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WHITEBAIT TRIALS: the latest successes

NATIVE AUSSIE FISH OFFER VALUABLE LESSONS

BLUEFIN TUNA – LOVE KIWI TUCKER

TAINTED OYSTERS REMAIN A THREAT

THE INDEPENDENT VOICE OF NEW ZEALAND AQUACULTURE

CONTENTS

3 EDITORIAL

4 NEWS
Action in the industry

6 BLUEFIN TUNA
Food for thought

8 NATIVE AUSTRALIAN FISH
The Granite Belt Fish Hatchery

10 OCEAN LAW: AQUACULTURE OVER THE HORIZON
Ready? Set? Action!

11 THE COST OF FOREIGN OYSTER RECALLS
Why bring tainted seafood to NZ?

12 ACROSS THE DITCH
Overheads killing the industry?

13 OTAGO UNIVERSITY'S SUCCESSFUL WHITEBAIT TRIAL
Inanga trials could lead to cashcrop

15 MTI SAVE NATIVE GIANT KOKOPU FROM EXTINCTION
Whitebait breeding now in third generation

COVER IMAGE: COURTESY MTI

ON THE COVER:
A newly hatched Giant Kokopu

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Lost investment opportunities?

BY KEITH INGRAM

The burning issues that face the aquaculture industry always seem to settle on areas of security of investment, and how to attract new investors with confidence.

The problems start at the top, with Government. While some of our politicians are talking the good talk, many marine farmers are waiting for the day when these guys will start walking the talk and give the industry some real confidence.

The second problem is the age old RMA and compliance issue. No matter how hard a potential marine farmer tries, or how much he spends on establishment costs and/or guarantees, some bloody newbie from town can pipe up that the farm will impact on his enjoyment of the marine vista, supported by a heap of spurious claims, which they will struggle to substantiate in the environment court, and yet could still win.

Is this a recipe for sound investment when a third of your establishment costs can be consumed in the legal process, with no guarantees, before you even consider putting a foot near the water? Clearly from past bitter experience the potential to successfully farm and raise fin fish on land is very limited. While there are opportunities and successes to encourage the raising of species such as paua, they require access to clean seawater via a good sea pipe source and existing sites are limited.

But isn't marine farming all about farming in the marine environment, not on land, which adds another level of compliance and risk? One would have thought so. But what chance does a small guy have when even the mighty, and proven King Salmon, have such a huge challenge confronting the compliance process, just to get water space to expand their operation?

Clearly marine farms are best suited to be in inshore, near coastal waters, where there is good tidal flushing and clean water. The New Zealand marine environment is claimed to be amongst the cleanest in the world. Sadly, it is no longer the purest, as both urban and agriculture runoff have put paid to this. Yes, the backbone of the New Zealand economy, our farming community, have been quietly poisoning our waterways and coastal waters for decades and it continues today. Be it sedimentation carried in the water column, fertilisers, high nutrients, bovine TB, brucellosis, or a raft of other common nasties from the land, once in the sea have a devastating impact on our marine life and biodiversity.

Raise this question with our politicians and the clucking tut-tut brigade is soon revealed. Questions become all too hard and we are left with an ever increasing raft of platitudes and excuses. Where is the commitment to deliver solutions, I ask? No matter where I look within our hard working aquaculture industry, there is a constant threatening cloud of gloom. Government, this must stop!

While I am not suggesting the situation is all bad, or that our politicians do not share our concerns when many do, the talk remains cheap and action costs heaps: a cost that normally falls on the marine farmer.

Meanwhile, Aquaculture New Zealand have been steadily working at a higher level, sometimes way up in the stratosphere, above the heads and out of sight of most small marine farmers. Many are expressing concerns to me that the small guys are not getting the support they would like from their national organisation working through the myriad of obstacles they are expected to negotiate. Likewise, small potential new farmers or investors, are struggling to get past the first information post. It would appear that even the old Ministry of Fisheries, now MPI, no longer provide any sort of advice service to newcomers and as such, many potential investors are being lost from the industry.

Ironically, resolutions must start with Government intervention by establishing an easier, environmentally friendly process for dealing with marine farming applications. The NIMBY objectors should be required to put up the facts, and when challenged, substantiate the facts at their own cost, not that of the applicant.

How often have we seen an application falter because the applicant runs out of funds to sustain an ever increasing plethora of claims of perceived risks and threats, that he is required to mitigate or prove as unsubstantiated, and while doing so, the protagonists are busy dreaming up more, until the applicant's limited funds are exhausted and an opportunity is lost?

Clearly Government intervention is required if we are going to encourage investors and our young people to develop and grow future aquaculture opportunities for the wider benefit of our small coastal communities and the New Zealand economy.

Is it time for political thought, commitment and action? Yes. Our politicians, both at central and local government levels, must now walk the talk.

ALLTECH AND NOFIMA IN STRATEGIC RESEARCH ALLIANCE

Global animal health and nutrition company Alltech and the Norwegian Institute of Food, Fisheries and Aquaculture Research, Nofima, have entered a strategic research alliance that will focus on optimising nutrition and management practices in the salmon industry.

The research from this partnership will be conducted in six of Nofima's Norwegian research centres, including Tromsø, Bergen, Stavanger, Ås, Sunndalsøra and Averøy.

The purpose of the research alliance is to further contribute to the understanding of microalgae in modern feed formulations and their role in health, performance and flesh quality.

Alltech Algae, a company based in Winchester, Kentucky, United States, is one of the largest algae production facilities in the world. The company is exploring the applications of algae in animal nutrition and aquaculture. Alltech's research alliance with Nofima is in line with the company's global sales strategy, which sees aquaculture as a significant contributor to its US$4 billion dollar sales goal.

This new partnership with Nofima follows the signing of another research alliance in March 2012 between Alltech and the University of Kentucky. The Alltech-UoK alliance is expected to generate research funding of US$2.5 million in the next year for collaborative projects in agriculture, medicine and basic biological sciences.

KATIKATI FISH FARM IN COURT

NZ Premium Aquaculture with Trevor Davidson listed as director, has been granted council consent to farm kingfish on their former kiwifruit and avocado orchard in Pukakura Road, Katikati. But local residents are appealing the decision in the Environment Court

The farm has obtained a regional council consent to pipe seawater a kilometre across country and to discharge it again into the Uretara Estuary.

