

AQUACULTURE DEVELOPMENT COUNCIL

**WESTERN AUSTRALIAN AQUACULTURE
INDUSTRY DEVELOPMENT STRATEGY 2009**



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Executive Summary

Aquaculture has emerged as a viable alternative to wild stock as a source of fish. The fastest growing food production sector globally, aquaculture is now set to overtake capture fisheries as a source of seafood, having provided 50% of global supply in 2009. To meet the projected seafood demand in 2030, annual aquaculture production must increase by 28.5 million tonnes.

The importance of aquaculture is increasing, in Australia and globally. Generally, fish stocks are in decline, even in Australia, which by world standards has well managed fisheries. In 2007-08, the total volume of Australian fisheries production fell by 3% to 236,000 tonnes and the value by 1% to \$2.19 billion. These values include the wild catch sector and aquaculture. The gross value of production for the wild catch sector fell by 6% (\$82.6 million) while the value of aquaculture production increased by \$62.7 million to \$868 million, accounting for 40% of the gross value of Australian fisheries production (Source: ABARE Fisheries Statistics 2009).

Historically, Australia has been a net importer of fisheries products in volume terms, but a net exporter in value terms. This is because fisheries exports are dominated by high value species, while imports largely consist of lower value products. In recent years, the gap between imports and exports has closed: in 2007-08 for the first time Australia became a net importer of fisheries products in value terms. As a result of the decline in wild capture production, Australia is now a net importer in terms of both volume and value. Aquaculture offers an opportunity to reverse this trend.

Notwithstanding the strong and increasing demand for seafood, by national and global standards aquaculture industry growth in Western Australia has been modest. There are numerous reasons for this poor growth, but they principally include a non-competitive regulatory regime and a lack of large areas of available sheltered water, which is the basic natural resource needed to support an offshore production sector growing marine finfish.

The regulatory impediments to aquaculture industry development are being addressed. Current initiatives include general legislative reform to streamline and provide more certainty in the licensing processes, the establishment of memoranda of understanding with environmental agencies, undertaking environmental carrying capacity studies to facilitate future large-scale development and establishing a process to enable aquaculture in Commonwealth waters. A State Policy Statement is also being written to demonstrate recognition of the industry and its development by the Government as strategically important to the State. The importance of regulatory reform for aquaculture cannot be understated and should be the Government's aquaculture policy priority.

Marine finfish production is the significant growth sector of the global aquaculture industry. Countries such as Norway, which have large areas of sheltered water, have led the development of this sector. In Australia, the leading states are Tasmania and South Australia: these too have developed marine finfish aquaculture in relatively sheltered areas. Western Australia lacks this basic resource but has considerable potential to host a significant offshore finfish aquaculture industry in more exposed waters.

The global demand for seafood is increasing rapidly, but the available sheltered sites are already fully utilised. The need for production growth, which can now only take place in exposed open ocean waters, has necessitated the development of

innovative cage farming technology, which is starting to be deployed globally. The development of open ocean aquaculture has undergone, and continues to experience, rapid development. Western Australia, with its high quality oceanic environment, extensive coastline and wide ranging climatic conditions is now well positioned to take advantage of these technological advances and has the potential to develop a globally competitive, world-class marine finfish aquaculture industry.

The Aquaculture Development Council (“ADC”) has identified marine finfish aquaculture as the industry sector most likely to establish a large-scale, globally competitive industry in WA. It formed that view following a series of independent studies and verification by international authorities. An independent comprehensive economic assessment, which consolidates and assesses the information developed by previous studies, is nearing completion.

Among other conclusions, the final draft of the economic study determined WA is well positioned and has the potential to develop a globally competitive, world-class marine finfish aquaculture industry. Its view that “the marine finfish aquaculture industry sector has growth potential in WA” is consistent with that of the ADC.

The offshore or open ocean aquaculture sector may represent the best remaining opportunity for WA to develop a world-class aquaculture industry. The economic study presents a compelling case for government intervention to achieve this objective. It argues there is a role for Government, under an aquaculture industry development strategy, to prove the production technology under open ocean conditions off the WA coast and that a positive outcome will set the foundations for a significant Western Australian aquaculture industry. Future growth is expected to come from new investment and entrants to the industry and by enabling existing operations to expand.

It is common for Government to be involved in experimental or proof of concept farms: the first experimental farm for the southern bluefin tuna industry in South Australia was established at Port Lincoln in 1991 with South Australian Government support. There are additional examples that demonstrate industry development being made possible because of the significant past and current investment by governments to prove technology and the capacity to grow out fish.

Over the past 10 years, a minimum of \$15 million of public funding has underpinned industry growth in Tasmania. Government spending on aquaculture in South Australia over the past five years has been approximately \$20-25 million (excluding aquaculture-related education). Queensland aquaculture production is growing steadily, due to the provision by the Queensland Government of special initiative funding in the order of several millions of dollars per year over the past few years and, in addition, ongoing aquaculture development funding of approximately \$4.4 million per year.

To realise the potential for establishment of a marine finfish aquaculture industry in WA, an additional Government investment of approximately \$8.5 million over four years will be required (see Table 1).

Key elements of this proposal for which new aquaculture development funding is sought include:

- operational funds for salaries and consultancies to support all development initiatives;
- funding for the establishment and operation of an open ocean “proof-of-concept” pilot farm;

- identification and reservation of aquaculture zones in Commonwealth and State waters off WA, including preliminary assessment to facilitate licensing and leasing processes.

Item	Financial Year Expenditure (\$'000)			
	2010/11	2011/12	2012/13	2013/14
Operating	500	500	500	500
OOA Proof of Concept Farm	500	1,500	1,700	1,700
Marine Sites Identification and Zoning	200	200	200	-
Stock Enhancement	10	-	-	-
Mill Diversification Incentives	100	100	100	200
Total	1,310	2,300	2,500	2,400

Table 1: Proposed aquaculture development funding to 2014

Key initiatives that do not require additional funding include ongoing Departmental responsibilities such as continuing the legislative reform process, establishment of a process to enable aquaculture in Commonwealth waters, completing the Environmental Carrying Capacity project and finalising the State Aquaculture Policy Statement for aquaculture.

The funding proposal does not seek an open-ended funding commitment from Government. It encompasses specific defined objectives over a finite period and the amount sought is capped: in the event that the project is unsuccessful, no additional funding will be sought for aquaculture development.

The economic study suggests, the “product” ensuing from a successful project outcome will be marketable and attractive for investment funding. Western Australia would be in a position where it can market its aquaculture potential to the private sector with the clear expectation that it would then be the role of the private sector to make the required investment in farms and bear the normal market risks.

