NEW ZEALAND FEDERATION OF FRESHWATER ANGLERS (INC.)

Background to NZFFA Policy on the commercialisation of recreational sport fishing.

Policy:
The Federation opposes the commercial farming and/or canning of trout, and the importation of fresh salmonoid flesh as risks to NZ freshwater sports fish, and the tourism and freshwater fishing industries the sport supports in New Zealand.

Opposition to the commercial farming of trout.
Rationale:

It's a no-brainer really. The reasons to not allow the commercial farming of trout hugely outnumber and outweigh any reasons to allow it. Despite that, the Federation has had to vigorously oppose the introduction of trout farming from its inception to the present day. Sadly, common sense is not a currency those bankrolling fish farming are used to dealing in. [4]

Here are some of the reasons why we oppose it. They can be broadly grouped into six categories, vis;

- A recreational asset
- Pollution
- Disease and Food Values
- Genetic modification and dilution
- Poaching and commercialisation
- Sustainability and resources

A number of the arguments, literature, and material quoted are derived from studies of salmon farms. As such, they are directly relevant to the farming of trout, particularly rainbow trout. Salmon, being seen as a more 'desirable' and profitable product, is more often farmed and studied than trout, which is seen as an inferior product with marginal economic returns. However, these facts and arguments are also something that you might like to think about the next time you see salmon for sale at your local supermarket or fish shop.

Ken Sims
New Zealand Federation of Freshwater Anglers (Inc)
17 February 2010

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A Recreational Asset:

"The race between education and erosion, between wisdom and waste has not run its course. George Perkins Marsh pointed out a century ago that greed and shortsightedness were the natural enemies of a prudent resources policy. Each generation must deal anew with the raiders, with the scramble to use public resources for private profit and with the tendency to prefer short-run profits to long-run necessities. The battle to preserve the common estate is far from won."

John F. Kennedy. 1963

Early European settlers to NZ were keen to escape the rigid and privileged class system of the old world, where only a wealthy few could fish rivers and enjoy the spoils of recreational fishing. They tried to set up laws and governance that would see universal and egalitarian access to rivers and fisheries. (Unfortunately, complex and inappropriate property laws are steadily and increasingly eroding these).

"We have to guard against exchanging something priceless for something which has only monetary value."

Minister of Lands. Mr Duncan McIntyre. 1969.

When sports fish were liberated and established in these rivers, they were seen as universal food sources as well as a recreational asset. Like seafood, there was an absolute and egalitarian right to fish for them for food. While this has to be more managed today, particularly in light of recent policies to stop liberating stock in rivers, the principal of egalitarian access to freshwater sports fishing remains, enshrined in the Wildlife and Conservation Law Reform Acts, and the Resource Management Act. Such Acts would have to be changed (gutted) to allow trout farming.

Private water, private fish, and the denial of access to public fishing waters are things that we oppose very strongly.

Falls Church
Virginia, USA 22041
9/3/70

Dear Mr Orman,

For some reason or other everybody seems to think that a great deal of money can easily be made by producing trout for the commercial market. I'm afraid that time has passed. Trout are highly sensitive organisms subject to many diseases and environmental changes. Since you still have excellent fisheries for wild trout in your country, it would seem a pity to jeopardise them by the introduction of a domestic strain or by the wholesale production and eventual change of a race that seems to be doing very well as it is.

If New Zealanders would attempt to go into the trout growing business with the hope of making money, it would probably be necessary for you to bring domesticated strains of fish into your country because of the necessity for a rapidly growing, efficient fish. In which case you will run the very grave risk of also importing any number of very serious disease organisms, which would seriously threaten your sports fisheries. At this time, there is no real way to be sure that eggs or fish are disease free before shipment.

In the event that you try to use wild fish for brood fish, it will take a number of generations of careful selection by trained geneticists before you will realise an efficient product. This of course, means years of low production and considerable expense.

You may know that we have had and are now having tremendous difficulties with trout diseases. At this time a number of commercial hatcheries have been closed down by government order due to Myxosoma cerebralis and State and Federal hatcheries are i8n the same situation. Commercial production without necessary government safeguards and disease biologists can cause much damage.

You have a wonderful race of rainbow in New Zealand. I have been fortunate in being able to catch some of them. Someday, I'm coming back. I would hate to think that short term efforts to make money would jeopardise them. Why try to improve on what is obviously a winning combination? In my view, your country would be making a great mistake in attempting to set up commercial trout production.

Sincerely yours,
Ben Schley
Chief of Public Use for Fish Hatcheries
Bureau of Sports Fisheries and Wildlife
U.S. Dept. of Interior.

Pollution:

Salmonid farming can be a dirty business. A large salmon farm may pour as much liquid waste into the environment, rivers or sea as a small city. To see fish farming at its worst, travel to Chile, where salmon farming has boomed in the past decade and generates $1 billion a year in export revenue. "A film of feed leftover made of fish oil, animal fat and transgenic soybean oil floats on the water around the salmon farms," says Ronald Pfeil, 67, a cattle farmer in Chile's remote Aysen region. "When the tide is low, the beaches stink." [1]

Rotting food, faeces and dead fish from salmon farms can pollute waterways. The waste from fish farms can produce smothered "dead zones" in bays and inlets. A salmon farm of 200,000 fish releases faecal matter roughly equivalent to the untreated sewage of 65,000 people. Many farms in Norway, Canada and Chile contain four to five times that number of fish. [1]

A 2004 study published in the journal *Science* found that farmed salmon—particularly from Scotland and other European areas—contained more PCBs, dioxins and other possible cancer-causing contaminants than wild salmon. The contaminants build up in small fish, like herring, that swim in industrial areas and then are fed to the farmed salmon. Specifically, the study found PCB levels that averaged 37 parts per billion for all farmed salmon studied, with wild salmon at 5 ppb. [2]

A study of an inland trout farm in Italy showed the farm released significant amounts of nitrogen and phosphorus, in to the Cedra Creek. This study supports the hypothesis that the ecological quality of creeks or streams receiving fish farm effluents can be seriously affected due to fine particle sedimentation, interstice clogging, simplification of benthic macrofauna communities, and stimulation of microfitobenthos growth. [3]

"As the aquaculture industry has developed and has incorporated technological advances, it has moved from extensive to intensive systems. This intensification of production methods has been accompanied by an increase in the potential threat to the already precarious ecological equilibrium in our streams, reservoirs and oceans….Recently, this intensification of aquaculture production has led to the industry being regarded as one of the leading polluters of the aquatic environment" (MacAllister and Partners: 1999, p55)[4]

