

Golden Perch Research at The Freshwater Fisheries and Aquaculture Centre, Walkamin .

Brett Herbert

Queensland Department of Primary Industries and Fisheries

Freshwater Fisheries & Aquaculture Centre

Walkamin , Australia

As part of the New Initiatives program in aquaculture, DPI & F Queenslandd has been investigating potential for aquaculture of native freshwater fish. This has concentrated on Murray -Darling strain golden perch (*Macquaria ambigua ambigua*).

There have been five main areas of research:

- Aquaculture potential
- Market
- Strains
- Diseases
- Pond production

Potential for Aquaculture

Golden perch are considered by many to be Australia 's prime freshwater table fish, and they have long been considered for aquaculture. Finding a suitable food for them in captivity has been problematic. They take fresh foods well (eg yabbies, meat, worms) but there have been problems maintaining them on pellet foods in pond grow out situations. Weaning juvenile golden perch onto artificial diets has been one barrier to development of golden perch aquaculture.

Golden perch growth rates in the wild indicate they could reach market size in under two years, as they reach up to 700g in two years. The high demand for golden perch for recreational fishing ensures good supplies of cheap fingerlings , which are produced by commercial hatcheries.

In short, golden perch meet the requirements of availability of seed stock, ready market and high price.

Market

Market in a niche market at present. The primary buyers are of Chinese origin who like eating fresh water fish, and also prefer moist flesh. The yellow colour of the fish is very important in this market, as the standard was the wild caught fish from the

rivers of New South Wales . The preferred size about 600-800 g, as determined by interviews and market studies of golden perch buyers. However, they will buy anything between 400 -1400g.

Aquaculture product will in the foreseeable future compete against wild caught gilled and gutted fish. Aquaculture golden perch received slight premium on wild caught when gill & gut taken into account, but this varied slightly. Market prices were also dependent on when fish were sold-if there were problems on the market floor or of aquaculture fish were put on sale late in the morning poor prices resulted. Additionally, Sydney fish market prices are somewhat determined by availability of all fish, so if supplies are huge then prices drop. Since SARS , fish prices have been generally low.

Market would prefer cleaned fish, we were unable to do this because we were not licensed to do so. Any operation would have to consider the cost of doing this. Fish of the lighter colour preferred by the market were produced in turbid water. The market has historically reached up to 1000t/year (Sydney/Melbourne), although recently 400T is about the average. This is based on assuming that an equal quantity of fish is sold outside of the Sydney fish market in Sydney , and that the Melbourne market is equal to the Sydney market.

As colour is important we tried 'bleaching' fish by keeping them in turbid water, using kaolin clay. This worked well, but when fish were held iced for three days (the length of time it takes to get from Tropical North Queensland to the Sydney markets) they darkened. We did find that killing them in a pale coloured chill bin appeared to retain the lighter colour and fish processed in this way appeared similar to wild caught product on the market floor.

Purging

Purging of golden perch in clean water resulted in significant weight loss (10%) over one week. We purged based on Queensland industry standards initially, then reduced the time. However, after extensive taste testing we tried pond purging. In pond purging (no feeding for four days) prior to harvest works well. No muddy flavours were detected in fish-all ponds were always sampled before harvest. The Queensland Aquaculture Association ran some tests and found that women are far more likely to detect off flavours . We found that wives and mothers-in-law were particularly good at tasting the fish-so much so that supply had to be limited.

Strains

There are three distinct strains of golden perch in Australia . The most commonly grown and sold are Murray-Darling strain, because impoundments for recreational fishing are mainly in this catchment stocking guidelines permit stocking of this strain in areas outside their natural distribution in Queensland. The Fitzroy subspecies (Central Queensland) is darker than the Murray-Darling strain. The Lake Eyre basin species is longer and thinner, and is generally more silver than the Murray-Darling strain.

The Fitzroy golden perch are produced to order by Queensland hatcheries. They appear to grow more evenly than Murray-Darling fish, but their darker colour is a serious issue that would need to be addressed.

Lake Eyre basin golden perch look like a silvery marine perch, some look almost like jewfish due to their larger head. The market does see them from time to time, as there is a capture fishery in South Australia after floods bring them in from Queensland . However, the capture methods can be rough, consisting of chain mesh dragged through waterholes between two tractors. There have been some difficulties in breeding to date preventing experimental grow out. Recently one fish hatchery in Queensland produced substantial quantities and found them easier to wean and with excellent growth in the very early stages. However, there were substantial losses with handling and grading which would need to be addressed.

Disease

Golden perch suffer from the usual aquaculture fish diseases, particularly as fry and fingerlings. As larger fish they are very tough, handling poor water quality (pH > 10, ammonia > 3mg /L). We do not recommend these conditions, as they will restrict growth. However, the fish can handle them for short periods with apparent ill effect.

However, they can suffer from bacterial septicaemia , skin infections and are particularly vulnerable to *Tetrahymanea corlissi* .

Use of probiotics eliminated problems with bacteria, but did not stop *Tetrahymanea* .

