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ALGAE PRODUCTION FORTIFIES FOOD

**TRAINING
WORKSHOPS
ON PACIFIC
OYSTERS**

**CHINESE LESSONS IN
SEAWEED PRODUCTION**

**SUMMER
MEANS BOATS
– PEOPLE, POOS
& WEES**



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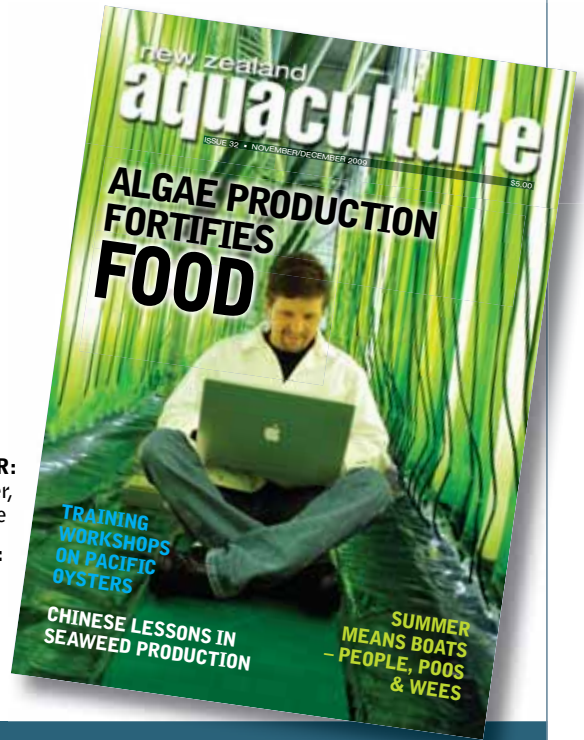


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ON THE COVER:
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Cawthron Institute
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FORTIFIES
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THE NEXT STEP



The impending 2009 Cawthron New Zealand Aquaculture Conference being held in Nelson on 5 and 6 November provides a milestone that allows us to review the past year. While it has been just over a year since the first national aquaculture conference held in July 2008 a great deal has been achieved.

The achievements have not purely been managed by Aquaculture New Zealand but it has been satisfying to have played a functional role as well as being a catalyst in what has been an important time for the sector.

At the first conference, the then shadow minister Phil Heatley opening the second day outlining National's policy for the development of aquaculture. We can now look back on what this meant in practice.

It was not a long wait until the sector saw the two Aquaculture Amendment Bills introduced into the house. The second of note because it was the last bill debated before the house broke for the elections. Notable was that there was not one dissenting speech in the house from any party. However, while they were important issues it was essentially tinkering with the current legislation.

It was around this time that the CEO Forum was established. From this somewhat unique gathering of CEOs from the sector, central and local government agencies the independent review of the regulatory regime for aquaculture was launched with the full support from the Ministers. There was no better forum for this exercise.

Following the election the sector was pleased to see that the new government was a major champion of aquaculture.

In a number of the legislative announcements aquaculture was cited as a key sector to benefit from the impending changes. The new Ministers also took the opportunity to reinforce their desire and support for major change to the regime under which the sector operates.

The raft of concurrent initiatives saw the sector's market development strategy achieving a number of milestones with the management and delivery of the contestable funding programme through New Zealand Trade and Enterprise providing one of the first tangible benefits of the strategy.

The Primary Growth Partnership (PGP) replaced the Fast Forward concept. As a sector aquaculture was prepared

for this and as a result has had the advantage of being in step with the agency as it develops its goals and management philosophy.

One of the areas that has slowed has been progress within the regions due to the view that the changes to the regulatory regime will be significant. With many of the proposed legislative changes affecting the decision-making processes of regional government a number of councils believe it is prudent to await the outcome of the central government deliberations.

There is no doubt the industry is about to take its next step on its sustainable growth path.

This is a growth supported by the confidence that the long term investment necessary in aquaculture will be made in a climate of certainty for individuals and companies.


The aspirations of the sector are about quality not quantity, ability to experiment and diversify as the market demands and to realise the sector's potential as a very real

FOLLOWING THE ELECTION THE SECTOR WAS PLEASED TO SEE THAT THE NEW GOVERNMENT WAS A MAJOR CHAMPION OF AQUACULTURE

contributor to the country's economic development.

All of these aspirations can be achieved. As time progresses the reality of their achievement becomes more than a strategy or desire. The balancing acts the sector has to make between economic opportunities and environmental sustainability and with the current resource users and coastal communities are an everyday occurrence.

The sector will never compete in terms of volume which means it must compete in quality and fleet footedness. New Zealand has a history of such business models competing with success internationally and there are many lessons we can, and are striving to, learn.

With the support of decision-makers working with the sector aquaculture has the ability and commitment to become New Zealand's next major primary sector. 

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KOURA BATTLE BROADENS

Koura farmers Vince Scully and Mary Shanahan had to cancel their participation in Kaikoura's annual Seafest event and won't be holding an open day for the farm in November either.

Theysay continual battles with Environment Canterbury and the organisation's apparent "hypocrisy and vindictiveness," has forced them into an impossible situation.

And, their complaints were given new credence recently when 10 Canterbury mayors wrote a joint letter expressing their dissatisfaction with the Canterbury Regional Council and Environment Canterbury's performance.

The couple had to redesign their farm to avoid pollution to their product from nearby cow farms. They were forced to write off \$30,000 and six months work, because ECan was taking too long to address the pollution in neighbouring creeks.

Since complaining to ECan about stock continually accessing creeks, which could potentially ruin their livelihood, the couple have been audited at a cost of \$2000. Now they are told they need to reapply for another consent to discharge water as they were forced to change their pond design.

ECan regulations director Kim Drummond has said the holding ponds at the koura farm exceeded healthy levels for contaminants such as nitrate, phosphate, ammonia, biological demand for oxygen, turbidity and faecal matter.