Introduction

Aquaculture – Global and National Outlook

Aquaculture has long been the fastest growing food production sector globally and is now set to overtake capture fisheries as a source of seafood, having provided 50% of global supply in 2009.¹ By comparison, world capture fishery production has remained at approximately 90 million tonnes per annum since the mid 1990s. According to the Food and Agriculture Organisation of the United Nations (FAO), globally, annual per capita seafood consumption was 16.7 kg in 2006. To meet the projected seafood demand in 2030 when the global population will be an estimated 8.32 billion, aquaculture production must increase by 28.5 million tonnes, from 52 million to 80.5 million tonnes.²

Despite aquaculture being the fastest growing food production sector globally, its rate of growth has declined recently. During the decade between 1985 and 1995, global aquaculture production experienced an approximate growth rate of 12%. The growth rate slowed to 7.1% the following decade and to 6.1% for the 2004-06 period.³ The FAO considers the current growth rate too slow to meet the seafood supply shortfall caused by the combination of declining capture fisheries and increasing global population, to the extent it believes world aquaculture has reached an important crossroad. To meet the increasing future global demand for seafood, aquaculture production would need to grow at a rate equal to, or greater than, the 12% it experienced previously. New challenges need to be met for global aquaculture to live up to its potential while ensuring economic, social and environmental sustainability.

Due to increasing pressure on the world's fresh water resources, it is unlikely the industrial-scale aquaculture of fresh water species will supply a significant proportion of the projected global demand. For the marine finfish sector, one of the major factors restricting production is the limited availability of suitable sheltered sites for sea-cages, most of which are fully utilised at present. Recent advances in technology suitable for fish culture in exposed, offshore waters provide an opportunity to significantly expand marine aquaculture production areas.⁴ Further, there is little doubt that current marine finfish aquaculture activities in some countries have not been co-ordinated to the extent they cater for all elements needed for sustainable, large-scale industrialisation from the outset. Therefore, this sector has the fundamental requirements to meet a large proportion of the projected world demand and is considered to have the greatest potential for growth.

Nationally, aquaculture production now accounts for 40% of the gross value of Australian fisheries production and the proportion is growing. Significantly, marine finfish aquaculture has driven growth over the past few years. Atlantic salmon now represent a key species in Australian aquaculture production. Between 2003 and 2007, farmed salmon in Tasmania increased by over 120% in value to approximately

¹ The most recent information suggests this milestone was achieved in 2009: globally, seafood production from aquaculture has now overtaken that from the wild fishery.

² [FAO report](#) cited in *Infish International* 4/2009.

³ There are several reasons why the growth rate is slowing. These include unsustainable practices, difficulties in reaching markets, the reliance on expensive protein sources such as fishmeal and marketing factors such as the need for standardised certification of product.

⁴ In this context, the offshore (open ocean) aquaculture production of marine fish is a sector with capacity for significant growth in production, provided it is underpinned by a comprehensive, integrated process for sustainable development.

\$300 million. A report from the relevant industry organisation places the value for 2008-09 at approximately \$340 million. In South Australia, aquaculture production rose 25% from 2007 to 2008 to \$263 million, now accounting for 56% of their total State seafood production, with the majority of this coming from marine finfish production.⁵

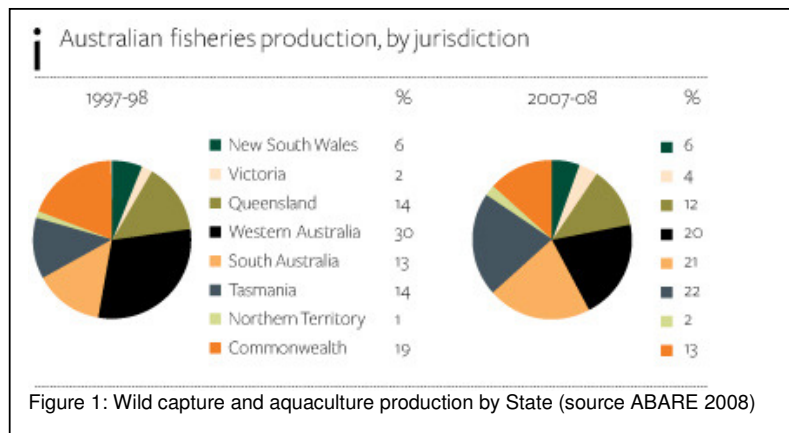
In Western Australia, aquaculture production is comparatively small but significantly, as for Tasmania and South Australia, growth is being driven by the marine finfish sector. Since 2007, the Western Australian aquaculture industry has doubled in production, predominantly due to the expansion of Marine Produce Australia Limited's (MPA) barramundi operation in Cone Bay. Aquaculture production has been steadily increasing across Australia since 2006 and globally, since 1997, signifying a shift in consumer attitudes towards consumption of farmed fish.⁶

Given Western Australia's suitable ocean resources, the availability of local infrastructure, expertise and the State's investment history (and importantly, the State Governments commitment to streamline the environmental approvals process), it is now well positioned to supply a significant proportion of the future global demand for marine finfish in particular and has the potential to build smaller but not insignificant niche industry sectors. Further detail supporting this statement and an outline of the State's important competitive advantages are elaborated in this report.

Evolution and Status of the Western Australian Aquaculture Industry

The Aquaculture Development Council (ADC) is charged with assisting the development of the Western Australian Aquaculture Industry. Currently, the majority of the sector consists of cottage industry style producers, with a small number of operators seeking to upscale to significant production levels.

During the past ten years Western Australia, once the largest combined wild catch and aquaculture fisheries production State by a significant margin (Figure 1), has been displaced by South Australia and Tasmania. Both States suffered declines in their wild catch during 2007/08, but growth in production value of their aquaculture sectors of 26% and 4% respectively



(driven by Government assisted development of large-scale finfish aquaculture) enabled them to surpass Western Australia's total fisheries production value. This is despite the value of Western Australia's aquaculture production (excluding pearls) increasing by 41% in the same period.

⁵ The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2007/08

⁶ Source: Australian Fisheries Statistics 2008, Australian Bureau of Agricultural and Resource Economics (ABARE) and FAO Yearbook Fishery and Aquaculture Statistics 2006

Aquaculture has occurred in Western Australia since the 1970s with the cultivation of trout. Western Australia's first significant development focus on aquaculture, however, did not occur until 1994 (see Figure 2) with the implementation of a major State Government development strategy committing an initial \$4.5 million over three years, which was extended in 1996 with \$8 million for a further four years. Additional funding inputs through to 2007 are illustrated in Figure 2.

