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**New
automation
for half-shell
mussels**

**CAWTHON MAINTAINS
KEY ROLE IN WATER
MANAGEMENT**

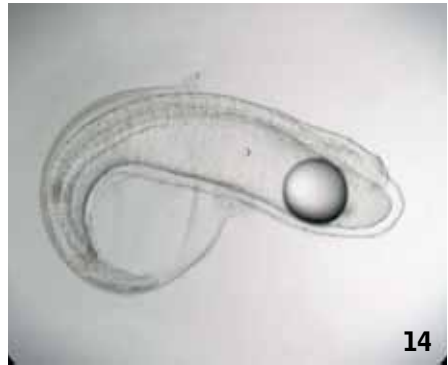
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A FUTURE OPPORTUNITY?**



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North Island Mussel Processor
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PHOTO BY:
Andrew Morgan

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Uncertainty hampers AQUACULTURE PROGRESS

BY KEITH INGRAM

Aquaculture is currently playing and will continue to play a major part in boosting global seafood production to meet consumers' growing demands for affordable, quality seafood for the table.

New Zealand's aquaculture industry has considerable potential to contribute to sustainable economic growth but the present regulatory framework severely constrains growth. The government has committed to streamlining and simplifying the regulatory regime for aquaculture to enable the industry to fulfill its potential, while still protecting the environment and the interests of other users of the coastal marine area.

Nice words, but the government's ability to deliver will be the telling question, as no new aquaculture space has been created since the current regime came into effect five years ago. There is a lack of incentives for local government to plan for aquaculture space and for the industry to invest.

However, the government says it is developing a reform package that aims to encourage investment in aquaculture by providing a clear role and framework for central government involvement, ensuring national and regional benefits are considered in the decision-making process, and increasing investment certainty.

These excellent words beg the question, how? A central element of the reform package is removing the requirement that aquaculture activity must be located within aquaculture management areas as defined in regional coastal plans.

No AMAs have been created where aquaculture didn't already exist in the last five years. The proposed changes will mean aquaculture consents can be applied for directly, without the need to first establish an AMA. Is this wishful thinking or a pipe dream? If only it was so easy.

The reform package is believed to include a range of measures to integrate aquaculture management with other activities managed under the Resource Management Act, and with activities managed under other legislation, particularly fishing.

The measures include integrating the undue adverse effects on fishing (UAE) test as a step in the consent process, yet this test has always been the stumbling block in the past. So who knows? At present it is a case of wait and see.

To add to the confusion there is the repeal of the Foreshore

and Seabed Act 2004. The government plans to remove ownership of the foreshore and seabed from the Crown and establish it as "public place", owned by no-one.

A bill is being drafted which will enable coastal tribes to achieve control of the foreshore and seabed by claiming customary title. The Crown has always owned the foreshore and seabed on behalf of all New Zealanders. If Maori thought they owned it, every Treaty of Waitangi claim since 1985 would have included the foreshore and seabed. None did.

If this bill is passed, I am advised it will be irreversible, as the Crown will no longer have ownership. This means the separatist law National is planning to introduce will open the floodgates for a massive land and resource grab by Maori.

Some Maori have indicated as much already and have stated that if they win ownership rights to the foreshore and seabed, they intend to start proceedings to seek compensation for loss of foreshore and seabed income since 1840.

Coastal assets like the iron sands alone have been valued by Crown Minerals at over \$1 trillion. If Maori become owners of the foreshore and seabed, they will have the right of veto over all coastal activities (with no rights of appeal), the right to develop the area, to mine the mineral wealth which they will own and to effectively control New Zealand's biggest public asset – including boat ramps, marinas, slipways, roads and eventually ports and all other business activities that depend on licences.

They will also have the right to set up aquaculture operations or at the very least clip the ticket of existing and new farms. This is scary stuff, if you ask me.

At present, by world standards just on 50 percent of all seafood available to the consumer comes from aquaculture. We have the skills and expertise to be a world leader and yet this potentially billion dollar industry is left languishing through a lack of cohesive direction and government commitment, even if the government is going through the motions of various reforms.

Will they be able to deliver the dangling carrot without a heap of fish hooks attached, or will we see a bunch of broken promises yet again?

Sad, but true ... otherwise, why have the problems and concerns not been resolved by now.



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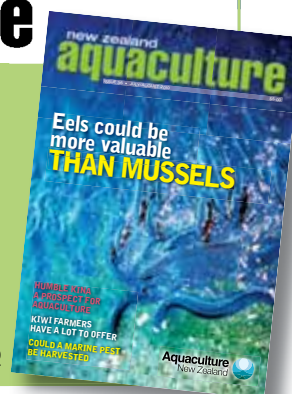
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GOVERNMENT FREES UP INDUSTRY BOTTLENECKS

Aquaculture reforms received a boost on July 22 when the Cabinet agreed to more recommendations to help the industry generate sustainable economic growth.

The industry had been stifled by inflexible rules that discouraged investment in the sector, said the Minister of Fisheries, Phil Heatley. “We’re working hard to enable aquaculture to grow within a framework of sustainable coastal management.” The regulations were necessary to support the goal of trebling current aquaculture sales to \$1 billion annually by 2025.

“It’s all about enabling sustainable use of our valuable natural resources to build the economy, create more jobs and get more people into work, especially in the regions,” Heatley said. The latest proposals build on measures announced in April.

The aim is to ensure minimal disruption to the existing industry and allow processing of outstanding aquaculture applications to be completed and new applications to be made.

More than 60 applications for a total area of over 8000ha are waiting for a decision.

“We want these applications to progress. This reform will effectively free up the bottleneck that has kept industry growth in limbo for many years,” he said.

Cabinet also proposed changing two regional coastal plans it considers present significant barriers to aquaculture growth – Tasman and Waikato – through an Aquaculture Reform Bill. The changes will enable applications for finfish farming in both regions, as long as environmental standards are met. Small extensions to existing farms in Waikato can also be made from the start of the new regime.