The proposed fish farm involves up to a million fish intensively grown with fingerlings imported and grown to maturity in a range of highly controlled indoor saltwater tanks. The fish farm has been given consent by the Western BOP District Council for a building 7900 square metres in area and up to nine metres in height, or about 40 times larger than what is permitted under the district plan.

NZ Premium Aquaculture propose that after the fish reach maturity they would be killed on site, put on ice and trucked to a processing plant. Solid fish waste would be stored and trucked off site. They predict a harvest rate of 10 tonnes per week and on site jobs for six people.

While consent is not required for permitted activities including aquaculture, the associated activities may require consent.

Real Estate agents describe the properties in Pukakura road that adjoin Tauranga Harbour using phrases such as: "beauty of a bygone era", "picturesque country manor". Pukakura road is also the location of Homewood Garden, and Katipatch.

Local residents are objecting to NZ Premium Aquaculture's fish farm proposal in the Environment Court saying they don't want to live next door to one million kingfish kept in tanks housed in a building "the size of Bunnings", kept alive by pumps and ventilation fans running 24/7.

NEW ZEALAND SALMON DEATHS NOT FROM SIGNIFICANT DISEASES

NIWA research scientist Andrew Forsythe says New Zealand salmon are free of commercially significant pathogens and parasites that caused disease in captive and wild salmon in other countries. His investigation follows the death of fish in unusually large numbers at New Zealand King Salmon's Waihinau farm in Pelorus Sound since last summer.

Forsythe said fish farmed by King Salmon are chinook, also known as king or quinnat salmon, which are not susceptible to normal diseases of New Zealand native fish. The one exception was the discovery of Aeromonas salmonicida bacteria in dead kanakana or lamprey, in September, and later in trout at a hatchery in Otago. He also said that reports that chinook in Canada had tested positive for ISA have proven incorrect.

New Zealand King Salmon sent samples from fish that died at Waihinau to the Ministry of Primary Industries to test for diseases including ISA and the vibrio species of bacteria. These tests came back negative. The ministry has since sent samples to laboratories in Canada and Norway with more experience in salmon disease The Ministry expect the test results will be made public when they are available.

Danny Boulton and Sustain Our Sounds are fighting an application to develop nine new salmon farms in the Marlborough Sounds, saying the risk of disease will increase if salmon farming expands.

King Salmon aquaculture manager Mark Preece has signalled the possibility of antibiotics being used on their farms.

KING SALMON HEARING DELAYED

The Environmental Protection Authority hearing to decide whether NZ King Salmon should be granted resource consent to develop nine new fish farms in the Marlborough Sounds was delayed two weeks.

The hearing will now begin in Blenheim on Monday August 27, at the Wisheart Room in the Floor Pride Marlborough Civic Theatre. The original start date was August 13.

The EPA board of inquiry delayed the start of the hearing in response to three submitters asking that the July 27 deadline for evidence be extended by a month. An EPA spokeswoman said the board decided an extra month was not feasible because it must release a final decision by December 31, nine months after King Salmon notified its application. However, it recognised the time constraints for this and extended the deadline for evidence by two weeks, to August 10.

Sustain Our Sounds chairman Danny Boulton said Sustain Our Sounds had met deadlines and did not request the delay, but members might have asked as individuals, who lived in remote areas of the Marlborough Sounds facing difficulties such as unexpected power cuts.

NZ King Salmon didn't request the delay and have met all the time requirements stipulated by the board of inquiry.

The EPA board has until the end of November to write its draft report, to accommodate a 20 working day period for comments and end-of-year deadline. The original due date for the draft was October 26. The NZ King Salmon deadline for rebuttal evidence had been extended from August 8 until August 17 and its final planning report is due by August 27.

CAGED GRASS CARP FOR WATERWEED CONTROL

A Ministry for Primary Industries-funded trial has shown that grass carp, a weed eating fish, could be used to eradicate early infestations of aquatic weeds in enclosures, doing away with the need to release large numbers of fish throughout a lake and preventing damage to other plant species in the water.

Using grass carp to remove invasive weeds from waterways is an effective biological control, but it always comes at a cost. Large numbers of fish are required, they remain in the waterway until they die, and they indiscriminately remove all plants present including desirable non-target species. The study was carried out for MPI by NIWA scientists, and found that if an unwanted aquatic weed species is found at an early enough stage, there is potential to eradicate it using fish contained in a pen, applied to

the area of weed infestation. They and their enclosure can be removed once the target invasive weed has been eradicated.

MPI Senior Science Adviser Andrew Bell says the recent successful trial was carried out at Waikato's Lake Karapiro treating the widespread pest weed hornwort. "This novel approach was so effective that MPI now has it in the toolbox for use should the "unwanted organism" hornwort be found in South Island lakes. Local iwi supported the project and are interested in the results and the potential to use grass carp as a biological control tool. They recognise that grass carp may have a role not only in biosecurity responses when hornwort occurs in new locations, but also as a potential invasive weed management tool in hydro dams and other sites in their areas."

Grass carp have been used successfully for the control of large infestations of other invasive weeds in New Zealand lakes since they were introduced in the late 1960s from Malaysia. They are a natural aquatic weed controller and are unable to breed in the wild in New Zealand, unlike koi carp which breed well and have become a pest species.

The team built six large enclosures 2.5m deep and 6m wide, and placed them within hornwort beds in Lake Karapiro. NIWA principal scientist aquatic plants, Dr John Clayton says, "The cages contained different numbers of fish in order to establish the most effective stocking rate required for rapid removal of nuisance weed within the enclosed area. Three to five fish per enclosure were found to be effective and very fast, with weed in the enclosed areas removed in nine weeks."

Designing enclosures that were escape-proof was particularly challenging for the NIWA team, but Dr Clayton says the end result was an innovative design that has animal ethics committee approval.

NEW DIETS TO COUNTER GLOBAL WARMING

Research by Skretting in Norway and Tasmania anticipates the problems that climate change will bring with warmer waters to the coast especially in summer. Work began in 2010, investigating the effects of high temperature on gut integrity.

Previous investigations had demonstrated that the gut wall is more permeable at higher temperatures, making the fish more vulnerable to invasion by pathogens, faster metabolism of anti-oxidants and that disruption of the gut wall leads to loss of appetite.

Diet modifications to counteract the loss of anti-oxidants by adding an appropriate anti-oxidant to the feed to help stabilse the gut, was tested in high temperature trials and scientists fount that fish were healthier, ate more, grew better and had a lower feed conversion ratio.