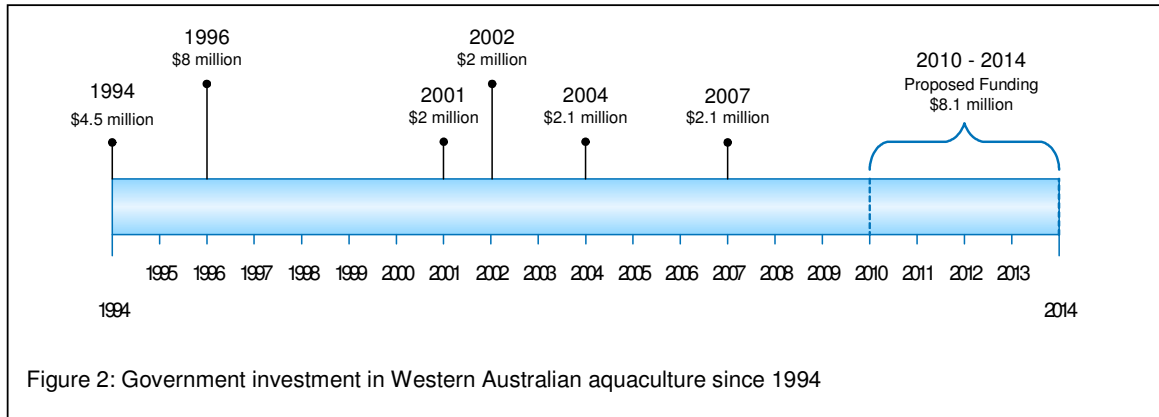


Figure 2: Government investment in Western Australian aquaculture since 1994

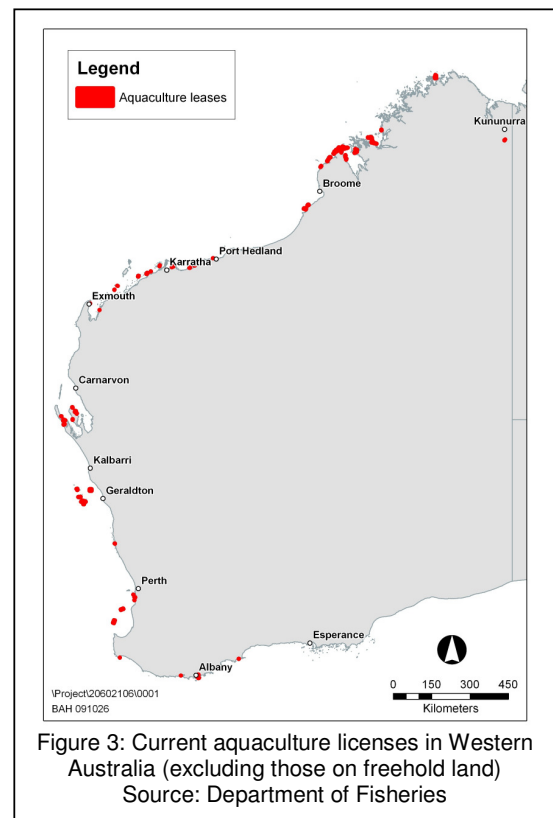
Broadly applied to State aquaculture development across all sectors, the initial aquaculture development funding packages in 1994 and 1996 were allocated, but not limited to, the following:

- Administration and salaries (Regional Aquaculture Development Officers);
- Industry projects (Aquaculture Development Fund) and industry development initiatives;
- Establishment of two regional aquaculture parks (Albany and Broome); and
- Support for a freshwater aquaculture research facility (Pemberton).

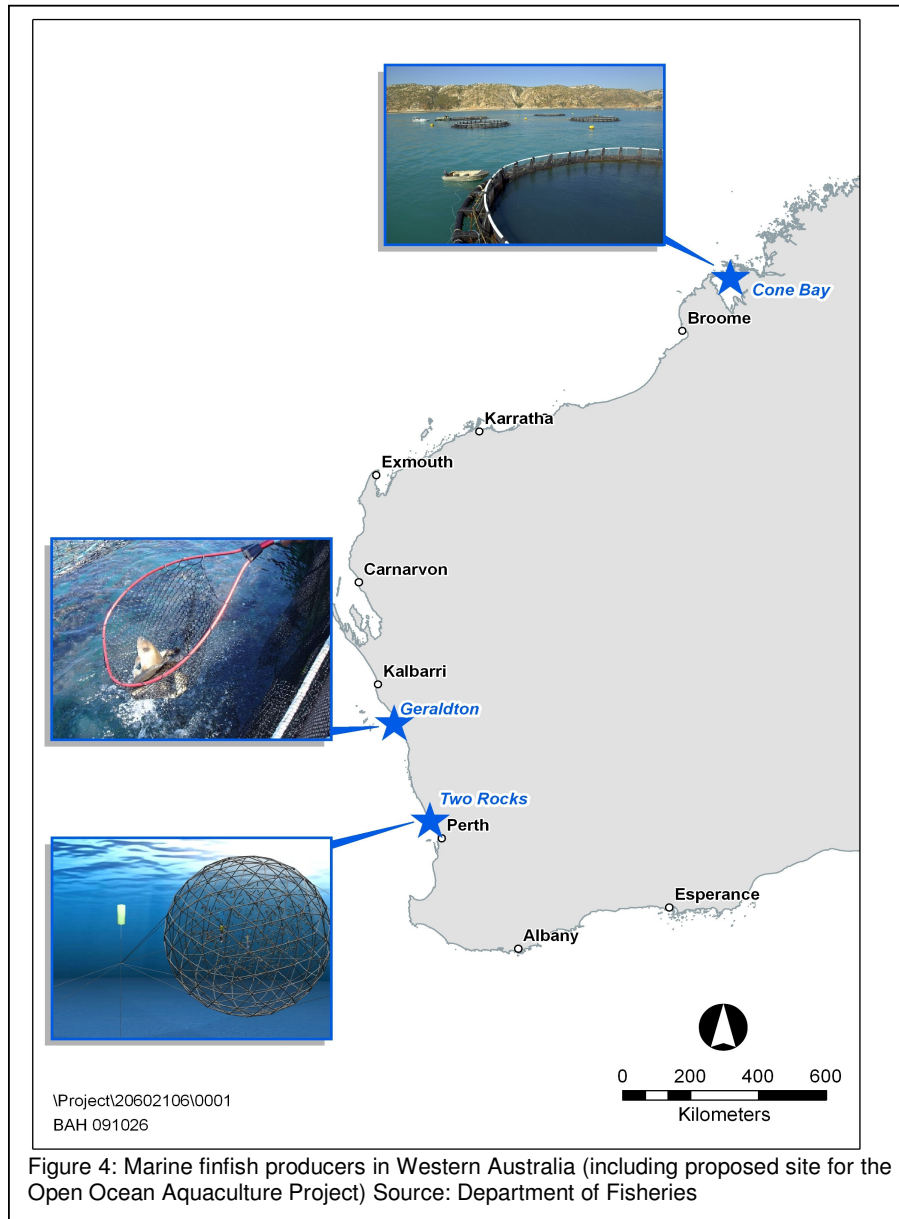
Over the past ten years, the State's aquaculture development priorities have shifted across a variety of different sectors. There are currently 453 aquaculture licenses in Western Australia (Figure 3). An overview of aquaculture development phases is provided below:

- Freshwater crayfish, specifically marron and yabbies, was the first sector provided with development assistance. Despite substantial expenditure on this sector, it became clear the majority of the industry comprised "hobbyist" and "life style" operators. Whilst providing an important diversification option for more traditional agriculturists at the time, it has since become evident freshwater crayfish are unlikely to represent a significant Western Australian industry.
- Focus then shifted to inland aquaculture prospects, initially production of barramundi at Lake Argyle in the Kimberley. Although significant resources were provided for the project, major disadvantages were unable to be overcome. These included challenges associated with the remoteness of the location and the need to purge the fish produced in saltwater due to the unpleasant flavour of freshwater barramundi.