Key points from the Cabinet’s decisions are:

- agreement on measures for transitioning existing marine farms into the new law with minimal disturbance
- agree to allow the processing of outstanding “old law” applications and the interim Aquaculture Management Areas to be concluded
- agree that the elements of the Aquaculture

Legislation Amendment Bill No. 2 that will remain relevant under the new law be incorporated into the Aquaculture Reform Bill

- consider funding options for improving regional coastal plans and related activities to address impediments to sustainable aquaculture developments, and
- agree to change the Tasman and Waikato regional coastal plans through the bill to enable applications for small extensions to existing farms in some areas of the Waikato and to remove the species prohibitions.

Changes to coastal plans in other regions have been suggested, but rather than use legislation, the aquaculture unit within MFish will work with local councils to improve sustainable aquaculture development opportunities within their regions.

Heatley said the government recognised that while new legislation would provide the framework within which aquaculture could grow, regional decisions would primarily determine the nature and pace of growth.

“Local people with an interest in their coastal area and local marine farmers can best inform local rules. Hence, funding for the first five years of the new regime will be set aside to help regional councils implement the reforms.

“This is in addition to the money that has been reprioritised to fund the aquaculture business unit, which will be made up of between six and eight aquaculture specialists.”

The government expects to introduce the Aquaculture Reform Bill later this year, with enactment in early 2011.

See www.fish.govt.nz/aquaculture-reform

CASH BOOST FOR BAY OF PLENTY AQUACULTURE

Eastern Bay of Plenty is to receive \$104,000 from New Zealand Trade and Enterprise and the Regional Governance Group to boost aquaculture in the region. These funds will help establish a regional aquaculture organisation and develop a regional profile of the emerging aquaculture industry and future infrastructure, according to the news website Voxy.

“Aquaculture will have a huge impact on the economic wellbeing of the Eastern Bay of Plenty,” said the mayor of Opotiki, John Forbes. He said the wider region would gain significantly as the industry grew.

“Having gained consent to establish a 3800ha marine farm, we now need to be sure we are using it to the best advantage. Marine farming is relatively new to New Zealand and we have a lot to learn. The Bay of Plenty aquaculture organisation will work to pull all the information together and help us reach the target of \$250 million generated through aquaculture by 2015.”

The aquaculture organisation is also to help develop Opotiki Harbour, which is linked to the development of the marine farm.



PHOTO: PATRICK CAHILL

DNA SEQUENCING REVEALS NEW INVASIVE SEA SQUIRT

Vigilance and DNA methodology have revealed a new species of potentially detrimental sea squirt in Port Nelson. Originating in Japan, it’s the first time the sea squirt *Ciona savignyi* has been reported in New Zealand or the southern hemisphere.

Cawthron scientist Andrew Fidler and PhD student Kirsty Smith found the new species during a survey of the shore at the Nelson Marina. *C. savignyi* was almost indistinguishable from *C. intestinalis*, the sea squirt the Cawthron team was surveying. They only identified *C. savignyi* after sequencing the mitochondrial cytochrome oxidase I (COI) gene and examining specimens for several morphological characters.

Smith says the implications of the find are unknown but could result in biofouling issues for shellfish aquaculture and other man-made structures, similar to the impacts of other invasive sea squirts.

“We were not pleased to find a new invasive sea squirt species! But we feel this case highlights the usefulness of DNA-based identification as a biosecurity tool for detecting invasive species.”

More sampling is currently underway to determine if it could have been present in Nelson Harbour and elsewhere around the New Zealand coast for some time.

SLIPPERY MOTORWAY A PUZZLE

Motorists on Auckland's Southern Motorway had to contend with a slippery problem on the morning of July 13. A load of eels and the water they were being carried in was strewn across a lane at the bottom of the Bombay Hills, making a 300m section of the road slippery. A motorway off-ramp and one lane were closed.

New Zealand Transport Agency spokesman Ewart Barnsley said it was not known how the cargo came to be on the road. "There's no sign of any truck and no sign of anyone scratching their head, wondering where their juice has gone to."

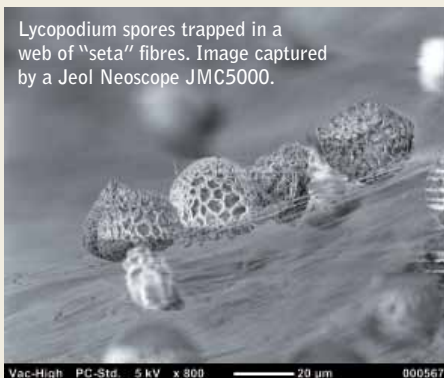
Special equipment was brought in to clean up the mess.

AIR FILTERS MADE FROM FISH SKIN FIBRE

A start-up Auckland firm is applying nanotechnology to turn hoki skins into anti-bacterial air filters.

The fibres, made from nano particle-sized fibres as little as 1/500th the thickness of an average human hair, are "spun" from collagen extracted from discarded hoki.

PHOTO: DR THORBURN



Lycopodium spores trapped in a web of "seta" fibres. Image captured by a Jeol Neoscope JMC5000.

The technical director of Revolution Fibres, Iain Hosie, says the company is close to commercialising the filter. To make the fibres it is building a commercial version of a laboratory-scale electro-spinning machine used by Plant & Food Research in its research.

Air filtration mats of nano-fibres provide a much greater surface area to capture pathogens and dust particles than conventional materials, while having less impact on airflow.

Hosie says it is going one step further. Instead of providing microbial protection by incorporating nano-silver particles, it is using manuka and other plant-based extracts to neutralise pathogens.

The biodegradable air filters will soon be available in New Zealand through the ventilation company HRV.

"Air filters are one of many products that have been hugely improved with the use of nanotechnology," says Hosie. The technology could be used in medicine and the textiles and electronic industries, using New Zealand-sourced natural materials in a sector dominated by synthetics derived from petro-chemicals.

Revolution Fibres was established with investment from TechNZ, which has provided more than \$844,000 of funding, the Foundation for Research, Science and Technology's business assistance programme. The concept to research and develop nano-fibres from raw materials such as collagen stemmed from Plant & Food's research programme, which the foundation also funded.

