



<http://www.dpi.nsw.gov.au/aboutus/news/recent-news/fishing-and-aquaculture/oyster-clean-up-program>



Hawkesbury's \$3.1 million oyster clean-up program a success

23 Sep 2008

Clean up of the Hawkesbury River's 400 hectares of oyster farms is now complete, following the devastating outbreak of the QX virus, which crippled the local industry four years ago, Minister for Primary Industries Ian Macdonald announced today.

Minister Macdonald said the NSW Government is now leading the world in research into the breeding of oysters for disease resistance and fast growth.

"The clean-up was part of the three-year, \$3.1 million program to support the Hawkesbury River oyster industry to recover from the QX disease," he said.

"The oyster industry is a valuable and productive industry, worth more than \$37 million to the NSW economy each year.

"The 2004 outbreak of the QX virus affected more than 23 of our Hawkesbury River oyster farmers, and resulted in the loss of 50 jobs in the area.

"This was a huge clean up, with more than 8,000 tonnes of dead oyster waste material removed from the estuary.

"We provided immediate and long-term assistance for oyster farmers to ensure they were able to get back onto their feet and continue production as soon as possible.

"In the months immediately after the outbreak, specially bred QX-resistant Sydney rock oysters were produced by the Department of Primary Industries and 200,000 juvenile oysters were provided to industry.

"The NSW Government also provided a \$240,000 package for affected growers, including waiving fees and \$200,000 worth of grants for farmers to restock their estuaries with healthy juvenile oysters.

"Our targeted recovery strategy has been successful and has ensured the Hawkesbury River oyster is back up and running quickly and effectively."

The NSW Government's \$3.1 million package included:

- \$2.7 million clean-up over three years to help affected growers return to production;
- More than \$100,000 in waived lease fees for all affected farmers for up to three years;

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- More than \$140,000 in waived Food Authority fees for all affected farmers for up to four years;
- Provision of 200,000 QX-resistant Sydney rock oysters;
- \$200,000 worth of grants for farmers to purchase additional stock;
- Additional research to better understand the window of infection for QX disease;
- Provision of counselling services in the region; and
- Extension of new technology for growers to help improve production capacity.

Mr Macdonald said the Hawkesbury was the State's third largest production area for Sydney rock oysters and farmers expect the value of their industry to be back to pre QX levels within the next few years.

"Our Sydney rock oyster farming industry is more than 130 years old and we are committed to ensuring it continues to contribute to the NSW fishing industry well into the future," Mr Macdonald said.

Member for Gosford Marie Andrews congratulated local oyster farmers on their efforts in managing the virus.

"The clean-up process was a huge effort by everyone, it also included the extensive removal of neglected leases to prevent possible environmental issues emerging if they collapsed into the river," Ms Andrews said.

"As a result of the clean-up, the Hawkesbury River is now a cleaner, more sustainable and productive waterway for both industry and the public to enjoy."

<http://portlincoln.yourguide.com.au/news/local/news/general/major-tuna-agreement/1282769.aspx>



Major tuna agreement

25/09/2008 3:32:00 PM

CLEAN Seas Tuna has made another significant step in its quest towards propagating southern bluefin tuna by signing an agreement with the Japanese university that already propagates northern bluefin tuna.

The agreement will see Kinki University share its knowledge with Clean Seas through an exchange of technology and techniques.

Kinki University scientists will start work at the company's Arno Bay hatchery in November this year and according to chairman Hagen Stehr, the university will become "part of the Clean Seas family" until the company achieves its long held goal of propagating the fish and beyond.

"They are committed to us and we are committed to them," he said.

"We won't move without them and they won't move without us."

Mr Stehr said from Japan on Tuesday he had seen northern bluefin tuna in the water that were successfully propagated by the university from 1kg up to 80kg.

He said a lot of people from within the fishing industry doubted the Kinki University would achieve its goal of propagating northern bluefin tuna, then once that was achieved, people doubted the university could make it cost effective, but it is well on its way toward achieving that.

"They have got their food conversion rate coming down all the time, and they are selling fingerlings to others to grow out so it must be cost effective," he said.

The agreement was signed on Monday at Kinki University in Wakayama near Osaka, by Mr Stehr and Kinki University director Professor Osamu Murata.

Kinki University's Northern Bluefin Tuna hatchery technology program started in 1970 and resulted in the spawning of the fish under natural ocean conditions in net cages off Wakayama in 1979, and the first successful completion of the tuna lifecycle in 2002.

The university's propagated fish are being used as broodstock, which Mr Stehr said effectively fully closes the NBT life cycle.

Last year the university sold 1500 bred tuna of one kilogram (about 40cm) to the Japan aquaculture farming market.

Mr Stehr said Clean Seas Tuna was on track with its artificial breeding regime, with its primary objective being the grow out of southern bluefin tuna fingerlings produced from its own broodstock to sizes required by the rapidly expanding world seafood markets.

<http://eyrepeninsula.yourguide.com.au/news/local/news/general/sharing-science/1281648.aspx>



Sharing science

24/09/2008 2:46:00 PM

Clean Seas Tuna will welcome Japanese scientists to its Arno Bay and Port Lincoln sites as part of an international collaboration agreement signed this week.

Clean Seas Tuna and Japan's Kinki University plan to exchange successful tuna propagation and husbandry technologies. The agreement will establish a visiting scientists program which will see Clean Seas scientists working in Japan and Kinki University scientists working in South Australia. It also has the potential to extend bi-lateral cooperation between the Japanese and Australian governments.