Skretting translated the results into commercial grower feeds for salmon in Norway and Tasmania. They found that the high protein formulations conventionally used over summer in the Australian salmon industry led to higher excretion of nitrogen.

Diet modifications to counteract the loss of anti-oxidants by adding an appropriate anti-oxidant to the feed, with lower protein levels, was tested in high temperature trials and scientists found that fish were healthier, ate more, grew better and had a lower feed conversion ratio and lower nitrogen outputs.

NAMIBIAN FISH FARMERS' PLEA FOR EQUIPMENT

Aquaculture farmers at the Karovho Fish Farm in the Kavango Region have put out a call for equipment and transport vehicles for their underperforming fish farm.

Employees at the farm say they are in dire need of a range of equipment to help them operate and monitor water quality in the fishponds. They are also calling for insecticides and pesticides, and would like to upgrade the quality of the feed used.

Several fish breeds such as Tilapia, and Three Spot and sometimes Catfish are bred at the farm.

Port Lincoln tuna sea cages

The birds arrive for tucker time

Bluefin Tuna: FOOD FOR THOUGHT

BY PETER HUTCHINSON, E.N. HUTCHINSON, NEW ZEALAND
AND JOE KEARNS, WENGER MANUFACTURING, INC., USA

Bluefin tuna aquaculture has grown into an industry worth hundreds of millions annually, with farms located in the Mediterranean, Japan, Australia and Mexico. Currently these farms are based on "ranching", which in aquaculture terms is used to describe the fattening of wild caught fish in pens. The tuna are fed bait fish and held in ocean cages until they reach ideal market size. This holding time varies from place to place primarily depending on water temperatures. In cooler regions of the Med fish may be held for several years, whereas in South Australia fish are caught at 15-20kg and fattened to 40-50kg over 8-10 months before winter temperatures make holding the fish unviable.

The last decade has seen a big investment in breeding of bluefin to secure reliable supply of juveniles, reduce pressure on wild stocks, and to grow the industry. Dealing with broodstock fish weighing in at several hundred kilogams clearly has its challenges, and it would be fair to say that hatchery success has been slow in coming. There has been some success over recent years however. Japan's Kinki University lead the hatchery charge and have been the most successful in terms of numbers in sea cages to date, with tens of thousands of animals making it through to grow out over the previous two years. Australia's Clean Seas Tuna has been close on the heels of Kinki, although are struggling to get good numbers. Hatchery development in the Med has been quickly catching up with the formation of SELFDOTT (now morphed into TRANSDOTT or, translation of domestication of Thunnus thynnus into an innovative commercial application), a group formed with funding from stake-holding nations and industry working together to reach a common goal: millions of tuna juveniles per season.

Another hurdle the industry must rapidly overcome once numbers start leaving hatcheries, is the supply of bait fish. Bait fish are limited, and their use is seen as a waste of fish resources. Furthermore, it does not allow for nutritional development and increases in growth are only attainable through the use of compounded feeds. The problem is that tuna can be fussy, particularly wild fish, and they haven't performed well in long term trials with compounded feeds to date. The size of the pellets required also presents some challenges when compared with the standard extrusion technology used to manufacture fish feeds.

In the early 2000's EN Hutchinson Ltd in NZ began work to produce extruded broodstock feeds for large marine fish. The challenges faced in producing these feeds (primarily palatability and size), were the same challenges facing the tuna industry.

In Mid 2010 during an informal discussion with members of the Australian tuna industry, Joe Kearns from Wenger Manufacturing, and Peter Hutchinson from EN Hutchinson Ltd, the solution became clear: the feed must be simple and cost effective to produce, unlike other tuna feeds which had been developed. To this extent extrusion was clearly the front runner. It must also be palatable, and ideally be shelf stable without having to be dried as the costs involved with drying large pellets may be uneconomic.

ENH Ltd had already resolved these issues with broodstock feeds it was manufacturing and had on sale in Australia. Within weeks of the discussion a bag of "BroodMax" pellets were delivered to Port Lincoln in South Australia. When tossed into the sea cages, the tuna had no hesitation in slamming the pellets despite mid winter temps supposedly making them "fussy feeders".

The palatability problem had been resolved through use of wet fish in the extrusion process. Wet fish included in the extrusion process increases palatability enormously, the protein is more digestible due to reduced processing, more sustainable due to reduced production energy requirements, and has the potential for greater utilisation of waste/by-products. The problem now, was that ENH Ltd's small research and development plant was limited in both capacity to produce volume for commercial on-farm growth trials, and its ability to include significant percentages of wet fish to make the ideal product for tuna requirements.

This is where Wenger Manufacturing picked up the ball with a newly developed extrusion cooker, the Thermal


Peter Hutchinson with the kiwi product


The extruder at EN Hutchinson Ltd Auckland


An example of our local product


The Wenger feed plant in Kansas

Twin Screw. Up until now extrusion had been well defined in terms of what ingredients could be used and at what percentages. The Thermal Twin changed everything. Starting with a completely redesigned and improved High Intensity Preconditioner which allows for increased addition of meat slurries, increased levels of process steam, higher gelatinisation levels, and greater retention time. The key for tuna feed production is the ability to use high levels of wet aquatic meats and/or terrestrial waste material, at inclusion rates of 50 percent to 60 percent or higher by weight. This preconditioner's design allows for the mixing of dry and liquid raw material whilst yielding a free flowing friable product into the extruder barrel. The new extruder barrel design, unlike standard twin screw extruders, allows for four to five times the steam injection with specially designed injectors into a reengineered screw profile, allowing complete inclusion and utilisation of the steam. Up to 12 percent steam injection by weight provides a thermal energy to mechanical energy ratio of 14 to 1. This is a critical process advantage given that it is virtually impossible to cook with mechanical energy when the moisture levels are approaching 40 to 50 percent. The addition of mid barrel flow restrictors as well as the proven back pressure valve, increase this machine's ability to produce these unique and challenging products that have never before been possible. Trials were conducted at the Tech Centre in Sabetha, Kansas, in Nov 2010, where wet fish inclusion was pushed in excess of 50 percent, while still producing beautiful pellets. These pellets were not dried, but were cooled with the inclusion of water loving ingredients, acids and mould inhibitors allowing the resulting high moisture pellets to remain shelf stable.

THE TUNA HAD NO HESITATION IN SLAMMING THE PELLETS...