"When that pond water is released back into the creek following harvest or from overflow when it rains, these high levels of nutrients and faecal contamination flow into the creek."

But Mr Scully disputes these claims, saying the farm has just been monitored as fully compliant with their water tests. Recent tests have come back "squeaky clean", he says.

Meanwhile Nelson/Marlborough Fish and Game regional manager Neil Deans agrees, saying koura farming is a relatively benign impact on the environment.

"Consent authorities, wherever they are, have difficulties with stock in streams," he said. "There has been a considerable effort by landowners and residents to try to address the issues. There are many farmers concerned about environmental impact but there are still some getting away with it."

Mr Deans said this created an untenable and unacceptable situation for freshwater farmers.

AQUACULTURE PRODUCING HALF OUR FISH NEEDS

An international team of researchers has found that fish farms now account for half the fish consumed globally.

But while the industry is more efficient than ever, it is also putting a significant strain on marine resources by consuming large amounts of feed made from wild fish harvested from the sea, the authors conclude.

The findings are published in the September 7 online edition of the Proceedings of the National Academy of Sciences (PNAS).

"Aquaculture is set to reach a landmark in 2009, supplying half of the total fish and shellfish for human consumption," the authors wrote. Between 1995 and 2007, global production of farmed fish nearly tripled in volume, in part because of rising consumer demand for long-chain omega-3 fatty acids.

Oily fish, such as salmon, are a major source of these omega-3s, which are effective in reducing the risk of cardiovascular disease, according to the National Institute of Health.

"The huge expansion is being driven by demand," said lead author Rosamond Naylor, a professor of environmental Earth

system science at Stanford University and director of the Stanford Programme on Food Security and the Environment. "As long as we are a health-conscious population trying to get our most healthy oils from fish, we are going to be demanding more of aquaculture and putting a lot of pressure on marine fisheries to meet that need."

To maximize growth and enhance flavour, many northern hemisphere aquaculture farms use large quantities of fishmeal and fish oil made from less valuable wild-caught species, including anchoveta and sardine.

"With the production of farmed fish eclipsing that of wild fish, another major transition is also underway: aquaculture's share of global fishmeal and fish oil consumption more than doubled over the past decade to 68 percent and 88 percent, respectively," the authors wrote.

In 2006, aquaculture production was 51.7 million tonnes, and about 20 million metric tons of wild fish were harvested for the production of fishmeal. "It can take up to five pounds of wild fish to produce one pound of salmon, and we eat a lot of salmon," said Naylor.

One way to make salmon farming more environmentally sustainable is to simply lower the amount of fish oil in the salmon's diet. According to the authors, a mere four percent reduction in fish oil would significantly reduce the amount of wild fish needed to produce one pound of salmon from five pounds to just 3.9 pounds. In contrast, reducing fishmeal use by four percent would have very little environmental impact, they said.

"Reducing the amount of fish oil in the salmon's diet definitely gets you a lot more bang for the buck than reducing the amount of fishmeal," Naylor said. "Our thirst for long-chain omega-3 oils will continue to put a lot of strain on marine ecosystems, unless we develop commercially viable alternatives soon."

Naylor and her co-authors pointed to several fish-feed substitutes currently being investigated, including protein made from grain and livestock byproducts, and long-chain omega-3 oils extracted from single-cell microorganisms and genetically modified land plants.

"With appropriate economic and regulatory incentives, the transition toward alternative feedstuffs could accelerate, paving the way for a consensus that aquaculture is aiding the ocean, not depleting it," the authors wrote.

FUNDING DECISION AWAITED

Nelson's Wakatu Incorporation expects to hear from the Government in November on whether it will help fund the Horoirangi Centre for Seafood and Aquaculture Innovation.

Horoirangi plan to blend science and

AQUACULTURE CONFERENCE IN NELSON

Aquaculture New Zealand, in association with the Cawthron Institute, will hold the second New Zealand Aquaculture Conference in Nelson in early November.

Themed "Beyond a Billion", this year's conference will build on the success of last year's one-day conference with a full two-day programme of international and national speakers.

The conference will be held on November 5-6 and subjects discussed will range from the latest legislative developments and the government led research and development initiatives, through to market development and insight and lessons from the issues being faced internationally.

A cross-section of associations, companies, government and regulatory agencies and people involved in the aquaculture sector throughout the country will be brought together at the conference. It is seen as an ideal chance for those in the industry and those with an interest in it to discuss and debate the opportunities and challenges New Zealand next major primary industry presents.

Registration costs for the two-day conference have been set at \$150 per person, which also includes attendance at the cocktail function. The option will also be available to purchase further cocktail party only tickets at \$50 per person. The registration deadline for the conference is Friday, October 30.

innovation to add value to New Zealand's seafood exports.

Wakatu is spearheading a region-wide drive for a \$10 million grant from the New Zealand Ministry of Economic Development regional partnerships fund towards the establishment infrastructure.

The proposed aquaculture research institute in Nelson will include laboratories, commercial hatcheries, nurseries, aquatic land-based research ponds and education facilities.

Horoirangi chief executive, Keith Turner, told The Marlborough Express, "We are going to translate that intellectual capital to demand premium prices for New Zealand seafood products".

NEW DIRECTORS APPOINTED

Five new directors have been appointed to the board of Aquaculture New Zealand.

The appointments were made at the recent annual meeting in Blenheim following elections held by the shareholding organisations, NZMIC, the New Zealand Salmon Farmer Association and the Oyster Industry Association over the previous month.

New board members are: Graham Stuart, CEO Sealord Group; Bryan Skeggs, CEO Pacifica Seafoods; Keith Palmer, CEO Wakatu Incorporated; Duncan Bates, Akarua

Salmon and Marlborough mussel farmer, Graeme Clarke.

The joint current members: Peter Vitasovich, Greenshell NZ; Bruce Hearn, Apex Farms; Callum McCallum, Clevedon Coast Oysters; Ted Culley, Sanford and Mark Gillard, NZ King Salmon as executive directors.

