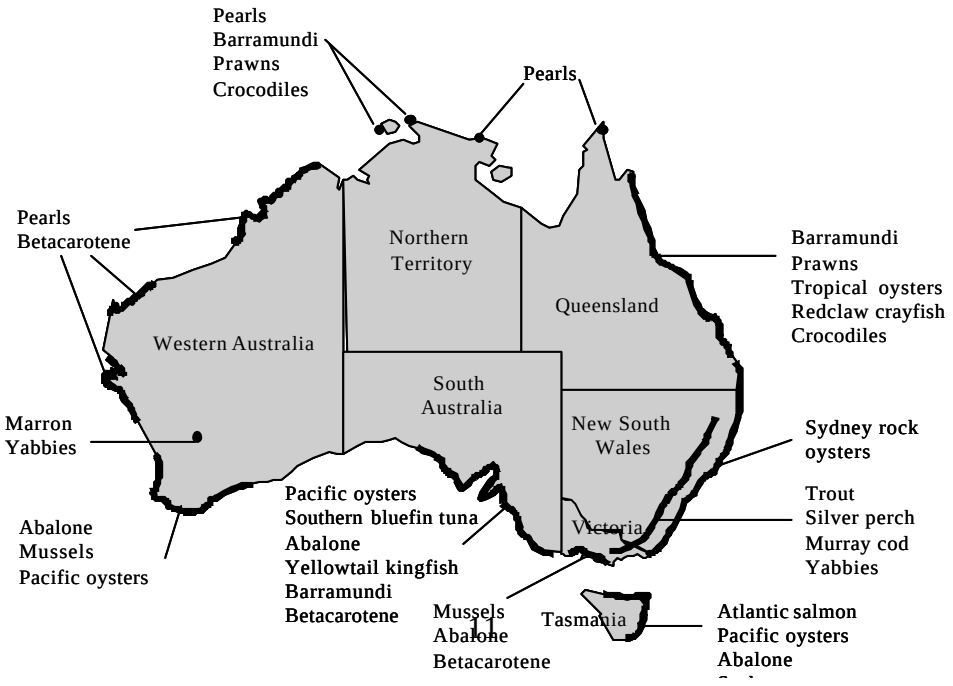
Aquaculture is…

the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants, with some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc.
UN Food and Agriculture Organisation 1989.

6.2 Main species farmed

Aquaculture is established throughout regional Australia. While more than 40 species are produced commercially, five main species — pearls, oysters, salmon, prawns and southern bluefin tuna — account for more than 90 per cent of the gross value of production.

Fig. B: Location of major Australian aquaculture species



6.2.1 Southern bluefin tuna

Australia's southern bluefin tuna (*Thunnus maccoyii*) farming industry is based on fattening wild-caught juvenile fish in sea pens near Port Lincoln, South Australia. The high-quality and high-value tuna are exported to the Japanese sashimi market. During the financial year 2000-01, the industry produced more than 9,000 tonnes of southern bluefin tuna for a farm-gate value of $264 million. It exported almost the entire production.

The first commercial production of southern bluefin tuna began only 10 years ago when quota restrictions were put in place for the wild tuna fishery. Since then, southern bluefin tuna farming has grown to become the largest aquaculture sector in Australia. The industry directly employs about 1,500 people. The southern bluefin tuna industry is responsible for much of the growth of the aquaculture industry in Australia during the past 10 years.

6.2.2 Pearl

Several species of pearl are found and cultured in Australian waters. The main pearl oyster cultured in Australia is the gold or silver lipped pearl oyster (*Pinctada maxima),* which produces a high-quality natural pearl and mother of pearl shell.

Pearl farming takes place from Exmouth, in Western Australia, to east of Darwin, in the Northern Territory. It is a large regional employer in those areas, with at least 1,000 jobs directly attributed to the industry. In 2000-01, its farm-gate value was about $221 million. Almost the entire production was exported at a final sales value of $419 million.

6.2.3 Atlantic salmon

Atlantic salmon (*Salmo salar*) is an introduced species, which is mainly farmed in floating sea pens along the Tasmanian coastline. The first commercial production of Atlantic salmon in Australia was in 1987. Production is now about 10,000 tonnes a year. Most of the production is consumed within Australia, where Atlantic salmon has carved out a significant niche as a premium restaurant fish. The industry faces increased competition on the domestic and international markets because of increasing production overseas, especially from Chile and Norway. In 2000-01, the industry produced more than 12,000 tonnes of Atlantic salmon for a farm-gate value of about $95 million. About 15 per cent was exported.

6.2.4 Oyster

The species of edible oyster farmed in Australia include the Sydney rock oyster (*Saccostrea glomerata*), Pacific oyster (*Crassostrea gigas*), the native flat oyster (*Ostrea angasi*), the milky or northern oyster (*Saccostrea amasa*) and the blacklip oyster (*Saccostrea echinata*). Historically, Sydney rock oyster has been the main edible oyster produced in Australia. However, production fell considerably during the 1980s, mainly because of the introduction of the Pacific oyster. As the production of Sydney rock oysters has declined, Pacific oyster production has significantly increased, mainly in Tasmania and South Australia. The industry produced nearly 13,000 tonnes of oysters in 2000-02 for a farm-gate value of about $58 million. It sold about 98 per cent of production domestically.

6.2.5 Prawn

Prawn farming has expanded rapidly in Australia since it began in 1984. The black tiger prawn (*Penaeus monodon)* is the major species farmed in Australia because it is faster growing and better able to withstand changes in salinity compared with other native prawn species.

A small number of farms grow the more valuable kuruma prawn (*Marsupenaeus japonicus*) for live export to Japan. The returns are much higher for kuruma than for black tiger prawns. However, the operating and capital costs are higher because of kuruma prawns' different farming requirements. Queensland is the largest producing state, but prawns are also farmed in northern New South Wales and the Northern Territory. In 2000-01, nearly 3,000 tonnes of prawns were produced for a farm-gate value of about $50 million. About 93 per cent were sold domestically.

6.2.6 Other species

Australia farms a wide range of fresh and marine finfish, the major ones being freshwater and ocean trout (*Oncorhynchus mykiss*), silver perch (*Bidyanus bidyanus*), Murray cod (*Maccullochella peeli*) and barramundi (*Lates calcarifer*). Silver perch, Murray cod and barramundi are mainly farmed in New South Wales, South Australia, Victoria and Queensland. Trout is mainly farmed in Tasmania, Victoria and New South Wales.

Three native species of freshwater crayfish are farmed in Australia, the yabby (*Cherax destructor*), redclaw (*C. quadricarinatus*) and marron (*C. tenuimanus*). Farming began in the 1960s. While most cultivation has been small scale in farm dams, a number of larger growers and marketing cooperatives are emerging.

The blue mussel (*Mytilus edulis*) is the only marine mussel species farmed in Australia. An estimated 2,500 tonnes of mussels with a farm-gate value of over $6 million were produced in 2000-01, mostly in Victoria and Western Australia.

Other species commercially farmed in Australia include short and long finned eel (*Anguilla australis* and *A. reinhardti*), saltwater crocodile (*Crocodylus porosus*), scallop (*Pecten fumatus*), abalone (*Haliotis rubra* and *H. laevigata*), betacarotene microalagae (*Dunaliella salina*) and many species of ornamental aquarium fish.

6.2.7 Emerging species

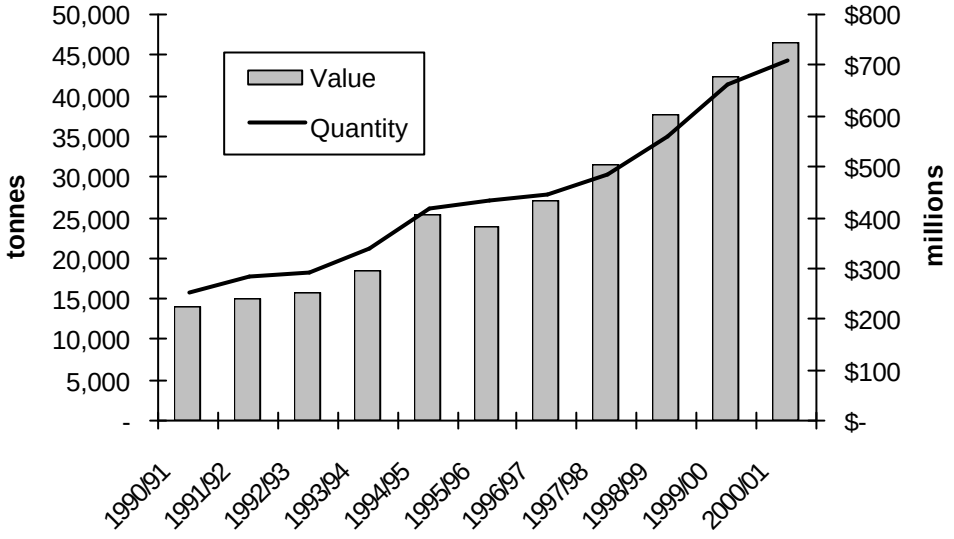
After many years of research, the industry has begun commercial production of a number of native Australian marine and freshwater species, including pen farming of yellowtail kingfish (*Seriola lalandi*) and snapper (*Pagrus auratus*), tank culture of various species of tropical reef fish and fat-bellied seahorse (*Hippocampus abdominalis*), and long-line farming of black pearls (*Pinctada margaritifera*).

