Finfish aquaculture in Western Australia

David Berry

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Aquaculture began in Western Australia at the Pemberton Hatchery in the 1930s with the cultivation of trout to stock rivers and streams for recreational purposes.

And while commercial aquaculture was underway by the 1950s, it was cultured pearls based at Broome, not finfish, which got the ball rolling. Today, pearls are worth $150 to 200 million a year with trout production almost static at $335,000. The combined value of farmed crustacea and molluscs – yabbies ($1.6 million), marron ($450,000) and mussels ($950,000) – easily surpass farmed finfish.

Although finfish aquaculture is not up to the speed of other forms of aquaculture, the momentum is growing with a wide range of species, ranging from the north-west’s barramundi to black bream and silver perch in the south. A new breed of pioneer has emerged – men and women prepared to take the bold step of investing heavily with time and money in a largely unproven concept.

Fueling their interest is continuing strong and rising consumer demand for fish and the fact that the world’s wild fish stocks are close to the limits of sustainable harvesting. Australians wide, finfish comprise more than a third of aquaculture production.

**Marine aquaculture**
The 12,000 kilometre sweep of relatively unpolluted coastline, covering a variety of climatic types, is a great positive for marine fish farming (mariculture).

But there are negatives, one of the largest being the low natural nutrient levels of coastal waters. The dominant southbound Leeuwin Current is nutrient-poor, as are the few major rivers which drain to the ocean from a largely semi-desert inland. The small local market, transport difficulties, and a largely unprotected coastline vulnerable to regular storms and cyclones have also discouraged mariculture investment.

Strong and stable ocean cages for growing fish, such as those common on the coastline of Scotland, can cost a quarter of a million dollars each.

The Fisheries Department of Western Australia’s Aquaculture Program manager, Greg Paust, oversees the development of the industry. He is enthusiastic for the potential of finfish, but concedes that “It is early days yet”. Greg acknowledges the considerable research effort underway on many fronts and that there is much to be learned.

“The jury is still out for the inland south-west. There is a lot of interest in black bream and silver perch. Also in southern areas dhufish has high potential, while in the north barramundi farming is being developed. We are very enthusiastic for the potential of the Gascoyne and Ord River districts,” Greg said.

**Trout and pay fishing**
There are seven licensed trout farms in the State, mainly in the Pemberton and Manjimup areas, producing 50 tonnes per year for a gross return of $335,000.
night rentals at $60. Paying to fish private waters, whilst uncommon in Australia, is very common in Europe.

The dam, built originally for irrigation, is up to 10 metres deep and faces east into the prevailing south-east winds, providing plenty of cool water for the trout during the summer.

The McCarthys’ experience will no doubt excite others but be warned, trout are fickle. For example, not all dams are suitable. The best sites are surrounded by pasture with plenty of nutrient-rich run-off. Dams close to native bushland are low in nutrient run-off.

The McCarthys buy trout in twice a year as “stockies” (about 20 centimetres long) from a commercial breeder. They used to buy fingerlings but found the losses too high. “If 10 per cent survived from a batch of 6000 to 10,000 we were surprised,” said Judy. The likely culprits were the big fish and the shags (cormorants), the latter pointing up the need to avoid shallow or transparently clear water. Trout don’t like muddy water either – they like to see what they eat.

“Our biggest worry is summer thunderstorms. The manure washes in and takes up all the oxygen. Ten years ago we lost the lot and had to wait two years for the water to change back,” Judy said.

TAFE and aquaculture
Western Australia’s Technical and Further Education (TAFE) system is in the vanguard of aquaculture development in Western Australia.

Fremantle TAFE has established one of the largest hatchery facilities in Australia. It is pursuing a two-pronged strategy of providing technical training in marine aquaculture and industry development through applied research projects, including seacage culture.

TAFE is also active with fish food research – critical to the industry because food determines growth rates and is the largest on-going cost of farm operations. A lot of effort is being put into the potential of Western Australian lupins.

The supply of prepared feeds for aquaculture is an exciting industry prospect in itself. For example, by the year 2005, the rapidly expanding prawn industry is expected to need 24,000 tonnes of feed costing over $35 million. World-wide, scientists are working overtime to find a replacement for fishmeal, which is expensive and uses millions of tonnes of wild fish annually.