The non-executive members are unchanged. They are: Rob Pooley, MFA; Gilbert James, Coromandel MFA; Harry Mikaere, representing Maori interests and Laws Lawson of Te Ohu Kaimoana.

The calibre of the board was a reflection of the importance the aquaculture sector had arisen to over the last two years, chairman Peter Vitasovich said.

He farewelled and thanked previous members for their contribution over the last two years. The previous members were: Andrew Selby, Sam Hobson, Aaron Pannell, Michael Field-Dodgson and Jon Safey.

EUROPEAN CONFERENCE ANNOUNCED

Mercator Media, organisers of the third Offshore Mariculture Conference have announced that Dubrovnik, Croatia will be the host for the conference to be held in 2010.

The European Aquaculture Society has already confirmed its continued support and details of further supporters and sponsors

will be released soon.

Aimed at growing offshore fish farming businesses, the conference will consist of two full days of technical papers exploring the progress and prospects for offshore aquaculture in European and international waters followed by a third day of fish farm visits.

Some of the topics to be covered are:

- Law of the Sea and other international and national legislation affecting sea space for farms.
- The business case including risk, profitability, financing, route to market and consumer demand.
- Developing technical advances to enable all year farming in harsh sea conditions.
- Cost-effective harvesting and stock processing technologies.
- Transfer and adaptation of technologies from other offshore sectors.
- Adequate onshore facilities for landings and hatcheries.

VIRUS KILLS CARP

Nearly the entire population of carp at California's Lake Kaweah may have been wiped out by an outbreak of a herpes virus, state wildlife officials say.

"It appears as if koi herpes virus killed the carp in the lake, as many as 90 percent or more of them," fish biologist Brian Beal said.



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Single seed Pacific oyster TRAINING WORKSHOPS

BY OLIN PILCHER, CAWTHRON INSTITUTE



May workshop group outside Te Matuku Bay Oysters' retail shop, Waiheke Island. From left to right: Olin Pilcher (Cawthron), Shaun Gregory (Pacific Marine Farms), Margaret Hippolite (Pacific Marine Farms), Robert Rush (TTM Enterprises), Robert Hippolite (Pacific Marine Farms), Achim Janke (Cawthron), Ian Herbert (Pacific Marine Farms), Vic Thirkell (Sanford), Emmanuel Malpot (Sanford)

Although hatchery based single seed oyster farming can provide improved product consistency, quality and farm efficiencies, management techniques are quite different from those suitable for traditional stick culture methods. This fact, having been recognised by farmers, has prompted Cawthron to look at providing a deeper understanding of all aspects of single seed oyster production. Earlier this year, Cawthron held two workshops aimed at filling this knowledge gap.

The oyster industry expressed interest in gaining a greater understanding of the principles and techniques involved in single seed oyster farming. In consequence, a two-day development and validation workshop with oyster growers, Cawthron and the Seafood Industry Training Organisation (SITO) was held in early 2007 at Cawthron. It helped us to shape a comprehensive training programme, comprising a series of level four unit standards accredited by the New Zealand Qualifications Authority (NZQA) (See Table).

A benefit of this accreditation is that SITO can now subsidise attendance at the workshops. The units cover aspects specific to single seed Pacific oyster farming, from selective breeding and hatchery production of spat to farm planning and field trials. They lead to an NZQA accredited

National Certificate in Aquaculture (Farm management of single seed Pacific oysters).

The first workshop (February 25-27) was a three-day informal workshop funded by Pacific Marine Farms and not formally assessed under the Unit Standards framework. It was attended by six keen staff and based at Cawthron's Glenhaven Aquaculture Centre (GACL) in Nelson.

Participants were introduced to the processes involved in creating the single seed spat that they receive on their farms, including hands-on 'oyster stripping' to produce the next generation of spat. Principles involved in maintaining spat quality through regular handling and grading were discussed, specifically in relation to how they applied to good farm practice.



Vic Thirkell (Sanford) strip-spawning a mature oyster at Cawthron's Glenhaven Aquaculture Centre, with Ian Herbert (Pacific Marine Farms) and Achim Janke (Cawthron) busy in the background.

The second workshop (May 25-29), covering unit standards 24670, 24671 and 24675, was attended by a mix of seven farmers from Pacific Marine Farms, Sanford and TTM Enterprises. The first three days were spent in Nelson at the GACL, where the principles and practices governing single seed spat production were presented. In addition, the biology of oyster 'fattening' and some of the techniques for its development were discussed with examples drawn from overseas and local experiences. This was followed by two days at Te Matuku Bay Oysters' farm on Waiheke Island. Nat Upchurch (Manager at Te Matuku Bay) showed how some of these principles apply in the farm environment. A flying visit to Kia Ora's oyster processing plant in Auckland highlighted the difference in quality between hatchery and traditional wild caught oysters, and demonstrated some of the processing advantages afforded by single seed oysters.

A one-day follow up assessment workshop (June 4) was held at Totara North to review some of the key aspects covered in May. While there, we also visited Pacific Marine Farm's Whangaroa site to view hatchery spat and oysters supplied from Cawthron's selective breeding programme.

Favourable comment from workshop participants has prompted us to schedule a further series (covering unit standards 24672, 24673 and 24677) for early 2010. We may also repeat unit standards covered this year if demand is sufficient.