Rock lobster (*Jasus noveahollandiae* and *Panuliris cygnus*) is Australia's most valuable fisheries product and export. Research to close the life cycle so it can be farmed to improve wild-stocks is ongoing. Mud crab (*Scylla serrata*) is also nearly ready for commercial aquaculture. Wild-caught mud crab is a high-value seafood product sold in Australia as well as overseas.

6.3 Value and production

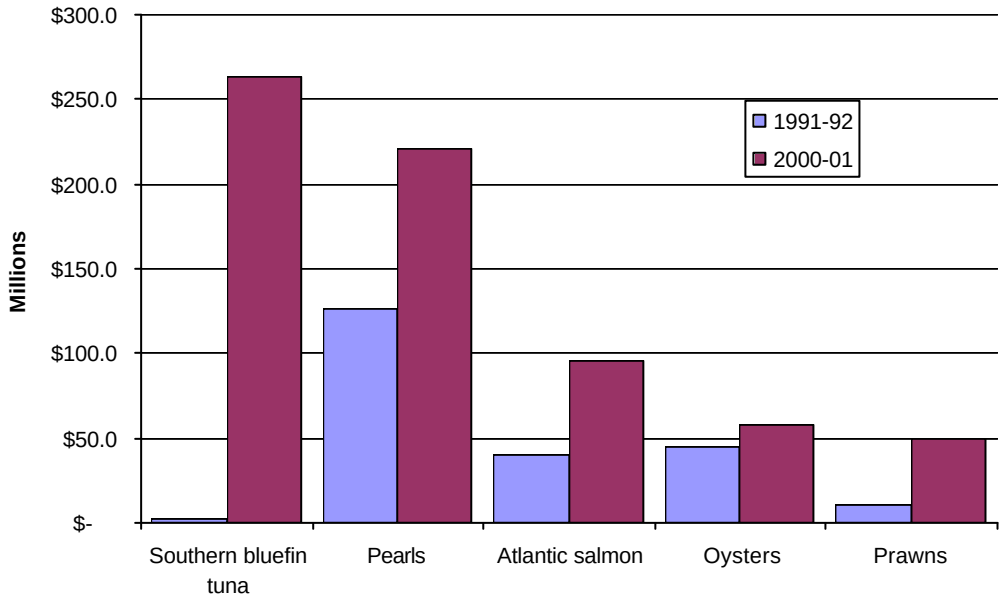
Aquaculture is Australia's fastest growing primary industry. It has grown by 13 per cent each year since 1990 (Fig. C). In 2000-01, the gross value of Australian aquaculture production was $746 million and accounted for about 30 per cent of Australia's fisheries production. The industry estimates its value at first point of sale is more than $1 billion.

Fig. C: Australian aquaculture production: 1990-91 – 2000-01



Source: *ABARE Fisheries Statistics 1990-2001*

Fig. D: Gross value of Australian aquaculture production for selected species: 1991-92 and 2000-01

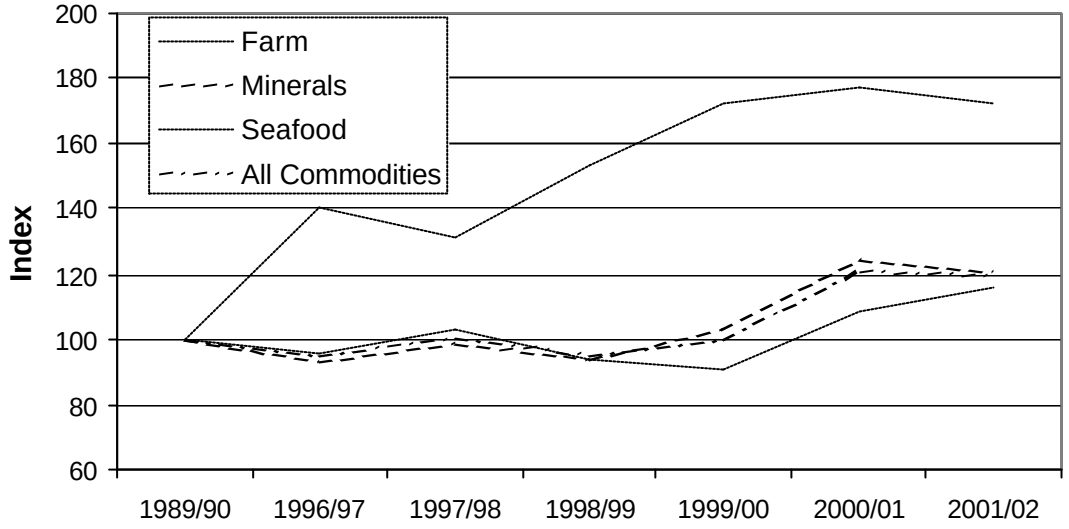


Source: *ABARE Fisheries Statistics 1992-2002*

6.4 An industry that adds value

During the past 10 years, Australia's fisheries and aquaculture industries have added more value to their product than most other major commodities (Fig. E).

Fig. E Value-adding for key commodities



Source: *ABARE*

Many aquaculture producers vertically integrate processing, marketing, retailing and transport into their businesses to add more value to the farmed product and to increase efficiencies in the supply chain from producer to consumer. In 2000-01, for example, the estimated gross value of product at the farm gate for the Atlantic salmon industry was $95 million (ABARE 2002), compared with an estimated value of about $170 million at first point of sale. Farmers achieved the difference through value-adding and processing activities, such as filleting and preserving.

6.5 Employment

A survey by the Cooperative Research Centre for Aquaculture, estimated that, in 1997-98, the industry directly employed more than 7,000 full-time and casual staff, and indirectly more than 20,000 people (CRC 1999). During the past four years, employment in aquaculture has grown by 260 per cent. It is the sixth fastest growing occupation in Australia and the fastest growing occupation within primary industries (Bagnall, D 2001). Industry projections suggest direct employment of about 36,000 if aquaculture production reaches $2.5 billion in 2010.

6.6 A proven exporter

Exports create more than 60 per cent of the value of Australian aquaculture production. Pearls and southern bluefin tuna dominate exports. Export success has not been limited to larger industry sectors. A number of small-to-medium scale aquaculture farmers have successfully established, and held, small, niche markets overseas, as well as in Australia, for products such as native freshwater fish, yabbies, marron and abalone.

Asia is Australia's major market for fisheries and aquaculture exports. The five main export destinations are Japan, Hong Kong, Chinese Taipei, the United States and Singapore, which together make up about 77 per cent of Australia's total fisheries exports ($2.17 billion).

Exports have boomed during the past five years for a number of reasons. They include a strong period of world economic growth, the devaluation of the Australian dollar against the currencies of our five major fisheries trading partners; and a rising global population estimated at 6 billion.

6.7 Contributing to regional development

The aquaculture industry is largely based in regional Australia and makes a significant contribution to regional development. Aquaculture adds diversity to a region's economic base and creates demand for educational and training services, extension services, infrastructure and locally produced goods. The South Australian aquaculture industry, for example, contributes $318 million to the economy. This growth, 69 per cent a year over the past decade, is making a substantial positive impact on employment and community populations on Eyre Peninsula, the base for most of South Australia's aquaculture industry.

6.8 An industry for all Australians

Many Indigenous Australian communities are already involved in the aquaculture industry and many more are strongly interested in becoming active participants. An unpublished study by the Bureau of Rural Sciences in 2001 revealed there were at least 28 aquaculture facilities in Australia with some level of Indigenous involvement. At least another 16 proposals were awaiting approval or seeking investment (Stutterd, E, 2001).

The NADC recognises and respects the rights, interests and aspirations of Indigenous people in the sustainable development of aquaculture in Australia.

7 Proposed initiatives

The National Aquaculture Development Committee has proposed eight key initiatives to drive the future growth of the industry, realise the industry's vision of sales of $2.5 billion a year by 2010 and lay the foundation for an extended program of cooperation between industry and government.

The following proposed initiatives are discussed in this section:

1. Making a National Aquaculture Policy Statement
2. Implementing an industry driven action agenda
3. Growing the industry within an ecologically sustainable framework
4. Investing for growth
5. Promoting aquaculture products in Australia and globally
6. Tackling the research and innovation challenges
7. Making the most of education, training and workplace opportunities
8. Creating an industry for all Australians

For each initiative, the NADC has suggested specific actions, timeframes and resource implications.

The NADC believes that, in providing these details, it will assist industry and government to form their response to the proposed initiatives. The committee suggests this information will also assist the development of an evaluation strategy for the Action Agenda to determine government and industry progress in achieving agreed outcomes. Ongoing data collection and monitoring will be essential to ensure a full evaluation of the effectiveness of individual actions.

From the NADC's point of view, the overall success of the Aquaculture Industry Action Agenda will be measured by the extent to which the committee's proposed initiatives are implemented in the timeframes identified, and that the aquaculture industry is on track to achieving its vision by 2010.