"This is a good example of a New Zealand firm capitalising on the best new knowledge and innovative new processes developed by a crown research institute," said Richard Bentley, general manager manufacturing and high-growth firms at the foundation.

"TechNZ funding has seen this firm grow from an idea to what could be a large export organisation in a fast-growing emerging market." The global nano-fibre market is estimated at US\$102 million and is expected to grow to US\$2.2 billion by 2020.

SCOTTISH MUSSEL FARM USES KIWI TECHNOLOGY

A mussel farm in Mull, Scotland, says it has successfully converted its operation to an innovative new cultivation system first pioneered in New Zealand that makes harvesting much more efficient.

Following a series of successful trials, Inverlussa Shellfish Ltd that it had fully upgraded its farm at Loch Spelve to the continuous loop rope system, a company spokesman, Ben Wilson, said on June 7.


At the moment most mussel cultivation in Scotland is carried out by growing mussels on single vertical ropes or fabric, suspended in the water by heavy horizontal ropes and flotation buoys.

The new system involves continuous loops of special rope hanging down from the heavy horizontal ones. During harvesting, instead of the time-consuming task of pulling in many single individual ropes, the continuous loops can be mechanically drawn aboard the mussel harvester vessel.

The rope is also "hairy" or filamentous, which makes collecting the mussel larvae or spat for on-growing much more efficient, as it ensures a consistent product with a minimal loss of shells.

Inverlussa Shellfish had increased its mussel harvesting rate from one or two tonnes an hour to over three tonnes per hour, Wilson said.

"This new system is working very well for us, and our employees like it as it takes away much of the physical hard work of harvesting. It also greatly enhances the efficiency of our harvesting and despatch operation," said Wilson.

The selected harvested mussels from Inverlussa are sent to the Scottish Shellfish Marketing Group's centre in Bellshill near Glasgow for processing and distribution. 

LETTER TO THE EDITOR

Regulating authorities

Dear Sir,

The oil pollution in the Gulf of Mexico could have been prevented if the regulating authority did not waive the need for a preliminary function test of the *Deepwater Horizon's* blowout preventer. That is: the ill-fated drilling rig's sub-sea safety valve.

Because if it had shut on activation when the drilled well started to blow out, the loss of life, the rig and the pollution could have been prevented. Therefore, in this case, the regulating authority has to take some responsibility for this pollution.

I would like to define pollution. Pollution is the externalisation of costs without consequence or regard for the quality of life or the welfare of third parties.

In New Zealand we have polluting industries. Our regulating authorities manage their mitigation. Regulating authorities, through their ability to use enforcement action, can influence the culture of our industry's work practices.

In a perfect world, pollution would be mitigated. In that perfect world, rules would be applied evenly to all activities with the potential to pollute. It also needs a regulating authority supported impartially by the central government and respected by the community at large. It has the skills, the resources and the attitude to manage our environment.

With concerns that we do not live in a perfect world, and citing the decline of health of our waterways, the Green Party is promoting the nurturing of sustainable, non-polluting industries as an alternative means to generate wealth.

I commend them for that, but I fear it will not happen until our regulating authorities effectively manage all activities with the potential to pollute air and water, and all the way to the far outreaches of its administrated area.

Vince Scully
Kaikoura



Prime Minister John Key opens the factory

Billion dollar industry MOVES A STEP CLOSER

BY DR ANDREW MORGAN



Sorting damage and rejects

The official opening of North Island Mussel Processors Limited's Mussel Factory 2 in Tauranga by the Prime Minister, the Hon John Key, on June 17 proved to be another significant step forward in reaching a billion dollar industry by 2025.

This was a significant event, as the \$23 million factory uses new automated mussel opening technology developed in New Zealand. This mechanisation of seafood processing technology means New Zealand is now a world leader in this area.

The opening started with an iwi welcome, with particular emphasis placed on the importance of kai moana culturally for Maori and the connections tangata whenua have with the sea.

Steve Wells had a significant involvement in driving the building of the new factory and its fitting out. He talked about the commitment of NIMPL to building the new factory and the hours of dedication from the team in getting things up and running.

NIMPL bought the site in 2005 from the Mills Reef Winery and converted the winery buildings into a mussel processing factory. Wells said developments on the site in terms of shellfish processing technology would make a major contribution to shaping a billion dollar industry by 2025.

The company is one of Tauranga's largest employers, with about 35 permanent and 185 seasonal staff. A further 200 seasonal staff were contracted during the transitional phase to begin processing in the new factory.

The chair of the NIMPL board, Geoff Burgess, gave an overview of the beginnings of the company and the development of the automated mussel openers for half-shell production. Sanfords undertook the initial development before ongoing testing and an eventual partnership with Industrial Research Ltd occurred.

A grant was received from Technology New Zealand



The finished product packaged for market



The Prime Minister samples the goods

to develop a workable commercial product. He said the processor and its use in the factory were the realisation of a vision and years of drive and enthusiasm by the Sanfords team to develop it.

Each of the 28 automated mussel opening machines can process up to 3600 mussels per hour, or more than 1.6 million mussels per 16-hour day.

Key spoke about the aquaculture industry globally and the expectation of farmed seafood as being a major source of protein for the future. The continuing increase in seafood consumption world-wide and the role aquaculture has in meeting consumer demand globally is growing.

Key spoke about the importance of China in the future in relation to the consumption of seafood and the need to feed 200 million working class citizens. He described China's developing economy and how critical it was for New Zealand to be well positioned to sell into that market in the future.

Seafood production in New Zealand was a major contributor to that market. Along these lines, the government's focus on aquaculture reforms would help the industry to develop in New Zealand and position itself to take advantage of these developing markets. In line with this was the importance of research and development for the aquaculture industry.

Key mentioned the major injection and funding boost into research, science and technology in the latest Budget, in particular the important role of universities and polytechnics in research.

However, some significant production hurdles still remain to be overcome. Although aquaculture management areas have been developed and some consents finally processed and approved for some significant developments, one fact remained.