"Intensive industrial scale aquaculture has become synonymous with pollution and destruction of the marine environment, conflicts with other resource users, and high levels of toxins in the fish produced. The spread of aquaculture, a cause of increasing concern and growing alarm, has been described as a cancer at the heart of the coastal environment" (Tudela: 2002) [4]

The EC admits in its 'Strategy for the Sustainable Development of European Aquaculture' that: "In areas with numerous farms, nutrient enrichment and the risk of eutrophication are significant issues" (EC: 2002c, p9). According to the Norwegian Directorate of Nature Management "in many countries, the aquaculture industry is the greatest source of human-created emissions of phosphorus and nitrogen" (DNM: 1999). WWF have estimated, for example (WWF Scotland: 2000), that Scottish

salmon farms discharge the sewage waste equivalent of over 9 million people (Scotland's population is 5.1 million). Both OSPAR and HELCOM have recently highlighted the problem of nitrogen and phosphorus discharges from both freshwater and marine farming operations into the North Sea and Baltic (OSPAR: 2001, HELCOM: 2001). In April 2000 the Norwegian State Pollution Control Agency admitted that salmon farms were "now major polluters" (ENDS: 2000). There is a link between toxic algal blooms (and shellfish poisoning events such as DSP, ASP and PSP) and fish farm wastes. [4]

Picture of a dead zone underneath a salmon cage. (Suzuki Foundation)

Disease and Food Values:

Disease is always a problem when fish are raised in close quarters. After a 1999 outbreak of infectious salmon anaemia in fish farms in Scotland, all the farm-grown fish within 25 miles were slaughtered. A similar anaemia outbreak in Maine two years ago led to the destruction of more than 2.5 million fish — and to federal insurance payouts totalling $16 million. "The more aquaculture there is," warns Callum Roberts, senior lecturer in marine conservation at the University of York in England, "the more disease there will be."

Parasite infestation is another chronic problem of high-density seafood farms. One of the most damaging organisms is the sea louse, which breeds by the millions in the vicinity of captive salmon. In 1989 Peter Mantle, who owns a wild salmon and sea-trout sport fishery in Delphi on the west coast of Ireland, discovered that young trout returning to his river from the ocean were covered with lice that were boring through the trouts' skin and feasting on their flesh. The sea lice were breeding near newly installed salmon farms in the inlet fed by his river. By the time the salmon farmers started dosing their pens with anti-sea-lice chemicals, the sea-trout fisheries of the west of Ireland were effectively dead. "Sea-trout fishing was sustainable and eco-friendly," says Mantle, "but the salmon farms killed it off within a decade."

The diet of farmed salmon lacks the small, pink-colored krill that their wild cousins eat, so the flesh of farmed fish is gray; a synthetic version of the chemical astaxanthin, is added to the feed. [1]

The spread of diseases and parasites, as in battery chicken farming, is a function of overstocking and intensive production (Paone: 2000b). It is therefore inevitable that new diseases on intensive fish farms will emerge (Meikle: 2002). Fish farms will continue to act as reservoirs for infectious diseases and parasitic infestations. ISA (Infectious Salmon Anaemia) has recently affected the Faroes (Gardar: 2002b) and it was reported in an escapee rainbow trout in Clew Bay, Ireland in August 2002 (Charron: 2002b). In Scotland during 1998-9, for example, ISA led to the destruction of 4 million salmon, the setting up of a 'National Crisis Centre' and a quarter of the industry was placed in quarantine (Royal Society of Edinburgh: 2001). Supermarkets in the UK refused to sell farmed salmon from ISA affected farms (Edwards: 1999). IPN is now "ubiquitous" in Scotland affecting 60-70% of salmon farms (Cameron: 2002f, Macaskill: 2002). In Norway, where 11 million farmed salmon died last year, both ISA and IPN have caused significant mortalities (Intrafish: 1999a,b, Intrafish: 2002c, Solsletten: 2001, 2002b). So serious is the IPN problem that the EC is now "developing recombinant DNA vaccines" (EC: 2002f). In view of the fact that IPN can infect turbot and halibut (European Parliament: 1996b) and the number of escapes of IPN infected farmed salmon (Scottish Parliament: 2002b) the risk of fish farms spreading diseases to wild fish should not be underestimated.

The scientific evidence linking sea lice infestation on wild salmon and sea trout with proximity to salmon farms has now been proved beyond reasonable doubt (Edwards: 1998, Butler and Watt: 2002, Bjorn and Finstadt: 2002, Gargan and Tully: 2002, Holst et al: 2002). "These parasites proliferate on farmed salmon, and the young wild fish of migratory species (mainly of sea trout) could be heavily infected during their estuarine movements. The reduction of wild salmonids abundance is also linked to

other factors but there is more and more scientific evidence establishing a direct link between the number of lice-infested wild fish and the presence of cages in the same estuary" (EC: 2002c, p9). Locating salmon cages, for example, at the mouth of salmon rivers and in sea trout areas is the antithesis of the precautionary principle. Surely the only sensible solution is to relocate farms away from such sensitive areas (Butler et al: 2001, FoE: 2001b). In view of the endemic disease and parasite problems and the build up of antibiotic and chemical resistance (EC: 2001e), chemical controls have patently failed to address the parasite problem.

Intensive finfish farmers, unlike shellfish farmers, are reliant upon a suite of chemicals to control diseases and parasites (Schnick et al: 1997, Alderman: 1999, Roth: 2000, Costello: 2001). Reports by the World Health Organisation and GESAMP have highlighted the environmental and public health threats of chemical use on fish farms (GESAMP: 1997, WHO: 1999). The use of synthetic pyrethroids, artificial colorants, antifoulants, antiparasitics and other 'marine pollutants' warrants serious concern (Staniford: 2002a). The cocktail of toxic chemicals used on salmon farms, in particular, jeopardises not only the marine environment but also the safety of workers (Douglas: 1995, GESAMP: 1997, Kelleher et al: 1998, Connolly: 2002).). Chemicals used on salmon farms include carcinogens, mutagens and a myriad of marine pollutants (Staniford: 2002b). Since many chemical 'treatments' are designed to kill sea lice (which are crustacea) shellfish farmers have raised concerns in relation to the negative effects other shellfish such as lobsters, crabs, mussels, oysters and scallops (Blythman: 2001, Ross and Holme: 2001).

