
A sturgeon gets a kiss

Aquaculture in Canada
lessons for Australia

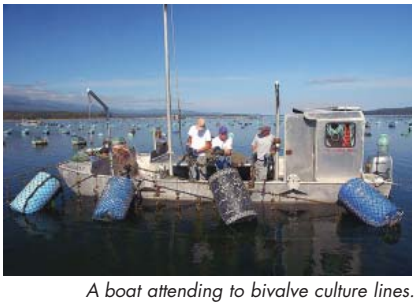
In late 2008, NMIT (Northern Melbourne Institute of TAFE) hosted Professor Don Furnell of Vancouver Island University, for a period of two weeks. During this time, Don carried out teaching duties and was also able to tour a variety of Victorian aquaculture enterprises to get a feel for the local industry.

An excellent seminar towards the end of his visit contained many pertinent messages for the aquaculture industry in Victoria and Australia and was attended by several industry figures.

Vancouver Island University was formerly known as Malaspina University College, and is an institution offering both vocational education and training (such as diplomas) and Bachelor degree-level courses. This mirrors the situation at NMIT, which (in 2006) became the first TAFE to begin offering degree level courses in addition to its range of certificate-level courses that have been running since 1997.

The courses being offered by VIU have a good reputation, which is just as well because the Canadian aquaculture industry is crying out for appropriately qualified graduates. As a thriving and rapidly growing sector, there are more jobs available than there are people to staff them.

While the university does have a good relationship with industry, there are cer-


A boat attending to bivalve culture lines.

Professor Don Furnell taking time out in Canada.

tainly no-go areas. The industry sees government-subsidised aquaculture product generated by universities as a direct threat to their bottom-line with farmers quickly becoming agitated if that harvest becoimes significant.

While the aquaculture industries in Canada and Australia are of comparable size, Don reckons the industry here will face similar challenges to those confronted by aquaculturists in British Columbia the further we progress.

Canadian aquaculture produce

Salmonids

Like the situation in Australia, Canadians have well and truly recognised the aquaculture potential of Atlantic salmon and, to a lesser extent, Chinook salmon. Part of this appeal stems from the markets they are looking to satisfy: the Japanese market, for example, prefers red-fleshed, fatty fish with a very high oil content. A good example here is the Yukon River Chinook salmon, which have a whopping 18% lipid content. But it is worth remembering here that Atlantic salmon can be stocked at around three times the density of their Chinook counterparts.

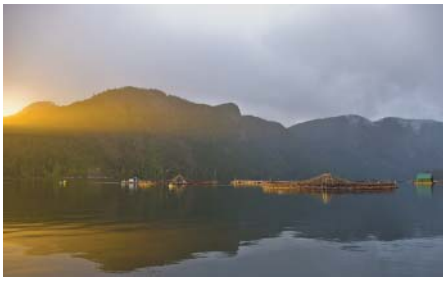
Caviar and Sturgeon

The popularity of caviar is increasing throughout the world, and Don explained the amazing situation with Fraser River White Sturgeon, *Acipenser transmontanus*. This enormous fish, which can attain an impressive maximum size of over six metres in length and masses over 800kg, was originally discovered in a tailings dam back in the late 1980s and by the mid 1990s the first spawn had been achieved.

Females of the species have a huge gonadosomatic index (GSI) of 10% of the overall body weight, meaning that they are highly fecund and therefore highly lucrative from the point of view of caviar production. The champion of Vancouver Island University was nicknamed 'Arnold Sturgeonator', and weighed in at a colossal 100kg! With caviar retailing for as much as $160 per ounce (or roughly $5.64 per gram), there have been instances in which single fish have seedstock on board with a potential value of US$16,000! And this is before we begin considering the value of the flesh which sells for a handsome price too and is well regarded.

Canada's caviar industry is all the more lucrative given the poor state of Russia's sturgeon stocks due to poaching and Iranian stocks also running low. If it wasn't for aquaculture, sturgeon roe probably wouldn't be able to be produced at anywhere near the current quantities.

Lines for culturing Pacific oysters, demonstrating the sheer scale of the aquaculture for this species



The Canadian vista on full display, with sunlight dancing on a sea cage stocked with salmon

Picturesque Canadian scenery; an estuary where a river meets the sea.

A salmon farm, the type of aquaculture establishment that has attracted much controversy over the years

Of course, being aquaculture, things don't always turn out as planned: Don recounted the soul-destroying instance of several of these magnificent broodfish (which are difficult to come by) being lost because of an error made by a trainee in attempting to replace a standpipe!

Sablefish

An intriguing variety of fish in Canadian aquaculture is the sablefish (*Anoplopoma fimbria*). These fish are typically inhabitants of the deep sea, found at depths of 2000-3000 metres. Unlike many of their deep-living compatriot species, these amazing fish will survive an ascent to the surface since they lack a swim bladder (in species with one it expands as the fish approaches the surface, pushing the internal organs out of the mouth).

While these fish have a relatively low metabolism, they have a food conversion ratio that is three times better than salmon and there are over several hundred thousand larvae currently being produced by aquaculture programs per year. This finfish could represent the next big thing in Canadian aquaculture.