To move beyond producing a few select species, significant financial resources and an exorbitant amount of time still had to be allocated to consenting to get a plan variation approved in an area already put aside specifically for aquaculture.

Aquaculture needed to diversify to create continuous overlapping production and safeguard the industry. It was also important to avoid a few select species from becoming cheap commodities and flooding the market. Further stalling the development of aquaculture was the difficulty in separating out pilot-scale research projects for commercial production within AMAs from actual farming consents.

However, all these matters are being addressed in the recent Technical Advisory Group report, Re-Starting Aquaculture, facilitated by chief executive Mike Burrell and his team at Aquaculture New Zealand. This report outlines these issues and how they might be solved, so the industry can get back to where it was positioned 10 years ago in expanding significantly.

Despite this, the NIMPL Mussel Factory 2 and its AMOs are a major technological development in expanding seafood processing production capacity that will better enable the industry to meet its 2025 vision of a billion dollars in annual sales.



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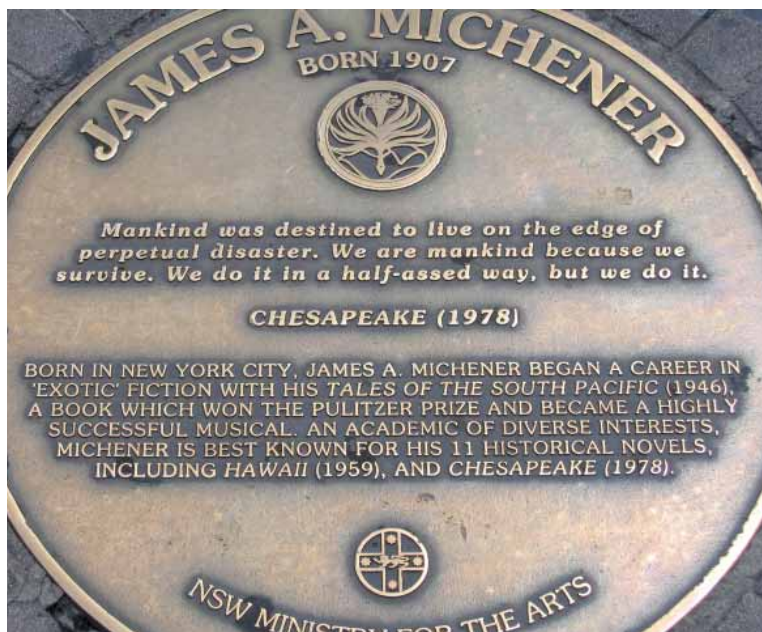
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WHAT'S THE WORST that could happen?

BY JOHN MOSIG



G'day Kiwi. How's it going over there? You'd be under a fair bit of the white stuff right about now, wouldn't you? We're getting a bit of it here, too. The snow bunnies have never been happier – or busier.

I've been looking at the global scene lately in relation to global warming. Or, more to the point, carbon dioxide build-up in the oceans. The science has it that the oceans absorb heaps more CO₂ than the trees. Goodness knows we're dropping them as quickly as you can say Husqvarna. And we all know what happens when CO₂ builds up in water.

The water becomes acidic. Just how acidic we don't really know at this stage, and as in all these debates, it depends whom you're talking to or, in most cases, listening to. Overall it probably doesn't matter much, but things are going to change in the blue yonder, for sure.

Doomsayers would have us believe whole marine ecosystems will be collapsing and, like all good doomsayers, they can support their frightening scenarios with facts and figures. While they are only projections, they do suggest the oceans are going to change. The challenge for us here is to be prepared for the change.

The impact on the wild catch is unknown, other than it's going to throw things out of whack. Whether this is for the good or for the bad, only time will tell. But if it's for the bad, we'd better be prepared. We're talking food security here. Never mind seafood being good for you, over a billion people rely on the ocean's bounty for their primary source of protein.

So, how is it going to effect aquaculture? With more CO₂ in the water you'd have to expect more phytoplankton production, presuming other nutrients such as nitrogen, potassium and phosphorus, for instance, are present in sufficient quantities. This has to be good and phytoplankton is at the centre of the marine food web. More seaweed

production too, for the same reason and with the same provisos.

So far, so good. But what happens if the other nutrients aren't present, or the acidification overwhelms the ecosystem as we know it? Not so good, and let's face it, if we're going to come out the other side of this mess, we're going to have to be prepared for the worst case scenario.

You'd have to suspect that the already fragile wild fishery would be the first to suffer. I can hear cash registers clinking in aquacultural minds already. But if the seas become less than friendly environments, cage culture in open seas would be equally compromised, wouldn't you say? And what about wild anchovy and other fodder fish harvests? What happens to the supply, never mind the price, of fish meal, should that sector collapse?

This makes the need to look at other sources of key ingredients suitable to seafood production imperative: key ingredients such as essential amino acids and lipids. We've used so-called trash fish in our aquaculture diets for high-order predators like salmon, trout and barramundi because it's convenient and cheap. Well, maybe not cheap in the dollar sense, but certainly in the cost-effective sense. Can these key ingredients be replaced?

I believe they can, but not without a good deal of research. And when I look across The Ditch I see you're right onto it. Cut out the middle man, get to the centre of things. Mass-produce algae as the key component of fish diets, not to mention in plastics and pharmaceutical production.


The possibilities are endless. We haven't even begun to understand the role algae plays in our chemical-based world, nor the range of species or the environmental possibilities in which they can be produced.

With research into hatchery production for new species driving research into better ways to produce the algae required by new species of shellfish and finfish at the larval stage, we are breaking into a wonderful new world of opportunities. With the global environment looking distinctly like it's going to have to reinvent itself, being able to catalogue the range of algae available to us could be the difference not only between a better life but also economic and environmental sustainability itself.

What triggered this line of thought? Just about every time I read something about the matter, New Zealand seems to appear somewhere in the article. It amazes me you're so good at so many things over there, yet so crap at cricket.