The focus will again be on a mixture of theory put into practice, seeing and doing the real thing, discussions, and information exchange between participants. We recognise that site-specific differences between farms rule out

NZQA UNIT STANDARDS FOR SINGLE SEED PACIFIC OYSTER FARMING

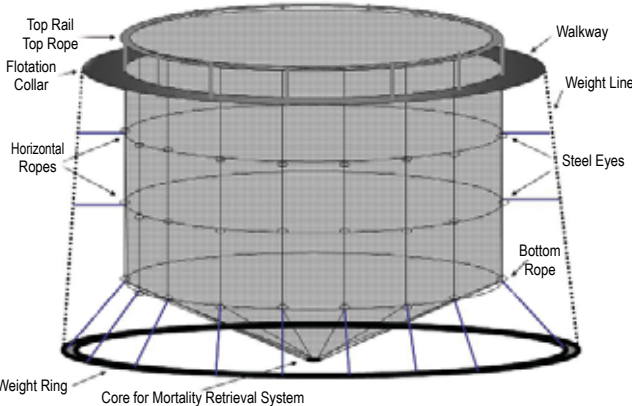

NUMBER	TITLE
24670	Explain selective breeding and hatchery techniques associated with culturing single seed Pacific oyster spat
24671	Explain the growth of single seed Pacific oyster spat in a pond-nursery system, and handle the spat to maintain quality
24672	Explain techniques used for farming single seed Pacific oysters to maximise quality on farm grow-outs
24673	Explain and carry out the grading of single seed Pacific oysters
24674	Compare oyster grow-out systems, and explain grow-out systems used to farm single seed Pacific oysters
24675	Explain techniques used to stimulate fattening of single seed Pacific oysters to achieve optimal market condition
24676	Monitor and maintain control of production for single seed Pacific oyster farm grow-out systems
24677	Explain and carry out farm trials for single seed Pacific oyster culture
24678	Develop and document an annual plan for farming a commercial species in an aquaculture facility
More information on the unit standards and the National Certificate in Aquaculture (Farm management of single seed oysters) qualification can be found on the Seafood ITO website www.seafoodito.co.nz	


a universal recipe for single seed oyster farming. In consequence, our courses are designed to enhance general knowledge and skills so that participants can devise their own solutions and best practices.





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AQUACULTURE and the loony leafies

BY JOHN MOSIG



G'day Kiwi. The days are getting a bit longer over here. How about your side of the Ditch? And hey, are you getting a bit tired of the Green Taliban telling us that aquaculture is akin to pouring Agent Orange into the water? Yeah, us too.

Look, don't you reckon that it's about time they took responsibility for their actions? They're always banging on about how environmentally destructive aquaculture is. And it's not only us. The thought of all those little piggy wiggies in their farrowing pens and broiler chooks being forced to grow to table size in 42 days sets them afire with indignation. The less stable of them turn to terrorism to make their point.

So, say we go back to those days of free range poultry and pigs out under their A frames all year round in those boggy paddocks with their litter trotting after them. The first thing we'd notice is that our productivity would go down and food prices would go up. Nonsense? OK, let's have a look. Let's presume a New World order based on the philosophies of the Green Taliban comes to power and we had to dismantle 40 years of intensive farming practices and throw out the science they were built on.

Without the temperature controlled facilities, the animals – and we'll get back to aquaculture in a minute – would lose roughly 30 percent of their winter growth. Maybe more. Egg production would fall by approximately the same.

Naturally the processors and their clients, the fast food outlets and the supermarket chains would resist the price rises. This would drive half the industry out of business before the bean counters with the cheque books realised they were running out of produce. Then the price rises would drive consumers away from poultry, eggs and pork.

To what? To red meat? Free range livestock of course. And how cheap is that going to be? And how available? We're like you; we export a heap of agricultural produce to buy manufactured goods and oil.

Could they turn to seafood? Why not? We're told it's an essential part of a healthy diet. Naturally, the seafood would be wild caught.

And where does the developing world get its cheap protein? Where do we get our cheap protein? Okay, it's not about the money. It's about the environment. So,

where do we get our protein?

Starting to get the picture? Abandon aquaculture as a means of putting seafood on the table for whatever reason and you immediately halve the seafood available for consumption. That's right, farmed seafood makes up, as near as damn it, half the volume of seafood consumed. The boys with the boats will love that. You want to eat seafood? You pay for it. And fair enough, it's no fun out there chasing fewer fish with escalating fuel prices and other production costs rising every time you return to port. And out there in wilder weather too, eh?

But let's look at poultry as a comparison to the halved seafood availability. They've been going longer than us. When the boys came home from the war poultry was something you ate on Sundays when your grandparents came for dinner. It took 62 days to produce a kilo of poultry. At the turn of this century it took 17 days to produce a kilo of poultry. In other words, if we went back to free range poultry, meat bird productivity would drop by whopping 3½ times.

Similar sorts of productivity losses could be expected in the pork sector.

Halleluia, we've saved the planet and released all those Disney barnyard characters from a life of mindless food production. Now what do we do for protein? And if anyone says eat legumes and nuts and I'll tip a bucket of organic brussel sprouts over them. We'd need three planets to produce enough plant protein to sustain the 6.5 billion souls – and counting – with whom we share spaceship Earth.

At this point it must be painfully obvious that even if we go back to mid 20th century agricultural pursuits it is not possible to feed the world's current population. There's just not enough room on the lifeboat. Some are not going to make it.

So under the régime change imposed by the New World Order, food production changes would precipitate massive famine like we cannot possibly imagine outside of Hell.

Of course, and I don't wish to be alarmist here, famine is not a straight line thing. It's not a board game where the pieces denied sustenance by the throw of a dice are removed painlessly from the game. Oh no, forget the rule book. This will be a no holds barred struggle for survival encompassing everything that goes with utter desperation. And we have the technology to do some quite serious and lasting damage.

So until the Green Taliban starts talking serious population control, they hardly have the right to be telling us that we're being cruel to animals or threatening the environment. And especially not on some of the flawed science they keep trotting out.

But it's not just the Looney Leafies that seem to have their heads screwed on backwards; governments are equally irresponsible. Food security should be one of the priorities of government policy. Along with health, education and resource management, which includes maintaining a healthy environment.

It's about balance. But how often do we see governments and bureaucracies caving in to populist clamouring and community self interest when it comes to making decisions about aquaculture? I've seen it first hand on our side of The Ditch and from what I read and here things aren't that much different on your side.

But here come the nurse with my medication. Let's leave the government's responsibility for another time.