Ongoing research in Scotland is investigating the impacts of the sea lice chemicals teflubenzuron, cypermethrin and emamectin benzoate on zooplankton and copepods (Edwards: 2002a, SAMS: 2002a, 2002b, 2002c). Cypermethrin, for example, has been recently linked to reproductive effects in wild salmon and significant impacts on shellfish over several hectares (Ernst et al: 2001, Moore and Waring: 2001). The European Medicines Evaluation Agency openly concedes that "the proposed use of Azamethiphos in fish farming means that deliberate contamination of the environment will occur" (EMEA: 1999) yet in Scotland over 700 licences to use cypermethrin, azamethiphos, teflubenzuron and emamectin have been issued since 1998 (Merritt: 2002). The decision to licence them is based more on economic expediency than consumer or environmental safety and is tantamount to state-sponsored pollution (Merritt: 2002). [4]

Environment Canada is investigating the use of an illegal pesticide, Cypermethrin, at salmon farms in New Brunswick's Bay of Fundy after tests revealed that dead lobsters had been exposed to the chemical. Over 800 kilograms of dead lobsters were discovered over a 50 kilometre area. David Thompson, an environmentalist, said many people in the area have suspicions about how it got in the water. "Public feeling is that it probably originated at salmon farm sites, with people attempting to control a very serious problem they had with sea lice," Thompson said. This isn't the first time that the pesticide has been found in the Bay of Fundy. In 1996, about 50,000 lobsters were found dead in a pound near St. George. Tests revealed they were exposed to Cypermethrin. Many people at the time blamed the aquaculture industries in the area for the pesticide getting into the water. [18]

Such was the historical use of chemicals like dichlorvos (Ross: 1989, 1990, Ross and Horsman: 1988) - banned by the UK in April 2002 as it was deemed carcinogenic (DEFRA: 2002) - that legal action from fish farm workers with cancers and other health issues is pending in the Scottish and Irish courts (Connolly: 2002, Staniford: 2002b). Significant clusters of testicular cancer in salmon farming areas have been reported in Ireland (Kelleher et al: 1998). Figures for the use of dichlorvos on Norwegian fish farms throughout the 1980s are also alarming (Grave et al: 1991, Horsberg: 2000). In Norway, the quantities of dichlorvos used were so high that fatal organophosphate poisoning of the farmed salmon took place (Salte et al: 1987, Horsberg et al: 1989) and residues were detected in the flesh of the salmon (Horsberg and Hoy: 1990). In the UK, the Government have estimated that up to 50 tonnes of dichlorvos (some four times more than all other household and agricultural uses combined) were used annually in the 1980s and early 1990s by Scottish salmon farmers (Davies: 1991, Department of the Environment: 1991, Scottish Office: 1992). Chemicals such as DDT, dieldrin, chlordane, hexachloro-benzene, PCBs, toxaphene and dioxins, which all bioaccumulate via the fish feed, have been found both under salmon cages and in the flesh of farmed salmon (Hellou: 2002a, 2002b, Pirie: 2001, Cameron: 2002c, PRC: 2002). Anti-fouling paints containing TBT, copper and zinc have also been found under salmon cages (Davies et al: 1998, SEPA: 1998b). The World Health Organisation concedes that "veterinary drug residues or heavy metals may accumulate in aquaculture products at levels of concern for public health. There is an alarming information gap. " (WHO: 1999).

Chemicals used illegally and detected in farmed salmon on sale in UK supermarkets include the recently banned carcinogen Malachite green (Department of Health: 1999, Cameron: 2002d, Scottish Executive: 2002a) and ivermectin (Cameron: 2001). So pervasive is the illegal use of toxic chemicals in Scotland that members of both Scottish Quality Salmon and the Shetland Salmon Farmers Association have both been caught using ivermectin and cypermethrin illegally (Intrafish: 1998, Barnett: 2000, BBC: 2000b, Cameron: 2002a) leading to calls by consumer groups for more testing of farmed salmon (Cameron: 2002b). Norwegian salmon farmers have also been caught using Malachite green illegally (Jensen: 2001) [4]

In the Tasmanian salmon industry one of the biggest problem for the industry has been its use of antibiotics to treat its fish. As many as 50,000 salmon are farmed inside each pen and keeping disease from spreading in these tight confines is a constant battle. Industry figures show that from 2006 to 2008 almost 18 tonnes of the antibiotics Oxytetracycline and Amoxicillin (also used to treat people) were fed to Tasmanian salmon. Critics like Tasmanian Greens MP Kim Booth says wild fish can eat the antibiotics, which are given to the salmon in fish pellets. "If they don't deal with the issues of antibiotics and they don't deal with the issues of the effluent that falls off these things into the bottom of the ocean they will end up ... they're being called the battery hens of the seas," he said.

Critics also insist that the antibiotic and nutrient-rich waste from the salmon industry is changing the local marine environments around Tasmanian fish farms. A number of large farms are in the D'Entrecasteaux Channel, a stunning and picturesque waterway south of Hobart. Divers from the University of Tasmania recently braved the chilly waters to study the impacts of fish farming on subtidal reef habitats. Co-supervised by Professor Jamie Kirkpatrick, Honours student Elizabeth Oh says in her report that fish

farming is now a significant source of nutrient pollution in the area, from feed and waste. [5]

Here in New Zealand it has recently been revealed that some large salmon farms have been feeding their fish with chicken feathers: more precisely chicken feather meal provided by an Australian supplier. The farms involved say that the meal is a high quality safe source of protein. Interestingly, USDA researchers have now found that chicken is the primary source of arsenic in the US diet. Many readers will wonder how chickens can possibly contain arsenic. The reason, surprising to most of us, is that chicken farmers are allowed to feed it to them (in the US at least), to kill intestinal parasites. [6]

Farmed salmon receive more antibiotics by weight than any other livestock. Wild salmon is one of the best sources of omega-3 fatty acids, which are vital nutrients for growth and development. Farmed salmon contain higher levels of unhealthy saturated fats and lower levels of beneficial omega-3 fatty acids because of the makeup of its feed—fishmeal, fish oil and various by-products and fillers. A U.S. Agriculture Department study found farmed Atlantic salmon contain 70 percent more fat than wild Atlantic salmon because of the high fat content in their feed. Farmed Atlantic salmon contain 200 percent more fat than wild Pacific pink or chum salmon. [7]

The Pew Environment Group recently acquired documents from the U.S. Food and Drug Administration (FDA) revealing that three Chilean salmon farming companies, including the two largest producers of farmed salmon, used a number of drugs not approved by the U.S. government. These chemicals include the antibiotics flumequine and oxolinic acid and the pesticide emamectin benzoate. The documents further show that the farmed salmon containing residues of unapproved chemicals were destined for the U.S. market.