By the way, congratulations on your effort over in South Africa. Coming through undefeated by that bunch of hair flickers and prima donnas was something no-one else managed to achieve.

Here comes the nurse with my medication. I'll catch you later.

If you ever find yourself walking around Sydney's Circular Quay, among the quotes of visitors to the Wide Brown Land you'll find this plaque embedded in the promenade. Very appropriate for our times, eh? 

BUYING QUALITY means using our senses

BY DOROTHY-JEAN MCCOUBREY



I have just returned to New Zealand after doing food safety work in Afghanistan. I was only there for three weeks but what an adventure! Like the 1001 Arabian Nights, I came home with 1001 stories, but most of all I came away humbled, having experienced the dignity, humour and positive outlook of the Afghan people.

Each night here in our comfortable living rooms the news media constantly focus our attention on the rough and tumble of war, where heroic soldiers take the lead role.

However, Kabul has three million people, of whom the majority are not linked to any military side. These people struggle each day to bring up their families as best they can; feeding, clothing, educating them and worrying about what the future will hold for them.

Of course Afghanistan is a long way from the ocean. Up in those spectacular mountains is about as far away as you can get from marine shores, so I presumed seafood would not feature on the household shopping list. But in fact fish is considered a treat and when shipments arrive, a fish is nailed up on a high wooden post in a prominent position at the market so everyone is aware to buy speedily before others devour them.

We are so much more fortunate here in New Zealand, with a wide selection of seafood species sold in an increasing range of places. Large supermarket chains now sell seafood from all over the world, speciality fish shops display visual feasts on ice in their windows and the local markets usually have a caravan operator hawking local fish, kina, paua and shellfish.

With so many places to buy seafood, how can we be sure we are buying freshly caught quality products? To do so involves using our sight, smell and tactile senses, so here are some hints to keep in mind when shopping.

Fresh, whole fish should appear bright and shiny, with most of the scales intact and adhering tightly to the skin. The eyes should be bright, clear and full. As the quality goes down the eyes will turn pink and become cloudy and sunken.

The gills should be red and free from slime; as the fish ages the gills will fade and become grey and then a dull brown. The odour should be fresh and mild, as the fishy odour only develops over time. Lastly, the flesh should be firm and elastic.

Fresh fillets and steaks should also be moist, firm and elastic. There should be no odour or it should be at least fresh and mild. If the fish is pre-packaged there should be little air space between the fish and the wrapping material and no liquid in the package.

Frozen seafood packages should be solid with no evidence of thawing such as water stains and ice crystals. Packaged, frozen seafood usually has an expiry date stamped on the label. Use the seafood before this date, as after that the quality will deteriorate.

Smoked fish should be bright and glossy. There should be no dried blood or mould on the product.


Purchase shellfish carefully. Buy oysters, mussels and clams (pipis, cockles) only from reputable markets. Ask the seller

where they came from to make sure they are from a harvest area that is managed under the microbiological and marine biotoxin testing programme. If they are from anywhere else they are being sold illegally.

Mussels, oysters and clams sold in their shells are usually alive and close tightly when tapped. Gaping shells indicate the shellfish are dead and not edible.

Most scallops in New Zealand are sold with the shell and gut removed. They should have a sweetish smell when purchased and be free of excessive liquid when in containers.

Unlike the folk in Afghanistan, we do not have to wait until the fish are posted to announce their arrival. We constantly have a large number of fish and shellfish species available so there is no need to put up with spoiled, low quality seafood.

To do so is to lose respect for the food itself and to those who have spent time catching and preparing it for us. Shop around and complain loudly to operators who do not provide you and your family with the best nutritious and freshly caught seafood. 



Local butchery shop in Kabul, sorry no fish



Aquaculture should earn emission **TRADING UNITS**

BY HAYLEY CAMPBELL BSC, LLB, SOLICITOR

New Zealand's Emissions Trading Scheme kicked in on July 1 for the stationary energy and industrial processes sector and the liquid fossil fuels sector.

This means that we are (or soon will be) all paying for the scheme through increased fuel and electricity generation costs. However, there is still a lack of awareness of what the actual effects of the scheme will be on individuals, businesses and in particular the aquaculture and fisheries sectors. In order to understand the possible effects of the scheme it helps to have an idea of what it is trying to achieve.

The driving force behind the ETS is the Kyoto Protocol, a protocol to the United Nations Framework Convention on Climate Change (UNFCCC) aimed at fighting global warming. The UNFCCC is an international environmental treaty with the goal of preventing dangerous human interference with the climate system.

The protocol was initially adopted on December 1997 and entered into force on February 16, 2005. As of November 2009, New Zealand and 186 other states had signed and ratified the protocol.

THE SCHEME WILL NOT PROVIDE THE AQUACULTURE INDUSTRY WITH ANY RELIEF FROM ETS-INDUCED COST INCREASES

In doing so, 37 industrialised countries, including New Zealand, committed themselves to reducing their emissions of certain greenhouse gases and groups of gases. The protocol provides a number of mechanisms countries can utilise to meet their greenhouse gas emission targets. These mechanisms include emissions trading.

Therefore, the aim of the ETS is to encourage reductions in emissions. Those businesses that emit greenhouse gases are compulsory participants in the scheme and are obliged to match their emissions by obtaining emission trading units, or ETUs, equivalent to what they are emitting.

An ETU is the equivalent of one tonne of carbon dioxide emissions. Those who need to purchase ETUs to cover their emissions can do so from owners of forests planted after 1989 who are issued units equivalent to the amount of carbon dioxide their forests sequester (or store), or from emitters who find themselves with more ETUs than they require because they have reduced their levels of emissions.

Emitters can also buy units from the government and from approved overseas sources. The scheme therefore aims to reward participants for sequestering carbon and reducing emissions and impose costs on them for increasing their emissions.

The government is allocating units free to certain participants at the beginning of the scheme so the cost of the scheme is not crippling. This assistance is particularly targeted at industries with relatively high emissions but which face international competition from countries that do not impose emission costs.