7.1 Making A National Aquaculture Policy Statement

Proposed Initiative 1

Making A National Aquaculture Policy Statement

Opportunity
To send a clear signal to the Australian public, aquaculture industry, and domestic and international investors of Australia's strong support for the sustainable development of the aquaculture industry in Australia.

Objective
To support the sustainable development of the aquaculture industry and deliver an efficient, effective and supportive regulatory environment.

Recommended actions
That the Commonwealth, State and Territory Governments make a National Aquaculture Policy Statement containing:

- a statement of support for sustainable aquaculture development in Australia;
- an outline of government commitments to sustainable aquaculture development;
- clarification of resource access arrangements and management of aquaculture in Commonwealth waters; and
- an agreement to plan for aquaculture development in advance of growth in the States and Territories.

That Commonwealth, State and Territory governments develop and implement nationally agreed best-practice principles for the development and management of aquaculture.

Responsibility for implementation
Commonwealth, State and Territory governments

Resources required
Commonwealth, State and Territory governments

Implementation timeframe
Policy statement within one year of commitment to this initiative.
Principles developed and implemented within three years of commitment to this initiative.

7.1.1 A public statement of support

The level of support from Commonwealth, State, Territory and local governments for aquaculture development can have a significant bearing on the development of the industry given their various roles in planning and managing resources, and providing infrastructure, and in trade, fish health, food safety, ecologically sustainable development and international relations.

Experiences in other countries have demonstrated that poor communication and an inability by industry, public and government to resolve issues have resulted in measures as extreme as moratoriums on aquaculture development.

Based on the above considerations, the NADC identified that some form of public statement of support from the Commonwealth, State and Territory governments, such as a National Aquaculture Policy Statement, would send a positive signal to domestic and international investors, as well as existing farmers, that their industry was recognised and supported at the highest levels in Australia as a sustainable industry of the future.

Growth of the Australian aquaculture industry depends on the availability and quality of natural resources, such as land, water and broodstock. These resources are not limitless and are often sought for other uses, such as urban development, tourism, recreation and wild fisheries. There is a need to develop ways to allocate these resources efficiently between users, as well as to identify and develop new resources for aquaculture. The regulatory environment should encourage aquaculture development, not work against it.

The national aquaculture workshop in 1999, and subsequent consultations for the Action Agenda, identified that prospective investors in aquaculture would have to negotiate a bewildering range of planning, public consultation, environmental and management processes, regulations and conditions to gain access to resources and aquaculture licences.

While the underlying reasons for these processes, regulations and conditions has never been questioned, the way in which they are applied and administered by Commonwealth, State and Territory governments has often failed to meet investor expectations. Depending on the type of activity proposed and access sought, some approvals can take months — if not years — of ongoing negotiation between governments and investors.

For investors, time is money, and slow regulatory and planning processes increase costs or may altogether discourage investment. For the community, inefficient and complex regulatory and planning processes create confusion and distrust. Investors and government need to communicate better with each other and be prepared to share information to achieve more timely regulatory and planning processes.

The NADC believes that, like the National Policy for the Translocation of Live Aquatic Organisms developed by Commonwealth, State and Territory governments in 1999 and national guidelines developed for other primary industries, the Commonwealth Government has an opportunity to demonstrate national leadership by working with State and Territory governments and industry to define, at a national level, principles for best management practices for aquaculture based on domestic and international experiences.

The principles would inform future reviews of Commonwealth, State and Territory government regulations and, over time, achieve a degree of consistency and best practice in government.

7.1.2 Planning for future aquaculture development

The Australian marine exclusive economic zone is the fifth largest in the world. Technologies and species are emerging that will enable aquaculture to be undertaken further off-shore and into Commonwealth waters. There is currently no legal recognition for aquaculture in Commonwealth waters. Aquaculture is not recognised within the Fisheries Management Act 1991. Clarifying aquaculture management in Commonwealth waters will provide certainty and access for investors to the resources in this area. The NADC suggests that as part of a National Aquaculture Policy Statement, the Commonwealth Government needs to clarify resource access and management arrangements for aquaculture in Commonwealth-owned waters to allow future offshore aquaculture development.

In the same way that the Commonwealth Government should clarify and plan for aquaculture in Commonwealth waters, State and Territory Governments should also agree to clearly identify through regional plans where future aquaculture development can take place in advance of likely growth in key sectors. Some states such as Tasmania, NSW, Victoria and South Australia are already well advanced in developing and implementing such plans.

7.2 Implementing an industry driven action agenda

Proposed Initiative 2

Implementing an industry driven action agenda

Opportunity
More than 50 associations and councils represent the Australian aquaculture industry. A well-resourced peak body is needed to draw together the major industry sectors into a powerful and dynamic organisation that can advance and promote the industry's collective vision and mission, in cooperation with the Commonwealth, State and Territory governments.

Objective
To establish an aquaculture industry peak body that will:

- coordinate industry-led Action Agenda activity;
- provide a high-level mechanism for government and industry to discuss industry-wide concerns;
- increase communication and networking opportunities between industry participants;
- improve the competitiveness of Australian aquaculture businesses through communication and industry promotion;
- promote resource access and ecologically sustainable development;
- risk manage any threats;
- encourage synergies with related food industries, e.g. wine and tourism;
- assist in implementing Australia's national strategic plan for aquatic animal health (AQUAPLAN);
- foster innovation;
- provide a one-stop shop for information on the regulatory, planning and management framework for aquaculture;
- formulate national aquaculture research priorities and their communication to research providers;
- attract sound investment to the industry; and
- encourage international marketing through branding, clean and green image.

Recommended actions
That the Commonwealth Government and aquaculture industry negotiate a joint funding package to establish a peak industry body to implement and review actions arising from the Aquaculture Industry Action Agenda on behalf of industry and government.

That industry and government develop and implement an aquaculture communication and promotion strategy including funding for the peak industry body to:

- establish and maintain an aquaculture information portal, comprising a national aquaculture internet website and a full-time communications officer; and
- promote the aquaculture industry, and facilitate international and domestic technology transfer.

Responsibility for implementation
Aquaculture industry and the Commonwealth Government

Resources required
The peak industry body will require funding from the Commonwealth Government and the aquaculture industry.

Implementation timeframe
The peak industry body established within one year of commitment to this initiative.
An aquaculture communication and promotion strategy developed and implemented within three years of commitment to this initiative.

7.2.1 Bringing a diverse industry together

The Australian aquaculture industry is very diverse, with about 3,000 businesses farming more than 40 species throughout Australia — from Atlantic salmon at Dover, Tasmania, to oysters at Ceduna, South Australia, to prawns at Cairns, in far north Queensland, and giant clams in the Cocos and Keeling Islands. In all there are more than 50 aquaculture associations and councils. The largest is the National Aquaculture Council representing about 60 per cent of the aquaculture industry by value.

The NADC identified the importance of ensuring efficient, effective and timely communication between industry, government, researchers, Indigenous peoples and the community on aquaculture issues and information. Aquaculture is an emerging industry and has a significant need to access and share new information within the industry and with others on new issues, innovation, investment opportunities, education and training opportunities, and government policies and programs.

Australia does not have an all-encompassing national peak industry body to represent industry views and to advise government. Establishment of a national peak industry body would represent a significant cost saving to government consultative processes and improve the industry's contribution to aquaculture policy and program development.

7.3 Growing the industry within an ecologically sustainable framework

Proposed Initiative 3

Growing the industry within an ecologically sustainable framework

Opportunity
There is significant potential to further increase aquaculture production by improving access to resources and ensuring their ecologically sustainable development (ESD). Compared with many other countries, Australia has significant, clean and disease-free natural resources including land, and inland and marine waters for aquaculture of a wide range of warm and cold water species.

Objectives
- To improve access to natural resources;
- Continual improvement of ecologically sustainable aquaculture practices;
- An efficient and transparent business and regulatory environment in which aquaculture can grow.

Recommended actions
That industry and government encourage ESD and planning of aquaculture by identifying resource availability and suitability for aquaculture in: coastal areas; offshore deep water marine; inland fresh and saline waters; integration with agriculture; and Indigenous and Commonwealth-owned waters.

That industry and government work together to implement, document and promote the benefits of ESD through codes of practice and environmental management systems. Where possible, these practices and systems should be strengthened by independent, third party auditing.

To ensure timely approval of aquaculture proposals, the Commonwealth, State and Territory governments, as a matter of priority, should negotiate agreements accrediting State and Territory government processes in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

That government and industry respond to the recommendations of the Fisheries Research and Development Corporation project "National Chemical Registration Framework for the Aquaculture Industry", which aims to identify an efficient and cost-effective mechanism for approving chemical use in the aquaculture industry, and to raise awareness of responsible chemical use in the industry. The aquaculture industry peak body should maintain a list of those chemicals approved for use in aquaculture on a national aquaculture information portal.

That government and industry continue implementing Australia's national strategic plan for aquatic animal health (AQUAPLAN) beyond 2003 especially by:
- providing more information, education and training for farmers and Indigenous Australians on preventing and managing disease occurrences;
- improving Australia's health diagnostic capabilities;
- investigating options for long-term industry and government funding for aquatic animal health; and
- supporting aquatic animal health surveillance and monitoring including data collection and holding.