Clean Seas Tuna earlier this year announced the world-first hatching of live and active southern bluefin tuna larvae at its land-based breeding facility at Arno Bay just 18 months after commencing its breeding program

<http://www.patagoniatimes.cl/content/view/647/1/>



MORE CHILEAN NGOS CALL FOR SALMON MORATORIUM



Written by Benjamin Witte

Tuesday, 23 September 2008



Activists want to keep Patagonia (above) salmon free

Photo by Helen Bunting

As a deadly fish virus known as Infectious Salmon Anemia (ISA) continues to spread throughout Chile's salmon farming regions, pressure is mounting for a so-called "moratorium" on southward expansion of the troubled aquaculture industry.

In a letter sent this week to Economy Minister Hugo Lavados, a group of eight environmental organizations expressed their shared opinion that until it can better regulate the US\$2.2 billion industry, the Chilean government should cease issuing salmon farming concessions in Regions XI and XII. Currently there are more than 1,000 concession requests pending for each of the two regions, Chile's southernmost.

Two of the letter's signers, Fundación Terram and Oceana, have already made repeated calls for such a moratorium (PT, July 31). The other groups behind the missive – Centro Ballena Azul, Conservación Marina, Corporación Chile Ambiente, Ecosistemas, Fundación Pumalín and the World Wildlife Foundation – are demanding a concession halt for the first time.

"We are very worried about the salmon industry's aggressive expansion into Chilean Patagonia. We feel this development is taking place without sufficient rules in place to guarantee proper conservation of the area's ecosystem," the letter reads.

"It doesn't make sense to continue handing out aquaculture concessions and approving environmental impact declarations while there's no clarity yet about the new laws that will regulate the salmon sector."

Other groups demanding a halt on southern expansion include Oxfam, the Region XI-based Association of Aysén Artisan Fisher Organizations, Region XII's Association of Magallanes Tourism Companies (PT, Aug. 1) and the Patagonia without Salmon Farms Social Coordinating Committee, also based in Region XII (PT, July 1).

The moratorium demand comes at a particularly complicated moment for the once-booming industry, which in an effort to escape overcrowding and disease problems in Region X is looking to expand into Patagonia's cleaner waters.

After growing by an average of 20 percent annually earlier in the decade, the industry has slowed significantly of late, due in large part to problems with ISA. First detected near Chiloé in mid 2007, the highly contagious disease that can be lethal to fish but does not affect humans has since spread throughout Region X and gained a strong foothold in Region XI as well.

"In and around Chiloé, there aren't any more possibilities for concessions because it's totally saturated," Marcela Acuña of the Santiago-based NGO Ecosistemas told the Patagonia Times. "And so they're extending the industry – asking for more concessions in the south. That means that in Aysén they're going to end up causing the same types of problems they already caused in Chiloé."

Chile's National Fishing Service (SERNAPESCA) currently lists 17 ISA outbreak sites: three in Region XI and the rest in Region X, where the disease was first discovered. The government body cites 24 farms as "suspicious" and maintains an additional 78 sites under quarantine. SERNAPESCA, furthermore, lists 46 sites as "temporarily decommissioned" – a relatively new category used to describe formerly infected farms that have eliminated all fish, thoroughly disinfected all facilities and agreed to remain inoperative for three months.

Earlier this year SERNAPESCA also admitted an ISA finding in Region XII, an area also known as Magallanes (PT, June 18). The government body has yet to include the finding on its official outbreak list.

The ISA woes, combined with higher overhead costs, have prompted major stock losses for the world's largest farmed salmon companies, which have closed Chilean farms and processing plants and so far this year, laid off more than 2,000 workers (PT, June 3).

On average, salmon stocks have fallen a whopping 50 percent in the past year. Marine Harvest stocks have fallen by 52.9 percent. The Norwegian-owned company is the world's largest salmon firm. Chilean salmon companies Invermar and Multiexport, meanwhile, have seen their stocks fall by 54.9 percent and 64 percent respectively.

By Benjamin Witte (patagoniatimes@gmail.com)

<http://www.northernadvocate.co.nz/localnews/storydisplay.cfm?storyid=3785659&thesection=localnews&thesubsection=&thesecondsubsection=>

The Northern **Advocate**



Eudistoma Elongatum at Okiato Point, in the Bay of Islands. Picture/supplied

It sounds cute but this squirt's ugly and unwanted

23.09.2008

by André Hueber

Frollicking lambs, blooming daffodils ... and slimy sea squirt.

The last item on that list is a new and unwelcome addition to spring in Northland.

A fresh variety of sea squirt - which looks like slimy white sausages clinging to the shore and is called Eudistoma elongatum - is rearing its ugly head in harbours around Northland.

However, while the pest is a nuisance and unsightly, it's not considered anywhere as nasty as Styela clava - an invasive sea squirt present at Marsden Cove - and it doesn't make it onto Biosecurity New Zealand's most unwanted list.

Biosecurity NZ spokesperson Lisa Gibbison said Eudistoma elongatum was spotted in Rangaunu Harbour, northeast of Kaitaia, in May.

It was first reported in Northland by an oyster farmer in the Houhora Harbour in 2005, and bloomed in a handful of locations around Northland the following year.

The organism came from Australia and had no history of invasiveness or threat for the aquaculture industry.

Meetings were called to discuss the invader but were postponed by the February 2007 floods, which also washed away all signs of Eudistoma, Ms Gibbison said.

The sea squirt appeared to be seasonal, dying back in winter and reappearing when water temperatures lifted.

The transfer of marine farm equipment was the most likely way the pest could have been spread around Northland, Ms Gibbison said.

Since the sighting in Houhora Harbour, it had been found on other oyster farms in Parengarenga Harbour, the Bay of Islands, and now Rangaunu.

"Each time Eudistoma has been reported it's been near oyster farms. It doesn't necessarily mean the farmers have spread the sea squirt, but it may be that they spend more time out in the bay looking closely at structures, so are more likely to see it."