Salmon farming hasn't impacted adversely on the waters of Waiapupu Springs – considered to be the world's purest water. The poor press associated with aquaculture is based, more often than not, on flawed science and ideology rather than objective studies and balanced decision making



Quality assurance programme attracts **GROWING SUPPORT**

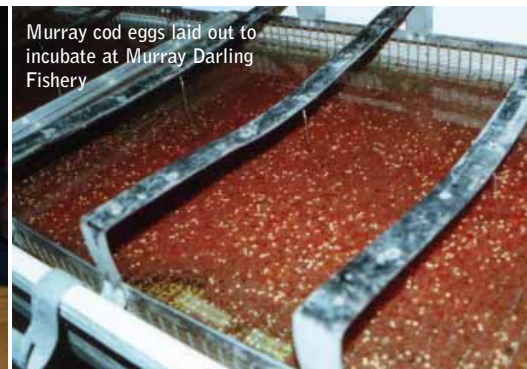
BY JOHN MOSIG



A ripe running silver perch (*Bidyanus bidyanus*) male



Injecting a Murray cod to induce ovulation at Moredun Ponds



Murray cod eggs laid out to incubate at Murray Darling Fishery

Around 30 private sector hatcheries now operate in NSW, Victoria and Queensland, and produce between five and eight million fish annually. Clients include recreational re-stocking groups, government agencies and commercial grow-out farms. A further 2.5 million are bred by government hatcheries for conservation and stock enhancement.

Ian Lyall, NSW Department of Primary Industry aquaculture manager, says there has been a wide acceptance of the protocols. Twelve hatcheries have been accredited. Of these, three are government hatcheries, eight work in the private sector and concentrate on restocking and one hatchery produces fish for commercial grow-out ponds. The split for those spawning fish for the restocking programme has been five holding Murray-Darling species and three holding bass.

As the hatchery sector grew in size and importance, there were some concerns and it became apparent there was a need to introduce quality assurance protocols so buyers could be confident they were getting what they paid for, and only what they paid for. NSW DPI under the direction of Dr Stuart Rowland at the Grafton Aquaculture Centre, developed a hatchery quality assurance programme (HQAP) for Murray cod (*Maccullochella peelii peelii*), golden perch (*Macquaria ambigua*) and silver perch (*Bidyanus bidyanus*).

In the past, poor hatchery practices have, in some cases, caused problems. Contaminated hatchery stocks have resulted in the translocation of banded grunter (*Amniataba percoidea*), from northern Australian waters to coastal catchments in southern Queensland and northern NSW, a wholly undesirable outcome from a conservation point of view.

The transfer of pathogens and disease, though mainly confined to manageable common ectoparasites, has been an issue in the industry. A more serious example has been Epizootic Ulcerative Syndrome (EUS or red spot), a disease that is due to infection by the fungus *Aphanomyces invadans* and is an extremely difficult disease to treat.

Murray cod, golden perch and silver perch are all indigenous to the Murray-Darling basin (MDB). While, in the dreamtime before the alteration of river flows to accommodate agricultural development, flood mitigation and electricity generation, the basin used to become like an inland sea in extremely wet seasons, it still possessed particular reaches of habitat that had their own ecological peculiarities. Each species is now known to consist of more

than one distinct population (or strain), and the differences between populations are thought to reflect natural selection and adaptation to local ecological conditions. Since the introduction of water regulation measures these populations may have become even more isolated. To conserve the genetically-distinct strains of Murray cod, golden perch and silver perch, the HQAP directs that brood stock be obtained only from catchments where fingerlings are to be liberated.

The HQAP contains guidelines for brood-stock collection, and for breeding programmes. Under the HQAP, all brood-stock must be tagged with a passive integrated transponder (PIT) and details of their source, strain and performance recorded. To protect the genetic integrity of the various species and populations, the programme is conservative and prescriptive. While some growers may find this an added administrative and management burden, most operators see having clear guidelines for brood-stock collection and breeding programmes as an advantage.

Bruce Malcolm of Uarah Fisheries at Grong Grong in southern NSW is one of the country's leading hatchery operators and was a major industry contributor to the development of the HQAP. His comments however were pertinent. "If the government is serious about the HQAP it will have to guarantee private hatcheries the same level of access to brood-stock as the DPI hatcheries or, quite simply, the programme will not work."

Since August 2008, the HQAP has been implemented through a hatchery quality assurance scheme (HQAS). The essential criteria in the HQAP are used as a basis to audit and accredit hatcheries. There are now seven commercial hatcheries and three government hatcheries (Grafton Aquaculture Centre, Narrandera Fisheries Centre, Port Stephens Fisheries Centre) that are accredited in NSW. The HQAS in NSW partly satisfies the need for a basin-wide accreditation scheme identified by the Murray-Darling Basin Commission, and fisheries authorities in Queensland and Victoria are developing similar schemes based on the NSW initiative.

The HQAP, by providing a basis for the elimination of poor practices from the hatchery sector, has opened the way for some serious sector and industry growth. By introducing genetic management, albeit at this stage for stock enhancement, the HQAP will assist in genetic improvement in the commercial grow-out sector in the long-term.



The science and law of aquaculture decisions – WHAT A CARRY ON



BY JUSTINE INNS, BA LLB

In August the Cawthron Institute released a report entitled Sustainable Aquaculture in New Zealand: Review of the Ecological effects of farming shellfish and other non-fish species. The report was commissioned by the Ministry of Fisheries in response to the identification by local authorities and the marine farming industry of a gap in publicly available information relating to the ecological effects of non-fish species.

The report was to be “a review of existing information and to summarise knowledge of ecological effects associated with non-fish species”. The information gap identified by councils and the industry is critical to regional aquaculture planning and development. The report focuses on the ecological effects on the seabed and water column, as well as wider ecological effects, such as the effects on other species and the spread of disease and invasive species. All these effects must be considered in the establishment of Aquaculture Management Areas (AMAs).