That the Commonwealth Government substantially upgrade compliance arrangements for ballast water discharge and hull fouling for ships operating in Australian waters, including consideration of the positive role that industry could play in reporting ships that are illegally dumping ballast water.

That, as part of a transparent decision-making system, the Commonwealth Government liaise closely with members of the aquaculture industry and State and Territory governments on import risk assessments and other quarantine-related processes.

That governments continue to improve management of translocation of aquatic organisms in line with the principles set out in the 1999 National Policy for the Translocation of Live Aquatic Organisms.

Responsibility for implementation
Aquaculture industry and Commonwealth, State and Territory governments.

Funding required
The following actions are likely to require new resources from industry and government: continued implementation of the AQUAPLAN; establishment of a chemical registration framework; upgrading compliance arrangements for ballast water discharge and hull fouling; documenting and promoting ESD; and improving access to natural resources.

Implementation timeframe
That industry and government identify resource availability and suitability for aquaculture in: coastal areas; off-shore deep water marine; inland fresh and saline waters; integration with agriculture; and Indigenous- and Commonwealth-owned waters within three years of commitment to this initiative.
That the Commonwealth Government accredit State and Territory government processes in line with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) within two years of commitment to this initiative.
That the Commonwealth Government substantially upgrade compliance arrangements for ballast water discharge and hull fouling for ships operating in Australian waters within two years of commitment to this initiative.
Other recommended actions ongoing.

7.3.1 Resource access and infrastructure

Aquaculture industry growth requires continued access to natural resources including freshwater, coastal areas, marine waters and Indigenous lands. Ninety five per cent of Australian aquaculture is based in coastal areas and depends on access to public marine resources. Facilitating and managing access and resource use presents many challenges to resource managers, industry and communities. Strategic planning, including identification of key areas for future development by State and Territory governments would simplify and accelerate access to these resources by prospective investors.

There is also significant potential to further develop freshwater aquaculture in Australia. The potential lies in multiple and sequential use of irrigation waters, the use of inland saline water and the integration of aquaculture and traditional farming. Advances like this will not only support the expansion of the aquaculture industry, but will also help the development of a more economically robust and ecologically sustainable farming sector.

A number of key aquaculture centres have developed in regional Australia, including Port Lincoln, in South Australia, and Broome, in Western Australia. Based initially on southern bluefin tuna and pearl industries respectively, other fisheries and aquaculture industries have developed in these areas, attracted by the infrastructure such as ports, storage facilities, communications, education and training facilities, engineering services and skilled labour. Key aquaculture centres encourage innovation and the aquaculture industry's contribution to regional development. Development of new key centres requires strategic resource planning and access to resources, as well as development of supporting on-land infrastructure such as three-phase power, roads, ancillary services and telecommunications.

7.3.2 Ecologically sustainable development

Australia's regulatory and management framework for ecologically sustainable development (ESD) is one of the best in the world. It provides for continual improvement in ecologically sustainable aquaculture development, maintaining Australia's productive natural resource base for future generations and Australia's reputation as a producer of premium-quality, clean and green fisheries and aquaculture products.

Complying with Commonwealth, State and Territory ESD-related legislation is one step towards achieving ecologically sustainable development. To reap the full benefits of ESD, industry needs to go beyond compliance and take steps, such as developing and implementing best management practices and systems, to use resources as efficiently as possible and to integrate ESD into each part of their business.

Regular documentation and publicising best-practice ESD aquaculture technologies are an effective mechanism for promoting and improving the uptake of ESD practices by industry. It also sends a clear message to government and the Australian public about the aquaculture industry's commitment to continual improvement in ESD management.

Generally, the NADC believes governments at all levels should strive to streamline the regulatory and administrative demands they place on industry. Duplication of Commonwealth, State and Territory government environmental approval and assessment processes is inefficient. It represents an unnecessary and added cost to governments and industry in aquaculture management and is detrimental to long-term industry investment and development. It also increases the possibility of delays in assessment and approval processes, leading to a loss of investor and community confidence.

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) contains provision to accredit State and Territory Government processes, which if implemented would significantly simplify Commonwealth, State and Territory government environmental approval and assessment processes for aquaculture. It is important to ensure that effective and meaningful interaction is maintained between industry and government on the application of Commonwealth, State and Territory government environment legislation and industry ESD practices.

7.3.3 Movement of aquatic organisms

Translocation of genetic strains of aquatic organisms within and between State and Territory government jurisdictions needs to be managed responsibly to ensure there are no adverse effects for receiving aquatic habitats and the organisms, while at the same time not providing a barrier to research and trade.

7.3.4 Seafood safety

Consumer concerns over seafood safety is one of the major impediments to increased domestic consumption of seafood (Ruello 1999).

The Council of Australian Government's has agreed on a nationally coordinated approach to food regulation and standards. It includes establishing specific primary production and processing standards that conform to the Primary Production and Processing Standards model and protocol, which incorporates obligations under the *Food Standards Australia New Zealand Act 2001* and all relevant policy guidelines. The seafood industry, including aquaculture producers and processors, are developing seafood production and processing standards.

7.3.5 Aquatic animal health

Australia is fortunate to have an aquaculture industry free from many diseases that occur elsewhere in the world. This provides the industry with a competitive advantage in production and trade. Maintaining and improving aquatic animal health is a major area of research and development for industry and government.

Commonwealth, State and Territory governments and industry developed Australia's national strategic plan for aquatic animal health (AQUAPLAN) in 1999. AQUAPLAN is a five-year plan that is due to end in 2003. The NADC notes the support provided by the Commonwealth Government to improve aquatic animal health management through the development and implementation of AQUAPLAN. A key aspect of the implementation and on-going maintenance of AQUAPLAN is a long-term resourcing and funding strategy, although industry and government have not successfully negotiated a strategy. The NADC is confident that formation of a peak industry body will provide the foundation for a dialogue on funding between industry and government.

Other key implementation needs include: providing more information, education and training to farmers and Indigenous Australians on preventing and managing disease occurrences; improving Australia's health diagnostic capabilities; and supporting aquatic animal health surveillance and monitoring, such as data collection and holding.

Chemical use in the Australian aquaculture industry is relatively low because Australia is free from many diseases that occur elsewhere in the world. If chemicals are needed, it is essential that they be previously assessed and approved for use in aquaculture by the National Registration Authority for Agricultural and Veterinary Chemicals. An FRDC-funded project "National Chemical Registration Framework for the Aquaculture Industry" is underway to identify an efficient and cost-effective mechanism for approving chemical use in the aquaculture industry, and to raise awareness of responsible chemical use.

Introduction of exotic diseases through fisheries-related trade or other movement is the single biggest threat to aquaculture growth in Australia. A disease outbreak in one of the major industry sectors would represent an immediate and significant reduction in aquaculture production, export earnings and regional employment. Because of this, a transparent decision-making system — based on sound and objective science — is fundamental to assessing the relative disease risks the Australian aquaculture industry faces from imported fisheries products. As individual farmers and the aquaculture industry have the most to lose from any disease outbreak, it is vital that to seek their views when assessing import risks and formulating Australian quarantine and trade policy. Similarly, incursions of endemic and exotic pests, weeds and diseases in the aquatic environment need to be managed and prevented to maintain Australia's unique aquatic biodiversity and to protect the industry from harmful exotic pests.

7.4 Investing for growth

Proposed Initiative 4

Investing for growth

Opportunity
To achieve a $2.5 billion aquaculture industry by 2010 will require substantial capital investment in large and small aquaculture businesses. As an emerging industry, aquaculture has at times struggled to access development capital. Given Australia's resource potential and ecologically sustainable development framework, any activities that provide easier access to development capital will deliver sustainable industry growth.

Objective
To increase productive and responsible investment in Australian aquaculture.

Recommended actions
That government and industry develop and implement an investment strategy that will attract development capital to the aquaculture industry. The strategy should include:

- an appraisal of taxation, excise and duties to determine if they constitute impediments, or if there are opportunities for facilitating investment in the industry; and
- an assessment of government investment incentive schemes in Australia and overseas.

Responsibility for implementation
Aquaculture peak industry body and the Commonwealth Government.

Resources required
The strategy will require some resourcing from industry and government.

Implementation timeframe
Investment strategy developed and implemented within three years of commitment to this initiative.

7.4.1 Investment constraints

The NADC realises that, if the Australian aquaculture industry is to achieve its vision of $2.5 billion in yearly sales by 2010, it will need to attract significant new investment, in particular, attracting development capital for emerging aquaculture industries. Most of the new investment will occur in rural and regional Australia, and will create significant regional economic development and employment benefits.

The ownership structure of most aquaculture producers, e.g. private companies, partnerships or trusts, creates serious obstacles to financing, preventing access to equity financing from the public or from institutional investors such as superannuation funds. Aquaculture experiences great variations in returns, especially in the start-up phase. The inability to pass on or offset losses and liquidity of buying into and out of an aquaculture business are issues preventing investment in the industry.

Apart from the normal risks faced by any production business, the aquaculture industry has an extra dimension of uncertainty associated with climatic and other environmental conditions. Droughts, floods, water temperature, water quality and disease all represent factors that are largely beyond the control of individual farmers. The only option for farmers is to anticipate and, where possible, put in place economic and production risk-management procedures. The NADC suggests this is an area not well understood in the aquaculture industry and for which a considerable lack of data exists.