The pesticide and antibiotic residues found are of concern due to their potential effects on human health and the environment. The pesticide emamectin benzoate, for example, is "very toxic to aquatic organisms" and "may cause long-term adverse effects in the environment," according to the manufacturer's safety data. The non-therapeutic use of antibiotics in fish destined for food production also raises concerns about possible antibiotic resistant bacterial infections in humans. In 2007, the United States imported 114,320 net tons of farmed salmon from Chile, but the FDA tested only 40 samples. [8]

"*We make an error in placing the emphasis mostly on production. We know how to produce good trout. But there is no use producing something you cannot sell.*"

American Fisheries and U.S. Trout News. November 1967.

Results of viral disease (VHS) moving from fish farms to American rivers.

It could be argued that commercial trout is a very over-rated delicacy. Many people maintain that farmed trout are not particularly palatable. While New Zealand wild trout can be excellent dining fare, available for all to enjoy for the cost of a licence; to suggest that farmed trout could supply the same high quality flesh, is suggesting the impossible.

The experience of an author, dining in an American Eating house, who saw 'brook trout' on the menu and ordered it, is described in a poem published in the Press of October 4th, 1969. [14]

> "Dry, flavourless, bony
> Far from their native book
> These trout were place before me –
> I couldn't blame the cook!
> Thousands of frozen miles between
> Some trout farm and that rural scene".

Whirling disease caused by Myxobolus cerebralis, has been found in trout in the South Island's Wamakariri, Raikaia and Rangitata River catchments. Rainbow trout are particularly susceptible to this disease, which has decimated some overseas wild fisheries. The original infections were associated with hatchery-raised fish. [15]

There have been no confirmed cases of this disease in the North Island to date, although there is some anecdotal evidence from anglers of possible symptoms in fish caught in the central North Island. [16]

Sea Lice bites incurred downstream from a salmon farm.

Genetic modification and dilution:

Wild fish face an even greater threat from captive fish escaping and competing with or consuming native fish, or crossbreeding with them and diluting the genes that have helped them survive. Fish escapes are common: nets are ripped open by predators or storms, fish in ponds get swept into channels by rainfall, and others are released accidentally during transport. [1].

EC-sponsored research has highlighted the negative impacts of farmed salmon escapees on wild fish in Norwegian, Irish, Scottish and Spanish rivers (McGinnity et al: 1997, Clifford et al: 1998, Fleming and Einum: 1997, EC: 2000e, EC: 2000h, Fleming et al: 2000, McGinnity et al: 2002, Scottish Executive: 2002b). Preliminary results suggest that farmed fish escapes and hatchery-reared fish are having such an impact that wild salmon stocks are precipitating into an "extinction vortex" (McGinnity et al: 2002). As well as spreading parasites and 'genetic pollution' via interbreeding and hybridisation, escapees have the capacity to spread infectious diseases to wild fish populations. For example, in Scotland since May 2002 (when it became law to report escapes) 3 out of the 4 escapes (totalling 57,000 fish: equivalent to the entire wild salmon catch in Scotland) came from farms infected with Infectious Pancreatic Necrosis (IPN). New information from the Scottish Executive reveals that there have been 28 escape incidents (involving an estimated 500,000 farmed fish) from Scottish fish farms affected by IPN restrictions since 1998 (Scottish Parliament: 2002b).

The inevitable risk of escapes was something that the UK's Agriculture, Environment and Biotechnology Commission took into consideration in September 2002 when it recommended a ban on GM salmon in sea cages (AEBC: 2002). Such a precautionary position is reinforced by the EC's 'Strategy on the Sustainable Development of European Aquaculture' which states that: "The potential deliberate release of transgenic fish without containment measures raises public concern in terms of risk to the environment" (EC: 2002c). However, the EC's ongoing investment into GM fish technologies and research (including salmon, tilapia, trout and carp) does not inspire confidence that GM aquaculture species will not be commercially developed (EC: 2000d, EC: 2000g, Carrell: 2001a, 2001b, 2001c, 2001d, Carrell and Lean: 2001, EC: 2002k, EC: 2002l). Field trials of GM salmon took place in Scotland on the shores of Loch Fyne as far back as 1995-6 (BBC: 2000a). EC-funded GM salmon research has been conducted at the National University of Ireland in Galway (EC: 2000d, EC: 2000g) although the researchers involved have been reluctant to divulge details (Charron: 2001). And outside the EU, Hungary has already completed GM fish experiments with Chinook salmon, carp and zebrafish (EC: 2002j).

In February 2002 over half a million salmon escaped in a single incident in the Faroes (Gardar: 2002a). In Scotland alone there have been over 1 million reported escapes since 1997 (Aitken: 2002) with evidence of interbreeding with wild salmon and hybridisation with brown trout (Webb et al: 1991, 1993, Youngson et al: 1997, 1998). In Norway, such is the historical problem of mass escapes, that some rivers are comprised of up to 90% farm escapees (Saegrov et al: 1997, Fleming and Einum: 1997, Fleming et al: 2000). And in Ireland, some river systems have been found to contain more farmed fish than wild fish (Crozier: 1993, 2000, Clifford et al: 1998).

The global problem of salmon escapes is so evident that Norwegian farmed salmon are now resident in the Faroes (Hansen et al: 1999) and salmon that escaped from an Irish farm in August 2001 were caught in English, Scottish and Welsh rivers (Milner and Evans: 2002). Moving cages further offshore will only increase the risk of escapes. Yet given the sheer number of escaped farmed salmon and the negative impact of hatcheries on wild salmon (McGinnity et al: 2002) the very future of wild Atlantic salmon may already be in question. That tuna, sea bass, sea bream, sea trout, cod, halibut, haddock, turbot and sole are already being farmed (and are already escaping) is a disaster waiting to happen. [4]

Environmental Damage from Escaped Farmed Salmon [9]

The escape of millions of salmon from enormous net pens every year has drastically altered marine environments, coastal rivers, and associated food chains around the world. These fugitive fish pose a new and little understood form of environmental pollution.

- Mass escapes of farmed salmon can result in interbreeding and competition with wild salmon for food, habitat, and mates.
- Escaped fish transmit diseases and parasites to wild salmon, and threaten to establish viable colonies that could not only push wild salmon to extinction, but also related species such as steelhead salmon and sea trout.

Open at the top, salmon net pens allow thousands of fish at a time to escape easily when there are rough seas and high waves. Other small scale escapes (called "leakage" by the industry) routinely occur from poorly maintained pens. Together, these produce staggering annual losses. Globally, an estimated three million salmon escape from farms annually.1 2

- In a single incident in 2005, nearly half a million salmon escaped from a Norwegian salmon farm.3
- One million farmed salmon in Chile escaped on one occasion in 2004.4
- 600,000 salmon in the Faeroe Islands cleared pens during a storm in 2002.5

These and hundreds of other escapes have had a serious cumulative effect: more than 1.7 million farmed salmon escaped to the wild from farms in Scotland since 1998;6 between 9 million and 18.6 million escapes from Chilean farms since factory operations started there in the 1980s;7 more than one million Atlantic salmon escaped from farms in Washington State since commercial operation began there.