The marine farming industry had told Biosecurity NZ the latest sea squirt had minimal impact on their operations, though Northland oyster farmers said it was a nuisance.

There was no current programme to eradicate Eudistoma, but educational material had been distributed to Northland boaties explaining how they could protect the area's waterways.

"The key message to the owners of moored vessels is to keep their boat hulls clean and thoroughly treated with anti-fouling paint," she said.

<http://www.thewest.com.au/default.aspx?MenuID=146&ContentID=99356>



Fish feed set to lure lupin Growers

24th September 2008, 6:00 WST

WA grain farmers are set to cash in on a booming aquaculture industry as overseas fish farms seek new protein sources to replace fishmeal or oil.

Australian researchers, who have developed a lupin-based fish feed being exported to Japan, Norway and Thailand, predict enormous growth in demand over the next decade.

Department of Fisheries research scientist Brett Glencross said almost half the fish consumed globally came from fish farms, with the aquaculture industry growing 10 per cent a year.

WA farmers, who produce much of the world's lupins, were best placed to capitalise on demand.

The traditional feed source of fish oil and fishmeal, generally sourced from smaller fish such as anchovies, was limited in growth so aquaculture needed sustainable alternative feed sources which were high in protein.

The new pellet, developed under the Aquaculture Feed Grains Program, is made of up to one-quarter



lupin flour and while it contains fishmeal, the amount is less than half that of a traditional feed pellet.

Dr Glencross said the use of WA lupins had risen from very small tonnages in 2000 to 5000-10,000 tonnes in recent years for the domestic aquaculture sector, but the real growth area was the export market.

"If we take an aggressive marketing approach, we could push a quarter of a million tonnes per year into the global aquafeed sector, but a more conservative estimate would be around 50,000 tonnes per year," he said.

The world's biggest lupin dehulling plant opened in Forrestfield last year as a joint venture between bulk grain handler CBH and food giant George Weston Foods, with the aquaculture industry expected to be a key market.

Mark Pontifex, lupin trading manager for CBH's marketing arm Grain Pool, said two poor seasons had drastically cut WA's lupin crop.

"Aquaculture is definitely promising, we have had interest from key markets, including Europe, and also Asia," Mr Pontifex said.

"We just haven't had the production in the last few years. Hopefully, however, this year we have a good year for all our farmers and our buyers return to using lupins."

Lupins are also used for stock feed and for high-protein human food sources, including bread and milk.

JODIE THOMSON

http://www.theglobeandmail.com/servlet/story/RTGAM.20080924.wlfishfarm24/BNStory/lifeFoodWine/home?cid=al_gam_mostemail

GlobeLife

Food & Wine

A new breed of fish farming

Aquaculture has long been a target of environmentalists, but the critters at this operation in B.C. tick all the right eco-boxes

FIONA MORROW

From Wednesday's Globe and Mail

September 24, 2008 at 10:29 AM EDT

AGASSIZ, B.C. — 'It was like being a leper.'

Bruce Swift is remembering his first attempts to generate interest in his B.C.-farmed coho salmon. It was four years ago, and the trip from his property in Agassiz, B.C., to Vancouver was a disaster.

"There wasn't one person who would take it," he recalls. "I came back and had to cull 1,500 to 2,000 fish. We shipped them all to the mink farm."

How times have changed: Mr. Swift's farmed coho are now an exclusive delicacy, available only at three high-end restaurants in Vancouver - Bishop's, Raincity Grill and the Show Case Restaurant in the Marriott Pinnacle. These critters tick all the right boxes with the local, sustainable and organic movement.



[Enlarge Image](#)

Bruce Swift's land-based salmon farm has environmentalists excited because it addresses a lot of the problems of ocean-based aquaculture. (*LAURA LEYSHON FOR THE GLOBE AND MAIL*)



This may come as a surprise to conscientious consumers, for whom "farmed" remains the f-word when it comes to fish. But Mr. Swift's product is a far cry from the farmed variety found at the supermarket.

Atlantic farmed salmon is reared in ocean-based pens - a practice widely accepted to be the cause of the preponderance of sea lice and concomitant disease in wild fish stocks.

Only last week it was announced that the pink salmon stocks in B.C.'s Broughton Archipelago had collapsed. In one key indicator stream, only 19,000 spawners have been counted this year, compared with 264,000 in 2007.

The time has come to look for sustainable alternatives and Mr. Swift's project may be the answer.

His farm is land-based, the coho kept in a series of enormous tanks, removing any possible contamination effect on wild salmon.

It's a system that has environmental groups excited.

"As part of the Coastal Alliance for Aquaculture Reform, we are advocating strongly at the provincial and federal level for investment in closed-containment pilot programs," said Catherine Stewart, Salmon Farm Campaigner at Living Oceans. "The system addresses a lot of the problems of open pens and we need a thorough analysis of what is a potential solution to a vital issue."

And the difference between the farmed salmon Mr. Swift rears and regular farmed salmon isn't only a matter of breeding grounds.

More than simply salmon reared in gigantic fish bowls, Mr. Swift's farm is part of a Canadian research concept known as integrated multi-trophic aquaculture being tested on both coasts by the universities of New Brunswick and Victoria. The idea is to grow one species in conjunction with others in a multi-level system that balances out biological and chemical processes.

It involves one fed species - in this case, the salmon eat pellets made from wild marine material developed by animal nutritionist Dr. MaryLou Swift (Mr. Swift's wife). Then other plants and animals that extract their nutrients from either the solid or water waste are introduced. At Swift Aquaculture, waste solids are filtered and become fertilizer for field crops such as garlic and beans, while waste water is used to grow wasabi,

watercress and algae. The algae, in turn, become a feed supplement for the crayfish bred in Mr. Swift's freshwater pond.

No additional nutrients are brought onto the farm. It's a meal in one backyard.