Where aquaculture depends on access to public resources, some degree of security of tenure or access is required to underpin an investment by the farmer or additional investors.

The aquaculture industry is highly sensitive to general economic conditions. New investment and sales are subject to financial factors, such as the prevailing interest rates and the taxation arrangements that apply to primary industries. The NADC believes the Commonwealth Government should carefully consider the impact of future reforms to Australia's taxation system on the aquaculture industry before taking any decisions. An investment strategy is needed to identify how industry and government can address the above issues.

7.5 Promoting aquaculture products in Australia and globally

Proposed Initiative 5

Promoting aquaculture products in Australia and globally

Opportunity
Australian aquaculture producers have a domestic and international reputation as suppliers of high-quality aquaculture products, and are close to Asia, which is responsible for about two-thirds of global fisheries consumption. Australian producers have a substantial opportunity to build on their existing image to increase sales domestically and overseas.

Objective
To promote aquaculture products in Australia and globally.

Recommended actions
That government and industry investigate the feasibility of developing, funding and implementing a strategy to generically promote and brand Australian aquaculture products internationally as high-quality, environmentally clean products.
Specifically:

- Undertake market research to determine the most appropriate and effective branding and promotional program;
- use branding to establish the value of Australian products in the mind of consumers in major markets, creating a framework to enable individual product and specific brands to be marketed to achieve growing volume and higher returns; and
- establish a specialist seafood industry group within the Department of Foreign Affairs and Trade.

Responsibility for implementation
Aquaculture peak industry body and Commonwealth, State and Territory governments.

Resources required
Development of the strategy will require some resourcing from industry and government.

Implementation timeframe
Feasibility study completed within one year of commitment to this initiative.

7.5.1 A supplier of high quality aquaculture products

Australia has an international and domestic reputation as a supplier of high quality aquaculture products. Its products are farmed in some of the cleanest waters in the world using innovative ecologically sustainable production and management technologies. Australia is also seen as a country that delivers the goods, an important element given the need to supply quality, fresh product (Australian Business Ltd 2001). These reputations are hard won and easily lost.

Australia aquaculture products typically occupy niche, often high-value, markets. These markets are established through persistence in developing quality, cost-competitive products targeted on a specific consumer need.

Australia's reputation as a supplier of high-quality aquaculture products benefits all sectors of the industry. The NADC suggests that the aquaculture industry needs to adopt the same style of generic marketing that has led Australian wine's success in the United Kingdom during the past 10 years.

Generic promotion to build on this reputation represents the most efficient and cost-effective mechanism for increasing sales across all aquaculture sectors. A generic promotion based on high-quality aquaculture products provides the framework for individual industry sectors, as well as individual farmers, to develop and market their individual brands and values.

For example, Australian pearl production accounts for a small percentage of the huge international jewellery market. North America buys just over half the world's jewellery and its consumption is increasing. Professional international branding for Australian pearls and, perhaps, other aquaculture products in North America could deliver a huge dividend for Australia.

It is critical that the appropriate logistics capability exists to sustain the deliver of quality product to new and existing markets. The Australian aquaculture industry should build on its strengths in logistics to improve its reputation as a supplier of high-quality products.

A 1999 study of the retail seafood industry in Sydney found that three quarters of consumers were not concerned whether the seafood they bought was farmed or wild-caught (Ruello 1999). As co-producers, aquaculture and wild-capture fisheries industries will have to consult each other closely on any generic marketing of fisheries and aquaculture products.

The NADC notes the considerable, useful assistance the Commonwealth Government gives aquaculture exporters through its market identification, logistics, market access and export facilitation agencies and programs, especially AusTRADE. It suggests the combined assistance of these agencies could support development of a generic product development and marketing strategy.

7.5.2 Market access

Despite steady reductions in tariffs on fish and aquaculture products in recent years, tariffs and non-tariff measures continue to have an adverse impact on Australian exporters. Reduction of trade barriers would increase the volume of world seafood trade, which would benefit Australian producers. Consistent with this, the NADC supports the Australian Seafood Industry Council in seeking the establishment of a specialist seafood industry unit within the Department of Foreign Affairs and Trade to assist the aquaculture and seafood industries to negotiate country access where industry identifies a strategic export benefit.

7.6 Tackling the research and innovation challenges

Proposed Initiative 6

Tackling the research and innovation challenges

Opportunity
Australian aquaculture mainly consists of the production of high-value species that require advanced aquaculture technologies, and research and innovation to drive their development and improve competitiveness. There is considerable opportunity to maximise the benefits of research and innovation in Australia by improving funding arrangements, strategically focusing the research effort and improving the extension of research outcomes to industry.

Objective
To maximise the benefits of research and innovation, and sharing best practices.

Recommended actions
That the Commonwealth Government and the peak industry body work together to assist industry and governments to regularly identify and review their research and innovation priorities at state, territory and national levels.

That all parties ensure that research and innovation is commercially driven.

That all parties adopt formal agreement mechanisms (e.g. memorandums of understanding) to clearly define research and innovation needs and funding for projects.

That the aquaculture industry be given the opportunity to participate fully in setting priorities for aquaculture research and development.

That government and industry provide incentives and encourage all sectors of the aquaculture industry to commit to investing at least 0.25 per cent of the three-year average gross value of product to support research and innovation.

That government and industry appraise Commonwealth research and innovation taxation incentives for the aquaculture industry.

That all aquaculture researchers, research funding providers and extensions officers promote research outcomes at regional and national aquaculture conferences, on the proposed aquaculture information portal and by contributing to the Australian rural research in progress (ARRIP) database maintained by the Commonwealth, State and Territory government-funded "Australian agriculture and natural resources online" initiative (http://www.infoscan.com.au/contents/index.html).

That the aquaculture peak industry body and Commonwealth Government take a lead role in fostering international technology alliances between aquaculture farmers and scientists through organisations such as the Network of Aquaculture Centres in the Asia-Pacific (NACA), Aquatic Animal Health Research Institute (AAHRI), Asia-Pacific Economic Cooperation Forum (APEC), Food and Agriculture Organisation of the United Nations (FAO) and the Southeast Asian Fisheries Development Centre (SEAFDEC).

Responsibility for implementation
Aquaculture peak industry body and Commonwealth, State and Territory Governments.

Resources required
Government and industry assistance will be required to improve industry and researcher linkages, appraise Commonwealth research and innovation taxation incentives, and encourage all sectors of the industry to commit to investing at least 0.25 per cent of the three-year average gross value of product to research and innovation.

Implementation timeframe
All sectors of the aquaculture industry committed to investing at least 0.25 per cent of the three-year average gross value of product to research and innovation within three years of commitment to this initiative.
An appraisal of Commonwealth Government research and innovation taxation incentives completed within one year of commitment to this initiative.
Other recommended actions ongoing.

7.6.1 Strategic focus to investment in research and innovation

At the national aquaculture workshop in 1999, aquaculture industry representatives agreed Australia's aquaculture research and innovation effort lacked strategic focus. There seemed to be a tendency to spread limited research funds over a large number of species (~70), some of which appear to have relatively little to contribute to potential industry development and profitability.

There is a need to focus Australia's aquaculture research efforts nationally and improve the coordination of the multitude of funding providers to ensure investment concentrates on commercially established species, and on identifying and encouraging the development of prospective species and technologies with a high commercial potential.

7.6.2 Return on research investment

Return on previous research and innovation investment in the aquaculture industry has been significant. For example, a 1995 evaluation by ABARE of a research project on improved transport and storage of live farmed kuruma prawns estimated a benefit-cost ratio of 25:1 (Stephens et al 1995).

One of the most successful innovations in the aquaculture industry has been the fattening of wild-caught southern bluefin tuna near Port Lincoln, in South Australia. Australian companies have expanded globally to farm southern bluefin tuna in Europe and North America — all using Australian technology. Evaluations of Fisheries Research and Development Corporation (FRDC) expenditure on southern bluefin tuna have estimated a benefit-cost ratio of 41:1.

7.6.3 Investing in research

The competitiveness and sustainability of the developing aquaculture industry depends heavily on private and public investment in research and innovation.

The NADC has identified that, for the aquaculture industry to reach its potential, a sustained research and innovation effort defined by end-user needs and funded at a higher level must be put in place to address the major opportunities and obstacles for future sustainable growth. Main research needs include aquatic animal nutrition and health, domestication of new species and ecologically sustainable production technologies.

In 1999-2000, the total Commonwealth, State and Territory government expenditure on aquaculture research was more than $20 million, about 3 per cent of that year's gross value of production (GVP). State and Territory governments contributed almost $9 million.

Total industry funding for research is not reliably known. Activities include on-farm experimentation within companies, and contributions to, and cooperation with, public sector agencies and funding sources (Cox et al 2001). Support from the industry varies, with larger sectors like southern bluefin tuna, salmon and prawns contributing substantial cash and in-kind funding on joint projects with government. Some of the smaller sectors miss out on receiving matching funding for research and development available through a range of Commonwealth Government programs.

This situation is not satisfactory from a whole-of-industry perspective and should be addressed as a matter of high priority. An industry-wide levy is one option. It would help to clarify how government sets priorities for investment in industries that have yet to attain a critical mass and level of cohesiveness to fund their research and innovation.