Mollusc culture

Introduced species make up a significant portion of the Canadian aquaculture industry. Nowhere is this truer than with Manila clams (*Venerupis philippinarum*) and the Pacific oyster (*Crassostrea gigas*), which are very important economically. This industry is made up of over 400 operations, consisting of rafts, racks and line culture systems; many are relatively small-scale and/or experimental in nature. Another molluscan industry in Canada which is expected to grow considerably in coming years is abalone. Four farms are currently producing abalone but, as is the case in Australia, poaching is shaping as a huge issue.

Challenges faced by the Canadian aquaculture industry

Onshore vs offshore

Aside from working at the University, Don has been involved in various consultancy projects. This explains why most of his publications in the scientific literature have been from his earlier days and he hasn't published a huge amount since; confidentiality clauses and intellectual property rights have have seen to that!

One such consultancy was with the now defunct Hagensbourg Marine Farms. One of his first pieces of advice was that the $7.5m spent on the onshore facility would be better employed on seacage aquaculture which could reasonably have been expected to produce five times more stock (approximately 4000 tonnes) per annum than what they were producing.

The scale of this onshore facility was impressive. It consisted of eight concrete tanks of 16m diameter, each 16m deep (with a volume therefore of over 3.2million litres). Flow rates were maintained at between 700 to 800 litres per second, and oxygen was supersaturated at 125mg/L with the use of a deep well booster system to keep the fish (which have a relatively high oxygen demand) happy in their highly stocked culture tanks.

Even with this point-source oxygen injection occurring, the fish – stocked at 100kg per cubic metre of water – would survive just 15 minutes were there to be a shutdown of the system. To cope with this a 625 kilowatt generator was installed as backup.

The system could have as much as 640,000m (or 640 mega litres; roughly a cubed football field!) of water pass through it on a typical day, with the most highly stocked tanks having around 800 litres per second pass through them.

The real drive behind this project was the desire to sell the technology to grow the fish rather than the fish themselves. Unfortunately, due to high running costs and relatively minimal production, this operation ended up joining the aquaculture enterprise graveyard.

The influence of ENGO's

When dining out, Don eats aquaculture produce whenever possible in preference to wild-caught fish. But many restaurants in Canada are reluctant to put farmed fish on the plate, a completely opposite stance to that in the US.

The difference is that the environmental lobby wields enormous influence in Canada – Greenpeace was founded in Vancouver and the David Suzuki Foundation is also very prominent. Environmental Non-Government Organisations (ENGOs), while being essentially not-for-profit groups, can have enormous cash flows. Indeed one chief executive officers was found to be making over $250,000 a year (by an individual who successfully infiltrated one such organisation and was able to report the results).

Canada's most prominent newspaper once featured advertisements for several weeks at a time – costing in the order of $75,000-$100,000 – targeted at the practice of sea cage farming.

It seems that the environmental lobby has the aquaculture industry firmly in its sights and sees it as a very hot topic. Don did not deny that sea cage farming is an issue that must be examined closely – noting unsustainable salmon farming practices in some parts of the world – but does take offence at the deliberate use of misinformation to sway members of the public.

As if killer whales (the "cuddliest animals on Vancouver Island") and 1500lb (680 kg) bull elephant seals (which occasionally gain access to salmon pens and cause major headaches) aren't enough to contend with!

He cited an article that appeared in the prestigious journal *Science*, which boldly claimed that a further four generations of farming could result in banishment of pink salmon (*Oncorhynchus gorbuscha*) from Canada due to sea lice infestations thought to have been assisted by aquaculture practices.

The study was based on a computer simulation that utilised some very questionable assumptions ... time will tell on its accuracy. However, around $3 million has been poured over the past 2-3 years into investigating linkages between the spread of sea lice (copepod parasites) between wild and farmed salmon stocks. It be a difficult problem to quantify, since sea lice infestations on large salmon do not appear to cause too many problems, whereas three sea lice on a fingerling can cause death.

So far, no smoking gun has been discovered one way or the other but this has not stopped certain groups splashing greatly magnified skin-crawling images of sea lice across the front of newspapers.

Whatever the case may be, one thing is certain: diseases such as BKD (Bacterial Kidney Disease), Furunculosis and Vibriosis (for which a vaccine has recently proven to be ineffective), along with IHNV (Infection Haematopoietic Necrosis Virus) are inordinately more dangerous and damaging to both wild caught and aquaculture stocks (as the current outbreak of an abalone virus in south western Victoria is ably demonstrating at the moment).

These diseases are always monitored closely by the industry, with most hatcheries now having to be certified as disease free for a period of at least two years (and many have certification that goes as far back as 15 years).

As the industry has developed, so too have the associated costs. Once upon a time a lease to engage in the practice of farming salmon cost somewhere in the vicinity of $100,000, whereas now the typical cost is somewhere between $300,000 and $500,000. Approval for these leases occurs at the rapid pace of two weeks.

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Don currently sits as chair of the Pacific Salmon Forum: for more information log onto www.pacificsalmonforum.ca

For those wanting further information on Vancouver Island University, log onto the website at www.mala.ca/fisheries. [Double check this website]

For NMIT's website, go to www.nmit.vic.edu.au