Unfortunately, due to border biosecurity restrictions it was not possible to bring any volume of product produced in the US to Australia for trials. Over the last two years ENH Ltd and Wenger Manufacturing have worked towards a common goal of establishing large scale sea trials. This has also involved some work with the development of hatchery feeds for juvenile tuna, based on the same extrusion technology, as it became apparent that the soluble protein available from inclusion of wet fish appeared to be a requirement for tuna nutrition.

It is worth noting that in Australia and elsewhere, the impact of large numbers of hatchery reared tuna becoming available will have an enormous impact on aquaculture nationwide, not just locally. Australian tuna farming is currently restricted to the area surrounding Port Lincoln due to the supply of wild migrating tuna through this area in late spring. The colder temperatures which prevail in this region are a limiting factor for growth. Availability of hatchery reared fish will open up the ability to farm east, west, and in warmer more northerly waters, and could see large scale growth in the industry in a very short space of time.

As of June 2012 the first tonne of extruded semi-moist tuna feed has been delivered to South Australia for extensive palatability trials, with the first commercial volumes for grow out trials due to be manufactured in Australia later this year. Following closely behind is feed destined for Europe, and the newly formed TRANSDOTT programme with its sea cage feed trials planned for next season. Not a moment to soon, with great expectations that juveniles will flow swiftly from the land based hatchery currently under construction!

Part of the hatchery at Granite Belt Fish Hatchery

NATIVE FISH: Granite Belt Fish Hatchery

BY JOHN MOSIG

The Donges family have been breeding warmwater Australian native fish at the Granite Belt Fish Hatchery since 1987. Situated just out of Stanthorpe on the NSW Queensland border, the farm has a reputation for producing quality fingerlings for both recreational and re-stocking markets. They breed Murray cod (*Maccullochella peelii peelii*), golden perch (*Macquaria ambigua*) and silver perch (*Bidyanus bidyanus*).

Three hundred megalitres of water can be pumped up from the Severn River over a three-year period. The average rainfall is 750mm and falls throughout the year, but being in the sub-tropics, the heaviest falls are in the warmer months. They also harvest runoff water and the three storage reservoirs hold another 300ML.

The summer climate is mild, and pond temperatures, even in the shallow plankton production ponds, rarely get above 27 degrees celsius.

Nick said they don't have to do much testing. With a pH of over eight, the water is well buffered. He checks the dissolved oxygen and phosphate levels to make sure there is enough to drive the plankton bloom. Over the years he's found that these are the key indicators that need to be monitored when raising fingerlings.

During winter Nick keeps water in his growout ponds, partly to kill the grass and as water storage itself. When spring approaches, this water is moved to one of the three main storage reservoirs and the ponds are allowed to dry out to prepare them for the cod and perch larvae. Drying them out breaks the build up of any aquatic invertebrates that would prey on the larvae. It also allows the pond to be fertilised and flooded to trigger a healthy plankton bloom.

The hatchery has been designed and built by the Donges family. Innovation can be seen at every turn: the tractor driven aerators for instance and the ingenious air pump for the hatchery. The air pump consists of a series of diaphragms, cams and mechanical arms, it is belt driven off the mains power. Nick said it was 20 years old and had never let them down. The tanks, bio-filters, plumbing and the drum filter, were all designed and cobbled together on the farm from stainless steel.

The hatchery consists of 16 x 1600L tanks connected to a recirculating system. Each tank has two 200L bio-filters using Aquasonic bio-balls, and the water from two tanks goes into a 400L swirl filter before going through a 100µm drum filter. It is then returned to the tanks via four 120w UV sterilisers. There is an in-line heating tank for each system. The water for the cod is kept at 24 degrees celsius.

Nick spreads the season. The cod are bred from eggs harvested from 22 spawning drums. The number of fertilised eggs they get from the drums varies with the season. "A couple of years ago we weaned about 200,000. This can cause more troubles than it's worth. Now we normally do around 100,000," Nick said.

They put the cod drums in and start checking the water when the temperature approaches 19 degrees celsius. The spawning trigger for cod is 20 degrees celsius and the ponds hit that in late September to early October.

... THEY WERE THE BEST COD HE'D EVER TAKEN DELIVERY OF

The cod eggs hatch within five to seven days of collection. The larvae are quite large when they hatch: 10mm to 12mm, and live on their yolk sack for up to 13 days. By this time they have spread out and they are looking for food.

Once the hatch has been successful, plankton ponds are fertilised and flooded. The juvenile cod have a large gape, and like their parents, will tackle anything they feel they can swallow. Nick makes sure the plankton bloom has matured and that the zooplankton are advanced. He stocks at fifty larvae per square metre.

Under optimum conditions the cod fingerlings have

reached 40mm before Christmas. Nick brings them in to the shed, acclimatises them, then weans them on to a dry feed, allowing him to grow them up to 60mm. The cod grow rapidly at this age and it only takes another three to four weeks to reach the size at which he feels they large enough to fend for themselves when re-stocked in open waters.

Once the cod are weaned they are fed at a rate of 3.5 percent body weight a day in total. A close check is done on the cod to watch for any large size variations and then they are graded. This normally happens every two weeks.

The main outlet is for re-stocking groups. However, Nick said when they were told by Fisheries not to stock any more cod because they were already well established in rivers, it left him with a few over. So he supplied a local commercial grower who commented that they were the best cod he'd ever taken delivery of. "I put a fair bit of growth and condition on them for the re-stockers and they were a bit ahead of the normal seedstock size he'd been used to getting. They'd had a good run in the ponds, I hold them for around eight weeks anyway," Nick said. "I'd had these in for a bit and weaned them onto dry food. They were graded and were between 3.5g and 4g."

Once the cod have finished spawning, Nick turns his attention to the golden perch. He'll do two or three spawns, which will also be ready to harvest early in the New Year. There isn't a large demand for silver perch, so he leaves them till last – around late February or early March.

He starts checking the golden perch for ova development and spermatozoa motility once the water reaches 21 degrees celsius. This is generally around the end of October. The broodstock are gill netted or angled from the ponds and sedated. The ova and the spermatozoa are checked under the microscope. Once the breeding teams have been selected for their viability, one female to two males, the females are injected with 1000iu of Chorulon and the males 500iu and placed in 1600L spawning tanks at 24 degrees celsius.

Spawning commences in 24 to 27 hours and the semi pelagic eggs hatch in 24 to 36 hours. Their mouths will be active in another three days and the larvae are ready to be stocked in the plankton ponds. The females produce approximately 100,000 eggs per kilo of body weight.