To further encourage industry contributions to research and innovation, especially for smaller industry sectors, the NADC also suggests an appraisal of Commonwealth taxation incentives for the aquaculture industry to identify if there are impediments or opportunities for increasing industry and government investment in research and innovation.

7.6.4 Fostering strategic partnerships

The aquaculture industry needs the right mix of skills and knowledge to achieve its potential. Australia has a very strong aquatic science, engineering and technology base. However, much of its expertise and complementary capacity is spread across institutional boundaries, leading to duplication of effort and poor communication of outcomes at a national level. Strategic partnerships must be created, involving those in education, research, business and government. A strong and representative peak industry body is needed to work with research, education and training providers to identify potential partnerships.

Strategic partnerships between research, education and training providers, such as the CSIRO, Australian Institute of Marine Science and the Australian Research Council, would enable development of focused 'centres of excellence'. It would reduce the time lapse between new knowledge and its commercial application, and ensure graduates entering the industry were equipped with relevant knowledge of the most recent research and innovations. Increased communication and coordination between Commonwealth, State and Territory government funding programs would help ensure the research effort could be focussed on priority issues. An example is the collaborative effort on salmon and tuna research through the Sustainable Aquaculture of Finfish CRC (Aquafin CRC), which began in 2001.

7.6.5 Extension of research outcomes

More emphasis should be placed on extending research and development results and available technology, and providing practical advice for in-firm innovation.

Government has a strong role to play in aiding the linkage between researchers, graduates and industry by implementing appropriate mechanisms and incentives to build strong links between funding bodies, research providers and the aquaculture industry. Recipients of government research funding need encouragement to play a greater role in promoting research findings to the wider industry and community. A commitment like this will enable research to be used for the benefit of the whole industry.

7.6.6 Benefiting from international linkages

It has been said that Australia's international science and technology links are as valuable as international trade in relation to Australia's future competitiveness and economic growth (Batterham, 2000). For example, Australia's Atlantic salmon industry owes much of its initial success to marine finfish farming technology from Europe.

The benefits to the Australian aquaculture industry from strengthening these international alliances include:

- learning from global research, experience and expertise;
- selling and showcasing Australia's research and innovations;
- accelerating knowledge and technology transfer through increased international research and technology gathering activities; and
- making Australia a 'visible' and active participant in the global production of knowledge.

Australia has established information and trade-sharing agreements with China and Thailand. Australia is a member of the Network of Aquaculture Centres in the Asia-Pacific (NACA), Food and Agriculture Organisation (FAO) and Asia-Pacific Economic Cooperation Forum (APEC). These arrangements provide opportunities for technical exchanges with overseas researchers, but much of this opportunity is under-utilised.

7.7 Making the most of education, training and workplace opportunities

Proposed Initiative 7

Making the most of education, training and workplace opportunities

Opportunity
Australian aquaculture mainly consists of producing high-value species that require advanced aquaculture technologies, supported by a highly skilled and flexible workforce. Any actions that improve the skills base and flexibility of an aquaculture workforce and convert its intellectual capital into a highly competitive product or service will directly improve the industry's competitiveness.

Opportunities to improve education and training performance exist through:

- access to education and training resources that meet the human resource requirements of the aquaculture industry, including Indigenous peoples, at all levels;
- extension of outcomes from research;
- career paths for new and existing industry participants;
- best practices in the workplace, including workplace relations, and occupational health and safety;
- sales of education and training overseas; and
- tertiary institutions responding to industry needs.

Objective
Develop the capacity of the aquaculture industry by converting the intellectual capital of its workforce into a highly competitive product or service.

Recommended actions
That the Commonwealth Government expand funding to implement the aquaculture component of the successful Seafood Industry Training Package.

That the aquaculture peak industry body develop and implement a strategy to substantially improve links between training providers and industry, including identifying culturally appropriate education and training opportunities for Indigenous Australians.

Responsibility for implementation
Aquaculture peak industry body, Commonwealth Government, and education and training providers.

Resources required
Additional Commonwealth Government funding to implement the aquaculture component of the Seafood Industry Training Package.

Implementation timeframe
Additional funding for the aquaculture component of the successful Seafood Industry Training Package within two years of commitment to this initiative.
Development and implementation of an industry education and training strategy within three years of commitment to this initiative.

7.7.1 Resourcing training needs and opportunities

For aquaculture farmers to increase their competitiveness in domestic and global markets, they need a highly flexible workforce that can maintain high levels of competency in all areas, including ecologically sustainable production technologies; business and project management; food safety; aquatic animal health; aquatic animal welfare; and total quality management and marketing.

Australia has a number of strengths in this area on which to capitalise. Seafood Training Australia has established the Seafood Industry Training Package (SITP) competency-based training programs for the aquaculture industry. These are delivered through an extensive network of training institutions throughout much of Australia.

Australia has a number of world-class universities and qualified teachers in aquaculture in most of the capital cities and major regional centres offering a variety of undergraduate and postgraduate courses.

The SITP and the network of tertiary institutions provides the foundation for Australia to exploit and apply its own and international intellectual expertise in aquaculture. They ensure Australia maintains its base of skilled and highly qualified aquaculture researchers, as well as provide the opportunities to sell Australian education and training services overseas.

The NADC's consultations identified the following ways to improve delivery of aquaculture competency-based training through the SITP:

- flexible delivery mechanisms, including access to distance education;
- improved availability of non-accredited short-term training courses;
- meet the needs of primary producers wanting to diversify into aquaculture but not necessarily seeking a formal qualification;
- offer training modules on the aquaculture regulatory environment and business planning;
- include a representative of the university aquaculture education sector in any reference or advisory groups to the SITP;
- promote the SITP to university students as one option for increasing their skills and practical knowledge of the industry; and
- identify clear career paths for students completing Technical and Further Education (TAFE) and tertiary courses.

A recent review of the SITP by Seafood Training Australia also identified ways to improve the extension capabilities and responsiveness of the SITP to better meet the needs of the aquaculture industry, including Indigenous Australians, at all levels.

The above opportunities could be secured through additional Commonwealth Government funding for the Seafood Industry Training Package.

The NADC's consultations also identified the following training needs, applicable to competency-based and tertiary education:

- entrepreneurial/business management and marketing skills;
- fish health and diagnostic skills; and
- food safety, logistic chain capabilities and quality-assurance skills.

7.7.2 Improving linkages between training providers and industry

The NADC's consultations determined that aquaculture students who finish tertiary education are not technically equipped to enter the industry. In some cases, tertiary graduates are undertaking competency-based training after university to upgrade their hands-on skills. The aquaculture industry, SITP and tertiary institutions need to establish course reviews and networks to identify and fill in the knowledge gaps amongst graduates at university level and strengthen their hands-on skills and competency training, as part of their entry to the industry. There is the opportunity to improve graduate skills by improving communication between the aquaculture industry and tertiary institutions, and the responsiveness of tertiary institutions to industry needs.

Courses that best meet the industries needs at all levels should be identified, and access to these programs improved by using modern training, education and communication tools (i.e. Internet and distance learning), as well as training scholarships. Partnerships will need to be created, between education, research, business and government. The communications strategy proposed in the second initiative will complement TAFE and university training courses. Through the consultation strategy, there is an opportunity to improve the extension-and-development officer network to give remote areas of Australia better access to education and training.

A participatory approach to curriculum development is one option to help provide a balance of practical and theoretical training for farmers and give the industry more skilful and innovative staff. The potential for integrating competency-based training, such as the SITP, into university qualifications could be examined.

Many institutes cater for aquaculture training, but few boast adequate on-campus facilities (e.g. tanks and a demonstration hatchery set up). The industry must provide greater access to on-farm training and education, through work placements for example, to ensure graduates can experience the commercial reality of the industry, and gain the appropriate skills and knowledge.

The aquaculture industry must define and articulate its needs for educational activities and, once more, brings the focus back to the need for a unified industry approach to its further development.

7.7.3 Workplace environment

Employee occupational health and safety remains a significant issue in aquaculture. Depending on the species, some aquaculture farmers and employees may need to work in potentially dangerous situations such as diving, maintaining cages and nets, and working around large tanks and dams.

Occupational health and safety can be improved by assisting employers to identify, assess and control health and safety hazards in their workplace. A number of aquaculture industry sectors have introduced programs to help employers identify, assess and control health and safety hazards. Development of programs in other aquaculture industry sectors would help the industry to improve occupational health and safety in the workplace.

The NADC notes the Workplace Relations Ministers' Council's endorsement of a National OHS Strategy on 24 May 2002. The Strategy establishes, as a target, a reduction in workplace injury by at least 40 per cent by the end of June 2012. In the interim, it would aim for a fall of 20 per cent by the end of June 2007. It is also after a significant continual reduction in work-related fatalities. It has set its sights on a reduction of at least 20 per cent by the end of June 2012, and a drop of 10 per cent by the end of June 2007. Commonwealth, State and Territory governments will try to implement the strategy in their areas of responsibility.

7.8 Creating an industry for all Australians

Proposed Initiative 8

Creating an industry for all Australians

Opportunity
Indigenous Australians can become significant stakeholders in the aquaculture industry and contribute to the industry's growth in its early development stage.

