2

The Aquaculture Industry in Northern Australia

Global Aquaculture

2.1 With an ever increasing global population, seafood has become a more popular source of protein. The Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES) reports that from the 1960s global per capita seafood consumption has increased from 10 kilograms per person to 19 kilograms per person. This is attributed to 'rising incomes and urbanisation, expansion of aquaculture production and increased efficiency of distribution channels.' The ABARES added that much of the growth in seafood consumption has been in Asia, and especially China.[1]

2.2 Increased global demand for seafood has spurred production in both wild-caught fisheries and aquaculture. The World Bank found that :

> During the last three decades [the 1980s, 1990s and 2000s], capture fisheries production increased from 69 million to 93 million tons; during the same time, world aquaculture production increased from 5 million to 63 million tons.[2]

2.3 The World Bank also found that aquaculture was one of the most rapidly growing food sectors globally. During the 1980s and 1990s, aquaculture production grew on average 10 per cent annually and since then growth has fallen to six per cent annually. This was in sharp contrast to wild-caught fisheries production which over the same period stagnated and then contracted in 2000–09.[3]

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1 Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES), *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 2.

2 The World Bank, *Fish to 2030 – Prospects for Fisheries and Aquaculture*, December 2013, p. xiii.

3 The World Bank, *Fish to 2030 – Prospects for Fisheries and Aquaculture*, December 2013, pp 4–5.

2.4 The Aquaculture Council of Western Australia (ACWA) observed that global aquaculture is worth US$144 billion and is forecast to grow to US$202 billion by 2020. The ACWA added that 'just under 50 per cent of the world's seafood now comes from aquaculture'.[4]

2.5 The Pearl Producers Association (PPA) reported that the World Bank estimated that by 2030:

> 62 per cent of the seafood we eat will be farm-raised to meet growing demand from regions such as Asia, where roughly 70 per cent of fish will be consumed. [China will produce 37 per cent of the world's fish, while consuming 38 per cent of the world's food fish].[5]

2.6 Globally, aquaculture investment is being pursued to meet food demand and also build economies. The BMT Oceanica stated:

> US$16 billion will be invested in Saudi Arabia in the next 16 years on aquaculture alone. … As the oil prices drop and the oil starts to dry up, they have got a real problem. They need to feed their populations, and they see fish farming as a way to do that.[6]

Australian Aquaculture

Current Production

2.7 Compared to global seafood production, Australia 'is a minor global player, producing less than 0.2 per cent of global fisheries and aquaculture supply'[7] and Australia's aquaculture production comprises less than one per cent of global aquaculture.[8]

2.8 Table 2.1 shows Australia's aquaculture and wild caught fisheries production by jurisdiction for 2013-14. In 2013-14 Australia produced 74 913 tonnes of aquaculture valued at $1 billion. This represented 33 per cent of total Australian fisheries production by volume, and 40 per cent by value.[9] In the same year the aquaculture industry employed 5111 people and 3594 people were employed in the commercial fishing industry.[10]

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4 Aquaculture Council of Western Australia (ACWA), *Submission 8*, p. 1.

5 Pearl Producers Association (PPA), *Submission 26*, p. 6.

6 Dr Glenn Shiell, Associate Principal, BMT Oceanic P/L, *Official Committee Hansard,* Perth 11 June 2015, p. 10.

7 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 2.

8 Department of Agriculture (DoA), *Submission 11*, p. 2.

9 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 7.

10 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 37.

Table 2.1 Australia's Aquaculture and Wild-Caught Fisheries Production by jurisdiction 2013–14 [11]

Jurisdiction	Aquaculture		Wild-caught	
	Value ($m)	*Vol. (tonnes)*	*Value ($m)*	*Vol. (tonnes)*
WA	73 (7.3%)	966 (1.3%)	417 (27.7%)	18 995 (12.5%)
NT	15 (1.5%)	815 (1.1%)	31 (2.1%)	5351 (3.5%)
QLD	89 (9.0%)	6446 (8.6%)	191 (12.7%)	20 785 (13.7%)
NSW	51 (5.1%)	4331 (5.8%)	86 (5.7%)	12 618 (8.3%)
SA	181 (18.2%)	15 447 (20.6%)	210 (14.0%)	41 886 (27.5%)
TAS	559 (56.3%)	44 488 (59.4%)	176 (11.7%)	5516 (3.60%)
VIC	25 (2.5%)	2420 (3.2%)	55 (3.7%)	4252 (2.8%)
Commonwealth[12]	—	—	338 (22.5%)	42 826 (28.1%)
Total	**993**	**74 913**	**1504**	**152 229**

Source *ABARES*, Australian fisheries and aquaculture statistics 2014, *pp 76–85, 88.*

Production in Northern Australia

2.9 Table 2.1 shows that the combined value of the aquaculture industries in the Northern Territory, Queensland, and Western Australia is less than the value of the South Australian aquaculture industry and less than a third of the value of the Tasmanian industry.

2.10 In addition, the saltwater crocodile, *Crocodylus porosus*, is found across Northern Australia. While, the ABARES statistics do not include production information for *Crocodylus porosus*, Porosus Pty Ltd stated that 'the best estimate is that there are probably now 170 000 or 175 000 crocodiles in captivity—certainly more in captivity than are in the wild' across Northern Australia.[13] A first grade skin, 40 centimetres wide, is worth $800.[14]

Northern Territory

2.11 The Northern Territory Department of Primary Industry and Fisheries (NTDPIF) stated that in the Northern Territory:

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11 The ABARES statistics for Queensland and Western Australia do not distinguish between production in Northern Australia and the rest of the state. The statistics include pearl production but do not include crocodile production.

12 The Commonwealth jurisdiction includes the Northern Prawn Fishery, the Torres Strait fisheries and the Southern and Eastern Scale Fish and Shark Fishery. A full list of fisheries is at: ABARES, *Australian fisheries and aquaculture statistics 2014*, pp 53–54.

13 Mr Michael Burns, Managing Director, Porosus Pty Ltd, *Official Committee Hansard,* Darwin 14 July 2015, p. 37.

14 Mr John Lever, Koorana, *Official Committee Hansard,* Brisbane 27 August 2015, p. 28.

> … there is currently a small number of active licences … In 2012/13 the NT aquaculture industry was valued at approximately $25 million; the pearling industry was [approximately valued at] $14.81 [million] and pond-based farmed barramundi was [approximately valued at] $10.22 million. … The number of pond-based barramundi farms has reduced from four to one … [15]

Queensland

2.12 The Commonwealth Scientific and Industrial Research Organisation (CSIRO) commented that in Queensland, 'prawns and barramundi are the most important farmed species, and a significant proportion of the State's aquaculture is based in the North.'[16]

2.13 In North Queensland one hundred tonnes of cobia fish[17] is being farmed by Pacific Reef Fisheries. Pacific Reef Fisheries recounted its progression in farming cobia fish and stated:

> In the last two years, we have had a lot of success from a production point of view. It has taken developing new diets and a lot of water quality understandings about what the needs of the animals are. … we have also undertaken quite significant marketing campaigns and are having a lot of success. It is a very high quality fish, so we are targeting the high-end, five-star restaurant type market and are getting extremely good feedback.[18]

2.14 Redclaw freshwater crayfish production is based in Queensland and in 2013–14 the industry produced about 36 tonnes of crayfish valued at $682 000.[19] The Queensland Crayfish Farmers Association (QCFA) stated that there are currently 'several long-term successful family-based farming operations', but the industry had declined from a production peak of 100 tonnes in 2006 'mainly due to the loss of a couple of major players [but also] a few minor ones.'[20]

2.15 The Aquaculture Association of Queensland (AAQ) commented that redclaw freshwater crayfish farming is successful in other parts of the

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15 NT Department of Primary Industry and Fisheries (NTDPIF), *Submission 13*, p. 2.