The report will be useful in at least two key ways. First, it will be a great educational resource for the general public and, in particular, groups who have a blanket opposition to marine farming, by pulling together existing information on the interaction between marine farms and the rest of the marine environment. The commentary in the report appears to support something that has long been suspected by those in the industry in relation to opposition to marine farming: that the science is so ‘young’ that the real issue for opponents of marine farming is social carrying capacity (ie how much the community will tolerate) rather than environmental effects.

Hopefully the release of this report will go some way toward extending the social carrying capacity. The report also usefully identifies a number of holes in the scientific information in relation to aquaculture and its effects on the marine environment. This will be particularly relevant to local authorities in making applications to the Ministry for the Environment’s Contestable Aquaculture Planning Fund, as these clearly identified information gaps need to be plugged.

As mentioned previously, the report shows that the science on the ecological effects of aquaculture is still very much in development. Popular terms such as ‘carrying capacity’, commonly used when considering applications for marine farms or AMAs, are noted as not being definitive. The example of the Marlborough Sounds is cited, although the area was

once said to have reached its carrying capacity (due to a stall in the production of mussels), that was clearly not the case as mussel production actually improved again subsequently.

Under the Fisheries Act 1996, the chief executive of the Ministry of Fisheries must make either a determination – a decision that he/she is satisfied that a proposed AMA will not have an undue adverse effect on (among other things) the sustainability of fisheries resources, or a reservation – a decision that he/she is not satisfied that a proposed AMA will not have an undue adverse effect on the sustainability of those resources.

It should also be noted that fisheries resources includes seabirds. However, the Cawthron report states that wider ecological issues such as the impact on fish, seabirds and mammals, the spread of invasive species or disease and genetic interactions are generally less well studied than seabed and water column effects. Given the earlier comments about how young the science is overall, this tends to suggest that research on those impacts is all but non-existent. The report attributes this to either “logistical difficulties in obtaining quantitative data, lack of awareness or because the need has not arisen – ie the potential for adverse effects is generally perceived to be low”.

Successive Ministers have made two decisions over the past year in respect of interim AMAs under the equivalent provisions of the Aquaculture Reform (Repeals and Transitional Provisions) Act 2004, and many more over the years under the marine farming permit provisions of the Fisheries Act 1983. So there is no doubt that the question has arisen. Are we to read the Cawthron report as saying that those decisions may have been made without an adequate scientific basis?

The report is a timely reminder that the industry is still a relatively young one, but that this should not be used as a barrier to forward movement. If the billion dollar target is to be reached then more needs to be invested in scientific investigation of the effects of the industry. Such investigation is necessary to ensure that opposition based on misinformation and misbeliefs can be overcome and, more importantly, that the industry doesn’t reach its carrying capacity, either ecological or social, without realising it and doing serious damage.

Justine Inns is a partner at Oceanlaw.

She previously spent more than a decade as an advisor to various iwi (tribes), including several years with Ngai Tahu.

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Summer means boats – **BOATS MEAN PEOPLE**

BY CHRIS CHOAT

Summer sees the annual boat maintenance schedule accelerated to ensure the pride and joy is put into the water to take advantage of daylight saving and impending holidays. The once relatively deserted boat ramps becoming like mall carparks before Christmas with fishers and families out on the water more often and for longer.

New Zealand's waterways, and particularly our beaches and sounds, are some of the best in the world making it no wonder that Kiwis flock to the water in one of the highest ratios of boat ownership to population worldwide. With the relatively easy access into clear and pristine water conditions many New Zealanders could be forgiven for taking it for granted. However, our coastline is much more than a playground, it is home to some of the country's significant economic contributors. While most will travel from the normal 'homebase' with the boat in tow there are a number of communities for whom the coast and local marine area is the direct and indirect source of their livelihood.

This livelihood is very often linked to the provision of the very amenities boat owners believe should be available when they travel to the coast. Coastal residents manage their lives within guidelines often focused on the well being of the coastal environment. Visitors while not bound by the same land use and sanitation needs of residents need to be aware of the reason for them and not undermine their goals in any way.

Essentially that is not to use the sea as a rubbish bin, or worse, a toilet. An attitude of 'It's so big, you say, it flows really quickly, it will be taken out to sea, it's only me how much harm can it do?' is not appropriate. A simple 'no 2' has the potential to put people in hospital and ruin a large number of holidays.

A number of councils are looking at regulations for boats that can overnight requiring them to have holding tanks for their heads – toilets for those landlocked readers. The aquaculture sector welcomes the attempts by councils to make locals and visitors aware of the importance of high water quality in coastal areas and the role they can play in its maintenance.

However, the mindset has merit for day-trippers. Just because people are out there for a day does not mean their capacity to harm the economic, let alone environmental, wellbeing of a region is any less.

The wealth of many of New Zealand's regions is directly linked to the coast and waterways and these assets are at their most vulnerable over the holiday period. Sound familiar? Such regions are flocked to every year by Kiwi's and international visitors alike.

A simple way to avoid any risk in this area is to have holding tanks or similar closed treatment systems on boats. The dumping of sewage consciously or otherwise can have a lasting effect on the local shellfish beds and poses a greater risk to local marine farms.

In the case of the former, it is the gatherer and their friends or family that can be affected. In the case of the latter it is an entire industry, New Zealand's reputation as a producer of safe and healthy food and the jobs of the thousands of people employed in the marine farming sector.

New Zealand's international premium food reputation is as important to our economy as the efficient and sustainable use of



natural resources. At the core of this reputation is the production of safe and healthy foodstuffs. A moment of thoughtless or careless behaviour can place that reputation at risk.

The impact of such outbreaks goes beyond the people affected directly. Shellfish contamination, often caused by human waste not managed in the appropriate way, has the potential to severely damage New Zealand's fastest growing primary industry and the livelihoods of everyone involved – all for the cost of a port-a-pottie.