Environmental and Genetic Chaos

Although large scale salmon farming has been practiced for less than 20 years, vast numbers of domesticated escapees are rapidly invading and colonizing the world's oceans and spawning rivers.

- Scientists calculate that as much as 90 percent of the salmon in some rivers of the Faeroe Islands, Norway, Scotland, Ireland, and Canada are fugitives and their progeny.

- In 1983, escapees accounted for only 5.5 percent of the salmon in New Brunswick's Magagaudavic River;[8] by 1995 the percentage had jumped to 90 percent. The invasive domesticated salmon also introduced sea lice, never before reported in the area.
- In 1995, escaped Atlantic salmon had moved into 18 British Columbia rivers; six years later, they were living in 77 rivers and streams throughout the province.[9]
- In 1999, samples of four domestic Atlantic salmon escapees and 10 wild salmon returning to the Magaguadavic River to spawn showed all fish carried the Infectious Salmon Anaemia (ISA) virus—never before seen in wild salmon.[10]
- The Scottish government reported in 2002 that three out of four salmon escapes occurred from farms affected by highly contagious and often fatal Infectious Pancreatic Necrosis.[11]

Farmed Salmon Displacing Wild Stocks

Virtually all factory farmed salmon are descended from 40 original stocks of Norwegian Atlantic salmon.[12] Successive breeding has selected for large, fast maturing, adaptable, somewhat aggressive salmon. These genetically similar fish often out-compete with native wild salmon for food, habitat, and mates. In contrast, wild salmon have developed into many genetically distinct types, specially adapted to particular geographic regions within the marine environment.

Successive infusions of newly escaped farmed salmon, however, have enabled a genetically inferior but physically dominant fish to interbreed and compromise the long-term survival not only of wild salmon, but also of other genetically related fish including brown trout.[13] A 10-year Irish study showed conclusively that repeated escapes from salmon farms could lead to extinctions in wild Atlantic salmon populations.[14]

Elsewhere, populations of escaped Atlantic salmon being farmed in the Pacific Northwest jeopardize native wild Pacific salmon, vying with wild species for food and habitat. Initially, the chances of survival in the wild for farmed Atlantic salmon were assumed to be slim, but the sheer number of escapees has increased the chances of success significantly. A Scottish scientific study recently reported on one measure of their viability in the wild: more than half a million salmon have escaped into just one Scottish loch system since a salmon farm was established in 1986 near the mouth of the River Ewe. Between 1987 and 2001, farmed salmon clearly established themselves in the river, indicated by the fact that they were caught by rod fishermen in 13 of the 15 years during the study period. In one year, escapees constituted at least 27 percent of potential spawning salmon in the Ewe.[15]

Inertia by Industry and Governments

The global aquaculture industry has largely ignored criticism and concerns over mass escapes. The North Atlantic Salmon Conservation Organization, comprised of member salmon farming nations, established a liaison group between salmon farmers,

the government, and wild fish interests.16 It also issued well-intentioned, but largely ineffective "Codes of Practice." Escapes and "leakage" continue unabated, while meaningful methods of control are postponed or rejected as uneconomical.

For example, companies have resisted tagging programs that would make it possible to track escaped fish—and easier for authorities to hold farm operators responsible. Countries with salmon aquaculture have also failed to tackle the growing problem of escapes. They, too, have resisted tagging programs, instead imposing symbolic fines on companies that fail to report salmon escapes. Scotland, for example, has a law on reporting escapes, but mass losses continue as before. Canada publishes annual escape figures but does not compile or issue the names of responsible companies.

Other strategies for slowing the biological and environmental "pollution" from domesticated salmon are available, although none is presently under serious consideration. Among these are (1) domesticating cultured salmon to render them incapable of breeding in the wild, and (2) sterilizing farmed-raised fish.

Mass escapes can only be stopped with a fundamental reconsideration of the net pen system. Closed containment, for example, would reduce escapes in one stroke. Not surprisingly, neither the salmon aquaculture industry nor national governments are yet willing to face up to this problem or work toward a solution. Their inaction only makes the problem worse. [9]

A genetically modified Salmon

Poaching and commercialisation:

The Conservation Act was written with the intent of preventing the sale of trout, for very good reasons. The NZFFA, along with others, believes that such intent is clear and still relevant. The primary and original intent in law is still (we believe) clear and relevant. Trout were never intended to be traded commercially in New Zealand, and that should be the case regardless of their origin.

It is therefore the Federations view that because trout in New Zealand are not, and were never intended to be, a tradeable item, it is iniquitous and unreasonable to initiate trade in trout flesh, within New Zealand.

The NZFFA strongly supports the contention that recreational trout fishing is a vital part of the New Zealand lifestyle. It is a recreational pursuit that is not only chosen by some 200,000 New Zealanders and international visitors each year, but these citizens pay to fully fund and manage the fishery. The right of all citizens to fish public rivers and lakes for trout, under common rules and conditions, is a jealously guarded right held in as high regard as public rights to freedom of speech, movement and association.

As well as the egalitarianism and common purpose that recreational trout fishing fosters within society, it encourages healthy athleticism, an appreciation of outdoor recreation, an understanding of natural ecosystems and habitat (and the things that may pollute or threaten them), and values that add to the wellness of society and individuals. This has lead to international programmes to teach young people these values through the activity of fishing, and to lead them away from activities and values that encourage crime and drug-taking. Perceived threats to such deeply held values and cherished activities are taken very seriously indeed.

The Federation sees the commercialisation of trout as a grave threat to the recreational fishery. We currently have a unique situation in New Zealand where our trout are not commercially saleable, and therefore have little value except to recreational fishermen. We believe that in itself is one of the main reasons our trout have not succumbed to the threats and pressures seen in overseas fisheries, and why so many overseas visitors come here specifically to fish for them. Allowing the farming of trout changes this situation and puts a commercial value on trout flesh. We, along with fisheries management agencies, believe that if this is done our wild fish stocks, (which are infinitely superior in taste and quality to factory farmed fish flesh from overseas), will become easy prey to illegal fishing. Such wild trout stocks are even more vulnerable than other species as their natural congregation during spawning allows for easy illegal harvesting at a time when to do so jeopardises the replenishment of those stocks to the greatest extent. The Federation views with alarm the pressures that commercialisation has placed on other fisheries within New Zealand waters, and the extent of illegal harvesting that it encourages. And this is in spite of "regulations" and "auditable records" - the only safeguards offered to us by those who would advocate such commercialism. [10]

Commercialisation of Trout

Readers may have noticed the article in a recent issue of the National Business Review "Trout farm ban costs NZ millions of dollars" promoting commercial trout farming.