16 Joint Select Committee on Northern Australia (JSCNA), Inquiry into the Development of Northern Australia: CSIRO, *Submission 108*, p. 12.

17 Cobia is a tropical pelagic fish which grows at triple the rate of barramundi.

18 Mr John Maloney, General Manager, Pacific Reef Fisheries (Pacific Reef), *Official Committee Hansard,* Brisbane 27 August 2015, p. 33.

19 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 88.

20 Mr John Stevenson, President, Queens and Crayfish Farmers Association (QCFA), *Official Committee Hansard,* Townsville 26 August 2015, p. 28.

world, but that Queensland Government policy has only encouraged small aquaculture ventures. The AAQ stated:

> When the extension services or the government came along with a business plan and said, 'This is what you as a fish farmer should be able to do; you should be able to produce your aquaculture species on five hectares or maybe 10,' suddenly, when you actually go out there and do it, you find out that your economies of scale are not large enough. It is driven that way with the way the policies are set up. If you have under five hectares in Queensland freshwater aquaculture, you do not even need to go to the government. There is a self-assessable code to do it. You just have a set of rules that you must apply. … But, at five hectares, you are never going to get enough income off it to sustain a family.[21]

Western Australia

2.16 The ACWA stated that aquaculture in Western Australia is not a 'very big industry'.[22] There are about 450 aquaculture licences, but the majority are 'not terribly active at this stage'.[23] The biggest aquaculture sector in the State apart from pearl oysters, is barramundi which in 2012–13 was worth about $12.5 million.[24] Marine Produce Australia Ltd (MPA) which farms barramundi in a sea cage operation in the Kimberley Aquaculture Development Zone (KADZ), advised that it had annually produced between 800 tonnes and 1300 tonnes.[25] The ABARES figures for the pearl oyster industry for 2013–14 indicate production was worth $61 million.[26]

21 Mr Robert Bartley, President, Aquaculture Association Queensland, *Official Committee Hansard,* Brisbane 27 August 2015, p. 12.

22 Ms Tina Thorne, Executive Officer, ACWA, *Official Committee Hansard,* Perth 11 June 2015, p. 14.

23 Ms Tina Thorne, ACWA, *Official Committee Hansard,* Perth 11 June 2015, p. 14.

24 Ms Tina Thorne, ACWA, *Official Committee Hansard,* Perth 11 June 2015, p. 14.

25 Dr Desiree Allen, Managing Director, Marine Produce Australia Ltd (MPA), *Official Committee Hansard,* Perth 11 June 2015, p. 50.

26 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 88.

Barramundi Fish – from the Egg to the Plate

In the Natural Environment

Barramundi fish naturally occurs from the Arabian Gulf to Taiwan and throughout Northern Australia extending as far south as the Noosa River on the east coast and the Ashburton River on the west coast of Australia. [27] Barramundi has a complex lifecycle, can change its sex and move between freshwater and saltwater. In the natural environment barramundi eggs hatch in saltwater bays and river mouths before being washed into coastal swamps and estuaries that are nurseries for the juvenile fish. After the wet season juveniles migrate upstream where they spend three to four years maturing as males. The male fish then return to their spawning grounds before heading out into the ocean where they change sex. [28]

Aquaculture Farming

In the early 1970s Thailand trialled barramundi aquaculture production. Australian production began with fingerlings produced by the Northern Fisheries Research Centre in Cairns in 1983, followed by the first commercial farm in Innisfail in 1986. [29] Australian barramundi is grown in freshwater ponds in Northern Queensland, saltwater ponds in the Northern Territory, sea cages in the Kimberley region of Western Australia, and recirculating systems in the southern Australian states. The industry predominantly produces larger fish for fillets with a small amount of plate sized fish also produced. The Australian barramundi aquaculture industry is currently worth approximately $60 million per annum. [30]

The Aquaculture Process

Farmed barramundi is grown in three distinct environments: the hatchery; the nursery; and the grow-out facility. While the lifecycle adds to the complexity of

27 Northern Territory Department of Primary Industry and Fisheries , *NT Barramundi Farming Handbook*, September 2007, p. 1.

28 Western Australia Department of Fisheries, 'Fisheries Fact Sheet: Barramundi', June 2011, http://www.fish.wa.gov.au/Documents/recreational_fishing/fact_sheets/fact_sheet_barramundi.pdf Accessed 11 November 2015; Schipp, G., 'Introduction to the Life History and Biology of Barramundi', October 1991, Darwin Aquaculture Centre, http://www.nt.gov.au/d/Content/File/p/Fishnote/FN07.pdf Accessed June 17 2015.

29 Northern Territory Department of Primary Industry, Fisheries, *NT Barramundi Farming Handbook*, September 2007, p. 2.

30 Australian Barramundi Farmers Association, *Submission 3*, April 2015, p. 1.

farming the species, the progression from hatchery to nursery, to grow-out facility is typical of most aquacultured species. [31]

Hatchery

Adult barramundi is kept in the hatchery as broodstock. The males are kept in conditions that purposefully limits their growth until a sex change is induced by moving them to more favourable conditions. The hatched larvae are fed simple foods such as algae, rotifers, and zooplankton. The larvae spend three to four weeks in the hatchery until they reach a size of 15-20 mm.

Nursery

Barramundi fingerlings are transferred to a nursery environment where they will continue to grow until they reach up to 100 mm. During this stage of development barramundi is highly cannibalistic, and so the fingerlings are regularly graded to ensure that larger fish do not share a tank with smaller fish. During the nursery period the fingerlings are weened onto the formulated feeds that they will eat as adults.

Grow-out

Fish are grown out to a range of sizes; an entrée sized fish may be harvested at 250 grams, a plate-sized fish at 600-800 grams, and fish to be filleted at around 3 kilograms. The grow-out period can range from three months to 18 months. Barramundi can be grown out in ponds on land (e.g. Humpty Doo Barramundi); in sea-cages in the ocean (e.g. Marine Produce Australia); or in Recirculating Aquaculture Systems (RAS) which are large tanks (e.g. Mainstream Aquaculture).

From Melbourne to the Kimberley – the Barramundi of Marine Produce Australia[32]

Marine Produce Australia (MPA) produces barramundi at Cone Bay, WA, in the Kimberley Aquaculture Development Zone (KADZ). The KADZ is an extremely remote area, six hours north of Derby by boat. The process used by MPA to obtain stock for its farm provides an example of the challenges faced by aquaculture operators in remote locations.