- Continuing the inland focus, the production of both freshwater and inland saline water species in the southern area of the State was considered. A small freshwater aquaculture industry has developed, but is not feasible on a large-scale due to remoteness and the cost structures involved.
- An important mussel and, to a lesser extent, oyster industry has developed on the Southern Flats in Cockburn Sound and at sites in Albany. Scope for growth in these sectors is limited due to low productivity in the nutrient poor coastal waters off Western Australia.
- Other sectors that have some promise include: pearl oysters (black pearls) in the Aboholhos, abalone off the south coast, including a 60 tonne abalone grow-out farm at Bremer Bay and most recently octopus production (currently in an early developmental stage). Whilst important, it is unlikely these sectors will become major industrial scale industries.
- Sectors that were explored, but for various reasons never eventuated, include prawns, clams and scallops.
- The history of aquaculture development initiatives has led to the current focus on marine finfish aquaculture. Currently there is a small marine finfish producer operating out of Geraldton, with Western Australia's largest marine finfish producer located in Cone Bay (Figure 4) and accounting for 40% of the entire state aquaculture industry production.



- The recent growth of Western Australia's aquaculture industry is due exclusively to this single company producing marine finfish in offshore waters. The company has identified offshore aquaculture as crucial for its future development prospects.



After taking the history of aquaculture development in Western Australia into account and commissioning several feasibility and investigative studies, in 2006, the ADC identified offshore marine finfish aquaculture as the only viable opportunity for Western Australia to develop a significant, world-class aquaculture Industry. For the reasons provided in this report, the development of the industry and the realisation of the opportunity requires the provision of additional Government funding. Following the complete implementation of the strategy outlined in this document in 2014, the Government's funding commitment to aquaculture development would be concluded.

When considering seafood aquaculture production nationally, it is clear the scale of Western Australia's aquaculture industry is insignificant, particularly when compared

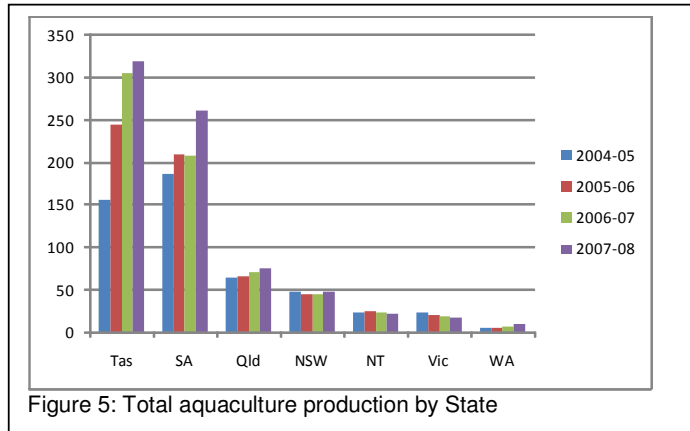


Figure 5: Total aquaculture production by State

with Tasmania and South Australia (see Figures 5 and 6). The impressive production and growth achieved by both latter States is largely based on offshore aquaculture production, which has developed in sheltered, nearshore waters using conventional technology. Large-scale development of Western Australia's marine aquaculture industry has been significantly impacted by a protracted and burdensome regulatory regime, coupled with a lack of sheltered marine areas of any size in close proximity to the requisite land-based infrastructure.

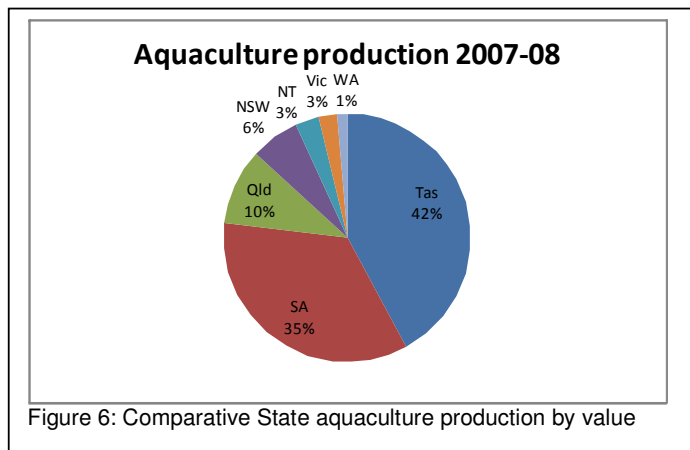


Figure 6: Comparative State aquaculture production by value

With the recent advent of technology suitable for the large-scale production of marine finfish in exposed offshore waters⁷, Western Australia has the

opportunity to develop an offshore marine aquaculture industry. Further, its growth could realistically mirror that of Tasmania and South Australia, illustrated in Figure 2, over a similar period, if the State Government remains committed to, and prioritises, streamlining the approvals processes for aquaculture licenses and environmental assessments.

Government commitment to and investment in aquaculture development is demonstrably essential for industry development and sustainability. By value of production, the aquaculture industry sectors in Tasmania, South Australia and Queensland are Australia's most successful (figures 5 and 6). The growth in aquaculture production and value in these States was initially due to and has since been underpinned by significant investment of public monies, either directly by the respective State Government or through other funding organisations and schemes, such as Co-operative Research Centres and the Fisheries Research and Development Corporation (FRDC).

⁷ It is significant that all countries with a major aquaculture industry, such as Norway and Chile, are those producing marine finfish in offshore waters. Approximately 5% of Norway's production of 800,000 tonnes per annum now takes place in exposed waters and this proportion is steadily increasing (source: Arne Fredheim, SINTEF, Norway, pers. Comm.).

Over the past 10 years, a minimum of \$15 million of public funding has underpinned industry growth in Tasmania.⁸ Government spending on aquaculture in South Australia over the past five years has been approximately \$20-25 million (excluding aquaculture-related education). Queensland aquaculture production is growing steadily, due to the provision by the Queensland Government of special initiative funding in the order of several millions of dollars per year previously and, in addition, ongoing aquaculture development funding of approximately \$4.4 million per year.⁹

Aquaculture Growth Opportunity

The importance of aquaculture is increasing, in Australia and globally. Generally, fish stocks are in decline, even in Australia, which by world standards has well managed fisheries. In 2007-08, the total volume of Australian fisheries production fell by 3% to 236,000 tonnes and the value by 1% to \$2.19 billion. These values include the wild catch sector and aquaculture. The gross value of production for the wild catch sector fell by 6% (\$82.6 million) while the value of aquaculture production increased by \$62.7 million to \$868 million, accounting for 40% of the gross value of Australian fisheries production.¹⁰

Historically, Australia has been a net importer of fisheries products in volume terms but a net exporter in value terms. This is because fisheries exports are dominated by high value species such as rock lobster, tuna and abalone, while imports largely consist of lower value products such as frozen fish fillets, canned fish and frozen prawns. In recent years, the gap between imports and exports has closed: in 2007-08 Australia became a net importer of fisheries products in value terms. As a result of the decline in wild capture production, Australia is now a net importer in terms of both volume and value. Aquaculture offers an opportunity to reverse this trend.