Fish & Game New Zealand reaffirms its total opposition to any exclusive capture or commercialisation of the wild sports fish and game resource, and opposes any proposals to change the total ban in New Zealand on the farming of trout, and the importation of trout flesh into New Zealand.

"New Zealand's freshwater anglers vehemently oppose any commercial trout farming in New Zealand," said Bryce Johnson, Chief Executive New Zealand Fish & Game Council. "The risk of disease spreading to wild fisheries through imported stock, and the almost certain establishment of a black market and poaching of wild fisheries are real concerns."

The Non-commercial Status of Trout in New Zealand

New Zealand's wild trout fishery is of significant cultural and recreational importance for New Zealanders and also provides significant benefits for tourism and local economies. The non-commercial status of trout in this country is considered to be important for maintaining these cultural, recreational and tourism values.

Allowing the sale of trout is likely to increase the risk to the wild New Zealand trout fishery from increased poaching. The current wild trout fishery is only just sustainable and any unplanned increase in take would adversely impact on the recreational fishery.

Current legislation prohibits the buying and selling of New Zealand wild trout (section 26ZQ(1A) of Conservation Act), and prohibits the domestic farming of trout (section 26ZI(4) of Conservation Act). The only other avenue for sourcing trout would be through imports, but the Customs Import Prohibition (Trout) Order 2007 restricts the importation of significant quantities of trout and the importation of trout and trout products for sale.

Under this Order, the Minister of Conservation may consent to the import of trout or trout products and impose conditions that are not inconsistent with the prohibition. The Order provides that in the case of private consignments (i.e. those not intended for sale) of less than 10kg the Minister's approval is not required, but in the case of private consignments of 10kg or greater, the Minister's approval is required

Poaching Threat

If trout were readily sold in the country, poaching from the wild fishery could become a potentially lucrative activity. Trout are easy to catch with nets in lakes or shallow streams but the lack of legal opportunities for selling them keeps poaching at low levels. Many New Zealanders are aware that trout are not commercially available in this country and would be quick to report any fish retailer or restaurateur that advertised trout for sale to Fish & Game or DOC enforcement officials. This situation creates very effective surveillance and compliance despite having relatively few trout fishery enforcement officers.

If trout could be sold, a large and costly increase in enforcement effort and fishing licence fees to recover the costs would be required by Fish &Game and DOC Taupo to protect the fishery. In the absence of adequate enforcement, the recreational trout fishery will decline through overfishing of adult fish, resulting in the loss of an internationally renowned wild trout fishery, a New Zealand cultural icon, and important recreational activity. The impacts on the local economies would be significant.

The wild salmon fishery is not as vulnerable to poaching as the trout fishery. Wild salmon are common in only half a dozen large rivers in the South Island. Salmon must be caught in the lower reaches of these rivers because once they reach the upper reaches their flesh condition has deteriorated and is no longer suitable for human consumption. Any attempt to use nets to catch salmon in the wide, visually exposed, lower reaches of the rivers is quickly reported to enforcement officials by salmon anglers. In contrast, trout spawn in generally smaller rivers and more isolated areas where the illegal harvest of fish can be more easily concealed. [11]

Evidence provided to us shows that poaching is already a problem. The Fish and Game Councils (and at Taupo, the Department of Conservation) that have responsibility to regulate the wild trout fisheries are already finding it difficult to match their resources, which are largely those of volunteer rangers, to the increasing incidence of poaching. While submissions supporting the commercialisation of trout argue that the availability of trout in supermarkets might lessen the incentive to poach, those supporting the bill have not accepted this as likely to characterise all potential poachers. Some people may still poach trout because supermarkets prices, similar to those charged for salmon, may nonetheless be too high. Further, it is argued, the legalisation of trout sales may provide a further incentive for poachers supplying others wishing for cheaper deals than that which may be offered by supermarkets or other vendors. Although a considerably enhanced compliance regime might mitigate to some degree any incentive for poaching arising from the commercialisation of trout, anglers are not convinced of the Government's track record in limiting the poaching of paua, rock lobster and finfish.[12]

In a bizarre twist to the commercialisation of trout, Target, the US mass discounter, has become the first leading US food retailer to stop selling farmed salmon in its stores, citing the negative impact of salmon farming on the environment. The retailer said on Tuesday that its own brand fresh, frozen and smoked salmon will now be wild-caught from Alaskan fisheries, "to ensure that its salmon offerings are sourced in a sustainable way that helps to preserve abundance, species health and doesn't harm local habitats". [13]

The NZFFA looks at the examples of other species that have been commercialised. When deer/venison were first commercialised public stocks were plundered and poaching with impunity was rampant. Even today, paua and other shellfish, crayfish and even finfish are being poached down to unsustainable levels – just because there is a ready market with no questions asked. In 2005 it was estimated (Mfish don't keep figures) that 400 tonnes of rock lobster are poached each year. The combined value of poached paua and rock lobster is therefore around $50M. [19] We are determined that trout will not be added to that list.

Sustainability and resources:

Farming pelagic fish is not a sustainable practice. Here's the catch: It takes a lot of input, in the form of other, lesser fish — also known as "reduction" or "trash" fish — to produce the kind of fish we prefer to eat directly. To create 1 kg (2.2 lbs.) of high-protein fishmeal, which is fed to farmed fish (along with fish oil, which also comes from other fish), it takes 4.5 kg (10 lbs.) of smaller pelagic, or open-ocean, fish. It then takes about three pounds of fish oil and fish meal to produce one pound of farmed salmon. (Ranched tuna is even worse – the ratio is about 20:1)

"Aquaculture's current heavy reliance on wild fish for feed carries substantial ecological risks," says Roz Naylor, a leading scholar on the subject at Stanford University's Center for Environmental Science and Policy. Unless the industry finds alternatives to using pelagic fish to sustain fish farms, says Naylor, the aquaculture industry could end up depleting an essential food source for many other species in the marine food chain. In the salmon industry, the largest aquaculture sector, the amount of wild fish required to produce one unit of salmon was reduced 25% between 1997 and 2001, but total industry production grew by 60% during the same time.

"The problem is we've gone straight to the top. By contrast, the fish species at the core of the millennia-long tradition of fish-farming in Asia and parts of Africa — catfish, carp and milkfish — actually require less fish input than is ultimately harvested, because they are herbivorous or omnivorous. In Asia, the idea of feeding several times more fishmeal to get one pound back would seem sheer folly. "Ultimately that is really where the solution is — to cut back on these carnivorous species and turn our attention to these plant-eating ones," says U. Rashid Sumaila, a bioeconomist at the University of British Columbia (UBC). "Whether we are willing to do that is another thing, but that's the fundamental solution."