In changes to the ETS legislated last year, the government quite rightly recognised the seafood sector as such an industry. Both aquaculture and wild harvest operators face high fuel costs, which are increasing due to the ETS, and sell internationally in competition with sellers who are not suffering from such increases.

However, the government opted to allocate ETUs to quota owners and not other industry participants. While arguments can be made as to the pros and cons of that approach (some argue the ETUs go to vessel operators who will pay the increased fuel costs), the fact remains that the scheme will not provide the aquaculture industry with any relief from ETS-induced cost increases.

As we have canvassed before (Issue 29, May/June 2009) the aquaculture industry potentially contributes to carbon sequestration and an argument could therefore be made that it should earn ETUs in the same way as post-1989 forests do.

The logic goes that, of course, shellfish, crustaceans and molluscs such as mussels and crayfish use carbon dioxide to calcify their shells. Because the carbon dioxide is removed from the water and effectively stored in the shells, the water is able to absorb more carbon dioxide from the atmosphere.

While some research has been undertaken in New Zealand and overseas on how to measure carbon sequestration in shells, it would be necessary to have this accepted at the international level under the Kyoto Protocol and the UNFCCC before New Zealand could consider treating marine farmers on a par with forest owners.

Given that international progress on combating climate change seems to be moving at a pace slightly slower than the glaciers are melting (if, indeed, you believe they are), any change of this kind is likely to be many years away. 

Hayley Campbell is a solicitor at Oceanlaw, where she works on a range of aquaculture, maritime and fisheries issues. As well as her law degree, she has a Bachelor of Science with a double major in marine biology, ecology and biodiversity.

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NSW HATCHERY quality assurance programme

BY JOHN MOSIG

New South Wales Fisheries developed techniques for commercial-scale production of Australian warm water native species found in the Murray Darling Basin at their Narrandra facility in the early 1980s. Around 30 private sector hatcheries now operate in New South Wales, Victoria and Queensland and between them they produce between five and eight million fish annually.

Clients include recreational re-stocking groups, government agencies and commercial growout farms. Government hatcheries breed a further 2.5 million for conservation and stock enhancement.

As the hatchery sector grew in size and importance 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.

The NSW Department of Primary Industries (now incorporating NSW Fisheries), under the direction of Dr Stuart Rowland at the Grafton Aquaculture Centre, took the lead. The result, the hatchery quality assurance programme, or HQAP, will apply to government and private hatcheries in NSW.

The programme covers Murray cod (*Maccullochella peelii peilii*), golden perch (*Macquaria ambigua*) and silver perch (*Bidyanus bidyanus*). These species make up the bulk of the inland recreational bag and almost the entire commercial crop of farmed, native fish.

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

In addition, the transfer of pathogens and disease, though mainly confined to manageable common ectoparasites, has been an issue in the industry. An exception has been epizootic ulcerative syndrome (EUS or red spot), which is due to infection by the fungus *Aphanomyces invadans* and is an extremely difficult disease to treat.

It is thought to be endemic only to coastal drainage systems and has caused the quarantining of one Victorian silver perch farm at the peak of the growing season after the disease was discovered in stock purchased from coastal NSW.

Murray cod, golden perch and silver perch are all indigenous to the Murray-Darling Basin. While the basin used to become like an inland sea in extremely wet seasons in the Dreamtime before river flows were altered to accommodate agricultural development, flood mitigation and electricity generation, it still possessed particular reaches of habitat with 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 found in these species, the hatchery quality assurance programme outlines that broodstock must be obtained only from catchments where fingerlings are to be liberated.



Recent studies* have found “low levels of genetic diversity in some populations and species” and “low levels of genetic variation in some hatchery stocks”. While it could be argued that low levels of genetic diversity in wild populations has been caused by declining populations and habitat degradation, thanks to studies carried out and the guidelines in the HQAP, hatcheries are now able to manage and improve their genetic strains.

The Department of Primary Industries is developing a broodstock collection and management policy. Under the HQAP, all broodstock must be tagged with a passive integrated transponder, and details of their source, strain and performance recorded. The policy is conservative to protect the genetic integrity of the various species and populations. While some growers may find this an added administrative and management burden, most operators see having clear guidelines for broodstock collection as an advantage.

Bruce Malcolm of Urah 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 assurance programme. 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 broodstock as the DPI hatcheries or, quite simply, the programme will not work,” Malcolm said.

The HQAP, along with industry consultation, will be used as a basis to develop a statutory Hatchery Accreditation Scheme. Until this has been completed, the HQAP is a voluntary best-practice guideline, but the DPI will use it in its “dollar-for-dollar” stock enhancement scheme and other stock purchases.

The response of the industry has been philosophical. The usual grumbling about the added cost and in some cases, onerous procedures have been tempered with the widely accepted knowledge that the HQAP will, by eliminating poor practices from the industry, lift the sector’s profile and ensure seedstock leaving hatcheries for the growout and recreational sectors is of the highest possible standard.

Growout farms will be able to breed their own stock, as before, without the extra cost of complying with the standards

CONTINUED ON PAGE 15 ►

* Rowland (1985, 1993), Musyl and Keenan (1992), Keenan et al (1995), Bearlin and Tikel (2003) and Nock et al (2003).

Cawthron has a **KEY ROLE** in water management projects

BY LAUREN MCKENZIE

The Cawthron Institute will work with NIWA, the National Institute of Water and Atmospheric Research, to investigate areas critical to the future of water management in New Zealand. The collaboration came after a successful bid for a share of \$22 million in government funding in the latest round of grants from the Foundation for Research, Science and Technology.

The crown research institute and Cawthron researchers will collaborate on three key projects exploring managing water quality and quantity, and remedial options for contaminated waterways. FRST has allocated \$7 million per year for the projects, which will run for the next six years, starting from October.

“While there is increasing recognition that water is our most valuable resource, we are clearly struggling as a nation to balance the social, environmental and economic interests in this precious resource,” says Rowan Strickland, who is Cawthron’s coastal and freshwater group manager. “We urgently need to improve our knowledge and develop better tools if we are to better manage our water into the future.”