"We only have four acres," says Mr. Swift. "Yet I could grow hundreds of thousands of fish - that's the beauty of aquaculture. One tank can hold 2,000 fish, and that's not high-density at all. The key thing when you're looking at a land-based system is that you can go up - you just make your tanks taller and deeper."

Nevertheless, Mr. Swift says he prefers to operate a smaller system, supplying to a niche market. "I like to avoid the middlemen," he explains. "I sell direct, meet the chef - these coho are not a commodity to me."

His approach is to grow small salmon - only 1 to 1.2 kilograms - that produce two fillets each. The brood stock are kept in tanks inside, under strict biosecurity conditions. From this stock, eggs and milt (sperm) are removed for fertilization and then transferred to the tanks where they will grow until harvest.

Keeping the fish small - and, as a result, not grading the fish for size - is important to reduce handling. If handled too much, grown Pacific salmon become stressed, triggering proliferative kidney disease, Mr. Swift explains.

Being unable to guarantee consistency is the one drawback to this system. "Sometimes that can be frustrating to restaurateurs, because there isn't this nice, evenly sized fish," he says. But the advantages to his broader approach more than compensate. "We don't use antibiotics or vaccines and we are also one of only two salmon stocks in Canada to be health certified by the DFO [Fisheries and Oceans Canada]."

Though he has no interest in expanding his own operation, Mr. Swift offers his services as a consultant. He imagines a future where every major city has land-based fish farms supplying high-quality, sustainably grown fish for a local market. The key, he argues, is to find people with existing horticultural infrastructure. "There's a lot of interest right now in Alberta and Saskatchewan to introduce aquaculture into the swine barns. They're losing \$50 to \$70 a head on pigs, so they're looking for a new business."

This is a market ready to explode, he says, citing the fact that a land-based system in Washington is supplying Whole Foods. "You get a place like that interested, and that triggers a market. I think there's going to be a big shift, and coho is a fish that can do it."

<http://news.smh.com.au/business/clean-seas-signs-deal-with-japanese-uni-20080923-4lzv.html>



Clean Seas signs deal with Japanese uni

September 23, 2008 - 8:52AM

South Australian fish exporter Clean Seas Tuna Ltd has agreed to share research technologies into tuna husbandry with a Japanese university.

Clean Seas chairman Hagen Stehr signed a collaboration agreement with the director of Kinki University, professor Osamu Murata, in Japan Monday.

The agreement will see the exchange of technologies and techniques between Clean Seas scientists working in Japan and Kinki scientists working in South Australia on the commercial propagation of tuna.

"The agreement is another step in the commercialisation of Southern Bluefin Tuna," Mr Stehr said in a statement.

"With the rapid depletion of tuna stocks in the northern hemisphere, the intelligence sharing partnership agreement signed with commercially-focused Kinki University already producing tuna is of substantial benefit for Clean Seas."

Clean Seas is currently developing an on-shore breeding facility for Southern Bluefin Tuna.

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EARNINGS STAGNANT FOR CHILEAN SALMON INDUSTRY



Written by Patagonia Times Staff

Sunday, 21 September 2008



A salmon farm near Puerto Montt, Region X
Photo by Benjamin Witte

Despite ongoing problems with Infectious Salmon Anemia (ISA), a deadly fish virus that continues to spread throughout Chile's salmon farming regions, exports of farmed salmon and trout actually increased during the first half of the year, SalmonChile reported. SalmonChile is the industry's private producers' association.

Between January and July, Chile exported some 279,291 tons of farmed salmon and trout, a 16 percent spike (in terms of volume) compared to the first half of 2007. Much of the fish went to the United States and Japan, which together accounted for some 64 percent of total purchases.

The volume increase, however, did not translate into greater earnings. Overall, salmon and trout exports took in some US\$1.396 billion during the period, roughly equivalent to what the industry earned in the first half of 2007. In other words, the industry – which earlier in the decade grew at average rate of 20 percent annually – is now stagnant.

SalmonChile says increased fuel costs and a weak U.S. dollar are partly to blame. But most observers insist the real problem is ISA, which was first detected in mid 2007 and has since spread to dozens of farms throughout Regions X and XI.

Chile's National Fishing Service (SERNAPESCA) currently lists 17 ISA outbreak sites: three in Region XI and the rest in

Region X, where the disease was first discovered. The government body cites 24 farms as “suspicious” and maintains an additional 78 sites under quarantine. SERNAPESCA, furthermore, lists 46 sites as “temporarily decommissioned” – a relatively new category used to describe formerly infected farms that have eliminated all fish, thoroughly disinfected all facilities and agreed to remain inoperative for three months.

By Patagonia Times Staff (patagoniatimes@gmail.com)

<http://www.thefishsite.com/fishnews/7947/wa-help-feed-worlds-farmed-fish>



Monday, September 22, 2008

WA Help Feed World's Farmed Fish

AUSTRALIA - Western Australian research is now helping to feed fish in aquaculture projects across the world and is providing another valuable market for the State's grain farmers.

The Aquaculture Feed Grains Program has brought together private and public sector partners, who saw the potential of developing a sustainable, nutritionally-sound product to feed farmed fish and create a new and growing export market.

Department of Fisheries research scientist Dr Brett Glencross said, with aquaculture developing as the fastest growing primary industry in the world, the traditional sources of fish feed would have meant a major constraint to growth and put further pressure on wild stocks. Traditional feed relied on fish oils and fishmeal, sourced from wild caught stocks.

“We have been able to develop a lupin-based fish feed from a renewable resource that is not only sustainable, but also provides great benefits for WA grain growers from additional sales of value-added lupin products,” Dr Glencross said.