Barramundi and Broome TAFE
Perhaps Broome TAFE’s greatest contribution so far to finish aquaculture has been its help with the development of barramundi farming.

The fish is highly prized and fetches top prices, but until recently remained an enigma. Its breeding secrets were locked away in the inland billabongs and
Broodstock tanks, TAFE, Fremantle.

ocean reefs which are its home. Barra is an estuarine species, which lives in fresh and salt water. In 1995-96, Broome's College of TAFE unravelled the puzzle and produced the State's first hatchery-bred barramundi.

The breeding project, which gets a lot of support from the Fisheries Department, is a joint venture between TAFE and Lake Argyle Fisheries which has harvested silver cobbler from Lake Argyle for some time and now also grows barramundi.

Today Lake Argyle Fisheries grows its stock from day-old larvae supplied from Northern Territory Government hatcheries in Darwin. Almost 200,000 larvae had been bought to the end of April 1997 and installed in the company's nursery. And while it sounds a lot, the survival rate by the time they are transferred to the pens in the lake is just 20 per cent.

All the fish are fed on special pelleted feed imported from Queensland.

Lake Argyle Fisheries supplies Melbourne and Perth wholesalers with fresh and live barramundi which are on-sold to niche markets as true, high quality, home grown barramundi. There is still competition from a string of barramundi farms which now operate across northern Australia.

A founding partner in the company, Neville Stewart, says their speciality used to be plate-sized barra of 500 to 600 grams; however, the emphasis is now swinging to bigger 3 to 4 kilogram fish, which they sell for $12 per kilogram.

But domestic sales is not where the future lies. According to Neville, "The future is exports".

Asia currently supplies Australia with a lot of sea bass which wholesales for $4 to $5 a kilo and is retailed as barramundi. At first glance the notion that Argyle can compete on price seems crazy, but ....

Neville says the sea bass is being "off-loaded" from some countries in Asia because "...they have water pollution problems and few health checks". He sees this as a clear signal of a great market opportunity. "Our fish, from pristine Western Australian waters, is just what they want over there, and they'll pay for it."

Lake Argyle Fisheries production is set to take off. After six years, production is just 10 to 20 tonnes but is forecast to climb to 1000 tonnes within two to three years.

It is not an industry to get into without doing your homework. Nevile says, "There's a huge future in it but it keeps you poor."

That barramundi is something less than beer and skittles was confirmed by the aquaculture development plan published by the Kimberley Development Commission in October 1996. It assessed barramundi as having only "average economic potential" in farm situations, with free-range ponds offering the best prospects. The outlook could improve if economies of scale were introduced, according to the report.

Barra and bream in the Gascoyne

Other regions are also looking at the prized barra. A study by the Gascoyne Development Commission in November 1996 assessed the outlook for large-scale
farming as poor, unless production costs can be decreased.

One possible way to raise the economic feasibility of barramundi farming is to control it more carefully, by taking it out of cages in the natural environment and placing it into fully managed ponds.

Aquaculture Project Officer with the Fisheries Department of Western Australia, Dr Jasper Trendall, is assessing the use of readily available bore water in pastoral areas, particularly in the Gascoyne, for just such a purpose.

Both barramundi and black bream are candidate species for the concept.

"Black bream certainly stands out as a candidate for a major finfish species for farming in Western Australia, but there still remains a lot of work to be done to prove it," Dr Trendall says. Growth rates, feed conversion rates, water quality, survival, costs and returns per kilogram, are all unanswered questions, he says.

"There are big pluses, however. Black bream has high tolerance of a range of water types, and it is a native species. Plus, there is a lot of enthusiasm and energy already for farming them."

Trendall sees the species having potential for diversification of farmers' incomes, as happened in the USA with the similarly versatile catfish. "Catfish farming has become important in the economies of Alabama, Louisiana and other southern states."

The hardy black bream is already being grown successfully in farm dams from Geraldton to Esperance, which is the spread of their natural environment. "It grows in waters from fresh to saltier than seawater," according to Fisheries Department's Greg Paust.