The MPA purchases either eggs or fingerlings from the Mainstream Aquaculture hatchery in Melbourne. As a result of Mainstream Aquaculture's breeding program these eggs and fingerlings develop into fast growing barramundi. The eggs or fingerlings are shipped to the Challenger Institute of TAFE in Perth, where they are grown to a one gram size. They are then packed in transport containers

31 The following description of the stages of barramundi aquaculture is drawn from: Northern Territory Department of Primary Industry, Fisheries, *NT Barramundi Farming Handbook*, September 2007.

32 Adapted from: Dr Desiree Allen, Managing Director, Marine Produce Australia, *Official Committee Hansard*, Perth, 11 June 2015, p. 53; Challenger Institute of TAFE, *Submission 5*, p. 1.

specially designed by Challenger to provide the fish with a constant supply of oxygen. They are then transported 2700 km to Derby by truck, where they are transferred to a boat and transported to an island in Cone Bay where MPA operates a small nursery. The fingerlings are grown to a size of 50 grams in the nursery before being transported to sea-cages for growing to their harvestable size.

Pond Farming in the Northern Territory

Humpty Doo Barramundi (Humpty Doo) is a saltwater pond based barramundi farm located on the Adelaide River, Northern Territory. Established in 1993, Humpty Doo was initially a small farm producing 300 kilograms of fish per annum,[33] but it has since grown to become one of the largest barramundi farms in Australia with sales in excess of $10 million per annum.[34] Humpty Doo supplies major supermarket chains and has onsite cooling and packing facilities to enable harvested fish to be processed for transport interstate.[35]

Humpty Doo has developed a low discharge farming system based on the use of artificial wetlands as a water treatment system. Water discharged from the farm passes through a wetland that filters nutrients from the water enabling it to be reused in the farm or released into the Adelaide River. Currently the wetlands take up between 50 and 70 per cent of the farm site.[36]

[33] Humpty Doo Barramundi, 'Our Farm', http://humptydoobarramundi.com.au/our-farm Accessed 20 November 2015.

[34] Mr Robert Richards, Managing Director, Humpty Doo Barramundi, *Official Committee Hansard*, Darwin, 14 July 2015, p. 31; NTDPIF, *Submission 13*, p. 2.

[35] Humpty Doo Barramundi, 'Farm Story', http://humptydoobarramundi.com.au/our-story/farm-story Accessed 20 November 2015.

[36] Mr Robert Richards, Humpty Doo Barramundi, *Official Committee Hansard*, Darwin, 14 July 2015, pp. 31-32; ABC, 'NT barramundi farm doubles size to meet growing local and national demand', http://www.abc.net.au/news/2014-09-10/barra-expansion/5733530 Accessed 20 November 2015.

Aquaculture Production Growth

2.17 The ABARES reported that 'since 2002–03 the real gross value of aquaculture production has increased by 4 per cent ($41 million), in real terms', with the largest increase being in salmonids[37] and barramundi.[38] The NTDPIF observed, however, that in Northern Australia:

> The long-term growth of tropical aquaculture industry has been significantly slower compared to most southern states. Queensland's aquaculture industry had a compound annual growth rate (in value terms) of around 4 per cent, while WA's was –3% and NT + 2%. In comparison, Tasmanian aquaculture industry has had a compound annual growth rate of around 14 per cent in recent years.[39]

Expansion of Existing Aquaculture Enterprises

Barramundi

2.18 Farmed barramundi production in both WA and the NT is expected to increase. The MPA stated that its production in the KADZ was set to expand significantly following an increase in its annual permit to 7000 tonnes. The MPA forecast that it would reach this level of production within 'six to seven years'.[40]

2.19 The NTDPIF advised that Humpty Doo Barramundi, the sole remaining barramundi farm in the NT, and 'now one of the largest barramundi producers in Australia' had an agenda for continual expansion.[41]

Grouper

2.20 Since 2013, when it took over the operation and brood stock of the Cairns Northern Fisheries Centre, Finfish Group (Finfish) has developed the aquaculture of grouper fish species.[42] The holding company of the Finfish Group, the Sustainable Development Corporation, stated that the facility in Cairns:

> … has a capacity to produce about 360 000 fingerlings per year, but our aim, over the next year or two, is to take that to 2½ million fingerlings. … We also lease a 17 hectare pond farm at Yorkeys

37 Salmon and trout.

38 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 13.

39 NTDPIF, *Submission 13*, p. 2.

40 Dr Desiree Allen, *Official Committee Hansard,* Perth 11 June 2015, p. 54.

41 NTDPIF, *Submission 13*, p. 2.

42 Mr Alan Wigan, Chief Executive Officer, Sustainable Development Corporation (Finfish), *Official Committee Hansard,* Cairns 24 August 2015, p. 28.

> Knob, which basically grows our fingerlings into consumption-sized fish for sale into the seafood market, and it has an annual capacity of about 350 tonnes per annum.[43]

2.21 In Australia, Finfish sells to 'high end Western restaurants and also wholesale distributors.' Live fish are also sold to Cantonese-style restaurants:[44]

> The restaurants like three-kilo [gram] fish because they can get more fillets out of that. The live-fish restaurants like anywhere from 800 grams to 1.5 kilo [grams], 800 grams being a plate-sized fish and 1.5 kilograms being more of a banquet-sized fish.[45]

2.22 The Finfish expansion program involves investing 'well over $20 million' in a recirculating aquaculture system (RAS)[46] for growing grouper indoors. The aim is to produce 1500 tonnes per annum thereby creating 100 jobs. Finfish Group stated:

> … we are looking at the giant grouper for Australia and Asia and the gold spot grouper for the Middle East. Gold spot is also known as orange spot or, in the Middle East, hamour. …
>
> In Asia, over 50 000 tonnes of grouper is consumed every year. …
>
> In the Middle East, one in every two table fish served at a restaurant in the [United Arab Emirates] is hamour.[47]

Pearl Oyster

2.23 The pearl oyster industry is currently valued at about $48 million per annum.[48] The NTDPIF stated, however, that the value of the pearling industry was predicted to increase as one major pearling producer steadily expanded its production.[49]

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43 Mr Alan Wigan, Finfish, *Official Committee Hansard,* Cairns 24 August 2015, p. 27.

44 Mr Alan Wigan, Finfish, *Official Committee Hansard,* Cairns 24 August 2015, p. 29.

45 Mr Alan Wigan, Finfish, *Official Committee Hansard,* Cairns 24 August 2015, p. 30.

46 A RAS is effectively an indoor tank facility where the water is treated and recirculated. With a large capital investment, a RAS can have zero discharge or, with a lesser investment, can have a 5-10 per cent daily discharge of treated water. Mr Alan Wigan, Finfish, *Official Committee Hansard,* Cairns 24 August 2015, pp 32–33.