Dr Glencross said delegates from the 12th International Lupin Conference visited the Department of Fisheries at Hillarys this week to see and hear about his research and, yesterday at the Conference in Fremantle, he presented a review of the nine year development path that has led to many scientific discoveries and technical improvements, as well as spawning a new, locally based, value-adding industry.

“WA now has the largest lupin processing plant of its kind in the world and we are now seeing lupins being used in fish feeds supporting aquaculture industries nationally and in many countries, including Norway, Chile, Japan, Thailand and New Zealand.

“This is really a story of success for two industries – using lupins to provide a high protein feed for fish increases their value as a crop to the grain farmer and it also provides a way for aquaculture to continue to grow to meet the world demand for fish and help take the pressure off wild stocks, when many fisheries are declining.”

Dr Glencross said in recent years WA growers had supplied up to 80 per cent of Australia's lupin production, from an important rotational crop that helped to replenish soil nitrogen after wheat growing.

<http://www.ext.vt.edu/pubs/seafood/600-050/600-050.html>



Intensive Marine Finfish Larviculture

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Publication Number 600-050, posted June 2007

Marine finfish production is a rapidly expanding field, both in research and industrial aquaculture. A driving force behind this growth is the inherently high value placed upon marine finfish products in the marketplace. With this higher product value, marine finfish production is perceived to be a relatively robust prospect for investment from the private sector. Additional catalysts for the trend towards increased investment in marine aquaculture include limitations on wild harvesting, projections for increased global seafood demand, and increasing interest in open-ocean aquaculture worldwide.

Fingerling production is one of the many challenges faced by those interested in promoting industrial production of emerging marine species. Marine finfish broodstock generally produce copious numbers of eggs during spawning; however, hatchling (or fry) production for marine species generally includes extended periods of complex live feeding requirements. Live feeds include rotifers, *Artemia*, and others, tiny creatures that are often the first foods in the marine food chain. In addition to these live feeding requirements, limitations exist in the types of live feeds that can be produced in numbers adequate to supply commercial production. Furthermore, understanding of the nutritional requirements for marine finfish larvae is limited, and knowledge on how to get these nutrients into live feeds for ingestion by the fry is even more limited. This publication provides an overview of basic fingerling production procedures for marine finfish such as cobia (*Rachycentron canadum*), flounder (*Paralichthys dentatus* and *P. lethostigma*), sea bass (*Centropristis striata*), and red drum (*Sciaenops ocellatus*).

Typical marine finfish larviculture is conducted in recirculating aquaculture systems (RAS). These systems link the production tank to the remainder of the RAS, which provides for solids removal, biofiltration, temperature control, and water sterilization. As such, "dirty" water flows out of the production tank, through the RAS for cleaning and sterilization, and returns "clean" to the production tank as needed (see Figure 1). The use of RAS technology enhances biosecurity and increases environmental and hydrodynamic control, maximizing production survival and system reliability.



Fig. 1. RAS water treatment

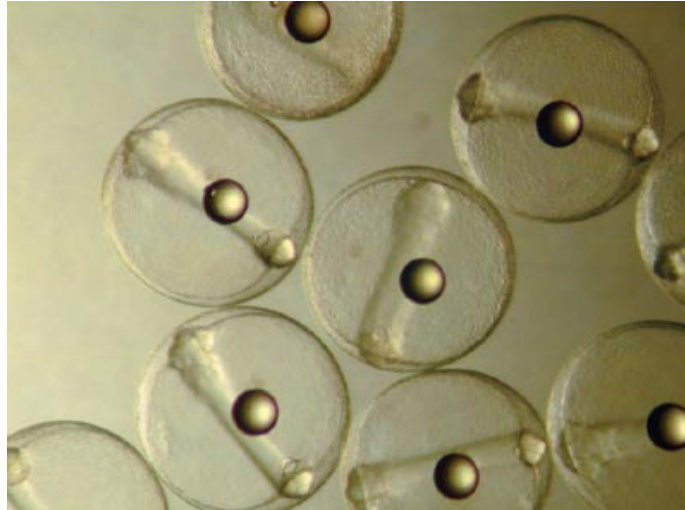


Fig. 2. Summer flounder fertilized eggs

Larviculture

Egg/sac-fry stage – Once marine finfish eggs are fertilized (see Figure 2), rapid development occurs followed by the hatching of sac-fry. Sac-fry (see Figure 3) subsist on endogenous reserves for a time period that is both species- and temperature-dependent. During this time, rapid physiological changes occur, such as the development of functioning eyes, mouthparts, and a rudimentary digestive tract. As endogenous reserves are utilized, the fry must begin to consume exogenous reserves or perish.

Fry stage – The first live feed which can be raised on a commercial scale and that has demonstrated palatability for the species listed as well as other marine finfish species is the rotifer *Brachyionous* spp. (see Figure 4). Rotifers range in size from 200 to about 400 microns (species dependent) and can be raised on algae or commercially available diets. Rotifers are required in large numbers during this feeding stage. A typical feeding rate for rotifers is based upon fry density in the production tank. For example, if cobia fry are stocked at 10 fry per liter at 28°C (82°F), then approximately 10,000 rotifers per liter should be added to the production system every 24 hours (numbers vary considerably based upon exchange and dilution rates for water in the production system). Thus, if 100,000 cobia fry have been stocked, then approximately 500 million rotifers per day will be required.