Competitive Advantages in Western Australia

With specific reference to offshore marine finfish aquaculture, Western Australia possesses significant competitive advantages that, subject to a successful outcome to the proof-of-concept project proposed in this report, represent a powerful attractant for investment. These competitive advantages include (but are not limited to):

- an extensive coastline from tropical to cool temperate climatic zones;
- high quality sea water with low nutrient levels, ideal for marine finfish aquaculture;
- freedom from serious diseases;
- strong scientific and technical capabilities;
- synergy with offshore engineering capabilities (with the oil and gas industry);
- modern, sophisticated infrastructure;
- geographic proximity to major regional seafood markets;
- strong entrepreneurial and business development capabilities; and
- political and economic stability.

⁸ This figure represents funding identified from two sources only; namely the final report of the Aquafin CRC Salmon Project and the TAFI Annual Report for 2006. The actual total is likely to be significantly higher.

⁹ Information on the amount of public funding provided for aquaculture development has proved difficult to compile, despite good cooperation from government agencies in other states. The figures provided in this text should therefore be considered best estimates (noting the actual spend is likely to be higher).

¹⁰ Source: ABARE Australian fisheries statistics 2009.

Disadvantages for aquaculture in WA mainly include isolation and a challenging regulatory environment, with complex approvals processes, particularly when compared to regional competitors.

Taking the respective competitive advantages of different Australian jurisdictions into account, at its March 2009 meeting, the Aquaculture Committee identified the aquaculture development targets of the States (see box below).¹¹

Collectively, these factors represent a significant opportunity for this State to develop a world-class marine finfish aquaculture industry. The market driver is the increased potential for aquaculture to supply global seafood markets in the face of declining wild-capture fisheries production, due to the ongoing exploitation of wild stocks at an unsustainable level and the collapse, or impending collapse, of several fisheries around the world.

Given the size of our State coastline; the technology advances and competitive advantages noted previously; and the outcomes of the recently completed Economic Strategy for Offshore Aquaculture (Attachment 1), a substantial opportunity exists for Western Australia to develop a large scale, premium quality, finfish aquaculture sector.¹² The ADC believes if Western Australia develops and promotes the right combination

Identified development targets

WA – large-scale, industrial, infrastructure-based production.

Qld – future in high-value species rather than expansion of production. Competes with SE Asia, so the competitive edge may be in technology.

Vic – agreed target for the industry for Pacific oysters with agreements for joint research.

SA – focus is on value adding and sustainability.

Tas – salmon in the mainstay for the 20-year outlook, taking climate change into account.

of regulatory, economic and environmental factors, significant investment in aquaculture can be attracted to this State.

¹¹ The Aquaculture Committee, a sub-committee of the Australian Fisheries Management Forum, operates within a reporting structure headed by the Primary Industries Ministerial Council.

¹² Various offshore production systems are currently deployed in experimental and commercial farms in areas that include South Korea, Hawaii, the Bahamas, elsewhere in the Caribbean and Ecuador.

Background

ADC's Development Focus

In recent years the ADC determined to narrow its focus for aquaculture development to achieve its strategic goal for the Western Australian aquaculture industry, namely a large scale industry producing in the vicinity of \$200 million of product annually. Prior to this the ADC's effort and resources, diluted across various aquaculture sectors, were not providing maximum benefit to the industry.

Marine finfish aquaculture, particularly open ocean aquaculture (OOA), was identified as the sector most likely to provide a large-scale, globally competitive industry with some development assistance. This determination was reached following the outcome of a comprehensive, iterative process that included extensive collaboration with international authorities in the field, consideration of the relative cost structures of land and marine-based aquaculture in this State, the quality and extent of seawater available for coastal marine finfish aquaculture and the low number of suitable and available Class 1 and Class 2 aquaculture sites (see box) in Western Australia. The operation of an OOA proof of concept farm to prove the technology under local conditions, test the assumptions made in previously commissioned reports and identify potential operational and management issues was considered an appropriate way forward.

Definition of Site Classes

Inshore Class 1 – no exposure to ocean swells, fully sheltered sites, generally suitable for rigid floating cage structures.

Inshore Class 2 – no exposure to ocean swells, semi exposed sites with some shelter from winds and waves, generally suitable for flexible floating cage structures.

Offshore Class 3 – exposure to ocean swells but local topographic features provide some shelter, generally suitable for more robust floating and semi-submersible cage systems.

Offshore Class 4 – full exposure to open ocean conditions (hence, Open Ocean Aquaculture), generally suited to very robust, floating, semi-submersible and submerged cage systems.

Recent issues, including the global financial crisis, the failure of some commercial aquaculture ventures and the recommendations of the ADC commissioned Investability and Governance Framework Project Report and Economic Strategy for Offshore Aquaculture, have led the ADC to review and assess its strategic objective and its identified development pathway to achieving it. The ADC's revised development pathway for the Western Australian Aquaculture Industry has the capacity to enable Western Australia to develop a sustainable, large-scale aquaculture industry that would be competitive in global markets and attract the requisite investment.

Achievements to Date

The role and focus of the ADC was revised and approved by Cabinet in January 2005 to reflect the development-oriented and commercially focused requirements of the industry. In March 2007 Cabinet approved funding of \$700,000 per annum for an additional three-year period commencing in 2007/08.

During the triennium to June 2010, the ADC has undertaken a number of significant projects, outlined in the Aquaculture Development Council Activity Report 07/08-

09/10 (Attachment 1), aimed at enabling the development of a robust and competitive Western Australian industry based largely on marine finfish aquaculture. Key initiatives include: commissioning a feasibility study of an open ocean aquaculture (OOA) project in Western Australia; gathering relevant environmental data such as seabed composition and wave action for specific marine areas; establishing and maintaining collaborative relationships with world experts in the field of OOA; and supporting the development of a regulatory framework for aquaculture in Commonwealth waters.

The main impediments Western Australian operators currently face are the cost and availability of suitable feed, regulatory issues and concerns relating to fish health. The ADC has attempted to assist in these areas but has been restricted by budget limitations.

Industry Development Strategy

Development Streams

The ADC remains of the view that marine finfish aquaculture is the sector most likely to offer significant opportunities to the State and therefore, its Industry Development Strategy is focused on projects that will assist in expanding this sector. Further, the Western Australian Government has already made a substantial investment in the development of the process to establish an offshore aquaculture industry in this State. Paramount to this is the survival and continued growth of existing marine finfish aquaculture operations at a time when capital markets are tight and the regulatory environment in Western Australia continues to impede aquaculture development initiatives.