**Bream hatchery processes**

A group of about 80 enthusiasts based at Mt Barker, known as SWIFA, are keen to see black bream farming grow.

Fremantle TAFE, in conjunction with SWIFA, has begun testing hatchery processes. A company called Fremantle Ocean Farmers buys fingerlings from TAFE and on-sells them to a restricted number of licensed farmers. By the end of this year it is expected that between half a million and one million black bream fingerlings will have found their way to Western Australian farm dams.

Greg Paust acknowledges that "...they are ideal for marketing because of year round production – in summer from salty water and in winter from fresh water". The Fisheries Department, in conjunction with Fremantle TAFE and Murdoch University, is seeking funding for further research on black bream aquaculture.

**Bore water projects**

Investigating the use of bore water for aquaculture development is a joint project involving the Fisheries Department, Agriculture Western Australia and the Gascoyne Development Commission.

"The perception in Western Australia is that we have a large coastline but it is often the case that 'the coast is sacred', says Trendall. This potential for conflicting uses offshore prompted him to look to the inland. The Gascoyne that for most of the year looks dry and
desolate, in fact has ‘massive’ water resources – underground!

"Bore water has minimal conflicts. It is on private land and provides a controlled environment. With farm dams or ponds it doesn’t matter if a cyclone comes through."

The Gascoyne Development Commission and the Fisheries Department prepared a desktop study last year of the suitability of the Gascoyne’s bore water for barramundi. Barra was chosen instead of black bream because of the abundant information available on the species. They both grow in fresh or salt water.

The study found the use of bore water "...looks sufficiently good" to move to a pilot production trial now in planning.

"The nice thing is that the Gascoyne water is warm artesian water. The temperature gives consistent optimal growth rates over 12 months."

"Plus, interest levels amongst pastoralists are high because they are already keenly looking for options for income diversification." The region also presents "...good freight rates", as the Gascoyne straddles the very busy freight lines between Perth and the north-west.

Trendall agrees with most industry observers that aquaculture’s future is in exports. "Overseas markets can support large scale production, while Australia is too small," he said.

**Nanga Station’s experience**

The Shark Bay area already has five years experience with rearing fish in bore water. The Sears family at Nanga Station has an aquaculture license and is successfully growing aquarium fish (goldfish and rainbows) on a limited scale in homestead dams.

Maureen Sears says they would like to try barramundi, but access to fingerlings is restricted by Government, pending the outcome of regional studies.

"The bore water is not all that salty, but it's warm and free flowing, with plenty of aeration," she said. "We don’t see barramundi as the way to make a fortune, it’s more for diversification."

**Silver perch**

Another species which has whipped up a head of enthusiasm is the fresh water silver perch. It is a native to Australia and was introduced to Western Australia from New South Wales in 1950 under license, to stock rural inland farm dams.

Of concern is the perceived risk the silver perch might pose if it invaded wild rivers and streams. Imports so far into the State have been subject to strict disease free certifications and confinement to impounded waters.

Total production of silver perch in New South Wales and Queensland is about 175 tonnes, about half of which sells to restaurants for between $12 and $15 a kilo. Little wonder the species has a strong following from prospective Western Australian fish farmers.

But exports remain largely untested and the discussion paper put the ceiling for sales to Western Australian restaurants at just two tonnes per week. "Export potential for silver perch has been identified in a number of countries but the fish is essentially unknown and untried overseas...liable estimates of demand cannot be obtained."

The paper remarks that "...for an aquaculture industry to be successful it must be based on species that possess both production potential and a high degree of marketability."

A major plus for the silver perch is its ability to fit into a self contained ecosystem, requiring low feed cost inputs. Stocked at low densities in farm dams it can feed on naturally occurring zooplankton, aquatic insects, freshwater crayfish and algae, and artificial feeding may not be required.

Glen Whisson is the president of the Silver Perch Association of Western Australia which embraces about 15 prospective farmers, aquaculture consultants and researchers.