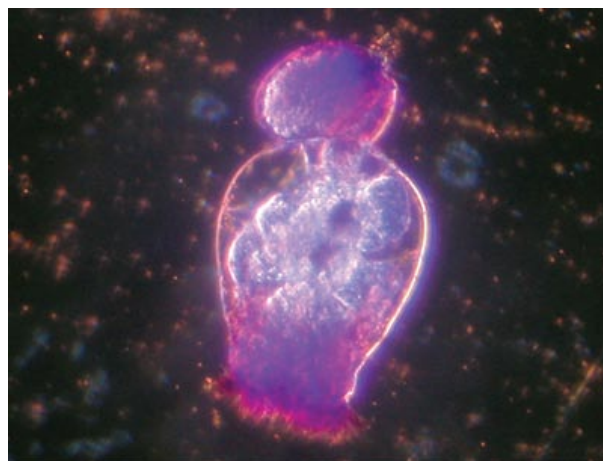


Fig. 3. Cobia sac fry

Fig. 4. Stained rotifer with egg

Before being fed to fry, rotifers require enrichment to enhance their nutritional value. Numerous commercially available products and techniques have been developed to accomplish this enrichment. Research and production protocols utilized by the Virginia TechAquaculture Group (VTAG) utilize an INVE product called Protein Selco Plus (www.inve.com). This product calls for a six-hour enrichment process wherein temperature, oxygen, and enrichment additions are closely monitored to maximize nutrient uptake by the rotifers. Once enriched, rotifers are rinsed, concentrated, enumerated, and placed into cold storage.

An important component typically associated with the rotifer feeding stage in fingerling production is the use of microscopic algae, typically *Nannochloropsis* spp. (see Figure 5). Depending upon the species and resultant cell size and density, a typical algal addition to the production tank ranges between 100,000 to 150,000 cells per milliliter. The addition of these algae to the tank water gives the water a green hue, and is thus commonly referred to as the “greenwater” stage.

In the past, marine hatcheries have had to utilize significant production space and labor resources for the production of live algae. However, recent advances in technology have made concentrated algae pastes available. These pastes come in concentrations as high as 16 billion cells per milliliter, and have demonstrated viability for live algae replacement during greenwater applications as well as rotifer production. These algae pastes can be purchased from companies such as Reed Mariculture (www.reed-mariculture.com) and can provide a significant cost savings to hatcheries along with reducing the risks associated with unexpected crashes in live algae production.

Artemia: As fry get larger, they quickly outgrow the prey size represented by rotifers, and a larger live feed is required. After rotifers, the most common live feed utilized during marine finfish fingerling production is *Artemia* spp. *Artemia* (see Figure 6) generally range from 500 to 900 microns, and represent the transitional feed after which artificial dry feeds can be used. *Artemia* are typically purchased as dry cysts and are packaged in vacuum-packed containers that have a long shelf life. *Artemia* are also fed based upon fry density – for the same number and density of cobia fry used in the rotifers example, approximately 250 million *Artemia* would be needed every 24 hours.

The first phase of *Artemia* production is typically hydration, followed by decapsulation. During hydration, the eggs are placed in an agitated and aerated container filled with salt water for 24 hours. Thereafter the eggs are filtered out and added to a buffered, cold bleach solution that chemically burns away the exterior of the *Artemia* egg casing. Once decapsulated, the eggs are once again placed into salt water and hatched for 24 hours, or placed in a refrigerator for later use. The hatching vessel is temperature-controlled and injected with pure oxygen to maintain oxygen levels. After hatching, the *Artemia* are harvested, rinsed, and placed into an enrichment vessel.

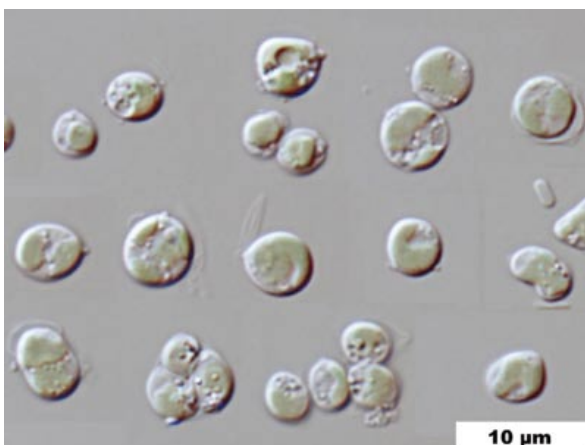


Fig. 5. Live algae Nanno. spp.

Fig. 6. Artemia



Fig. 7. Live feeds cold storage

Fig. 8. Automatic dry feed feeder

Like rotifers, the inherent nutritional value of *Artemia* is low, resulting in similar enrichment requirements. *Artemia* enrichments are also commercially available. Research and production protocols utilized by the VTAG call for an INVE product called DC DHA Selco. This product provides a 24-hour enrichment process whereby temperature, oxygen, pH, and enrichment additions are closely monitored to maximize nutrient uptake by the *Artemia*. Once enriched, *Artemia* are rinsed, concentrated, enumerated, and placed into cold storage for tank additions as necessary.

Cold storage is a process whereby live feeds, after having undergone a process to maximize their nutritional value, are rapidly cooled and maintained below 7°C (45°F) for up to 24 hours to minimize their metabolic activity. By minimizing metabolic activity, their energy and nutrient reserves are maintained for transfer to the fry upon consumption. This cold storage method reduces hatchery labor by requiring only one enrichment process per day for each live feed type. A typical live feed cold storage setup (see Figure 7) consists of a cooler, floating ice bottles, and aeration to keep live feeds in suspension.

Feeding regimens are species- and temperature-dependent. With coho as an example, algae, rotifers, and/or *Artemia* are added to the tank in predetermined levels every six hours. When the fry are large enough to begin the transfer to dry diets, a co-feeding period begins for a few days. This involves adding the dry diet to the tank (generally with an automatic feeder; see Figure 8) at a set time period just before the addition of *Artemia*. After a few days of co-feeding, a weaning process occurs whereby more frequent dry diet feedings occur in conjunction with a gradual elimination of the live feed. The fry are considered weaned once they are feeding solely on dry diets. At this point, they can be considered fingerlings, and the process of fingerling production is complete.