Objective
To enhance the growth of the aquaculture industry by imp roving the opportunities for Indigenous Australians to contribute to, and participate in, its sustainable development.

Recommended actions
Implement the National Aquaculture Development Strategy for Indigenous Communities in Australia. As a first step, the strategy recommends the establishment of a small and highly focussed 'aquaculture steering committee', supported by an aquaculture unit, to advise, help develop funding applications and otherwise promote Indigenous aquaculture development.

Responsibility for implementation
Aquaculture peak industry body, ATSIC, Commonwealth, State and Territory governments.

Resources required
Establishment by the Commonwealth Government of a small Indigenous aquaculture unit.

Implementation timeframe
Establishment of the Indigenous aquaculture unit within one year of commitment to this initiative.

7.8.1 Indigenous Australians and aquaculture

Indigenous Australians must be included in the development of aquaculture and fishing policies affecting their communities. Previous failure to involve them in aquaculture and marine policy development has resulted in low levels of Indigenous participation in the industry, unsuccessful aquaculture ventures because of lack of training and education, lost joint-investment and employment opportunities, and more importantly inequitable distribution of income generated through the industry. This has limited the expansion of the industry in areas where Indigenous people have access to natural resources.

7.8.2 National Aquaculture Development Strategy for Indigenous Communities in Australia

In 1999, the Department of Agriculture, Fisheries and Forestry – Australia (AFFA) commissioned a national strategy and management framework to accelerate the involvement of Indigenous communities in aquaculture and to build up their economic independence and food-production capabilities through involvement in aquaculture. The National Aquaculture Development Strategy for Indigenous Communities in Australia was published in 2001.

The strategy identified a need for better use and targeting of existing Commonwealth Government programs to support medium-to-large scale Indigenous aquaculture activities. It recommended the establishment by the Commonwealth Government of a specialist work unit with the skills and experience to provide advice, facilitate investment and otherwise promote Indigenous aquaculture development.

8 Summary of proposed initiatives and recommended actions

Proposed initiative	Recommended action	Implementation timeframe	Responsibility
Making a National Aquaculture Policy Statement	1 That the Commonwealth, State and Territory governments make a National Aquaculture Policy Statement containing: • a statement of support for sustainable aquaculture development in Australia; • an outline of government commitments to sustainable aquaculture development; • clarification of resource access arrangements and management of aquaculture in Commonwealth waters; • an agreement to plan for aquaculture development in advance of growth in the States and Territories.	One year	Commonwealth, State and Territory governments
Making a National Aquaculture Policy Statement	2 That Commonwealth, State and Territory governments develop and implement nationally agreed best-practice principles for the development and management of aquaculture.	Three years	Commonwealth, State and Territory governments
Implementing an industry driven action agenda	3 That the Commonwealth Government and aquaculture industry negotiate a joint funding package to establish a peak industry body to implement and review actions arising from the Aquaculture Industry Action Agenda on behalf of industry and government.	One year	Aquaculture industry and Commonwealth Government
Implementing an industry driven action agenda	4 That industry and government develop and implement an aquaculture communications and promotion strategy, including funding, for the peak industry body to: • establish and maintain an aquaculture information portal, comprising a national aquaculture internet website and a full-time communications officer; and • promote the aquaculture industry and facilitate international and domestic technology transfer.	Three years	Aquaculture peak industry body and Commonwealth Government
Growing the industry within an ecologically sustainable framework	5 That industry and government encourage ecologically sustainable development and planning of aquaculture by identifying resource availability and suitability for aquaculture in: • coastal areas; • off-shore deep water marine; • inland fresh and saline waters; • integration with agriculture; and • Indigenous and Commonwealth owned waters.	Three years	Aquaculture industry and Commonwealth, State and Territory governments
Growing the industry within an ecologically sustainable framework	6 That industry and government work together to implement, document and promote the benefits of ecologically sustainable aquaculture development through codes of practice and environmental management systems. Where possible, these practices and systems should be strengthened by independent third-party auditing.	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments

Proposed initiative	Recommended action		Implementation timeframe	Responsibility
Growing the industry within an ecologically sustainable framework	7	To ensure timely approval of aquaculture proposals, the Commonwealth, State and Territory Governments, as a matter of priority, should negotiate agreements accrediting State and Territory government processes in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).	Two years	Commonwealth, State and Territory governments
Growing the industry within an ecologically sustainable framework	8	That government and industry respond to the recommendations of the Fisheries Research and Development Corporation project "National Chemical Registration Framework for the Aquaculture Industry" which aims to identify a more efficient and cost-effective mechanism for approving chemical use in the aquaculture industry and to raise awareness of responsible chemical use in the industry. The aquaculture industry peak body should maintain a list of those chemicals approved for use in aquaculture on a national aquaculture information portal.	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments
Growing the industry within an ecologically sustainable framework	9	That government and industry continue implementing Australia's national strategic plan for aquatic animal health (AQUAPLAN) beyond 2003, especially by: • providing more information, education and training to farmers and Indigenous Australians on preventing and managing disease occurrences; • improving Australia's health diagnostic capabilities; • investigating options for long-term industry and government funding for aquatic animal health; and • supporting aquatic animal health surveillance and monitoring, including data collection and holding.	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments
Growing the industry within an ecologically sustainable framework	10	That the Commonwealth Government substantially upgrade compliance arrangements for ballast water discharge and hull fouling for ships operating in Australian waters, including consideration of the positive role that industry could play in reporting ships that are illegally dumping ballast water.	Two years	Aquaculture industry and Commonwealth, State and Territory governments
Growing the industry within an ecologically sustainable framework	11	That, as part of a transparent decision-making system, the Commonwealth Government liaise closely with members of the aquaculture industry and State and Territory governments on import risk assessments and other quarantine-related processes. This includes engaging with other countries through organisations such as the Asia-Pacific Economic Cooperation Forum (APEC), Food and Agriculture Organisation of the United Nations (FAO), World Trade Organisation (WTO) and the Network of Aquaculture Centres in the Asia-Pacific (NACA) to develop quarantine and aquatic animal health standards to reduce the spread of disease through trade in aquatic animals and products.	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments

Proposed initiative	Recommended action	Implementation timeframe	Responsibility
Growing the industry within an ecologically sustainable framework	12 That governments continues to improve management of translocation of aquatic organisms in line with the principles set out in the 1999 National Policy for the Translocation of Live Aquatic Organisms.	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments
Investing for growth	13 That government and industry develop and implement an investment strategy that will attract development capital to the aquaculture industry. The strategy should include: • an appraisal of the current taxation, excise and duties to determine if they constitute impediments or if there are opportunities for facilitating investment in the industry; and • an assessment of government investment incentive schemes in Australia and overseas.	Three years	Aquaculture peak industry body and Commonwealth Government
Promoting aquaculture products in Australia and globally	14 That the Commonwealth Government and industry investigate the feasibility of developing, funding and implementing a strategy to generically promote and brand Australian aquaculture products internationally as high-quality, environmentally clean products. Specifically: • undertaking market research to determine the most appropriate and effective branding and promotional program; • use branding to establish the value of Australian products in the mind of consumers in major markets, creating a framework to enable individual product and specific brands to be marketed to achieve growing volume and higher returns; and • establish a specialist seafood industry unit within the Department of Foreign Affairs and Trade.	One year	Aquaculture peak industry body and Commonwealth Government
Tackling the research and innovation challenges	15 That the Commonwealth Government and peak industry body work together to assist industry and governments to regularly identify and review their research and development priorities at state, territory and national levels.	Ongoing	Aquaculture industry and Commonwealth, State and Territory Governments
Tackling the research and innovation challenges	16 That all parties ensure that research and innovation is commercially driven.	Ongoing	Aquaculture industry and Commonwealth, State and Territory Governments
Tackling the research and innovation challenges	17 That all parties adopt formal agreement mechanisms (e.g. Memorandums of Understanding) to clearly define research and innovation needs and funding for projects.	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments

Proposed initiative	Recommended action		Implementation timeframe	Responsibility
Tackling the research and innovation challenges	18	That all parties should ensure that the aquaculture industry has the opportunity to participate fully in setting priorities for aquaculture research and development.	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments
Tackling the research and innovation challenges	19	That government and industry provide incentives and encourage all sectors of the aquaculture industry to commit to investing at least 0.25 per cent of the three-year average gross value of product to support research and innovation.	Three years	Aquaculture industry and Commonwealth, State and Territory governments
Tackling the research and innovation challenges	20	That government and industry appraise research and innovation taxation incentives for the aquaculture industry.	One year	Aquaculture industry and Commonwealth Government
Tackling the research and innovation challenges	21	That all aquaculture researchers, research funding providers and extensions officers promote research outcomes at regional and national aquaculture conferences, on the proposed aquaculture information portal and by contributing to the Australian rural research in progress (ARRIP) database maintained by the Commonwealth and State/Territory government-funded "Australian agriculture and natural resources online" initiative (http://www.infoscan.com.au/contents/index.html).	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments
Tackling the research and innovation challenges	22	That the aquaculture industry peak body and Commonwealth Government take a lead role in fostering international technology alliances between aquaculture farmers and scientists through organisations such as the Network of Aquaculture Centres in the Asia-Pacific (NACA), Aquatic Animal Health Research Institute (AAHRI), Asia-Pacific Economic Cooperation Forum (APEC), Food and Agriculture Organisation of the United Nations (FAO) and the Southeast Asian Fisheries Development Centre (SEAFDEC).	Ongoing	Aquaculture industry and Commonwealth, State and Territory governments
Making the most of education, training and workplace opportunities	23	That the Commonwealth Government expand funding for implementation of the successful Seafood Industry Training Package.	Two years	Commonwealth Government
Making the most of education, training and workplace opportunities	24	That industry develop and implement a strategy to substantially improve links between training providers and industry, including identifying culturally appropriate education and training opportunities for Indigenous Australians.	Three years	Aquaculture peak industry body
Creating an industry for all Australians	25	Implement the National Aquaculture Development Strategy for Indigenous Communities in Australia. As a first step, the strategy recommends the establishment of a small and highly focused 'aquaculture steering committee', supported by an aquaculture unit, to provide advice, help develop funding applications and otherwise promote Indigenous aquaculture development.	One year	Aquaculture peak industry body, ATSIC, Commonwealth, State and Territory governments.