The news is not all grim. There are people who take the well being of our coastal areas seriously as relayed recently by a honorary fisheries officer who in casting an eye over a returning boat discovered the occupants had an alternative use for an empty 1.5 litre plastic drink bottle. When raised, the fishers said that if they are not prepared to cook their catch in the contents why let the fish drink it beforehand. Applause from residents and marine farmers could be heard for the admirable sentiment. While not demanding similar action, the possible impact one can have on the coastal environment should be recognised by all that use it.

We all want, and need, the coastal waters of New Zealand to stay the way they are, now and for our future generations and by taking a few simple steps it is possible.



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Aquaculture in SHANDONG CHINA

BY PHIL HEATH



Turbot selective breeding unit



Laminaria on longline
(Picture Shawn Robinson)



Kelp harvesters rest on their way home
(Picture Shawn Robinson)



Chinese divers with
catch of clams

Just over a year ago, Quindao, in the Shandong province of China, hosted the sailing events for the 2009 Olympics. Many of the athletes staying there may have sampled a wide range of seafood on offer in this region, particularly specialities such as kelp, jellyfish and sea cucumbers. But I wonder how many fully appreciated that most of this seafood was produced by the massive and diverse marine farming industry in the province.

In July this year an international group of aquaculture scientists specialising in Integrated Multi-Trophic Aquaculture (IMTA) met in Qingdao to kick off an IMTA research consortium. Funded through the European Union's International Research Staff Exchange Scheme (IRSES) programme, the aim of the consortium is to co-ordinate IMTA research activities worldwide. As part of this meeting our hosts, The Yellow Seas Fisheries Research Institute (YSFRI), organised for us to visit some of the many mariculture producers and processors in the region.

First on the list was a flatfish hatchery. The hatchery is a joint venture between YSFRI and a commercial farmer (Hai Yang, Yellow Sea Aquatic Product Co). It supplies juvenile Japanese

sole, Tongue fish and European turbot juveniles to a number of other farms and also has its own grow-out facility. In northern China there are estimated to be more than 10 million m² of tank space for farming flatfish. Currently, the greatest demand is for turbot and the hatchery has instigated a selective breeding programme for this species that was producing over 120 family lines as well as tetraploid and triploid fish.

From the fish hatchery we visited YSFRI's shrimp selective breeding unit and then went north to Rongcheng to see Shandong Oriental Ocean Sci-tech Group's massive new seaweed hatchery and sea cucumber and abalone hatcheries owned by the Xunshan Group. The abalone hatchery produces around 20 million seed each year for on-growing in sea cages. The sea cucumbers they produce form only a small part of the Yellow Sea's 80,000 tonne (NZ\$ 2.5 billion) industry.

All the hatcheries employed very simple culture technologies and relied heavily on the large available labour force for feeding, cleaning and grading: a trend that was common throughout an industry that prefers to use people power rather than machinery. Biosecurity standards within the hatcheries were rather low. We were allowed to wander



IMTA research group with Mr Qu (Lidao chairman – centre) outside the Lidao seaweed cooking plant



Workers in the Lidao seaweed factory processing Laminaria

within and between hatcheries with a complete absence of the footbaths or protective clothing required before entering hatcheries in other parts of the world.

Following the hatchery tours, we got our first glimpse of Sungo Bay. The bay is 133 km² of uninterrupted multi-species aquaculture. Seaweeds, in particular the giant kelp *Laminaria*, and oysters dominate. The bay produces over 50,000 tonnes of kelp and 80,000 tonnes of oysters each year for domestic consumption. The kelp is either dried for chemical extraction or processed fresh as food. The kelp is harvested by hand (of course!) from May to August. Flotillas of small wooden boats are towed to the harvest sites where the two man crews haul around 20 lines (two tonnes wet weight) of kelp onboard, before being towed back to the landing dock.

Other seaweeds growing on the lines are harvested and processed as feed for abalone (1000 t/year) and sea-cucumbers (1500 t/year) that are farmed in cages hung below the kelp, along with oysters and a range of scallop species (10,000 t/year). There are also occasional fish farms dotted throughout the bay. These mainly produce small rockfish, largely for local consumption. Controls on farming are minimal, the provincial government charge rent of around NZ\$75/Ha/year and there is no requirement for a description of the farming activity, species or biomass production.

After a couple of hours boating on the bay we started to appreciate the scale of aquaculture in this area (worth a look on Google Earth), were overwhelmed by the hospitality of our hosts, and gave up trying to estimate the number of floats!

Back on shore we had two more very interesting visits. The Bright Moon Seaweed Group, established in 1968, employs 2000 staff to process kelps into a series of extracts, including: alginates (10,000 tonne), PGA, mannitol (5000 tonne), iodine, fucoidan, and algal oil. The company has recently expanded its range to

include pharmaceuticals from algae. They currently process over 40,000 tonnes of seaweed from China and import an additional 20,000 tonnes from Chile and Peru. Waste from the plant is processed as feed for abalone, sea cucumbers and shrimps.

Later we visited Lidao Company who farm kelp and process it into food products such as kelp noodles, knots and wrappings. Kelp landed to the factory is unbundled, cooked and salted before being passed to around 2000 women who chop, slice and shred the fronds into a range of products for markets throughout China.

The following day, for our final visit, we returned to the boats to visit Zhudao Aquatic Products Company, who run a sea ranching stock enhancement programme. The company re-seeds a range of shellfish and sea cucumbers in a shallow coastal embayment where they are tended and harvested by a team of divers.

After the tours we moved back to Qingdao for the inaugural IRSES IMTA meeting, followed by presentations from each of the group at the 10th International Forum on Marine Science and Economic Development. The trip was an incredible learning experience in terms of the scale of Chinese aquaculture, which is probably only matched by the scale of hospitality from our hosts.

NIWA will host the next IRSES IMTA group meeting in February 2010, with a focus on IMTA strategies around the world. A workshop and site visits are currently being planned and will be advertised later this year.