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<http://www.cfsph.iastate.edu/iicab/meetings/iabc-2009.htm>



**INTERNATIONAL
AQUACULTURE
BIOSECURITY
CONFERENCE**

**Practical Approaches for the
Prevention, Control, and
Eradication of Disease**
August 13-18, 2009
Trondheim, Norway

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Principal Coordinating Entities

- American Veterinary Medical Association (AVMA; Dr. David Scarfe)
- Atlantic Veterinary College, University of Prince Edward Island (AVC-UPEI; Dr. Larry Hammell)
- Center for Food Security and Public Health, Iowa State University (CFSPH; Dr. James Roth)
- College of Veterinary Medicine, Iowa State University (CVM-ISU; Drs. James Roth, Dušan Palić)
- Institute for International Cooperation in Animal Biologics, Iowa State University (IICAB; Dr. James Roth)
- Norwegian Veterinary Institute (NVI; Dr. Roar Gidding)
- World Aquatic Veterinary Medical Association (WAVMA; Dr. Chris Walster)

Executive Summary

The CFSPH, IICAB, ISU-CVM, UPEI-AVC, WAVMA and the AVMA serve as coordinating entities and provide initial guidance and assistance to support, develop, promote and execute a 5-day International Aquaculture Biosecurity Conference in Norway, August 13-18, 2009 that includes:

- A 3-day program of internationally-recognized keynote speakers; contributed presentations and posters
- A 2-day workshop for participants to develop optimal and practical approaches for aquaculture biosecurity, and for participants to test these approaches in on-farm exercises; and,
- Publications including Proceedings, a peer-reviewed Aquaculture Biosecurity Manual addressing technical and science-based areas pivotal to aquaculture biosecurity, and a Practical ABC Manual for applying, auditing and certifying on-farm biosecurity.

Background & Justification

- For more than 40 years aquaculture production throughout the world has been the fastest growing sector of animal agriculture that now rivals or exceeds other global animal agriculture sectors. Aquatic animal disease is now the greatest obstacle to sustained aquaculture development, to national growth of the

aquaculture industries, and to national and international trade, and also has an enormous impact on natural resources and harvest fisheries.

- Legislation, regulations, policies and programs that address aquaculture biosecurity (the prevention, control and possible eradication of aquatic animal diseases) have become high priorities at international, national, state/provincial and local levels for governments, non-governmental bodies, aquaculture industries and producers, and the veterinary profession; however, many proposed approaches to aquaculture biosecurity are extremely diverse, disparate and, in some cases, appear to be contrary to the best interests of producers, industries and governments.

For more information on specific sessions, contributing papers, publication, social programs, accommodation, travel arrangements and more, go to: <http://www.IABConference.org> and sign up to receive updates.

Audiences/Participants

International, national, state/provincial and local:

- Aquatic veterinarians and veterinary organizations
- Aquaculture producers and industry organizations
- Government agencies and standards-setting bodies
- Academic education, research and extension personnel
- Commercial aquaculture-supportive companies

Conference/Workshop Coverage

- National/International Biosecurity Strategies
- Legislation/Regulations
- Risk-Analysis and Hazard Identification
- Epidemiology/Surveillance
- Prioritizing, Diagnosing and Confirming Diseases
- Certifying and Auditing Disease Status
- Contingency/Emergency Responses
- Building and Implementing Disease and Site-Specific Biosecurity Plans

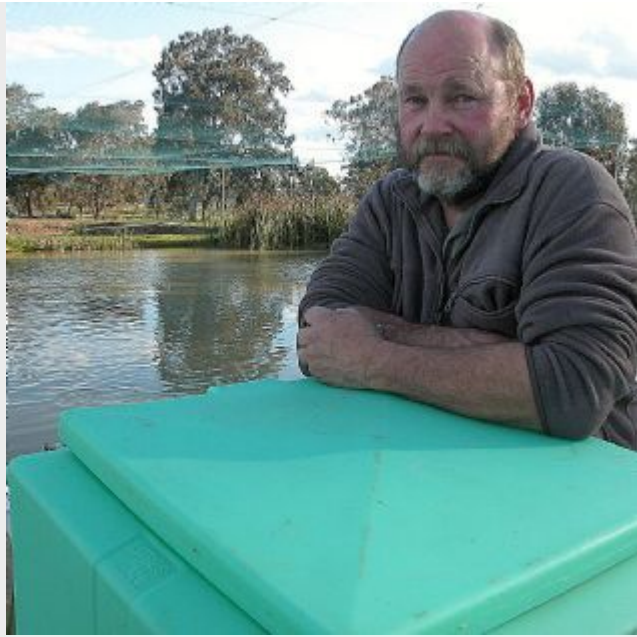
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http://www.weeklytimesnow.com.au/article/2008/09/17/6295_on-farm.html

Aquaculture win for Peter

September 17, 2008



Sparking up: Peter Moore's electrical background came in handy when designing an automated fish feeder for his southern NSW farm.



On the line: Peter Moore finds silver perch the best fish species for his small-scale operation.

[more news](#)

IT MAY seem strange, but Peter Moore relied on ingenuity and skills he acquired as an electrical contractor to set up his southern NSW aquaculture farm.

Working to a tight budget and with no blueprint, he expanded the business over the past decade as funds became available.

Peter and his wife, Christine, grow silver perch in an open-pond system on their small farm at Corowa.

Along the way, with some measure of trial and error, Peter assembled technology in his workshop to automate the one-man operation so he can better juggle fish farming and working off farm.

One of his inventions was an automated fish feeder using a garden blower-vacuum and plastic chemical tank, which shoots commercial fish pellets across the water at preset intervals.

Putting the whole enterprise together on a tight budget prompted Peter to call the business Shoestring Fisheries.

He moved from Melbourne to the 8.4ha unimproved farm in 1988 as a "tree change".