Tetrahymanea caused major losses of both Fitzroy and Murray-Darling fish. We believe that this was because the fish were naïve to the *Tetrahymanea* in our area, which may have been brought in by guppies in the channel water. All commonly used chemotherapeutants were used without any effect-even 1000 mg/L of potassium permanganate and 250 mg/L of formalin with 10‰ salt had no effect on the animals. We have problems a second year when using probiotics and found that bacterial septicaemia associated with the previous year's infection was absent. In the second year the infections were found to be primary, that is the parasites initiated lesions in the fish skin. Eventually we decided to try systemic treatment (works from within the tissues) and it was extremely effective. However, it is not registered for use in Australia and no fish treated were sold.

Further Research Needs

Triploidy -producing sterile fish which may have better growth or dress out characteristics is well worth investigating.

Selective breeding also promises rapid gains in improvement of growth rates.

Nutrition-40% protein is sufficient, but diets more specific to golden perch require development is best growth is to be obtained.

Manipulating pond conditions to produce turbid water, which is already present in many inland areas.

Assessment of temperature effects on growth and dress out characteristics.

There are also considerable opportunities for development of a freshwater aquaculture industry in land areas using the thousands of off river water storages in irrigation areas in Queensland and New south Wales . The development of systems for this has proceeded, with a private company in Queensland developing an floating raceway system for use in storages which minimises problems associated with cages. DPI&F has assisted in testing of these systems and developing a whole of farm approach for management.

Production of golden perch in pond systems.

Several areas needed to be looked at. We investigated the systems in place both overseas and in Australia , and, after some initial trials, decided to follow the methods developed here in New South Wales by Stuart Rowland and his team at Grafton for silver perch.

We split the research into three distinct areas:

Weaning

Nursery

Grow out.

Weaning.

Weaning is a process where fingerlings are transferred from a plankton diet to an artificial diet. It fits in with current fingerling production methods, where fingerlings may be shifted from one pond to another half way through the cycle to maintain growth rates once one pond has been eaten out of plankton.

The method we use takes about 3-4 weeks. Initially, we feed the fingerlings frozen plankton, at the same place in the tank, after turning off aeration and water inflow. The fingerlings become habituated to this in a couple of days. We generally feed them frozen plankton for a week or so to allow recovery from purging and transport. During this time we also treat them with formalin and salt baths to reduce parasite loads and as a quarantine treatment.

Plankton is sieved (250 m m-1mm), concentrated into a sludge , then frozen in ice blocks. The volume of plankton needed is determined by observation. The ratio of plankton sludge to crumble diet is reduced by 10% each day. Plankton ice blocks are replaced by mix each day until they are 100% crumble. Once the plankton-crumble blend is finished, the crumble is spread over the water surface above the basket.

Fish which do not wean successfully die off after 10-20 days. Weaning success is usually 90-95%, although this can be variable depending on the batch of fish. Small fish (0.15g, 19mm) wean as well as larger fish (0.5g, 32mm), but grow quicker during the weaning period.

Weaning is best done in dim light conditions, although fish will wean in bright light, but are stressed. We have weaned up to 4000 fingerlings in a 2t tank. Up to 50000 fingerlings have been weaned in a raceway (5m³).

Nursery

To start with, we introduced the weaned fingerlings into cages near shelter in the pond. A proportion revert back to natural food, which is an issue as these fish do not grow afterwards. The introduction into the pond is a critical period. Some fish do not appear to grow when stocked into ponds. In the first three months the difference between growers and non-growers becomes obvious, so this is a good time to grade out the non-performers. There was no distinct difference between high and low densities. (see Figure)

Nursery Management : Sinking food essential as golden perch are bottom feeders.

Because they are bottom feeders, feeding must be monitored using feed trays. Sample the fish regularly to determine size of pellet being fed, and always have a transition period when increasing the pellet size. We found that significant numbers of fish chocked if this was not observed. Broadcast feeding is best, even if providing shelter (ie feed over the hole pond area, not just at one spot). Grade out after three months, although it does not appear to be strictly necessary. In our experience, about 50% of fish will not perform in aquaculture. These fish do not eat pellet food but do cost in oxygen and ammonia etc.

Growout

After about two to three months of nursery, grading is advisable. It is more for management purposes than production *per se* . The lower 50% of fingerlings do grow, but not quickly enough to be viable for aquaculture.

Grow out from 200g to market size is relatively quick. With good water quality and temperatures >15 ° 100g per month is achieved, sometimes more. When an average size of 600g+ is achieved, the pond is ready to harvest. Fish sizes will range from 350g to 1kg+ (90%>450g).This takes from 14-18 months.

Grading

Sydney fish market does not have grades for aquaculture golden perch.

•We sold in five size classes-

.250-350g

.350-450g

.450-700g

.700-1000g

.1kg+

All size classes sold well. The smaller fish occasionally got a better price than the larger fish, but we only sold small numbers as a trial to see if people would buy them and they did. However, as the market preference is for larger fish we would still recommend aiming for the 400-700 g size range.

Market factors varied, but all size classes sold well and all for >\$14/kg if market conditions were normal. Lower prices were sometimes obtained if the market was chaotic due to equipment breakdowns or if fish were held over to another day when buyers of golden perch were not there. Generally the price was about \$2 per kg less than wild caught fish.

Conclusion

- Feed a sinking pellet, 40% protein.
- Monitor feeding closely-size, quality, regularity .
- Maintain water quality.
- Realise that only 50% of fish may grow, bank on 30%.
- Taste a sample of product before harvest!