MPA, the State's largest existing marine finfish aquaculture company, requires significant investment if they are to survive and grow to achieve their production goals. Their plans consist of expansion from current production levels of approximately 500 tonnes per annum to 5,000 tonnes of annual production within seven to eight years requiring approximately \$10 million of capital in the first year and an additional \$10 million over the following three years. Failure to raise this capital will see MPA's growth stagnate and production possibly decline.

The Latitude/Newbold Abrolhos Project is a potentially large-scale finfish aquaculture operation. Current plans consist of a staggered development schedule for a range of species with the intent of growing to 2000 tonnes of production over the next three to five years. The first stage in this venture is currently being conducted in Geraldton by Indian Ocean Fresh Australia, where pilot scale operations are being undertaken. To achieve the full development schedule, significant investment of over \$10 million in initial start up funding is required. The venture is unlikely to progress without financial backing from either the commercial banking sector or other sources of capital.¹³

It is envisaged that from this base, a much larger offshore aquaculture industry will be developed (for example, future aquaculture zones similar in size to that proposed offshore from Two Rocks would be large enough to support, annual marine finfish production in the order of 60,000 tonnes each), provided a realistic and achievable development pathway and appropriate incentives are set. Investment attraction of the magnitude required is unlikely to occur without this. Figure 7 outlines the development streams, projects and linkages that form the ADC's Industry Development Strategy.

¹³ In comparison, approximately 7500 tonnes of wild caught finfish (combined species) was recorded for the 2007-08 season in Western Australia.

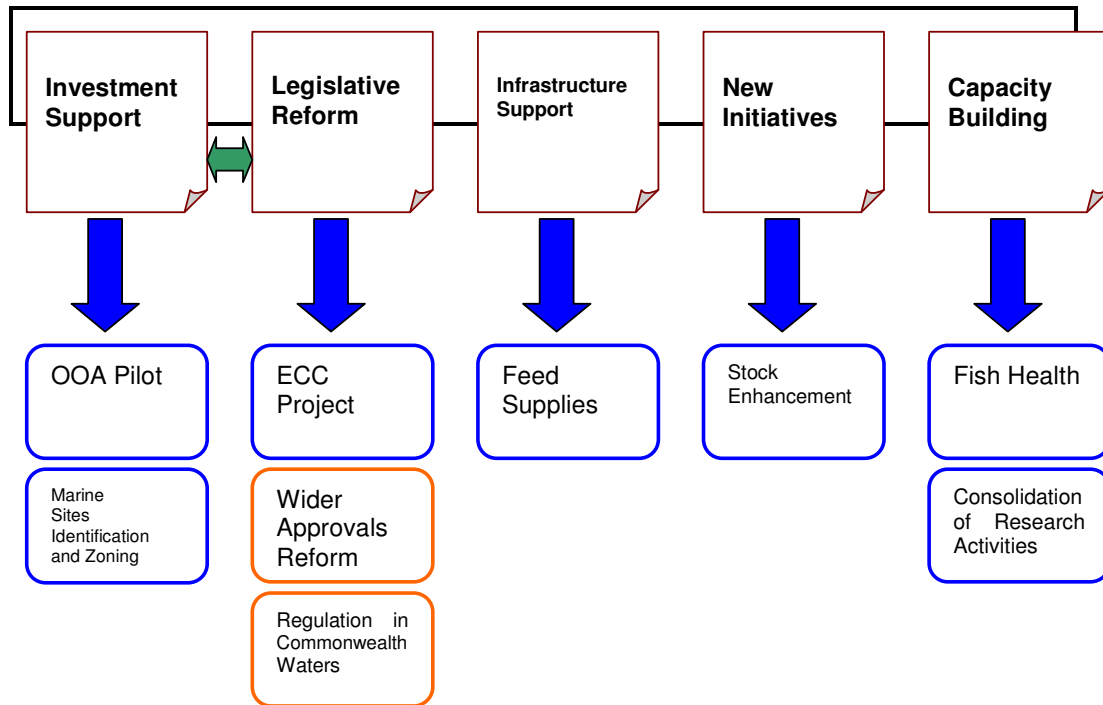


Figure 7: Aquaculture Industry Development Streams (note, projects in orange are DoF led initiatives with ADC support)

Investment Support

Open Ocean Aquaculture Pilot

Implementation of an OOA Proof of Concept Farm remains an integral component of the ADC’s industry development strategy, however, noting the current financial climate and issues surrounding regulation of aquaculture in Commonwealth waters, the ADC reviewed the urgency of this project. The OOA Proof of Concept Farm will validate required technologies under Western Australian conditions, assist in de-risking investment in the industry and confirm some of the assumptions made in the Opportunity Study of an Open Ocean Aquaculture Project in Western Australia commissioned by the ADC in 2006.

A successful conclusion to the proof-of-concept project and other work associated with the development of an offshore aquaculture industry in WA will result in a “product” that can then be marketed internationally. There have been indications from personal communications that local companies and overseas investors have targeted, and are interested in investing in, WA aquaculture. The product that will be the outcome of the work proposed in this report will provide the basis for such investment.

Recommendations of the Investability and Governance Framework Project Report support the implementation of an OOA Proof of Concept Farm, if public funding is available. Seeking investment funds for the project from the private sector was discouraged due to the current economic climate. Further, according to the recently commissioned Economic Strategy for Offshore Aquaculture, this is a particular activity where the private sector will under allocate resources and where a positive outcome can provide significant economic benefits for the economy from industry

development. It is not unusual for Government to be involved in experimental or proof of concept farms, in fact, an experimental southern bluefin tuna farm was established at Port Lincoln in 1991 with the support of the South Australian Government.

This project would not easily lend itself to Government calls for expression of interest from private businesses to undertake the OOA Proof of Concept farm as the objectives of Government and those of the private sector in such an experimental activity would be entirely different. The Government would view this as a public good where the outcomes can be extended to potential investors, whilst the private business objective is to internalise the knowledge for its own commercial benefit.

The FRDC, collaboratively with the South Australian Government, the Japanese Overseas Fishery Corporation Foundation and the Tuna Boat Owners of South Australia funded experimental farming of southern bluefin tuna and thus the southern bluefin tuna aquaculture industry was created.

Source: FRDC Southern Bluefin Tuna Aquaculture Fact Sheet

The ADC recommends continued progression of the OOA Proof of Concept Farm Project with a view to implementation over the next two to three years, in parallel with the development and implementation of a regulatory framework for aquaculture in Commonwealth waters.

Marine Sites Identification and Zoning Project

Western Australia has no Inshore Class 1 sites that can form the foundation of an industry development process, through the progressive maturity stages characteristic of industries that have developed elsewhere. Further, there are few Inshore Class 2 sites considered suitable for aquaculture development.¹⁴ The ADC has commenced a Marine Sites Identification Project to identify and prioritise potentially suitable Class 2, 3 and 4 sites along the Western Australia coast within State and Commonwealth waters. A standard set of internationally recognised selection criteria for site selection will be utilised in the identification and prioritisation process.

