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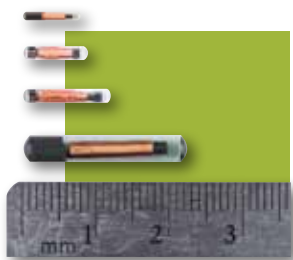
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BETTER BREEDING

Australian producer breeds for new premium strain of golden barramundi

A long-term selective breeding program by Mainstream Aquaculture is paying dividends with the development of a golden-scaled cultivar that delivers a white flesh fillet with premium market appeal.

BY JOHN MOSIG

Mainstream Aquaculture has been at the forefront of innovation in the modern aquaculture industry. Focussing on barramundi (*Lates calcarifer*), the Australian company has become the world's largest supplier of seedstock, and now exports to 21 countries.

Mainstream is also a producer in its own right, growing 200t of market-sized fish annually, and currently expanding production by adding a further 1,200t of RAS capacity at its Melbourne site. This expansion will see it become one of Australia's major barramundi food producers, in addition to its global seedstock market.

The market for quality aquaculture product is strong and barramundi is considered one of the products with greatest potential for industrial-scale growth. Mainstream's confidence in this sector of the industry is fuelled by its ongoing 10-year genetic development program.

An outcome of the company's selective breeding has been the serendipitous development of two lines of silver-scaled fish that produce a golden-scaled cultivar. These fish have all the fine eating qualities of the standard barramundi product, and have the added advantage of not producing melanin. This gives the flesh a much-favoured pure white flakiness that has premium market appeal.



Golden barramundi

COMMERCIAL BREEDING PROGRAM

While the actual breeding methodology is a closely kept secret, Mainstream's Research and Development Manager Holly Cate, said they were well on the way to generating a commercial breeding population.

"Interestingly," she said. "Most golden offspring come from crossing two specific lines of silver fish that were sourced many years ago from rivers in Far North Queensland."

"The hatchery has now isolated over 600 gold-phenotype and numerous silver 'carriers' spread over 12 different families. To achieve this, we've examined specific family pairings for their ability to produce golden offspring and combined this with investigations on both DNA and RNA. This has improved our understanding of the underlying genetic control. With a predictable golden subset in our broodstock pool, the next step will be to out-cross those genes into our broader breeding population to increase genetic diversity and create a golden breeding nucleus."

LONG TERM PROGRAM

Mainstream's goal is to develop a sustainable breeding population that will support golden barramundi production on an industrial scale. "It's a long term program," said

Paul Harrison, Mainstream's Head of Innovation who is responsible for commercialising this new technology.

"Over the next 1-3 years we're going to see many thousands of golden fish come onto the market. In the longer term, a 3-7 year horizon in our mind, we will have generated a strong breeding population of golden fish that will have a strong diversity component and not be subject to inbreeding."

At all times the emphasis of the breeding program is on improving the on-farm production metrics: growth rates, feed consumption & FCR, fillet yields, and general robustness.

Paul said they were now three generations into their program. They utilise a family-based breeding program that is augmented by using early stage molecular markers to estimate breeding values. Given that barramundi can repeat spawn for several years, they have also cross-identified high performance fish from previous generations with the latest generations.

"On our own farm, we recorded a 20% improvement in average growth rate during the formative stages of breed nucleus development," he said. "We're at the point now where we are applying a more rigorous family based generational breeding program where we are targeting a 15%+ improvement per generation."

TIME AND CAPITAL

It goes without saying that the work involved in bringing the golden barramundi production up to commercial levels has not come without a huge commitment of time and capital. Questioned on the possibility of genetic piracy, Paul pointed out that Mainstream held the genetic IP in their family lines, and that it would not be possible for someone to copy it from the crossbred seed-stock without the development of those lines. He also noted that their breeding program was a work in progress, and as such would be looking for ongoing improvements as production data was collated. In other words, seedstock would be continuously superseded.

Up until now they've focussed on a breeding program that domesticated the fish and eliminated poor performance traits in the broodstock pool.

"The best indication of success of this program is feedback from our clients," says Paul. "Firstly they tell us that they're getting calmer fish; fish that are more interested in going after the feed rather than each other. Secondly they're telling us that they are getting more consistent growth from batch to batch, and within each batch. From a business point of view this is an enormous benefit to farm management and marketing. And this has resulted in demand on our improved fingerlings doubling each year over the past four years. We are really excited by this growth and continue to re-invest the earnings from fingerling sales into the selective breeding program."

Over the decade of the program they have established more than 1,200 family combinations. The golden fish have been a spin-off from this decade of targeted breeding, run in parallel to the primary breeding goals.

The task of commercialising golden barramundi by breeding the golden gene into the silver family lines has now commenced. It comes at a cost however. Apart from the costs of running the program, Mainstream has had to sacrifice just under 50 tonnes of annual production capacity to warehouse the golden barramundi families and trial the best combinations, the ones that will produce the best commercial outcomes with melanin-free fillets. Paul acknowledged support of an Australian federal government grant scheme called "Accelerating Commercialisation" which provides funding for the development of innovations that will increase the economic viability of an industry sector.

Mainstream's primary objective is to produce a white flesh fillet. "Our market research in Asia has shown that there's a significant premium for the golden barramundi, particularly in Japan and China," says Paul. The ornamental trade has also shown significant interest in live fish, but the big game is the white flesh fillet for the retail market.

"We see four or five candidates globally that could fill the portfolio gap for a sustainably farmed premium white flesh fillet, and barramundi is one of them. Globally, white fish fillets typically come from locally caught fish. There is no universal white flesh offering, as there is in the pink category that is filled by salmon. We have been asked by supermarkets in Australia to provide them with a 'white salmon.' We are part of a global race to reliably provide a sustainable white flesh fillet. The normal barramundi fillet is white and can fill this category, however, it has streaks of subcutaneous grey through it. The golden barramundi delivers a pure white fillet, which we have every reason to believe will provide a premium offer."

"Barramundi has all the attributes required of a global species, and is already grown on four continents. The year-round availability of a superior genotype is just one of the developments that are pointing to it becoming a 'super' fish alongside the salmonids. The species' adaptability to a wide geographic span, its ability to grow in either pure fresh or highly saline water, [its] year round spawning capability, and adaptability to all known aquaculture production systems, all make it a strong candidate to become the next global fish. "We are very excited and optimistic about the growth potential of barramundi as a globally farmed species," said Paul.

The company is on track to exceed output of over 18 million fry this year and credits its growth to an ability to supply clients on a monthly basis with healthy seedstock. For more information contact Mainstream at: www.mainstreamaquaculture.com



Dr. Holly Cate and Paul Harrison. The background is a poster featuring a pearly white, golden barramundi fillet.



Standard barramundi fillet in an Australian supermarket. Note the darker flesh pigmentation.

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