The plankton ponds are prepared in the same way as for the cod except the timing is more crucial. The fertilised ponds are flooded when the spawn has proven successful and the plankton is not as advanced. They are stocked at 100 larvae per square metre. The 5mm long larvae are far more vulnerable than the cod and the food requirement is much smaller. The nauplii of copepods, claudoceran and rotifers are the first feed zooplankton of preference.

Survival can be unpredictable. An adverse turn in the weather can send plankton blooms crashing, but after over 25 years in the job the Donges have a good feel for plankton production.

While the water itself is healthy, Nick still has to regularly check for parasites. Both the cod and the perch are vulnerable to *Trichodina*, and the cod are also vulnerable to *Chilodonella*. He samples the fish every three days, and if any infestation appears imminent the pond is treated with formalin. He doses the ponds at the rate of 25ppm and uses power taken off the universal of the tractor to drive the mixer, which also helps maintain the dissolved oxygen levels.

Harvesting of the golden perch follows the cod harvest in mid to late January. Nick usually produces around 350K to 400K golden perch a year. Last year, with 450,000 tails, was a record crop.

Being over 800m above sea level, once the days start to get shorter the nights cool down quickly. By the end of April pond temperatures are below 20 degrees celsius and Nick likes to have all the fingerlings out of the ponds by the start of April.


Aerial view of the farm taken in 1997

Markets are mainly to Queensland re-stocking groups, who receive a dollar for dollar incentive to do this from anglers' license fees. There are also a few sales to farmers wishing to stock their dams. Nick said the market was competitive. The recent prolonged drought left some hatcheries without water and farm dam sales had literally dried up. Now that the rains have come back, and although the farm dams need to be re-stocked, every hatchery also has plenty of water and production is at an all time high as producers try to make up for the times they were out of production.

Nick Donges can be contacted by phone on 0061 7 4683 5242, and by email on gbfh@halenet.com.au


Nick demonstrates how the nesting boxes work


The farm-built drum filter


The farm-built air pump designed by Jeff Donges

Ready? Set? **ACTION!**

BY JUSTINE INNS

The Government recently issued a National Strategy and Five-Year Action Plan to Support Aquaculture. The Strategy and Plan represent the latest in a number of efforts made by successive governments to assist the aquaculture industry in meeting its goal of $1 billion sales in annual sales revenue by 2025.

While the Strategy and Plan do not have any legal effect in and of themselves, they do have substantially more meat to them than is usual in such documents, which often tend towards the 'motherhood and apple pie' end of the usefulness spectrum. The Strategy and Plan recognise that sector growth must be "industry-led" and that local authorities remain responsible for individual planning and resource consenting decisions. Within these parameters, however, central government agencies have a number of roles and responsibilities to fulfil.

The intent of the Strategy and Plan is that these central government roles and responsibilities will be carried out in such a way as to promote a series of identified objectives, namely:

- a healthy aquatic environment
- quality planning and permitting
- effective and responsive regulation
- supporting Maori objectives
- increasing market revenues
- increasing value through research and development
- sound governance

Okay, so those objectives do sound a bit motherhood and apple pie-ish. But a direction that all nine central government agencies with core roles and responsibilities in respect of aquaculture, should operate in such a way as to advance a single set of objectives, is certainly useful. Moreover, the Five-Year Action Plan attached to the Strategy goes further into specifics, even including performance measures, introduced as, "*we will know we have succeeded when*". The inclusion of measurable targets that will allow the industry to assign a pass/fail mark in five years time is, in large part, what gives this Strategy and Plan some real substance.

One of those measurable targets is that, by 2016, "80 percent of regional coastal plans include aquaculture provisions in accordance with the policies in the NZCPS (New Zealand Coastal Policy Statement)". Unlike the Strategy and Action Plan, the NZCPS does have legal effect, via the Resource Management Act 1991. The RMA requires that there be an NZCPS in force at all times and that the purpose of the NZCPS is, among other things, to state objectives and policies about activities involving the use or development of areas of the coastal environment.

For the first time, the NZCPS, approved in 2010, included a policy specifically relating to aquaculture. Policy 8 provides that persons exercising functions and powers under the RMA should:

Recognise the significant existing and potential contribution of aquaculture to the social, economic and cultural well-being of people and communities by:

a. including in regional policy statements and regional coastal plans provision for aquaculture activities in appropriate places in the coastal environment, recognising that relevant considerations may include:
   i. the need for high water quality for aquaculture activities; and
   ii. the need for land-based facilities associated with marine farming;
b. taking account of the social and economic benefits of aquaculture, including any available assessments of national and regional economic benefits; and
c. ensuring that development in the coastal environment does not make water quality unfit for aquaculture activities in areas approved for that purpose.

In the language of national policy statements, that constitutes a pretty strong statement of central government support for aquaculture, and requires some positive action from local authorities to include in their policies and plans "provision for aquaculture activities in appropriate places". This is supported by requirements in the RMA that regional policy statements and regional and district plans must give effect to the NZCPS, and that local authorities must amend those statements and plans to ensure that they do so "as soon as practicable". Even before such policy and plan changes are made, local authorities must have regard to the NZCPS when considering resource consent applications.

In order to support the task of amending local authority policy statements and plans to better address aquaculture, the National Strategy and Action Plan direct that relevant government agencies will work with local authorities to "identify opportunities for aquaculture growth", with the target of having 4000 hectares of new aquaculture space developed by 2016. It is also recognised that some local authorities have work to do in the area of infrastructure if aquaculture opportunities in their region are to be realised.

The Strategy and Action Plan also deal with a number of other initiatives in fields including market development, research and innovation, and establishing biosecurity plans. All in all, they signal a number of positive and remarkably concrete government contributions to the development of the sector.

Justine Inns is a partner at Oceanlaw. She has spent more than a decade as an advisor to various iwi including several years with Ngai Tahu.

Costs of **FOREIGN OYSTER RECALLS**

BY DOROTHY-JEAN MCCOUBREY

Once again the New Zealand public have been alerted to the need for a fast recall of imported oysters because they contain harmful pathogens. This month United World Foods Ltd, in conjunction with the Ministry of Primary Industries, announced the public recall of Sea Cuisine branded oysters from Asia. Although norovirus had only been found in the raw oyster meat, United World Foods took the responsible attitude in recalling all Sea Cuisine battered, floured and crumbed oyster products.