The ADC recommends the most appropriate sites then be officially zoned for aquaculture use, with baseline environmental data established by the State Government, which will result in direct cost savings for industry and reduce approval delays. The Governance Framework Project Report supports this view, suggesting the ADC drive the creation of pre-approved zones for aquaculture.

Legislative Reform

The ADC has received numerous reports from existing operators that current deficiencies in the Western Australian aquaculture regulatory environment and project approvals process remain the largest challenge facing the emerging Western Australian marine finfish aquaculture industry. This view was confirmed in the Investability and Governance Framework Project Report, part of which comprised direct industry and potential investor feedback.

¹⁴ In this context, when used to refer to sites, the word “suitable” indicates the site meets basic selection criteria, including biological and physical features and basic economic conditions such as infrastructure.

Environmental Carrying Capacity Project

The Environmental Carrying Capacity (ECC) Project seeks to investigate the potential impacts of aquaculture operations on key sensitive ecological receptors (coral communities, seagrass meadows and mangrove communities) and establish carrying capacity modelling tools at both the operational and regulatory level. The models, particularly at the regulatory level, will be an essential component within the new, streamlined aquaculture approvals assessment process.

The ADC and industry believe this is an essential body of work. It will assist in streamlining, and form the foundations of, future approvals processes. In recognition of this, the ADC has committed a substantial amount of funding to the project.

Wider State Aquaculture Approvals Process Reform

Wider reform of the current State aquaculture approvals processes is underway, led by the Department of Fisheries (DoF). The ADC views this reform as fundamental to facilitate major development of the industry and significant investment attraction. Existing operators have experienced lengthy procedural and administrative delays when applying for environmental approvals.

A case in point is MPA's license variation application to increase their production level to 1,000 tonnes per annum. The variation was initially submitted in February 2006 and was not resolved until mid 2009. The ADC believes such an extended timeline is unacceptable and is effectively prohibiting significant investment in the industry. As such, it strongly encourages the swift implementation of vastly streamlined processes.

The ADC's view on this issue is supported by the Investability and Governance Framework Project Report, which advises "any protracted delay or major impediment in the granting of approvals will almost certainly be fatal to getting a project up" and recommends a maximum 18 month timeframe for granting all approvals, with best practise targeting 6 months. Further, the report notes Western Australia has not developed a "facilitation" culture within Government in regards to aquaculture approvals and establishment of aquaculture zones, comparable to the majority of other States and the Northern Territory.

Aquaculture Regulation in Commonwealth Waters

The results of the ADC's preliminary investigation into provision of tenure within Commonwealth waters implied the application of State aquaculture legislation in these waters would be a relatively simple process. However, during the more detailed development and analysis of the OOA Proof of Concept Farm Project, the ADC became aware of the inability to provide tenure for aquaculture operations in Commonwealth waters due to an amendment to Commonwealth fisheries legislation that directly prevents the application of State aquaculture legislation.

Development of a consolidated, national position on the management of aquaculture in Commonwealth waters is underway, led by DoF. The ADC supports this endeavour, given the future need for expansion into Commonwealth waters in Western Australia due to a lack of available and suitable sites for large-scale aquaculture production in State waters. In the interim, the establishment of a base level of production in immediately accessible State waters is a high priority for the ADC.

Infrastructure Support

Feed Supplies

Expenses associated with long distance transport of feed from eastern states suppliers impacts significantly on cash flow for existing operations and greatly increases start up costs for new ventures. MPA have reported difficulties in securing ongoing feed supply contracts, the pressures of increased feed expenses related to transport and the increased risks (including delayed or in some cases, non-delivery) associated with long distance transport of feed to the ADC on several occasions. This was verified in the recently conducted Economic Case for Offshore Aquaculture, in which the consultants identified feed costs as the most significant economic driver influencing profitability.

Worldwide fishmeal production has remained stable at between five and six million tonnes over the past decade, raising some concern about the increasing demand for fishmeal and the sustainability of the resource. According to the International Fishmeal and Fish Oil Organisation (IFFO), lack of growth in the world's fishmeal and fish oil production will not be a limiting factor for aquaculture. Global fishmeal production is unlikely to increase in the future; however, IFFO has predicted alternate feed sources will allow aquaculture growth to continue.¹⁵

The role of fishmeal in future aquaculture diets is likely to change, becoming a strategic ingredient used at particular periods of the life cycle. In grower diets, the proportion of fishmeal is being decreased with the inclusion of other protein sources. These alternate protein sources are abundant, including soya, potentially farmed algae and, importantly for Western Australia, lupins.

The production of plant proteins and their incorporation into manufactured diets is an area in which we excel in this State and research previously undertaken by Dr Brett Glencross, formerly of DoF and now based at the CSIRO, has demonstrated significant potential for lupins as an ingredient in fish diets. A small tonnage of lupins is currently exported to major aquaculture feed manufacturers overseas that is likely to increase in parallel with the demand for fishmeal and fish oil alternatives. Locally, the level of demand (directly related to the current scale of the industry) has not yet warranted the development of an aquaculture feed mill.

Establishment of a feed manufacturing base in Western Australia would substantially reduce feed costs, support future industry growth and provide a strong investment incentive. Noting the current size of Western Australia's aquaculture industry, manufacturers of traditional stock feeds in this State are unlikely to invest in the required plant equipment to expand into aquaculture feed production. Consequently, some financial diversification incentive for operating feed mills to provide manufactured diets for aquaculture is recommended.

New Initiatives

Stock Enhancement

Coastal fisheries are in decline around the world, with Western Australia no exception. Resource managers are increasingly considering stock enhancement as one tool to replenish depleted fish stocks and increase fishery landings. With stock enhancement experts now utilising a multi-disciplinary approach and with a

¹⁵ Shepherd, IFFO, cited in *Infofish International* 4/2009.

worldwide network of scientists involved, Western Australia is fortunate to have internationally recognised expertise locally available to assist in its implementation here.

The ADC is currently investigating finfish stock enhancement opportunities in Western Australia, in particular the release of barramundi into Lake Argyle and Lake Kununurra. Recognised globally as a science, appropriately designed stock enhancement programs can also provide significant tourism benefits, particularly through recreational and charter fishing. Due to issues in securing a reliable supply of juveniles from external providers, MPA are proposing to build a tropical hatchery facility in the north of the state. This facility, when constructed, could be contracted to supply juveniles for stock enhancement purposes.

Stock enhancement programs undertaken in Queensland have delivered excellent results. A cost benefit analysis of barramundi restocking in Lake Tinaroo, Queensland, concluded that each dollar spent on stock enhancement returned \$31 worth of benefits to the Queensland economy¹⁶. Assessment of stock enhancement programs in three other Queensland lakes estimated angler visits returned between 1 and 1.5 million dollars¹⁷ per dam, per annum to the State.

The ADC is in the process of commissioning a Stock Enhancement Paper to analyse the potential benefits and risks associated with this activity for Western Australia. It is recommended DoF utilise the outcomes of this paper as the basis for developing a Stock Enhancement Policy for both marine and freshwater locations throughout the state.