There's no dispute that it's a finite resource — and demand keeps growing. A staggering 37% of all global seafood is now ground into feed, up from 7.7% in 1948, according to recent research from the UBC Fisheries Centre. One third of that feed goes to China, where 70% of the world's fish farming takes place; China now devotes nearly 1 million hectares (close to 4,000 sq. mi.) of land to shrimp farms. And about 45% of the global production of fishmeal and fish oil goes to the world's livestock industry, mostly pigs and poultry, up from 10% in 1988. If current trends continue, demand for fish oil will outstrip supply within a decade and the same could happen for fishmeal by 2050, says Stanford's Naylor. Already, the global supply of fishmeal has dropped from 7.7 million metric tons to 5.8 million metric tons between 1994 and 2005, according to the International Fishmeal and Fish Oil Organization.

Although salmon farming for decades has been a highly profitable industry, profits are being squeezed today — making it more difficult for operators to adopt more expensive, eco-friendly methods. About 75% of salmon-farming firms are relatively small and privately held and don't make their finances public. The large, publicly held companies in the business — including Dutch food producer Nutreco Holdings NV and Norwegian seafood giants Fjord Seafood ASA, Stolt Sea Farm and Pan Fish ASA — are feeling the pinch. Pan Fish recently reported a quarterly operating loss of $18.5 million. [1]

Sustainable fishing remains far more theory than practice, according to an article published in the current issue of *Nature.* The study by the Fisheries Centre at the University of British Columbia (UBC), the Federal University of Rio Grande and the World Wildlife Federation looked at fishing policies and practices from the 53 countries that account for 96% of the world's fish catch, to see how well they followed the FAO's code. The results were sobering for anyone who enjoys a tuna steak: 28 countries, accounting for 40% of the world's fish catch, completely failed to follow the code. Only six countries had compliance scores above 60% — top performers were Norway and the U.S. — yet even these leaders failed to adhere to several aspects of the code. "We found it really disappointing," says Tony Pitcher, a professor in the department of zoology at UBC. "We didn't think it would be quite as bad as this, but this is what we found."

There are scorecards to help shoppers choose the most environmentally sustainable fish; one of the best known is the Monterey Bay Aquarium's Seafood Watch Card. The card grades fish as green (good), yellow (okay), or red (avoid), based on the species' health stability, and how much harvesting practices harm the environment. All farmed salmon is graded "red". [2]

Intensive sea cage fish farming's dependence upon a fast diminishing and increasingly contaminated resource – namely fish meal and fish oil – threatens to blow sea cage fish farming out of the water altogether. The fifth fundamental flaw – the unresolved and unsolvable feed/food issue - will ultimately be the final fatal flaw for sea cage fish farming. Aquaculture's appetite for fish meal and fish oil is rapidly impacting on the capture fisheries sector (Tacon: 1994, Naylor et al: 1998, Naylor et al: 2000, Pauly et al: 2002). Salmon farming is running on empty - it is literally running out of fuel. Such is aquaculture's insatiable growth that it already uses up ca. 70% of the world's fish oil and ca. 35% of the world's fish meal (Tacon and Forster: 2001, Tacon and Barg: 2001). In June 2001 the Research Council of Norway predicted that "within three to eight years" the lack of marine oil raw materials could hinder the growth of Norwegian salmon farming (Hjellestad: 2001a). A staggering 80 per cent of all fish caught by Norwegian trawlers is already used to provide feed for the fish farming industry and the International Fish Meal and Fish Oil Manufacturers Association (IFOMA) predict that aquaculture may consume 90 per cent of the world's fish oil by 2010 (Pike and Barlow: 1999). Moreover:

"It would be a mistake to abandon the significance of fish oils as subservient to that of fish meal. There is a risk that quality fish oils could prove to be the more finite commodity in the next decade as aquaculture is projected to use 87% of world supply in 2010. This has obvious implications for the salmon sector and others where much of the dietary energy is provided as oil at present" (MacAllister and Partners: 1999, p39)

Just as oil companies are looking further afield, fishing fleets are sinking to greater depths in search of fish oil – the new 'blue gold'. Feed companies are already harvesting sandeels, sprats, capelin, anchovies, herring, mackerel, blue whiting and even looking to exploit krill (Hjellestad: 2001b, 2002). Desperate to find an alternative fuel supply, salmon farmers have turned to vegetables, wheat, soya, seaweed and other non-fish meal and fish oil diets. Replacing fish oil in salmon diets with vegetable lipids has already lead to problems with the Japanese sending back

consignments of farmed salmon as it tastes too 'earthy'. The problem of consumer acceptability of salmon fed on vegetables is something that the EC are now investigating (EC: 2001g). The search for fish feed substitutes (Hjellestad: 2001a) is addressed in the EC's "Strategy for the Sustainable Development of European Aquaculture":

However, turning a carnivore into an herbivore is ultimately doomed to failure. In fact, the EC is currently sponsoring a project looking into the welfare, disease and animal health implications of feeding vegetables to salmon (EC: 2001f). On land we only farm herbivores such as cattle, pigs, sheep and chickens so why do we not apply the same principles when farming in the sea? Why not continue farming shellfish such as mussels, oysters, clams and scallops that has been practised for millennia? When all the environmental, economic and social costs are internalised, sea cage fish farming makes precious little sense at all. Sadly, common sense is not a currency those bankrolling sea cage farming are used to dealing in (Staniford: 2001).

Not only is aquaculture's food supply fast running out but also what fish remains is contaminated with organochlorine pesticides. In the Northern hemisphere especially, the marine environment has been polluted to such an extent that the consequences are now being seen in the biomagnification of contaminants up through our food chain. EC measures designed to tackle the problem of PCB and dioxin contamination (EC: 2000a, 2000b, 2001a, 2002a, 2002b) have been met with fierce resistance by the fish feed industry whose products have been effectively labelled 'hazardous goods'. In November 2000 the EC's Scientific Committee on Animal Nutrition stated that "fish meal and fish oil are the most heavily contaminated feed materials.