To me this sounds like déjà vu, as in 2006 there was a need to recall Korean oysters when they caused a high profile food poisoning outbreak associated with a rugby event. Up to 350 people became ill because of the Korean oysters and to date this is New Zealand's largest norovirus outbreak.

The risk of marine invaders is too great

Any food company will tell you recalls are expensive, there are the advertising costs, loss of product, administration time, and loss of face and likely loss of future customers. As well as local trade dents, today's global communication systems mean recall details are quickly plastered across international websites, resulting in fast blemishing of brand and country reputations.

New Zealand is a country rich in seafood resources and we have a world reputation for quality products grown, harvested and processed in food safe environments. So whenever I read that imported seafood products are causing food safety problems I wonder why we need to import them at all. According to Ministry of Primary Industries officials we need to allow seafood to come into New Zealand so that we can retain our export markets for primary products such as beef and lamb. It seems that today's globalised free market means that there is the need for trade-offs between economic development, food safety and environmental protection.

So what are the health effects of consuming norovirus? Within a day of exposure a person can often experience violent vomiting and diarrhoea which may last a few days. People can also quickly transfer the norovirus particles to others. This is why norovirus outbreaks so often occur on cruise ships, in rest homes and school camps.

How does seafood become contaminated with norovirus? If the seafood is harvested from waters polluted with human sewage there is a high likelihood it will contain norovirus and a range of other pathogens. Hepatitis, salmonella have also been linked to overseas seafood taken from polluted areas.

New Zealand does operate a comprehensive shellfish quality assurance programme that endeavours to ensure that all harvests are taken from unpolluted waters. Even so, we have occasionally had our own virus problems, both in commercial and non-commercial harvest areas. This just shows that we cannot be complacent about our clean, green image and there is a need for constant vigilance on the state of our environment. While New Zealand does have 22 core indicators to monitor environment degradation, none of these indicators monitor the effects of pollution on our marine resources.

The Government supports the aquaculture industry's mission to become a billion dollar industry by 2025. This support has included the widening of the Sustainable Farming Fund to enable projects that support economic and environmental performance of the aquaculture sector to be considered. This is commendable, but scientific projects are just part of the equation. If such projects do not translate into sound environmental policies the aquaculture industry will still be vulnerable to the effects of marine pollution. We know that leaking septic tanks, poorly performing waste water treatment plants and illegal marine discharges have cause seafood safety problems in New Zealand. Agriculture discharges can also add to the bacterial loading of shellfish.

If the New Zealand Government is serious about expanding the aquaculture industry it will also need to underpin this growth with sound environmental policies to protect our marine environment. The formulation of an environmental policy is not an end in itself, but simply a step in the process of ensuring environmental quality. Environmental policies need to be implemented, monitored and adapted to ensure success. There will also need to be collaboration with local communities, particularly those small communities who often do have the resources to effectively manage their effluent sources.

If we do not take proactive steps to preserve our coastal environment it is likely that there will be further public recalls of seafood. As mentioned earlier, food recalls are expensive, but when they implicate New Zealand's brands the cost can become immeasurable.

The cost of overheads tapping the **INDUSTRY**

G'day Kiwi. How's it going over there? With all those first placings over in London I suspect you'll be changing over to the gold standard pretty soon, eh? We're battling on a few scores over here, and not just in London. We're losing jobs left, right and centre. We're losing them to places with cheaper inputs: inputs from power, raw material and labour, just to mention the obvious ones. Regulatory concessions and government incentives, if not hidden, are usually not well publicised. And yes, some of those jobs and industries have ended up in Aotearoa, and good luck to you for being good enough to land them.

I don't want to get political, but with so many Kiwis living in Oz you're sure to have heard that we have a minority government that, judging by the opinion polls, is on the nose with the voters. And now there are undenied rumours flying around cyberspace that the Prime Minister herself may not be as lilywhite as you would expect of someone in high office. You wouldn't have to be Einstein to work out that all this has been a major distraction, and that government has been more about putting out the fires the opposition keeps fanning, than good governance. You could of course shrug and say that's the Westminster system, if it wasn't for one salient point: this is probably the most dynamic and fluid time the population of Planet Earth has faced for several generations.

With the world economy glued together with printed paper, the global climate, whatever the cause, is reaching unsustainable environmental extremes, and seemingly uncontrollable growth in the world's population is stretching social harmony to the limit: you'd think it was time when we should be sitting in counsel, not only in our own house of talking, but on a global scale. That aside, we're getting a lot of cashed up people buying our food producing industries. It's not a new thing, but the rate has increased dramatically over the last few years. No second prizes for guessing who the most cashed up of the cashed up people are, but it's interesting that they're not buying into aquaculture.

This got me to thinking: why not? When I had a look around I found we didn't have a lot of aquaculture to sell. Well, not of the scale of operation that would be any bigger than a family run operation in the Middle Kingdom. But I got to thinking that maybe there was something else ringing warning bells in the ears of would be investors. After all, it's not as if fish farming is a new thing in the Orient. Taking on a medium sized business and expanding it shouldn't be a problem for growers who produce half the world's farmed fish and seafood. Maybe there was something they saw that warned them off buying into Australian aquaculture.

When I compared the fish farming operations of the two cultures – Eastern Asia and The Wide Brown Land, it wasn't difficult to come up with some stark differences.

The most seemingly obvious one is labour costs. But when you look at it closely, there seems to be a lot more people wandering, and I choose the word wandering deliberately, around the farms I've been on in Asia. However, on-costs such as holiday pay, long service and sick leave, superannuation, accident insurance and other award issues, aren't nearly the financial and administrative burden they are in the developed world.

Power costs are relative to what the going rate is in the region, and let's face it, fish farming uses a power of aeration, and both fish and shellfish farming use heaps in processing. These variables can include subsidies, the price of fuel delivered to the site and the sophistication of the generation plant. Now in Oz, our power costs are subject to a carbon tax, the impact of which is unclear, but worrying.

The most worrying part is that we don't know just what impact it's going to have. The government has its carbon tax police on duty and no one's prepared to say what's going up and what's coming down. But that's really part of another story.

The other disincentive I could come up with is environmental impact regulations. And here's the rub: the cost of establishment here in Oz is frightening on two scores: the time it takes to get permission to expand or set up a green field site, and the out of pocket outlays associated with the long drawn out process of, public consultation and the need for approval from the various departments that are enacted to ensure compliance with the law of the land.