Capacity Building

Fish Health

The ADC has recognised the need for additional fish health diagnostic capacity in the aquaculture industry. Whilst the Fish Health Unit of DoF is able to offer high quality and efficient pathological services after a disease outbreak, there is a lack of fish health advice, diagnosis and treatment prescription services available to Western Australian operators.

In support of this, the ADC has provided financial assistance to the Batavia Coast Marine Institute for a Fish Health Research and Development Officer. The ADC has also committed to providing support to the DoF Fish Health Unit's Mulloway and Yellowtail Kingfish Fish Health Project, dependant on the outcome of other funding grant applications associated with the project.

The ADC is of the opinion that the availability of professional expertise in this area is an essential service to support industry development. Noting the current status of the industry, the ADC recommends investigating the cost of a State funded fish veterinarian position. Key responsibilities would include regular industry liaison with operators regarding preventative measures and provision of diagnostic and treatment advice and services. As the industry develops, the position could become either co- or fully funded by industry operators.

¹⁶ Sourced from Rutledge W, Rimmer M, Russell DJ, Garrett R, Barlow C (1990) Cost benefit of hatchery-reared barramundi, *Lates calcarifer* (Bloch), in Queensland. *Aquaculture and Fisheries Management* 21, 443-448

¹⁷ After adjusting for non-fishing activities of holiday makers to the relevant dams

Consolidation of Research Activities

Aquaculture research in Western Australia is disjointed and at times conducted in a non-collegial manner. Various aquaculture research facilities are located around the State, a number of which are supported in some manner by public funding. A consolidated approach to aquaculture research, driven by a focused research plan collectively developed between research institutions, policy development agencies and industry members, would greatly improve the application and relevance of research outcomes for industry.

The ADC recommends an audit of aquaculture research facilities be undertaken with a view to either reducing the number of operating facilities and developing one or two of the best equipped centres to consolidate available research capacity, or developing existing facilities into specialised centres with a specific focus. This could provide for centres with a sector specific focus (e.g. marine finfish, mollusc, crustacean etc) or a research stream focus (e.g. fish health, production techniques, non-food production etc). This proposal could also assist, or in fact initiate, the Fisheries Research and Development Corporation's proposed national audit of aquaculture facilities.

Regional Benefits

Regional locations in Western Australia are well placed to benefit from the implementation of this aquaculture industry development strategy. It is highly likely the Marine Sites Identification Study will identify suitable areas for aquaculture zones close to regional centres, which will potentially lead to the establishment of aquaculture operations. Such operations will provide additional income and employment streams for regional centres and could offer alternate employment for those within declining commercial fishing industries. The Economic Case for Offshore Aquaculture estimates an industry producing 60,000 tonnes per annum (at full capacity a zone of similar size to that proposed at Two Rocks could produce this amount) could provide up to 400 direct employment opportunities.

Aquaculture Development Funding

Item	Financial Year Expenditure (\$'000)			
	2010/11	2011/12	2012/13	2013/14
Operating	500	500	500	500
OOA Proof of Concept Farm	500	1,500	1,700	1,700
Marine Sites Identification and Zoning	200	200	200	-
Stock Enhancement	10	-	-	-
Mill Diversification Incentives	100	100	100	200
Total	1,310	2,300	2,500	2,400

Note, the ADC has not requested specific funding associated with streamlining the aquaculture approvals process in Western Australia, as it is aware DoF is currently leading this process. As noted previously, the ADC has committed a substantial amount of funding to the ECC Project, the results of which will significantly assist in implementing regulatory change. The ADC would strongly support additional funding in this area if it accelerated delivery of the required regulatory changes.

Operating

Operating funds of \$500,000 per annum will cover salaries, administration costs and consultancies required to supplement the proposed scope of work. These consultancies may include tasks such as undertaking an audit of aquaculture research activities and facilities in Western Australia.

OOA Proof of Concept Farm

The funding allocation for the OOA Proof of Concept Farm is a staged approach to achieve the following:

- Stage 1 (2010/11): Selection of specific site for OOA Proof of Concept Farm; deployment of current meter and assessment of generated data; assessment of water column composition; development of technical specifications and engineering design.
- Stage 2 (2011/12): Purchase and construction of required equipment (e.g. mooring grid, cages, feeding equipment).
- Stage 3 (2012/13): OOA Proof of Concept Farm operation, interim reporting and release of data to industry.
- Stage 4 (2013/14): OOA Proof of Concept Farm operation, reporting and release of data to industry.

Marine Sites Identification and Zoning

The provision of dedicated aquaculture zones is a key element of the strategy. Investment-ready aquaculture zones, which provide certainty and transparency for the licensing process and secure property rights through long-term tenure for aquaculture development in State and Commonwealth waters, will be essential for investment in the industry. Aquaculture Zones will be achieved by:

1. continuing the site identification and strategic assessment processes to identify areas suitable for zoning in State waters;
2. continuing the process Western Australia is leading, through the Aquaculture Committee, to enable aquaculture in Commonwealth waters; and
3. utilising spatial planning to provide guidance and data for locating sites and environmental management and monitoring, in accordance with the process proposed by EPA in its EIA process review.

Work undertaken to date to characterise the proposed Two Rocks Aquaculture Zone in Western Australia cost approximately \$200,000. Similar costs were associated with work undertaken on equivalent aquaculture zones in other States.

Stock Enhancement

This funding will be utilised for international collaboration with world leaders in the field of stock enhancement, to ensure any policies developed are in line with the latest scientific research in this field.

Mill Diversification Incentives

Encouraging existing stock feed mills to diversify their production lines with the inclusion of manufactured aquaculture diets will directly reduce operating expenses for new and existing aquaculture operators. As previously identified, the cost of feed

and in Western Australia, additional costs and risks associated with long distance transport, have significant influence on profitability.

Conclusion

WA is positioned and has the potential to develop a competitive, world-class marine finfish aquaculture industry based on offshore production systems in an open ocean environment.

This sector may represent the best remaining opportunity for WA to develop a world-class aquaculture industry.

An independent economic study commissioned by the ADC presents a compelling case for government intervention to achieve this objective. It argues there is a role for Government, under an aquaculture industry development strategy, to prove the production technology under open ocean conditions off the WA coast and that a positive outcome can provide significant economic benefits for the economy from industry development.

It is not unusual for governments to be involved in experimental or proof of concept farms: the first experimental farm for the southern bluefin tuna industry in South Australia was established at Port Lincoln in 1991 with South Australian Government support.

There are additional examples that demonstrate industry development being made possible because of the significant past and current investment by governments to prove technology and the capacity to grow out fish.

To realise the potential for establishment of a marine finfish aquaculture industry in WA, however, additional Government investment will be required.

Key elements of this proposal for which new aquaculture development funding is sought include:

- operational funds for salaries and consultancies to support all development initiatives;
- funding for the establishment and operation of an open ocean “proof-of-concept” pilot farm;
- identification and reservation of aquaculture zones in Commonwealth and State waters off WA, including preliminary assessment to facilitate licensing and leasing processes.