Glen has one of the few commercial licenses in the State and spends most of his time deep in a PhD study at Curtin University looking at the feasibility of silver perch and marron being farmed simultaneously. The Silver Perch Association was recently awarded a $10,000 grant from the State Aquaculture Development Fund to look at the commercial feasibility of perch-marron polyculture.

"Translocation fears are not the real issue," says Whisson. "The bottom line is that the risk is extremely minimal. Silver perch’s reproductive biology does not
make it a prospect for wild establishment as we have seen with the European carp in the Murray River."

He says the required environmental cues for successful wild breeding of silver perch do not occur in this State. We do not have river volumes swelling from tropical inflows from as far north as Queensland nor the spreading out of the water over hot river banks which creates the warm shallow environment, ideal for laying eggs.

After extensive work, the Fisheries Department will soon release its policy for controlling translocation and farming of silver perch. "We’re happy with the policy," says Whisson although he says members would have liked it a lot earlier.

The Silver Perch Association made good use of the delay by test marketing its product in Perth. Late in 1996 it ran a three month study of live marketing to city restaurants, including taste tests and the display of live fish in aquariums.

"Farmers received $15 per kilogram for fish delivered to the restaurants who clearly liked the product," he said. "We’re confident a market of 50 tonnes is there." This would seem to provide considerable scope for medium-term growth.

He says there is huge interest in the species, mostly from farmers keen to stock dams, thereby diversifying, and from marron farmers who are trying to maximise profits by running silver perch with their marron.

Glamorous tuna

Tuna is the glamour finfish species for mariculture. But while South Australia has cemented itself into the lucrative Japanese market for southern bluefin tuna, interest in Western Australia centres on its cousin, the yellowfin tuna. The concept is the same – fish are caught in the wild, herded to large cages and fattened for a value-added sale.

One development license has been issued so far for yellow fin to Shark Bay Tuna, owned by a group of Geraldton fishermen. The project is in its first year. The signs are good and the company’s enthusiasm is high, said Greg Paust of the Fisheries Department.

**Jurien commercial fish operation**

Recently rated in the media as ‘Australia’s largest commercial fish operation’, the claim belies the cautious attitude of the principals of Jurien Fish Farmers Pty Ltd who, over the past five years, have paid out much more than they have received from fish sales.

The project has an ambitious target of 5000 tonnes of finfish a year, from a proposed investment of about $10 million. Already well over $2 million has been spent.

The farm is a cooperative venture, run by a group of enterprising ex-farmers, including sheep farmers Merv (chairman) and Wayne Collison (director). The project has the backing of the Wheatbelt Development Commission.

Merv Collison says "...the project began with 17 people all of whom had stars in their eyes. Now there are eight."

"The intention was to emerge as individual fish farmers, but we realised that replicating expensive land-based infrastructure, including a $600,000 land based hatchery, growing cages and so on meant that economies of scale would emerge with a more cooperative approach, and that’s what we have now," he said.

The project keeps a stock of breeding fish (mostly black bream, but also snapper) in offshore pens. They’re brought to the on-shore hatchery for breeding purposes, as required.

The first transfer of a commercial batch of half a million black bream fingerlings to the huge offshore pens was completed in April 1997. They are expected to be a marketable size by late 1998.

The company believes black bream and snapper have ready markets in Asia, as well as Australia.

Merv Collison says there is a long way to go before successful operations and financial viability are assured. "With this first batch we are still to test a wide range of variables, including nutritional requirements."

Preliminary trials indicate that good food conversion ratios can be obtained by using locally produced cereal grains for part of the formulated feeds. Together with the University of Western Australia, further baseline monitoring of physical, environmental and ecological impacts is underway to ensure no deleterious effects.

Collison laments the ventures which sprang up in the south-west in the 1980s which he says were aimed at a quick dollar but poorly researched. "They put Western Australian aquaculture back 10 years."

When asked for his advice to newcomers, the first reaction from this fish farmer of five years experience was a modest “I’m not in a position to give it”. When pushed, Collison elaborated to say, "Try a few fish first, become familiar with what you are doing, and be prepared to grow slowly”.

That is good advice for anyone considering aquaculture.

For further information contact Greg Paust at Fisheries Department, (08) 9482 7333.