Then there's ongoing cost of compliance – gathering data that you're pretty sure no one looks at. Then there's the ever present undercurrent of uncertainty should you either slip over the sometimes overly stringent parameters, or heaven forbid, you in some way challenge those who issue your license to farm in the first place.

A PRAWN FARM LICENSE WOULD COST BETWEEN $250,000 AND $500,000

I've been told that to get a prawn farm license up on the coral coast of Queensland would cost between $250,000 and $500,000. And that was a few years back. That's without building the farm. I'd say you could get a lot done in Eastern and South East Asia for that sort of money.

I could be wrong of course. It could just be that the investors are aware of the risk involved and that they're really only buying a right to farm a plot of water, whereas buying a terrestrial farm gives them freehold value for eternity – or the end of the world, whichever comes sooner, eh?

But if I were looking at investing in Australian aquaculture they'd be things I'd take into account. I'd also factor in that these strict OH&S standards could be got around by using imported labour that wouldn't be drawing any non-compliance issues to the attention of the union rep. And that the high environmental standards could be used as a selling point for the produce when selling it to the cashed up and health conscious Asian middle classes.

Putting that aside, maybe there's a message there, that here in Oz we're never going to be global players in fish and seafood production. How about over in Kiwi, anyone buying up the farm? And if so, how do you feel about it?

Whitebait the NEXT BIG THING?

BY MATTHEW WYLIE MSC
AND DR MARK LOKMAN,
UNIVERSITY OF OTAGO

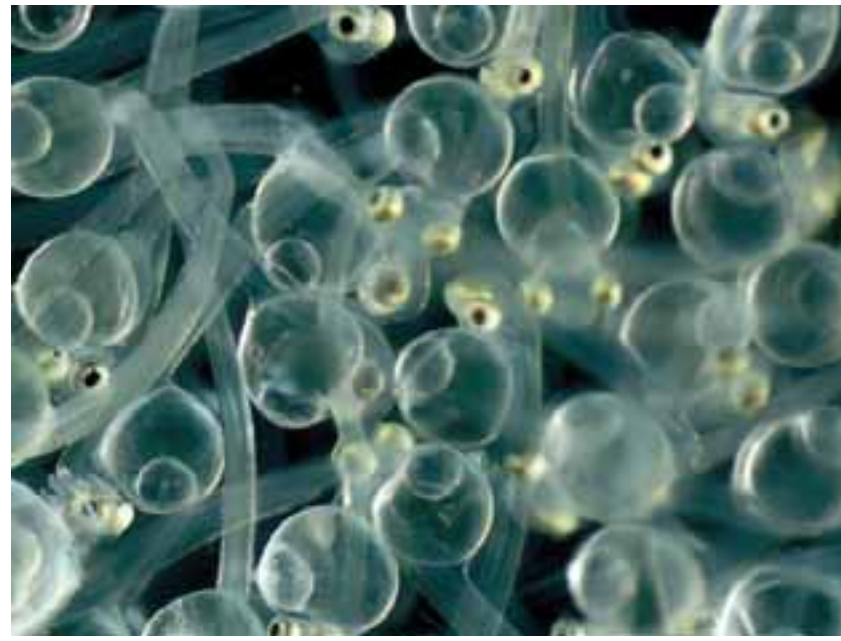

Matt holding a spent giant kokopu

Whitebait is a much-praised and highly-prized seasonal delicacy in New Zealand. The bait are the juveniles of a handful of fish species belonging to the Family Galaxiidae, though well over 90 percent of the whitebait are believed to belong to just a single species: the inanga (Galaxias maculatus). The juveniles, some 45-50mm in length and around 0.4g in weight, are several months old by the time they endeavour to make their way into freshwater rivers and streams from the sea, and when many meet the nets from eager fishers, especially along the West Coast of the South Island. The high price of whitebait has prompted at least one entrepreneur in the North Island to develop a ranching approach to growing whitebait.

Overseas, whitebait have also been in the spotlight, and this is best illustrated by the recent efforts of a Chilean group to breed inanga for the purpose of growing whitebait as cash crops. However, broodstock that are more fecund (producers of larger numbers of eggs) than inanga were considered a necessity to increase profitability. It is from this viewpoint that Matthew Wylie, a keen amateur fish keeper and Zoology graduate student at the University of Otago, opted to explore the possibilities of using the giant kokopu, or 'GK' (Galaxias argenteus). This fish is thought to only make a minor contribution to the whitebait catch, but because of its large size, up to 40 cm, and high fecundity, 10-25,000 eggs, were seen as key attributes that could prove suitable for generating whitebait, whether for aquaculture or conservation purposes. His proposal was funded through through a Te Tipu Putaiao Fellowship awarded by the Foundation of Research, Science and Technology.

Starting in late 2009, Matt employed a two-pronged approach: he took monthly samples (blood and developing eggs) from both wild fish and from fish that were captured and maintained indoors under a simulated natural photothermal regime. To by-pass the need for sacrifice, developing eggs were sampled by minor surgical manipulations. In doing so, Matt could compare natural egg development and development under captive conditions, leading to findings that were presented to an international scientific audience in 2011. He found that fish started to yolk their eggs from February for a 3-4 month period, by which time egg growth had completed.

Collections of wild fish were made until late June, when males were running ripe and females had fully distended abdomens. On return to our holding facilities, these fish were maintained until ovulation was confirmed a few days later, and GKs were spawned artificially without the need for any hormonal intervention. The captive-held fish also spawned, reinforcing that wild giant kokopu can be readily acclimated to captive conditions and captive feeds, and that they can eventually reach spawning condition.


Newly hatched larvae


A one year old giant kokopu

Spawning of wild fish was repeated successfully in 2011 and 2012. Thousands of eggs hatched after 3-5 weeks at 10-17 degrees Celsius. Matt has been rearing the larvae from the 2011 cohort successfully to whitebait on brine shrimp, and they were thereafter weaned onto salmon starter. At a leisurely pace, the fish reached 40g within the first year in recirculating tanks. The ease of propagation and the robustness of the larvae when reared in seawater suggest that this species at least, has the biological attributes to be considered as a valuable species for New Zealand's future aquaculture industry. Indeed, GKs may potentially contribute to species diversification, a perceived need by Aquaculture NZ, to help grow the industry.