47 Mr Alan Wigan, Finfish, *Official Committee Hansard,* Cairns 24 August 2015, p. 28.

48 Pearl Producers Association, *Submission 26*, p. 9.

49 NTDPIF, *Submission 13*, p. 2.

Case Study – The South Sea Pearl Industry

The pearling industry was integral to the economic development of Broome and the Kimberley region. By 1910 Broome was the world's largest pearl centre with 3500 people directly employed in the industry.[50] Initially the industry was focussed on diving for naturally produced pearls and the creation of cultured pearls was prohibited. In 1949 this prohibition was lifted and gradually the industry moved to culturing pearls using a mix of wild harvested and hatchery produced shells.[51]

Recent Difficulties

Prior to the Global Financial Crisis (GFC) the Australian wholesale south sea pearl (*Pinctada maxima)* industry was worth $200 million per annum.[52] Recent years, however, have been difficult for the industry with the overall value of production falling to $48 million per annum, and the number of pearl producers falling from twelve to three.[53] Many factors have contributed to this downturn including the reduced demand for luxury products in the wake of the GFC; the emergence of low-cost competitors in Southeast Asia; the high Australian dollar; the increased costs of production due to the mining boom in Northwest WA; and the impact of Oyster Oedema Disease.[54]

Current Challenges

Despite the recent challenges the pearl industry remains Western Australia's most valuable aquaculture industry,[55] and is an important part of the economy of the Kimberley region. If the industry is to halt its recent decline and recover some of its lost value it must overcome significant challenges including:

The emergence of low-cost Asian pearls: Australia has by far the world's largest supply of natural south sea pearl oyster beds. South sea pearls are widely regarded as the highest grade of pearls and therefore Australian producers enjoyed a competitive advantage during the period when pearls were exclusively cultured in wild harvested shells. The development of hatchery technology to produce juvenile oysters has allowed overseas companies to produce large

50 Australian Government, 'Australia's pearling industry', http://www.australia.gov.au/about-australia/australian-story/australias-pearling-industry Accessed on 3 June 2015.

51 Fletcher, W., Friedman, K., Weir, V., McCrea, J. and Clark, R. *Pearl Oyster Fishery,* Department of Fisheries, Western Australia, January 2006, p. 11.

52 Cygnet Bay Pearls, *Submission 27*, May 2015, p. 2.

53 Pearl Producers Association, *Submission 26*, May 2015, p. 8; Cygnet Bay Pearls, *Submission 27*, May 2015, p. 5.

54 Cygnet Bay Pearls, *Submission 27*, May 2015, p. 5.

55 ABARES, *Australian fisheries and aquaculture statistics 2014*, Australian Bureau of Agricultural and Resource Economics and Sciences, December 2015, p. 21.

numbers of pearls, reducing Australia's competitive advantage and depressing world pearl prices.[56] While the industry has contracted in Australia it is growing rapidly in China, the Philippines, and especially Indonesia where export values doubled between 2008 and 2012.[57]

Infrastructure limitations: The pearl industry is largely located in remote locations with limited road access and is burdened by the resulting transport and logistics challenges. The industry is also under pressure from competition for marine and port space from the oil and gas industries. [58]

Oyster Oedema Disease: Oyster Oedema Disease (OOD) first appeared in Australia in October 2006 when it infected producers and hatcheries in the Exmouth Gulf region resulting in the death of 2.8 million shells and the closing or sale of a number of farms.[59] The disease has continued to affect the industry with Cygnet Bay Pearls reporting that almost 100 per cent of juvenile shells produced in their hatcheries die as a result of the disease.[60]

Opportunities

Australia's reputation for quality pearls: Australia has consistently produced the world's highest quality pearls and Australian pearls attract a premium price. [61] As there is no official labelling system for Australian pearls it is difficult for consumers to identify the origin of pearls. Some producers believe that it is common for Southeast Asian pearls to be falsely sold as Australian pearls.[62]

Tourism and vertical integration: The depressed prices in the wholesale pearl market have forced Australian producers to seek alternative revenue streams. Producers have begun selling former by-products such as pearl meat and mother of pearl shells, as well as operating showrooms and selling pearls online, in an attempt to realise a greater share of the retail value of their products. Cygnet Bay Pearls has opened tourist accommodation and a restaurant at its farm. Cygnet Bay Pearls considers further integration with tourism vital for the pearling industry, suggesting the development of a 'Broome Pearl Region' modelled on the Margaret River Wine Region.[63]

56 Cygnet Bay Pearls, *Submission 27*, May 2015, pp 4-5.
57 Pearl Producers Association (PPA), *Submission 26*, May 2015, p. 9.
58 Clipper Pearls, *Submission 20*, May 2015, p. 2; PPA, *Submission 26*, May 2015, p. 7.
59 Cygnet Bay Pearls, *Submission 27*, May 2015, p. 5.
60 Cygnet Bay Pearls, *Submission 27*, May 2015, p. 5.
61 PPA, *Submission 26*, May 2015, p. 8.
62 Cygnet Bay Pearls, *Submission 27*, May 2015, p. 5.
63 Cygnet Bay Pearls, *Submission 27*, May 2015, p. 7.

New Aquaculture Projects

Prawns

2.24 The CSIRO's evidence to the Committee's *Inquiry into the Development of Northern Australia* stated:

> Recent CSIRO advances in tropical aquaculture technology, together with emerging commercial interest in large-scale prawn farming (approximately $1 billion potential production value) indicate a strong trajectory for the growth of tropical aquaculture in Northern Australia. Research has identified significant potential for the development of large-scale, saltwater pond aquaculture [in] coastal regions of Northern Australia, (about 528 000 ha in NT, 594 000 ha in Qld and 516 000 ha in WA).[64]

2.25 Seafarms Group (Seafarms) is proposing *Project Sea Dragon*, 'a large-scale, integrated, land-based aquaculture project in Northern Australia' producing 'world scale volumes of black tiger prawns':

> Stage 1 will consist of 1080 ha of grow-out ponds supported by a breeding centre, broodstock centre and commercial hatchery.
>
> Ultimately the project is scaled to consist of 10 000 hectares of grow-out farm supported by: a feed mill; broodstock and hatchery facilities; a power station; processing plant; and storage and export facilities.[65]

2.26 Seafarms hoped to commence construction during the 2017 dry season,[66] and expected the project to take 10 years to reach completion.[67] When fully operational, the 100 000 tonne production would be valued at $1.7 billion,[68] which represents a 20-fold increase in Australia's farmed prawn production.[69]

2.27 Seafarms predicted that at full capacity, Project Sea Dragon would employ 1600 to 1700 people 'spread across Kununurra, Legune Station, Darwin and Exmouth.' The workforce would need to be locally based because the operation is 'not well suited to a fly-in fly-out' employment arrangement.[70] The production site at Legune Station is estimated to employ 700 people and the processing plant at Kununurra would employ 600 people.[71]

64 JSCNA, Inquiry into the Development of Northern Australia: CSIRO, *Submission 108*, p. 12.
65 Seafarms, *Submission 4*, pp 5–6.
66 Dr Chris Mitchell, Seafarms, *Official Committee Hansard,* Brisbane 27 August 2015, p. 20.
67 Dr Chris Mitchell, Seafarms, *Official Committee Hansard,* Brisbane 27 August 2015, p. 17.
68 Dr Chris Mitchell, Seafarms, *Official Committee Hansard,* Brisbane 27 August 2015, p. 21.
69 Dr Chris Mitchell, Seafarms, *Official Committee Hansard,* Brisbane 27 August 2015, p. 16.
70 Dr Chris Mitchell, Seafarms, *Official Committee Hansard,* Brisbane 27 August 2015, p. 17.
71 Dr Chris Mitchell, Seafarms, *Official Committee Hansard,* Brisbane 27 August 2015, p. 19.