9 References

ABARE (Australian Bureau of Agricultural and Resource Economics) 2002, *Australian Fisheries Statistics 2001*, Canberra.

ABS (Australian Bureau of Statistics) 2000, *Apparent Consumption of Foodstuffs, 1997-98 and 1998-99*, cat. no. 4306.0, Canberra.

ACIL 1999, *Aquaculture Beyond 2000 Workshop: Facilitator's Report*, Report prepared for Fisheries and Aquaculture Branch, Agriculture, Fisheries and Forestry – Australia, Canberra.

AFFA (Agriculture, Fisheries and Forestry – Australia) 1999, *AQUAPLAN: Australia's National Strategic Plan for Aquatic Animal Health 1998 – 2003*, Commonwealth of Australia, Canberra.

Australian Business Ltd 2001, *Asian Foodbuyers' Survey*, Agri Chain Solutions Ltd. Canberra.

Bagnall, D 2001, *Jobs of the future - New Work Order, The Bulletin*, October 23, 2001.

Batterham, R. 2000, *The Chance to Change*, Final Report of the Australian Science Capability Review, Canberra.

Brown, D. and Connell, P. 2001, *Market Demand for Australian Aquaculture Products*, Report prepared for the Fisheries Resources Research Fund, Canberra, January.

Cox, A., Davies, L., Hardcastle, S. and Stubbs, M. 2001, Aquaculture Development in Australia: A Review of Key Economic Issues, Report prepared for the Fisheries Resources Research Fund, Canberra, May.

CRC (Cooperative Research Centre) for Aquaculture 1999, *Fish Bites*, Newsletter of the CRC for Aquaculture, Issue No 19, autumn 1999.

Drucker, P. 1999, *Beyond the information revolution*. *The Atlantic Monthly*, Digital Ed. October 1999, http://www.theatlantic.com/issues/99oct/9910drucker.htm . Accessed on 19 February 2002.

EconSearch Pty Ltd 1998, *The Economic Impact of Aquaculture in the Eyre Peninsula Region and South Australia 1998/99*. Report prepared for Aquaculture Group, Primary Industries and Resources, South Australia.

FAO (Food and Agriculture Organisation of the United Nations) 1989, *Aquaculture production (1984-1986)*. FAO Fisheries Circular, 815, Rome.

FAO 2000, *State of World Fisheries and Aquaculture 2000*, FAO Fisheries Department, Rome (and previous issues).

FRDC (Fisheries Research and Development Corporation), 2000, *Investing for tomorrow's fish: the FRDC's research and development plan, 2000 to 2005*. Canberra.

Ruello & Associates 1999, *A study of the retail sale and consumption of seafood in Sydney*. Fisheries Research and Development Corporation Project 1998/345, Canberra.

Stephens, M., Tran, Q.T., Battaglene, T., Curtotti, R and Bull, T. 1995, *Fisheries Research – An evaluation of the costs and benefits of selected projects.* ABARE, Canberra.

Stutterd, E, 2001 (unpublished) *Indigenous involvement in the Australian aquaculture industry, post, present and future.* Bureau of Rural Sciences, Canberra.

World Futurist Society, 2001, *Top 10 Forecasts from Outlook 2002,* Outlook 2002, originally published in the November-December 2001 issue of *The Futurist*. http://www.wfs.org/forecasts.htm. Accessed 19 February 2002.

Appendix 1: National Aquaculture Development Committee

CHAIR
MR BRIAN JEFFRIESS
PO Box 416
Fullerton SA 5577
Phone: 08 8373 2507
Mobile: 0419 840 299
Fax: 08 8373 2508
Email: austuna@bigpond.com

MR SIMON BENNISON
PO Box 55
Mount Hawthorn WA 6016
Phone: 08 9244 2933
Mobile: 0407 776 439
Fax: 08 9244 2934
E-mail: acwa@wafic.org.au

MR MARTIN BREEN
PO Box 3128
South Brisbane QLD 4101
Phone: 07 3255 1070
Mobile: 0417 006 639
Fax: 07 3844 7307
E-mail: apfa@qff.org.au

MR CRAIG FOSTER
PO Box 117
Rosny Park Tasmania 7018
Phone: 03 6216 1209
Mobile: 0419 322 584
Fax: 03 6216 1233
E-mail: craig.foster@nutreco.com

MR GLENN HURRY
GPO Box 858
Canberra ACT 2601
Phone: 02 6272 5777
Mobile: 0409 224 892
Fax: 02 6272 4875
E-mail: glenn.hurry@affa.gov.au

MR JOHN JENKIN
Level 1
14 Phillimore Street
Fremantle WA 6160
Phone: 08 9335 2092
Fax: 08 8336 3359
E-mail: antiproj@iinet.net.au

MR RUSS NEAL
PO Box 533
Curtin ACT 2605
Phone: 02 6281 0383
Fax: 02 6281 0438
E-mail: rneal@asic.org.au

MR PETER SHELLEY
GPO Box 293
Hobart Tasmania 7001
Phone: 03 6211 6662
Mobile: 0418 120 772
Fax: 03 6211 6668
E-mail: pshelley@appanel.com.au

MRS SALLY TONKIN
13 Knott Street
Port Lincoln SA 5606
Phone: 08 8682 4228
Fax: 08 8682 5993
E-mail: tonkin@centralonline.com.au

MR PAUL TREVETHAN
Dunoon
RMB 4030
Howlong NSW 2643
Phone: 02 6026 5276
Mobile: 0429 007 197
Fax: 02 6026 5177
E-mail: paultrevethan@bigpond.com

MR BRUCE ZIPPEL
1 Decres Bay Road
Ceduna SA 5690
Phone: 08 8625 7022
Mobile: 0428 476 245
Fax: 08 8625 3779
E-mail: bruce.zippel@bigpond.com.au

MR DILLON SOTHINATHAN - OBSERVER
Aboriginal and Torres Strait Islander Commission.
PO Box 17
Woden ACT 2606
Phone: (02) 6121-4366
Fax: 02 6285 4030
E-mail: Dillon.Sothinathan@atsic.gov.au

MR GREG PAUST - OBSERVER
Fisheries WA
168-170 St Georges Terrace
PERTH WA 6000
Phone: 08 9482 7319
Fax: 08 9482 7363
E-mail: gpaust@fish.wa.gov.au

NATIONAL AQUACULTURE DEVELOPMENT COMMITTEE
TERMS OF REFERENCE

The National Aquaculture Development Committee will:

1) Advance the development of a sustainable, internationally competitive and export oriented aquaculture industry capable of achieving $2.5 billion in annual sales by 2010.

2) Develop and implement the Aquaculture Action Agenda including:

   a) develop a communication strategy;

   b) identify impediments to development of the industry and suggest solutions;

   c) identify and prioritise outcomes necessary to enhance growth;

   d) identify and prioritise actions required to achieve outcomes;

   e) develop a timetable for undertaking priority actions and achieving outcomes;

   f) allocate responsibility amongst stakeholders for each action; and

   g) regularly review and report on progress of the action agenda.

3) Gain industry and community support for continued aquaculture development.

4) Encourage economic, social and environmental sustainable aquaculture development.

5) Encourage mutual trust and cooperation between government and the aquaculture industry.

6) Disseminate information to industry and governments regarding the Committee's business

Appendix 2: Consultation process

The NADC and the Commonwealth Government published a discussion paper in June 2001 to highlight potential impediments and opportunities to aquaculture growth. During a six-week consultation period from 11 June to 20 July 2001, the NADC and Commonwealth Government invited public submissions and held focus-group meetings to identify impediments and opportunities for aquaculture growth, and seek ideas to address them.

The NADC received 49 detailed and constructive submissions on its discussion paper. Twelve focus-group meetings were held. Representatives from the NADC, aquaculture industry and government took part in each meeting.

Summaries of the submissions and focus-group meeting outcomes are available on request from the Aquaculture Action Agenda Taskforce, phone 02 6272 5918 or email: fisheries@affa.gov.au.