Adult Giant Kokopu

Extinction threat EXTINGUISHED

BY DR JOHN WALSBY

PHOTOS MAHURANGI TECHNICAL INSTITUTE

Mahurangi Technical Institute based in Warkworth has successfully bred huge numbers of one of New Zealand's rarest native whitebait species, the Giant Kokopu or *Galaxias argenteus*, from captive fish bred in its conservation hatchery.

Work in eel breeding, and over 20 years of breeding the many millions of grass and silver carp that are used throughout New Zealand for clearing nuisance pond weeds and algae from lakes, have earned MTI an international recognition for its breakthrough successes as a fish conservation hatchery.

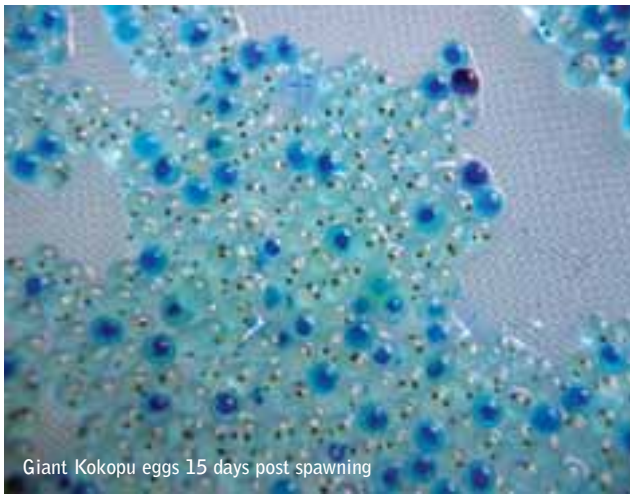
During the last ten years MTI aquaculture scientists and students have been investigating the breeding of many of New Zealand's native fish, including the six species that make up the New Zealand whitebait catch.

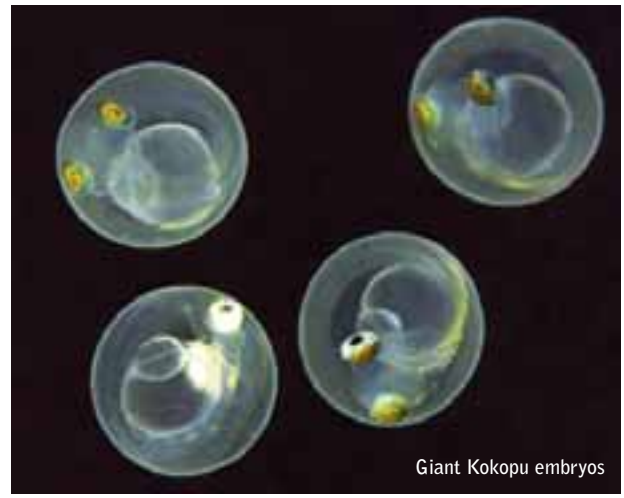
It is widely accepted that the presence of Giant Kokopu whitebait in the South Island West Coast catches provide their renowned, superior flavour. But in conservation circles there is alarm that this important native fish is in serious decline. The Red List of the International Union for the Conservation of Nature's ranks Giant Kokopu as Vulnerable which means they are "facing a high risk of extinction in the wild".

From tiny beginnings, Giant Kokopu grow into New Zealand's most impressive native freshwater fish. Sometimes dubbed the "New Zealand native trout", adults can grow to two kilograms and exceed half a metre in length. With fine dappled markings of rings and crescents over a dark background, and a delicate scatter of gold spots, the Giant Kokopu, is a handsome specimen that is seldom seen because of its rarity.

MTI's breeding success is especially remarkable because the parents were themselves hatched at MTI's laboratory from a small cluster of eggs collected in the wild four years ago. Hatching the eggs, raising the larvae and growing the juveniles through to sexually mature adults from which offspring have been produced, is a major achievement. It is the first demonstration of what fish scientists term, "closing the life cycle", or producing a second generation from fish hatched and raised in a hatchery.

The precise details of natural breeding by Giant Kokopu in the wild have not been reported by fish scientists and have been the subject of much speculation for many decades. In the absence of clues from the wild, the current achievement of both spawning and hatching many thousands of this rare New Zealand native freshwater fish in its hatchery, is considerable.


Giant Kokopu eggs 15 days post spawning


Giant Kokopu embryos


Giant Kokopu emerging from egg


Giant Kokopu newly hatched

Paul Decker, of MTI, said "These are our grandchildren whose parents were our first born." Although the mechanics of fish egg fertilisation are not complicated, creating the right conditions for the synchronised production of good quality, fully mature eggs, and milt or fish semen, requires careful culturing and monitoring of the parent fish.

"Hatching the eggs is a painstaking procedure to ensure that they are not physically damaged, and are protected from diseases and attack by micro predators. Throughout the incubation period it is critical that the eggs are kept in ideal conditions with temperature, moisture and aeration levels that suit them. A major part of the breeding success has been to achieve the hatching and larval raising on such a large scale. We are now in our fourth week of breeding and are hatching literally thousands upon thousands of Giant Kokopu whitebait every 21 days after egg laying. With production at these levels, security of supply for commercial whitebait farming can now be assured.

"Within the next 10 weeks the juveniles will have grown to what the public recognise as whitebait and some of our aquaculture students and staff will be taste testing samples of these delicious fish."

Hatchery-produced fish fry for use in aquaculture must be healthy and have high survival rates. Poor incubation and larval raising conditions can produce weak offspring, but according to Decker, "The fry being raised at MTI's hatchery are already showing excellent health, and because of precautions taken, they are disease free."

This will be invaluable for stock that is grown on for commercial whitebait production, but also for stock that is to be released into the wild for conservation enhancement projects. In the past, survival of transferred fish from other sources has often been below expectations due to health issues.

MTI sees two distinct but complimentary benefits to New Zealand from the hatchery breeding of Giant Kokopu:

- The first is for conservation, with the goal being to release adult fish back into restored natural waterways that have yet to be recolonised.
- The second is their commercialisation, as a farmed whitebait fish to meet the demand for dishes such as whitebait fritters. For this, culture could be on a year round basis to make farming of this delicacy commercially viable.

MTI's Warkworth facility is a conservation fish hatchery actively involved in a collaboration with the Department of Conservation to reintroduce native fish to natural habitats. They are also helping Auckland Zoo with their native fish breeding programme, and native fish display.

The researchers are hopeful that the farming of whitebait will have real conservation benefits in that commercial harvesting will reduce pressure on natural populations enabling them to recover, demonstrating that conservation and commercial initiatives can be complimentary.

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