2.28 In Queensland, Pacific Reef Fisheries (Pacific Reef) has proposed a new prawn farm at Guthalungra, between Ayr and Bowen. It is estimated the 259 hectare site would produce between 2500 to 3000 tonnes of prawns worth approximately $50 million and employ 100 full-time and 100 casual employees. Approval for the project is yet to be granted.[72]

2.29 Further discussion about the regulations affecting the establishment of new aquaculture projects along the Great Barrier Reef seaboard is included in Chapter 3.

Redclaw Freshwater Crayfish

2.30 A five-year selective breeding project, completed in 2012, on the redclaw crayfish industry in Queensland resulted in increased growth rates of the crayfish and enabled hatchery production of stage 3 juveniles. The QCFA has since promoted the redclaw crayfish industry through a website, a published crayfish growing manual, a conference, and regular workshops. Consequently, there are four farms under construction and another 'four or six people actively getting organised to start farming' this product.[73]

2.31 As redclaw crayfish are not native to WA, new farms growing this aquaculture product in WA would have licensing constraints as barriers to market entry. In regard to redclaw crayfish farming requirements in WA, the Kimberley Training Institute commented that farms needed:

> … to be a long way away from anywhere with waterways … Redclaw have a fairly unique taxis in that when they notice that the water is flowing they will actually move into the water flow, which means that they can get out of ponds and move all over the place.[74]

Trepang

2.32 Trepang or sea cucumber (sand fish) is a saltwater bottom dwelling sea animal native to Northern Australia. Larval trepang settle in shallow water and move to deeper water as they grow and reach harvestable size.[75] When harvested the trepang is dried for 4 to 5 weeks which reduces their weight by 90 per cent. One kilogram of dry weight trepang is worth

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72 Mr John Maloney, Pacific Reef, *Official Committee Hansard,* Brisbane 27 August 2015, p. 32; Pacific Reef, *Submission 6*, p. 1.

73 Mr John Stevenson, President, QCFA, *Official Committee Hansard,* Townsville 26 August 2015, p. 28.

74 Mr Geoffrey Cooper, Portfolio Manager, Kimberley Training Institute, *Official Committee Hansard,* Broome 10 June 2015, p. 8.

75 Tasmanian Seafoods, *Submission 16*, p. 2.

about AUD $150 in the Chinese market. Japanese trepang, regarded as a superior species, is worth between AUD $1200 to $1500 per kilogram.[76]

2.33 Tasmanian Seafoods is currently trialling trepang sea ranching in the NT, with 100 000 trepang being raised in each hatchery batch and released into shallow water.[77] In October 2015, the first harvest of 200 tonnes of trepang was completed at Goulburn Island.[78] Tasmanian Seafoods is planning to expand its sea ranching project to 'the Kimberley in Western Australia including Napier Broome Bay, Vansittart Bay, the Osborne Island group and the Pilbara.'[79]

Trade in Aquaculture Products

Seafood

2.34 In 2013–14, Australians consumed 345 500 tonnes of seafood, 69 per cent of which was imported (around 65 per cent of barramundi[80] and 64 per cent of prawns[81] consumed in Australia are imported).[82]

2.35 Competition from frozen imports from Asia has, amongst other factors, seriously limited the growth of the aquaculture industry in the NT.[83] Charles Darwin University (CDU) stated that:

> We all know that when the imported prawns came in, it was just crazy. It hit Queensland. It smacked [the market] in two and cut it by 50 percent up here. [The prawn producers] held on and held on and then they realised the cost of it.[84]

2.36 Despite this view, the MPA commented that there was demand from Australia's major supermarkets for its product and that some 5000 tonnes of barramundi could be supplied to supermarkets. The MPA could also easily sell between 2000 to 3000 tonnes to the premium restaurant segment of the market.[85]

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76 Mr Chauncey Hammond, Commercial Adviser, Tasmanian Seafoods, *Official Committee Hansard,* Darwin 14 July 2015, p. 55.

77 Tasmanian Seafoods, *Submission 16*, p. 2.

78 ABC Radio National Breakfast, *First Commercial Crop of Farmed Sea Cucumber Harvested off Australia's Top End*, <http://www.abc.net.au/radionational/programs/breakfast/first-commercial-crop-of-farmed-sea-cucumber/6864864> Accessed 21 October 2015.

79 Tasmanian Seafoods, *Submission 16*, p. 3.

80 ABFA, *Submission 3*, p. 1.

81 APFA, *Submission 10*, p. 3.

82 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, pp 1, 2.

83 NTDPIF, *Submission 13*, p. 3.

84 Mr Chadd Mumme, A/g Team Leader, Horticulture and Aquaculture for Primary Industries, Charles Darwin University (CDU), *Committee Hansard,* Darwin 14 July 2015, p. 15.

85 Dr Desiree Alan, MPA, *Official Committee Hansard,* Perth 11 June 2015, p. 51.

2.37 Mainstream Aquaculture believed there was an opportunity for barramundi to rival salmon in the market and stated:

> … we think barramundi should be bigger than salmon. We consume 200 000 tonnes of premium white fish every year. We consume 20 000 tonnes of barramundi and 60 000 tonnes of salmon. Why the differential when every consumer survey suggests barramundi is Australia's most popular fish? …
>
> I think the first step is import substitution—those 13 000 tonnes that are coming in, produced locally, we can achieve that. The second step is to capture a big part of the premium white [fish] category. Why can't barramundi be 80 per cent of those 200 000 tonnes rather than 10 per cent? There is no reason that can't happen.[86]

2.38 Pacific Reef which sells about 80 per cent of its farmed prawns to a major supermarket chain stated that there is demand for Australian prawns:

> We are the main supplier to [the supermarket chain]. They want more. They are pushing us to try and put more ponds in, because they currently would like to replace the imported product on their shelves but they cannot get it within Australia.[87]

2.39 Australia's free trade agreements with its North Asian trading partners will provide opportunities for seafood exporters as 'tariffs of up to 20 per cent on seafood will be eliminated.'[88]

2.40 Seafarms observed that Australian aquaculture producers needed to be in the lowest quartile of lowest cost producers to be globally competitive. Small scale production is unlikely to be internationally cost-competitive because of relatively high labour costs, a small local Australian market, and transport logistics (particularly for Northern Australia).[89]

2.41 The Department of Agriculture (DoA) observed that on average aquaculture incurred 'a higher cost of production compared to wild-catch fisheries, largely due to higher feed costs and capital requirements.'[90]

2.42 Humpty Doo Barramundi (which used to export product to the United States of America, but stopped when the Australian dollar rose above

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86 Mr Boris Musa, Managing Director, Mainstream Aquaculture, *Official Committee Hansard,* Townsville 26 August 2015, p. 36.

87 Mr John Maloney, General Manager, Pacific Reef, *Official Committee Hansard,* Brisbane 27 August 2015, pp 32–33.

88 Ms Jane Madden, General Manager, Investment Division, Austrade, *Official Committee Hansard,* Canberra 15 September 2015, p. 9.