He says the projects hold the key to providing the information and tools to guide local and central government policy and planning, developers and the community in harnessing water for economic benefit, while protecting our waterways for our children and future generations to enjoy.

One key area of research to secure funding is the cumulative effect of a variety of contaminants on aquatic ecosystems. It

involves scientists looking at various river health indicators across a gradient of rivers, from pristine to polluted, to see how they respond to changes in intensity of land use.

The lack of knowledge about cumulative effects is one of the major causes of declining river health in this country, says freshwater ecologist Roger Young. It is widely recognised as a challenge for resource management.

He says contaminants associated with intensification of farming are still taking a toll on freshwater and estuarine ecosystems, despite our knowledge of best-management practices, dairy industry initiatives such as the Clean Streams Accord, community involvement and the development of regional water quality standards. Key contaminants include sediment, nutrients, bacteria and pesticides.

“The current assumption is this contamination is a gradual process that increases over time, but it may be that once a certain amount of nutrients enter a system, everything turns to custard at once and there is nothing anyone can do at this point to change the outcome,” says Young. “By comparing changes in intensity of land use we can look at setting standards to ensure those tipping points are never met, better safeguarding our waterways.”

The research will take more of a holistic view than currently exists, looking at cumulative effects, not isolated ones, as at present.

Under the consent process, regional councils look only at how a single development, such as a dairy shed, will impact on a system. The discharge from that one shed might result in only a very minimal and therefore acceptable change to water quality downstream.

“However, when there are 500 farms in one catchment, all with effluent discharged from sheds and off land, perhaps combined with a sewage treatment plant and maybe a meatworks, we know the outcome is likely to be a very different story.”

Young says ultimately it is envisaged the research will set standards and guidelines around nutrient loading to assist regional councils with their planning. The outcome will differ from area to area depending on soil types, climate and values in a particular water body.

While Cawthron’s involvement in the cumulative effects project is new, its work on river health indicators is internationally recognised. Primary research sites for this project will be in Canterbury, Kaipara Harbour, Hawkes Bay, Otago and Taupo.

Following the successful funding bid, researchers will also research options for restoring contaminated aquatic systems. Rowan Strickland says many of New Zealand’s rivers, lakes

Cawthron staff members Aaron Quarterman and Iain Maxwell assessing a method to survey fish populations on the Motueka River using DIDSON camera technology





Cawthron staff member Robin Holmes detecting tagged trout in the Rainy River (Passive Integrated Transponder – PIT)



Cawthron staff member Karen Shearer collecting an invertebrate sample from the bottom of a stream bed on the Rainy River

and estuaries are in a degraded and often worsening state, which is not only an issue for the public but also threatens our “clean green” image.

“We need to work out not just how to rehabilitate streams, but which ones should have priority. That rests on their values and on where the money is best spent,” says Strickland. “The worst cases will not necessarily be top priority, because we should also consider how well streams will respond to rehabilitation. Landowners, community groups, industry, iwi and the government could end up pouring millions of dollars into clean up operations for no gain.”

The government has already committed around \$433 million for rehabilitation projects in Taupo, the Te Arawa/ Rotorua Lakes and the Waikato River. Industry initiatives such as the Dairying and Clean Streams Accord, the best practice catchments for sustainable dairying research project and community-led land care initiatives are also being implemented.

Strickland says given these large investments of time, effort and money in aquatic rehabilitation, it is vital to set realistic objectives to ensure cost-effective outcomes.

Researchers will be putting logs into streams to see how wooden structures, which are known to be important in creating habitat, might improve fish life, and looking at the effect of willows on rivers, both positive and negative.

This project, involving NIWA, Cawthron and Otago and Canterbury Universities, will largely be based in the Waikato region, but some work will be conducted nationally in conjunction with the dairy industry, looking at streams they have been monitoring with their best practice catchments project in Southland, South Canterbury, Westland, Taranaki and Waikato.

One of the most topical areas of research to receive funding involves determining environmental flow regimes for rivers, to guide sustainable water allocation. This will build on existing research on water allocation and its environmental effects.

Freshwater fisheries scientist John Hayes says with water use increasing rapidly in New Zealand, primarily to support the growing agricultural sector, improved water allocation decision-making is essential if we are to allocate water for environmental, cultural, social and economic needs fairly and efficiently.

“The ‘water rush’ for intensified agriculture in dryland regions such as Canterbury in recent years and the continuing interests in hydro-electric power generation has raised awareness that water is a limited resource and has high value,” says Hayes. “Where big dollars are involved, clearly the more precise our estimates of sustainable allocation are, the better it is for the economy and the environment.”

This project will also involve research on the hydrological and environmental effects of water storage, with the agricultural industry looking more closely at water storage for solving supply problems when intensifying farming in dryland regions.

Most of the environmental flows research will be done in Canterbury, with some also in Hawkes Bay and Tasman.

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Where to from here FOR EELS, AND WHEN?

BY PAUL DECKER, DIRECTOR, MAHURANGI TECHNICAL INSTITUTE



Shortfin hatchling –
38 hours after egg fertilisation



Shortfin hatchling – eight days old

Henry Kaspar's excellent editorial, "Make money and save the eel" (New Zealand Aquaculture 36) begs the question, "Where to from here?"

Kaspar's claim that both longfin and shortfin eels are national treasures and important taonga for Maori is right on the button. These eels also have immense value as an aquaculture species, not only for producing high quality food and therefore income, but also because an eel farming industry would reduce pressure on the wild harvesting of eels.

Internationally, eel aquaculture is a NZ\$3 billion farm gate industry. It produces 80 percent of the world eel consumption of 250,000 tonnes by cultivating glass eels taken from the wild and growing them through to a commercially harvestable size.

It is little wonder that the species is in serious decline, as the industry has not yet commercialised the breeding process. Therefore all farmed eels must be cultivated from wild-caught stocks of glass eels.

Catching glass eels for farmers to grow-on is big business throughout Europe and Asia. However, over-fishing (the old story of taking more than is sustainable) is now taking its toll.