For further information contact: Dr Phil Heath (p.heath@niwa.co.nz) or Jeanie Stenton-Dozey (j.stenton-dozey@niwa.co.nz)

My thanks go to all at YSFRI and to all the producers and processors who extended tremendous hospitality to the group during our stay in China.



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The people of THE SEA

BY ANDREW MORGAN



science in ensuring a unified notion of sustainability and maintenance of ecosystem function in the spirit of Tangaroa/Poseidon (God of the Sea).

Our foreshore and seabed is critical to the future of sustainable expansion of economic wealth in New Zealand. As it becomes unlocked there is growing concern about the impact of the outpouring of the Aotearoa human induced changing life blood on the ability to continue farming and harvesting kai moana (seafood).

The drive from Ngatea to Paeroa and from Tauranga to Opotiki, crossing pastoral whenua (land) and stopping at waterways, rivers, and streams, invites contemplation of future consequence. Journeying inland for example, to nearer the headwaters of the Tarawera River, stop, titiro (look), and ponder. A significant contrast exists between the same waterway(s) passing through the landscape and out to sea. The tamariki (children) of Tangaroa/Poseidon live the past, live in what is witnessed, and foretell what this holds for the future of the mihi (people) of the sea and Aotearoa.

Historical knowledge unequivocally shows in both pre and post European times what the consequences of unabated exploitation of land-based resources are and its consequences for our coast and oceans. Evidence shows over hundreds of years what happens when the mihi of Aotearoa exhaust a resource compared to when it is managed in either a sustainable or non-sustainable manner. The complexities of interrelationships that exist between resources and a sustained and functioning habitat are altered. In both pre and post European times these lessons have been learnt but not always successfully translated into action that leads to changes for the better. As the world changes, now more than ever that 1000 or so years of both global and local Pakeha (European) and Maori knowledge has never been more important in determining a direction and a way forward.

The great Maori waka and European tall ships have graced the world's oceans with their presence for many hundreds of years. Throughout there has been an increasing sense of Tu tangata (stand tall) for all, honouring an obligation as the people of Aotearoa to embrace the past before they can see the future. 'What goes around comes around' and the past 30 odd years for Aotearoa have reflected this sense of Utu (reciprocity), through such legislation as the Aquaculture Settlement Act. Combined with a warrior wairua (spiritness), this sense of honour and tradition in upholding moral and ethical values throughout confrontation is second nature to all. To be humble in victory or graceful in defeat creates a special bond. All of these things the people of Aotearoa have in the spirit of Tangaroa/Poseidon.

The mihi (people) of the moana (sea) upon Aotearoa have been on a hikoi (journey) of ages. Being oceanic voyagers, both Maori and Pakeha settlers have shared a history that binds them in Tangaroa/Poseidon (god of the sea) and to Aotearoa. If circumstances were any different, New Caledonia and the culture of France would be part of the whanau (family). As the tamariki (children) of Tangaroa/Poseidon stand with Maui on Aotearoa on the verge of unlocking and releasing the riches of the sea, one can not help but reflect on the journey and the way forward, to release to Aotearoa the riches of ages.

Aquaculture is the great leveller and stepping stone, enabling the expansion of a marine and maritime industry well beyond the amount that could ever be done on any whenua (land) that exists above the water line. To be successful, legislative reform, cultural unity and a shared passion for the sea and its resources need to be integrated and framed by a formulated and articulated oceans policy.

Supporting this will be continued development and adoption of new technology enabling economically viable access to the variety of resources available, including the transition to the notion of farming the Exclusive Economic Zone (EEZ). Underpinning this will be the continued development and deepening role of integrated systems

Algae production for **COMPOUND EXTRACTION**

BY JOHN MOSIG

New Zealand's high profile research centre, the Nelson based Cawthron Institute and Supreme Biotechnologies, a privately funded company, have signed a Research and Technology Agreement to develop technology that will enable them to identify and extract high value compounds from algae for the global market.

In announcing the partnership, Cawthron CEO Gill Wratt said Supreme Biotechnologies, as part of the deal, would use Cawthron's modular enclosed algae farming system.

Algae is normally grown in open ponds or enclosed, climate-controlled bioreactors. The former suffers all the limitations of a system exposed to seasonal variations and daily vagaries of the weather. The latter is expensive to operate and generally employed in high intensity larval production. The algae production system at Cawthron has been developed over 15 years and provides the operator with total control over the production variables on a commercial scale operation. It will be the first time large scale algal farming has been attempted using this technology.

Science Project Leader Dr Mike Packer said the algae farms will use CO₂ and waste heat from an industrial facility to help grow algae, an added benefit to the environment. Algae consumes CO₂ during photosynthesis, this CO₂ would normally have been released into the atmosphere.

The photo bioreactor system uses plastic tubes as the container for the media carrying the algae, artificial light for the provision of energy and the use of air mixed with CO₂ for the mixing of the culture and provision of a carbon source.

The initial products that have been identified are compounds used in the fortified food, nutraceutical and the cosmetics industries. In due course Supreme is targeting precursors for industry such as biopolymers.

The key advantage of using the naturally sourced compounds as in general they are more biologically active than synthetically derived equivalents.

An earlier feasibility study, jointly funded by the Foundation of Science Research and Technology and Supreme Biotechnologies, provided the ground work upon which the commercial extraction venture is based.

Supreme will be working with partners for their extraction and in New Zealand we have access to some world class extraction companies.

Funding sourced by Supreme Biotechnologies will provide for the construction of a pilot plant and then a commercial scale algae farm over the next few months.

Paul Collins of Supreme says, "people have invested in Supreme for two reasons – they believe in our management team, our long term vision to build a global biotech company using algae as a vector, and in the capabilities of our partners; each of whom have garnered world class reputations in their respective fields.

"Creating the capacity and capability to produce high value products the market wants is essential for global growth. This project combines New Zealand's niche, world class skills in the research, production and processing of algae and starts



Recently inoculated algae in our prototype algae farm

a process we believe will create a lot of value for New Zealand exports and jobs."



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