89 Seafarms, *Submission 4*, p. 5.

90 Department of Agriculture (DoA), *Submission 11*, p. 6.

US$0.75), observed that efficiency in the barramundi industry was growing:

> … there is a strong incentive to mechanise, automate and improve the efficiency of the industry. Long-term, there could be a turnaround in who is producing the cheapest fish.[91]

Pearls

2.43 Prior to the global financial crisis (GFC) in 2007–08, Australia's annual turnover of south sea pearls exceeded $200 million.[92] Cygnet Bay Pearls stated that:

> … the Australian industry was hit by the 'perfect storm' of insults including the GFC, high Australian dollar, rapid increase in production cost due to [a] surrounding mining and resource boom, and ultimately oyster shell health and subsequent reduced pearl crop quality from the introduction of the oyster oedema disease.[93]

2.44 The number of independent producers fell from twelve to three 'with an annual value of under $50 million and falling'.[94]

2.45 Australian producer Cygnet Bay Pearls stated that Australian south sea pearls retain one competitive advantage over imported pearls and that is 'the premium that consumers are prepared to pay for the provenance of an Australian pearl.'[95] This premium is now being affected by imported pearls grown specifically in Southeast Asia and marketed as Australian pearls. Cygnet Bay Pearls explained:

> As one of the three remaining producers in WA and cognisant of the dramatic drop in supply of Australian pearls over the past five to ten years, we are unfortunately acutely aware of the misleading sales practices that are utilised throughout the sales supply chain which result in local consumers purchasing what they believe to be a 'Broome Pearl' but are in fact not.[96]

2.46 Cygnet Bay Pearls recommended there be a mechanism 'which discourages and penalises retailers selling "low-cost" imported pearls under the guise that they are Australian' pearls. Cygnet Bay Pearls

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91 Mr Robert Richards, Managing Director, Humpty Doo Barramundi, *Official Committee Hansard,* Darwin 14 July 2015, p. 34.

92 PPA, *Submission 26*, p. 9.

93 Cygnet Bay Pearls, *Submission 27*, p. 5.

94 Cygnet Bay Pearls, *Submission 27*, p. 5.

95 Cygnet Bay Pearls, *Submission 27*, p. 8.

96 Cygnet Bay Pearls, *Submission 27*, p. 9.

suggested that the Marine Stewardship Council certification[97] of the pearling industry may also assist with this objective.[98]

Saltwater Crocodiles

2.47 In Australia, the saltwater crocodile, *Crocodylus porosus*, is listed in Appendix II of the Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES).[99] Consequently, the export of *C. porosus* products requires a CITES certificate.[100]

2.48 A report prepared for the United Nations Environment Programme World Conservation Monitoring Centre (UNEP–WCMC) using the CITES Trade Database indicates that Australia is the major exporter of *C. porosus* skins. Since 2002, Australian production of saltwater crocodiles has tripled, and in 2011 Australia exported 60 per cent of the world's trade of over 50 000 skins.[101] Australian crocodile skins are generally exported to France and Italy.[102]

2.49 Only farmed crocodiles are suitable for skin production. Hartley's Creek Crocodile Farming Company stated:

> … you could never use a poached crocodile skin because it would be so covered in scratches, marks and blemishes that you would not be able to use it … The minute it has one line or one mark on it, it is worth nothing. Wild crocodiles bite and scratch each other and damage their skins every day of the week.[103]

2.50 There is also a trade in crocodile meat. The UNEP–WCMC report stated that in 2011, Australia exported 16 tonnes of crocodile meat annually, a decrease from 28 tonnes in 2010. Japan, New Zealand, Malaysia, Hong

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97 The certification system allows certified products to be traced back to the production fishery. Marine Stewardship Council, *Traceability in the Supply Chain*, https://www.msc.org/about-us/credibility/traceability-in-the-supply-chain Accessed 26 October 2015.

98 Cygnet Bay Pearls, *Submission 27*, p. 10.

99 Appendix II includes species that, although currently not threatened with extinction, may become so without trade controls. It also includes species that resemble other listed species and need to be regulated in order to effectively control the trade in those other listed species. Exporters must obtain a CITES permit from their national CITES Management Authority for each shipment that contains CITES listed specimens.

100 U.S. Fish & Wildlife Service, *Understanding CITES – CITES Appendix II Supports Sustainable Use*, https://www.fws.gov/international/pdf/factsheet-cites-appendix-ii-2014.pdf Accessed 27 October 2015.

101 John Caldwell, *World Trade in Crocodilian Skins 2009–2011*, United Nations Environment Programme world conservation monitoring Centre, Cambridge, 2013, p. 14.

102 Mr John Lever, Owner, Koorana Crocodile Farm (Koorana), *Official Committee Hansard*, Brisbane 27 August 2015, p. 27.

103 Mrs Angela Freeman, Co-owner, Hartley's Creek Crocodile Farming Company, *Official Committee Hansard*, Cairns 24 August 2015, p. 12.

Kong and Taiwan are the main export destinations for Australian crocodile meat. The UNEP–WCMC report attributed the decline in exports to a possible increase in local consumption.[104]

2.51 Koorana Crocodile Farm (Koorana) commented that it had operated an AQIS accredited abattoir 'for years', but operating 'in the bush' had created difficulties with AQIS inspections and so it had relinquished accreditation.[105] Koorana added:

> We were selling 10 tonnes [of crocodile meat] a year to Japan. I could not ever supply 10 tonnes; I had to buy it in from other farms and market their meat for them to make up the container load. … The meat [from an] animal is worth about $100. A lot of farms just do not even want to bother with the meat. [106]

2.52 Koorana now supplies the domestic Australian market,[107] but commented that it would have an excess of meat by 2017 and 'might look at getting export accreditation again'.[108]

2.53 The UNEP–WCMC report also found that 'Australia is the world's foremost importer of crocodile teeth and between 2002 and 2010 imported over 222 000' teeth. Most crocodile teeth were from *C. porosus* captive-breeding operations in Malaysia, Papua New Guinea (PNG) and Singapore. In 2011, over 35 000 teeth ('almost 12 tonnes') were exported from PNG to Australia.[109]

Potential New Aquaculture Products for Northern Australia

Finfish

2.54 Several northern species of finfish have been identified as having the potential for aquaculture, including: silver cobbler (a catfish), some cod species, gold band snapper and the sooty grunter.[110] A further species—the threadfin salmon—was recommended by the Kimberley Training Institute:

> … threadfin salmon would be a fantastic species for aquaculture. They have many attributes which are similar to barramundi: they are fast growing, they are hermaphrodites and, from what we can

104 John Caldwell, *World Trade in Crocodilian Skins 2009–2011*, p. 25.

105 Mr John Lever, Koorana, *Official Committee Hansard,* Brisbane 27 August 2015, p. 26.

106 Mr John Lever, Koorana, *Official Committee Hansard,* Brisbane 27 August 2015, p. 28.

107 Mr John Lever, Koorana, *Official Committee Hansard,* Brisbane 27 August 2015, p. 26.

108 Mr John Lever, Koorana, *Official Committee Hansard,* Brisbane 27 August 2015, p. 28.

109 John Caldwell, *World Trade in Crocodilian Skins 2009–2011*, p. 27.

110 Mr Chris Mitchell, Councillor, Shire of Broome, *Official Committee Hansard,* Broome 9 June 2015, p. 6; Mr Kenneth Robinson, *Official Committee Hansard,* Darwin 14 July 2015, p. 63.