Growing up on the Murray River, at Mathoura, Peter had always been a keen angler.

When a mate at Robinvale began experimenting with farmed trout cod, redbfin and catfish, he thought he would have a dabble in the industry.

"I stocked the two dams here with 150 yellowbelly (golden perch) for sport fishing in the early 1990s and they grew well," Peter said.

"So I decided to set up a reticulated system using tanks indoors for the yellowbelly but it was not successful."

In the mid 1990s he had four large ponds dug and stocked them with silver perch fingerlings, experimenting with three types of commercial pellets.

"The fish grew, so the next step was to put a bigger bore down to supply water," Peter said.

"The bore was put down to 122m in the mid 1990s and the water was crystal clear."

At the time, Peter could find little industry information on farming fish in open ponds so simply learnt from his mistakes.

"I made all the mistakes on a small scale and taught myself," he said.

He said he took things step by step, including enrolling in the first two-year aquaculture course at Grafton, in northern NSW.

Peter persevered with the fish, with plenty of markets opening in the regional hospitality industry.

"In the first season I did the farmers' markets and ran out of fish, as I hadn't structured the volumes well," he said.

"I was growing the fish out to 300-500g and selling them for \$9 a kilogram gilled and gutted.

"But with all the associated costs of licence fees, Foodsafe (compliance) and electricity, the break-even price rose, pushing prices to \$12 a kilogram."

Electricity to drive all the pumps and associated equipment remains the biggest cost, at \$2000 a quarter in winter and rising to \$3500 in summer.

As the business outgrew the farmers' markets, Peter was forced to search for alternative market outlets.

At the same time, a large-scale silver perch operation was started by nearby Howlong farmer Paul Trevethan.

Peter and Paul now work together to supply fish to Melbourne wholesaler Racovolis Amalgamated Fish Agents.

"We supply chilled whole fish on ice, with the Asian restaurant trade our biggest customers," Peter said.

In peak periods he sends up to a dozen boxes of fish each week to the Tuesday fish market in Melbourne.

Retail prices range from \$11 to \$13.50/kg.

It takes two years for a silver perch to grow from a fingerling to a plate-sized 500g fish.

Peter buys the fingerlings from a Riverina hatchery at 25mm in length and grows them in indoor tanks kept at a constant 25C.

"I have tried Australian bass and catfish but they proved unsuitable," he said.

"The silver perch are a tough fish that are easy to wean on to pellets.

"The fingerlings are fed at 4 per cent of their body weight a day, while the adults eat 1 per cent.

"The fingerlings leave the indoor tanks at the end of September, when daytime temperatures warm up to 20C and they are about 60mm in length."

Peter said birds preying on the fish in the open ponds are a constant problem and the entire area requires netting.

Small submersible 1kW motors are used to oxygenate the ponds.

Waste water drains to a nearby effluent dam.

Peter and Christine have planted nashi pears and other horticultural crops with a view to recycling the waste water.

"Farmgate sales during the summer help supplement our income from the fish," he said.

"The outlook for the industry is good but it is best for anyone thinking of investing in open pond farming to have a look here first.

"They can then save on money and mistakes."

<http://www.news-press.com/apps/pbcs.dll/article?AID=/20080917/COLUMNISTS09/809170403/1058/sports>



Issue of fish farms piled with waste

It's not often a fishing columnist gets to write about booze, drugs and scandalous sexual conduct — once every 23 years, so far - but here we go!

First, a few words about offshore aquaculture in the Gulf of Mexico. That's an issue that has created stranger bedfellows than an ex-Vietnam POW paired with an Alaskan caribou hunter.

Which is to ask, when was the last time we saw recreational anglers, commercial fishermen and environmental activists all on the same side? And who's going those oxen?

The answer is offshore aquaculture, by which the farming industry would be granted permits to monopolize areas of the Gulf for the purpose of growing fish. The Gulf of Mexico Fishery Management Council has been developing rules for that purpose for about five years, and it's in the process of collecting final public comments (see GulfCouncil.org).

It is the time to file complaints about the government giving away public waters without compensation, so private fish-farming firms can compete with commercial fishermen and fish houses for seafood marketplace sales.

Environmentalists also list a bevy of potential problems with ocean fish farming, even though non-native and genetically modified fish have been outlawed from the get-go. But issues, including introducing lots of fish-doctoring chemicals into the Gulf, remain.

There also is the issue of fish farms producing poop ultimately equivalent to the untreated sewage of 17 million people, according to the Institute for Fisheries Resources. No matter how far offshore, there will be tremendous concentrations of fish waste full of fish medicine going straight into wild habitat.

Ocean aquaculture operations feed their fish at tremendous rates, in order to grow them fast. All that food, plus the structure of the holding pens, amount to giant magnets for wild fish in the ocean.

That would be dandy if we could fish around them, but they'll be sequestered in protective zones recreational and commercial fishermen won't be allowed to enter. So there would be no-fishing zones, surrounded by no-fish zones.

What I see as the worst property of the fish farms, however, is the fish food. Ocean-farmed fish are carnivores that eat fish meal made from wild baitfish. It takes up to 20 pounds of baitfish to yield 1 pound of farmed fish.

According to the Marine Aquaculture Task Force Report, that's unsustainable. Which means baitfish populations, and thus ocean ecosystems, could collapse.

All these problems have slowed the Gulf Council in making regulations, miffing the Bush administration, which has pushed hard for the farms. So the feds have tried an end-around, which brings us to the booze-drug-and-sex-riddled Minerals Management Service, which literally has been in bed with the oil industry (see Google).

The MMS has claimed it has the right to permit fish farms attached to offshore oil rigs. But some members of Congress vehemently disagree, so this is starting to smell like a fine kettle o' fish.

Stay tuned.