This presents New Zealand with a great opportunity. We need to look at a sustainable glass eel harvest against retiring

some of the catch quota for adults. We should even consider returning a percentage of farmed fish to the wild for future glass eel recruitment.

Currently we have no eel farming industry in New Zealand and our eel fishery is in decline from environmental degradation and because we are catching and killing too much of the breeding stock. Adding value to the industry by breeding and encouraging the restocking of wild habitats is long overdue.

Elsewhere in the world there is well-established technology for growing-on glass eels to market size, but it is species-specific. There is also a well organised and profitable marketing and supply chain in place. Together, these present great potential for exploitation but the opportunity may be lost through inaction.

The recent National Eel Fisheries Workshop held in Whakatane and supported by the Ministry of Fisheries, Te Wai Maori, FRST and Te Puni Kokoiri was a good start. It was well attended by everybody in New Zealand with interests in eels.

Two resolutions came out of the workshop:

- to trial a model eel farm using glass eels caught from the wild, and
- to support the closing of the life cycle by breeding in the laboratory so glass eels can be supplied to future eel farms without the need for wild capture.

This may sound simple enough, as eel farming is already a common commercial farming activity around the world. Eels are successfully farmed in large numbers in other countries but the technology cannot just be imported.

Our species will be different to farm. We already know there are disease challenges in New Zealand and our species of eels are more adept at escaping than other species. So research is essential through the development of a trial model eel farm.

NIWA, the National Institute of Water and Atmospheric Research, completed some interesting aquaculture experiments a few years ago on raising eels in recirculating aquaculture systems, but this was more an exercise in comparing culture in salt water against fresh water and was not a model farm set-up.

The most difficult aspect is ensuring a reliable, continuous supply of glass eels for the grow-on eel farms. An initial suggestion has been to allow limited harvesting of wild glass eels in order to develop the economics and practicalities of commercial eel farming.





MTI's research facility – eel breeding stock holding tanks



Dr Tagried Kurwie – inspects a breeding longfin eel



Dr Tagried Kurwie stands alongside egg incubators

As the size of the sustainable harvest is unknown, careful research will be required to set limits, otherwise, as overseas experience has shown, the glass eel supply will soon become exhausted. China has long since devastated its glass eel supply through over-harvesting and Europe has got to the point where the glass eel is listed under CITES, the Convention for International Trade in Endangered Species. Now eel farmers in Europe and Asia have started exploiting the African supply, which will doubtless also become exhausted in the near future.

The Holy Grail, both economically and in terms of conservation benefits, lies with breeding eels in hatcheries. This was a key issue of discussion at the workshop. The big question was, “When will it happen?”

Will we still be dilly-dallying here in Godzone, having hui and discussing “The way forward” in five or 10 years time? By then the rest of the world may have cracked the problem and New Zealand might have missed a huge commercial opportunity.

We have the ability within New Zealand to lead the world. The Mahurangi Technical Institute, the Cawthron Institute, Otago University and NIWA all have skilled people with considerable experience in eel culture and biology.

MTI in particular has been able to hatch eggs of the shortfin eel, *Anguilla australis*, for several years. Its research team can spawn them year-round, rather than only during the natural

season, and can produce good quality larvae in large quantities (ie, millions), which can be reliably raised to 12 or 14 days old.

At this stage the baby eels begin to feed, and research into their feeding requirements is now the next barrier to further development. The significant achievements of MTT's breeding programme have attracted the attention of many international eel researchers, especially scientists in Europe.

All these New Zealand achievements risk being wasted if eel farming is not taken to the next stage and the need for progress is urgent. It is feared that personnel will go elsewhere to find employment and facilities will be dismantled or put to other uses if momentum is lost.

New Zealand urgently needs to put time, effort and money into developing an eel breeding and farming industry for the New Zealand eel species before the opportunity to stay ahead of other countries is lost. There are financial risks and the commitment required is considerable but the opportunity is too great to ignore.

As the top predator of freshwater habitats, New Zealand eels are an important part of the native wild life and deserve special conservation attention and our highest respect. As tuna to Maori, it is a taonga that can be both treasured and exploited. To do nothing would be to miss out on a golden economic opportunity and may also result in the loss of this treasured species.



◀ CONTINUED FROM PAGE 11

set in the document. However, they will not be able to sell their seedstock as coming from an accredited establishment under the scheme.

The document is more than just a list of regulations. Dr Rowland, assisted by Patrick Tully of the Port Stephens Fisheries Centre and numerous industry and government people, has put together a manual that established and incoming hatchery operators can use to improve the efficiency of their operation.

In its own words, the HQAP “describes key features of native fish hatcheries and identifies essential criteria for site selection, design and operation, and management of broodstock, breeding programmes, water quality management and fish health.”

Essential criteria, as the name implies, are prerequisites for accreditation of native fish hatcheries by the DPI. It also identifies recommended criteria for crucial, although not enforceable, inputs such as site selection, system design and operation and management procedures.

A measure considered long overdue in some quarters, DPI sees the document as a model for developing protocols for other

species not included in the current programme. In particular, it provides a basis for breeding programmes for threatened species, such as trout cod, eastern freshwater cod, Mary River cod and Macquarie perch.

More than that, by removing unprofessional practices from the hatchery sector, the HQAP has opened the way for some serious sector and industry growth. The longest lever in the pig and poultry industries has long been recognised as genetics.

By introducing genetic management, albeit at this stage for stock enhancement, the HQAP opens the door for genetic improvement of commercial growout strains. Some improvements have already been demonstrated through the DPI's breeding programme for silver perch.

Once the private sector has the tools and infrastructure in place to track broodstock and progeny, a wider base for genetic improvement is expected, with the whole industry, from seedstock producers to consumers, benefiting.

Copies of the HQAP are available through the New South Wales Department of Primary Industries. Contact Dr Stuart Rowland at the Grafton Aquaculture Centre, phone 02 6640 1691 or by email Stuart.Rowland@fisheries.nsw.gov.au





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