> tell, they have good feed conversion rates. … And they taste fantastic. I would take threadfin salmon over barra any day …[111]

2.55 The NTDPIF observed that the coral reef habitat of Northern Australia was largely unexplored and unexploited and offered 'unique, new, high-value species for the ornamental aquarium trade.' The aquarium sector believed there was little scope to grow the industry through wild-caught product and was 'keen to explore opportunities to farm ornamental species.' The NTDPIF added that:

> … the Aquaculture Unit is establishing an R&D partnership with industry to assess production methods and national and international market potential for a range of potentially high-value ornamental marine species.[112]

Turtles

2.56 Wildlife Management International suggested that hawksbill turtles could be farmed in Northern Australia and stated:

> Sea turtles, contrary to popular belief, are at carrying capacity. You cannot put any more in the ocean here. Every time there is a cyclone and seagrass beds get disturbed the turtles all starve to death. … Their [reproduction strategy] is masses of eggs and very low survival.[113]

2.57 Wildlife Management International drew attention to the demand for the shell plates of hawksbill turtles from the bekko artisan industry in Japan.[114]

Cherabin Freshwater Prawn

2.58 Mr Kenneth Robinson advocated the aquaculture of the Australian giant freshwater prawn, *Macrobrachium spinepes,* known as cherabin. A closely related species 'is widely farmed throughout the Asian and South East Asia area and the South Pacific, [and] there is about 200 000 tonnes sold annually.'[115] The species needs brackish water for larval development but can then be grown out in freshwater ponds. Formulated feeds containing 'relatively low animal/plant protein content (20 to 25 per cent)' can be used. Stocking density, however, 'needs to be much lower (5 to 10 per

111 Mr Jeffrey Cooper, KTI, *Official Committee Hansard,* Broome 9 June 2015, p. 27.

112 NTDPIF, *Submission 13*, p. 6.

113 Professor Grahame Webb, Director, Wildlife Management International, *Official Committee Hansard,* Darwin 14 July 2015, p. 42.

114 Professor Grahame Webb, Wildlife Management International, *Official Committee Hansard,* Darwin 14 July 2015, p. 42.

115 Mr Kenneth Robinson, *Submission 19*, p. 1.

square metre) than marine penaeid prawns … because of male aggression and cannibalism'.[116]

2.59 The UN FAO Fisheries and Aquaculture Department found that:

> The development of freshwater prawn farming was inhibited in the past by its longer hatchery phase and lower grow-out productivity compared to marine shrimp. These constraints are now balanced by a number of positive factors concerning its sustainability …
>
> The culture of *Macrobrachium* spp. is less likely to have a detrimental impact because freshwater prawns cannot be reared at densities as high as those commonly used in marine shrimp farming. … and (unlike the inland culture of marine shrimp) the grow-out of *Macrobrachium* does not make agricultural land saline.[117]

Clams, Oysters, and Sea Snails

2.60 Cygnet Bay Pearls advised that a desk top survey conducted in the early 2000s identified two issues holding back the development of Kimberley rock oysters:

> … the investment in infrastructure to support it, such as the pearling infrastructure that now lies dormant all over the coast; and the access to market.[118]

2.61 Cygnet Bay Pearls stated that the Kimberley Marine Research Project (KMRP) had support from local traditional owners to undertake a feasibility study to develop an edible rock oyster industry in the Kimberley. The feasibility study 'could lead to commercialisation within three to five years.'[119]

2.62 The Reef and Rainforest Research Centre (RRRC) stated that clam aquaculture in the 1980s could not compete with the wild harvest of clams. The capacity to harvest wild clams however is 'hugely diminished', so commercial clam aquaculture is now potentially viable.[120]

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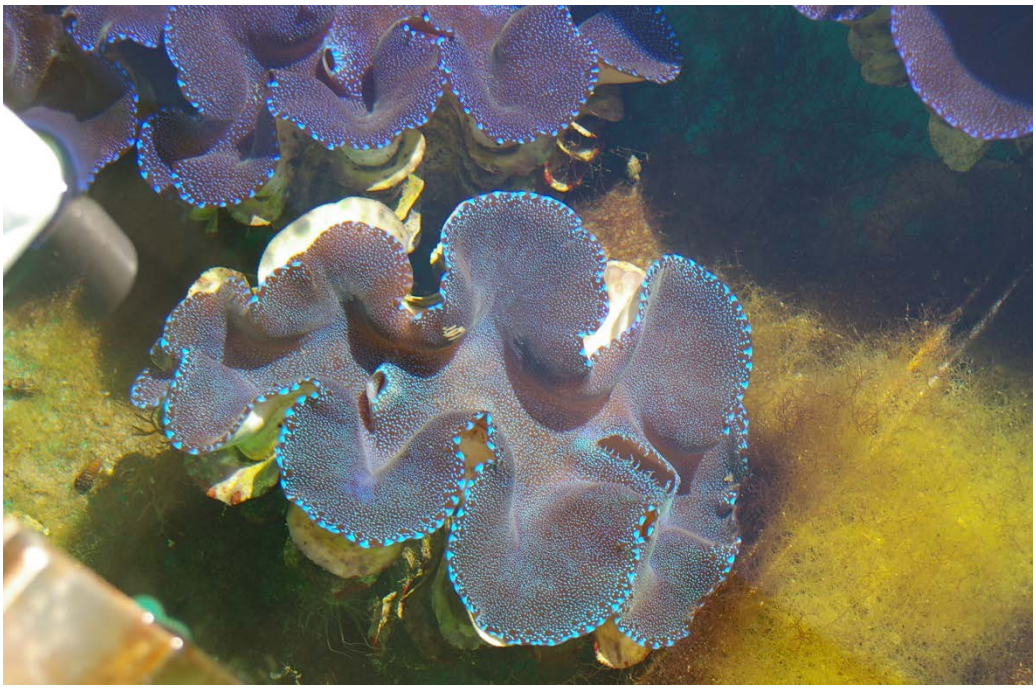
116 Mr Kenneth Robinson, *Submission 19.1*, p. 1.

117 UN FAO Fisheries and Agriculture Department, *Cultured Aquatic Species Information Programme Macrobrachium rosenbergii (De Man, 1879)* http://www.fao.org/fishery/culturedspecies/Macrobrachium_rosenbergii/en Accessed 30 October 2015.

118 Mr James Brown, Cygnet Bay Pearls, *Official Committee Hansard,* Broome 9 June 2015, p. 12.

119 Cygnet Bay Pearls, *Submission 27*, p. 14.

120 Ms Sheridan Morris, Managing Director, Reef and Rainforest Research Centre (RRRC), *Official Committee Hansard,* Cairns 24 August 2015, p. 6.



A giant clam being cultured at the Darwin Aquaculture Centre

2.63 The NTDPIF stated it was currently investigating the markets for black lip tropical rock oyster and the fluted giant clam through 'various market analysis and product specification activities.'[121] A broader analysis of the potential for black lip tropical rock oyster in the national seafood market was planned as a result.[122]

2.64 The RRRC commented that the aquaculture of depleted species such as triton shell (a species of sea snail) could replenish depleted stocks and contribute to the management strategy for pest species such as the crown of thorns starfish, which is a major threat to the health of coral in the Great Barrier Reef.[123] The Kimberley Aquaculture Aboriginal Corporation commented that a reseeding project for trochus shell (a species of sea snail) had been successful in the past.[124]

Sponges

2.65 The RRRC noted that there had been 'some research around some of the [sea] sponges' and one species had 'significant potential':

> … the live sponge or real sponge industry has basically collapsed around the world. It was mostly in the Mediterranean and through

121 NTDPIF, *Submission 13*, p. 6.

122 NTDPIF, *Submission 13*, pp 6–7.

123 Ms Sheridan Morris, RRRC, *Official Committee Hansard,* Cairns 24 August 2015, p. 6.

124 Mr Charles Prouse, Kimberley Aquaculture Aboriginal Corporation, *Official Committee Hansard,* Broome 9 June 2015, p. 21.

> Florida and those areas. We have a collagen-based sponge in the Torres Strait, of very good quality.[125]

Algae

2.66 The Western Australian Department of Fisheries (WADF) drew attention to a June 2012 *Pilbara Algae Industry Study* report which identified 'several areas in which future investment in the algae industry could be fostered.'[126] The report found that:

- the 'open pond system is the preferred practical method for large-scale algal production';
- for the use of algae in biofuel production: 'the establishment of commercially viable operating facilities is still a considerable way off';
- for health foods and pharmaceuticals: 'the current scale of the markets for algae-based products is relatively small, and … there already exists commercially viable operating facilities producing algae-based health food products'; and
- for feedstock products: algal feedstock products are seen as 'an end use for the large accumulation of spent algae.'[127]

2.67 The WADF advised that a private company proposed establishing an algae aquaculture industry in the Pilbara, but later withdrew its proposal. Another company, however, has recently applied for a new aquaculture licence to grow algae 'using the facilities developed by the initial organisation.'[128]

2.68 In Queensland a collaboration between MBD Energy and James Cook University:

> … has invested more than $40 million of private equity and $30 million of government grants/rebates over [the] last five years to create a strong commercial business in:
>
> - the provision of biological-based remediation of industrial waste systems, and
> - the high-yield production of valuable algae-based by-products.[129]

125 Ms Sheridan Morris, RRRC, *Official Committee Hansard,* Cairns 24 August 2015, p. 6.

126 Western Australian Department of Fisheries (WADF), *Submission 23*, p. 2.

127 WorleyParsons, *Pilbara Algae Industry Study,* June 2012, pp 5, 7.

128 Western Australian Department of Fisheries (WADF), *Submission 23*, p. 2.

129 James Cook University, *Submission 14, Attachment A*, p. 3.

Environmental Impacts and Sustainability

2.69 Pew Charitable Trusts (Pew) and the Amateur Fishermen's Association of the NT (AFANT) raised specific concerns about the potential environmental impact of aquaculture. Both organisations were supportive of aquaculture in principle, Pew describing aquaculture as potentially a 'low-impact and positive industry' but with the need to manage potential risks to the environment.[130]

2.70 Pew raised the following potential environmental impacts of aquaculture that should to be managed or avoided:

- the potential transfer of pests and diseases from aquaculture operations to wild fish stocks;
- local or regional pollution from nutrient run-off;
- genetic contamination of wild fish populations through fish escapes; and
- removal of native vegetation such as mangroves.[131]

Concluding Comment

Global Aquaculture

2.71 There is an increasing global demand for seafood as a source of high quality protein. Globally, countries are turning towards aquaculture to meet seafood protein demand as reliance on wild-caught fisheries cannot meet this demand. In Australia aquaculture production is increasing as seafood demand increases. Most seafood that Australians consume is imported and this provides local producers with a significant opportunity and challenge to increase market share through import replacement.

Production in Northern Australia

2.72 Northern Australia has a natural advantage of a long coastline, pristine waters, availability of suitable land, and proximity to Asia, where there is significant demand for seafood. In addition there are also a number of tropical species found in Northern Australia which are highly suited for use in aquaculture.

2.73 Aquaculture production in the Northern Australian jurisdictions is small compared to the rest of Australia. Table 2.1 which details aquaculture production figures for each jurisdiction in 2013–14 shows that the total

130 Mr Tim Nichol, Kimberley Manager, Pew Charitable Trusts (Pew), *Official Committee Hansard*, Perth, 11 June 2015, p. 26.

131 Pew, *Submission 24*, p. 3.

value of aquaculture in Western Australia, the Northern Territory and Queensland was $177 million. This was significantly less than the production of salmonids in Tasmania in the same period, which was valued at $531 million.[132]

2.74 The Committee is concerned by the rapid decline in the value of the south sea pearl industry. In recent times the Australian pearl industry has encountered challenging market conditions caused by increased competition from readily available, low-cost overseas sources, coupled with a decline in demand for luxury goods such as pearls, in the wake of the Global Financial Crisis. In addition to this many producers have suffered widespread damage to their stock due to the spread of oyster oedema disease. To address this, the Committee has recommended the establishment of an Australian Pearling Industry Recovery Taskforce. Additional comments in this vein are included in Chapter 4.

Aquaculture Production Growth

2.75 The Committee welcomes the expansion of barramundi farming in WA and the NT and the proposed Project Sea Dragon prawn farm in the NT. When it reaches full capacity, the Project Sea Dragon is predicted to annually produce 100 000 tonnes of prawns and generate $800 million in export revenue.[133] While the project is set to become a major industry in Northern Australia,[134] annual prawn production in Australia would still be significantly less than annual production in Vietnam (500 000 tonnes) and China (1.2 million tonnes).[135]

Trade in Aquaculture Products

2.76 Aquaculture products have a high cost of production and unless they are of a high value they will have difficulty in competing in the international marketplace. Project Sea Dragon aspires to achieve the efficiencies and economies of scale which will enable it to enter the export market. Increased production by other aquaculture ventures to meet local demand and improved production efficiency may see more companies becoming internationally competitive and seek to export their product.

2.77 The Committee believes that when this occurs there will be significant opportunities provided by Australia's recent FTAs with its North Asia trading partners which have seen the reduction of seafood tariffs.

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132 ABARES, *Australian Fisheries and Aquaculture Statistics 2014*, December 2015, p. 88.

133 Seafarms, *Submission 4*, p. 6.

134 In comparison, although prices for cattle have risen significantly, live cattle exports from Northern Australia in 2009–10 generated $416.7 million: see Northern Australia Ministerial Forum, *Strategic Directions for the Northern Australia Beef Industry*, November 2012, p. 2.

135 Seafarms, *Submission 4*, p. 3.

Recommendations

Recommendation 1

2.78 **The Committee recommends the establishment of an Australian Pearling Industry Recovery Taskforce to fund a research program focussed on identifying the causative agent of the oyster oedema disease and possible remedial actions to reduce the incidence, and mitigate the impacts of the disease.**