Conclusions - closing the net on sea cage fish farming:

The pace of aquaculture expansion has meant that certain farmed fish products now represent a global threat to both the marine environment and consumer safety (e.g. the recent SANCO Rapid Food Alerts concerning chloramphenicol in farmed shrimp from Asia or the ongoing crisis over dioxins and PCBs in farmed salmon). Moreover, the need for increasing quantities of wild caught fish meal to fuel the expansion of sea cage fish farms (such as tuna, salmon, trout, halibut, cod, sea bass and sea bream) is jeopardising the very future of wild capture fisheries. As Dr Daniel Pauly points out in the scientific journal Nature:

"Modern aquaculture practices are largely unsustainable: they consume natural resources at a high rate and, because of their intensity, they are extremely vulnerable to the pollution and disease outbreaks they induce…..Much of what is described as aquaculture, at least in Europe, North America and other parts of the developed world, consists of feedlot operations in which carnivorous fish (mainly salmon, but also various sea bass and other species) are fattened on a diet rich in fish meal and oil. The idea makes commercial sense, as the farmed fish fetch a much higher market price than the fish ground up for fish meal (even though they may consist of species that are consumed by people, such as herring, sardine or mackerels, forming the bulk of the pelagic fishes). The point is that operations of this type, which are directed to wealthy consumers, use up much more fish flesh than they produce, and hence cannot replace capture fisheries, especially in developing countries, where very few can afford

imported smoked salmon. Indeed, this form of aquaculture represents another source of pressure on wild fish populations (Pauly et al: 2002)
Therefore, by farming carnivores such as salmon, sea bass, sea bream and tuna at the top of the food chain it's a case of 'robbing Peter to pay Paul'. Given the net loss in fisheries resources it is no wonder fishermen feel short-changed (Staniford: 2001).

The future of fish farming lies in moving away from the intensive monoculture of finfish towards shellfish farming and integrated polyculture systems. This is something that the Commission's "Strategy for the Sustainable Development of European Aquaculture" tentatively addresses:

"The improvement of traditional aquaculture activities such as mollusc farming, that are important in maintaining the social and environmental tissue of specific areas, should be encouraged…. Efforts should possibly be oriented to species such as seaweed, molluscs and herbivorous fish, that are able to utilise the primary production more efficiently" (European Commission: 2002, p12)

If cage fish farming is to have any long-term future it must be forced to treat its wastes and focus on non-carnivorous species that do not lead to a net deficit in fisheries resources (FoE: 2001a). Closed containment systems may solve the waste and escapes problems but the final fatal flaw lies in feed and food issues. Far from being a panacea for the decline in wild fisheries and the need for healthy food, sea cage fish farming serves only to compound the current crisis. [4]

Nothing, perhaps not even climate change, will matter more to humanity's future on this planet over the next century than the fate of our rivers - Fred Pearce, When the Rivers Run Dry.

And Farmers struggling to comprehend their carbon footprint will soon have something else to worry about – their water footprint. Plant & Food Research environmental scientist Brent Clothier says many organisations internationally are developing measures for sustainable water use and New Zealand farmers will increasingly be required to show that their water usage meets these standards.

Clothier says in New Zealand three quarters of the water taken from our resources is for agricultural purposes. Current figures show that New Zealand is in the top three exporters of virtual water per capita, behind Australia and Canada. 'To develop and export sustainable food and drink, New Zealand needs measures of the impacts of water use, not just the amount of water use.

He says international debate around water sustainability is lagging around five to 10 years behind the carbon footprinting debate. 'But this debate will become unavoidable as the world becomes increasingly water-constrained. [17]

Trout farming requires large amounts of clean fresh running water. The Snake River Trout Company in Idaho produces one million pound weight of trout per year. The company routes water through its farms, ponds and canals at a rate of 60,000 gallons per minute. This is more water than the city of Denver, Colorado uses in a single day!

That water comes out of fish farms heavily polluted and needs extensive and expensive treatment. As noted (above) it is a significant source of nitrogen and phosphate. Recall the figure of 200 cusecs of the Snake River Trout Company. Now note the following water flows: Mohaka River 500 cusecs, Otaki River 600 cusecs, Manawatu River (Palmerston North) 500 cusecs, Motueka River 530 cusecs, Wairau River 480 cusecs, and Hurunui River 550 cusecs. Obviously if trout farms were to be economically viable, they would need the right to draw the majority of the flow of such rivers, which are public waters. [14] Equally obviously, that would be in direct competition to recreational use, hydroelectric power generation and other farming usage.

It is the NZFFA's contention that the issue of trout farming in New Zealand is a 'no-brainer'. Why would you deliberately jeopardise a legislated recreational resource, supporting a self-sustaining industry worth at least $120 million per year, for something that is commercially unattractive, highly polluting, marginally economic at best, fraught with environmental risks and completely unsustainable? Just so a few individuals can try to make money from it? We don't think so!

The prospect has proven to be politically unacceptable to New Zealanders in the past. It is the contention of our members that it still is.

References:

1: Is fish farming safe? Time Magazine. June 12th, 2008.

2: Stanford Magazine

3: Chemistry and Ecology, Volume 23, Issue 1 February 2007

4: Sea cage fish farming: an evaluation of environmental and public health aspects (the five fundamental flaws of sea cage fish farming)
European Parliament's Committee on Fisheries public hearing on 'Aquaculture in the European Union: Present Situation and Future Prospects', 1st October 2002:

5. ABC News December 8th – 10th, 2009

6. Factory Farming – A View from New Zealand. McKeown. M. International Health News.

7. World Health Organization (WHO)(1999). Food Safety Issues Associated with Products From Aquaculture. WHO Technical Report #883, Geneva.
U.S. Food and Drug Administration Nutrition Database (www.fda.gov/).
World Health Organization (1997). "The Medical Impact of Antimicrobial Use in Food Animals. Report of a WHO Meeting." Berlin, Germany, 13-17 October, 1997.
Reifenberg, Ann. "Wall Street Journal/Northwest."

8. Pew Research Institute. Washington, DC - 02/05/2009

9. Environmental Damage from Escaped Farmed Salmon

[1] R. Naylor et al., "Fugitive Salmon: Assessing the Risks of Escaped Fish from Net Pen Aquaculture," Bioscience, 55:5 (May 2005), <http://iisdb.stanford.edu/pubs/20871/Naylor.et.al.fugitive.salmon_05.pdf>.
[2] Salmon Farm Protest Group (SFPG), "1 million salmon escape in Chile," The Salmon Farm Monitor, August 2004, <www.salmonfarmmonitor.org/intlnewsaugust2004.shtml#item4>.
[3] A. Berg, "Marine Harvest salmon escape could cost millions," Intrafish, September 13, 2005, <www.intrafish.no/global/news/article92929.ece>.
[4] SFPG, Op cit.
[5] "600,000 farmed salmon lost in Faeroe Islands," Seafood News, February 28, 2002, <http://list.zetnet.co.uk/pipermail/seatrout-rev/2002March/000109.html>.
[6] M. Aitken, "Staggering extent of fish farm escapes - over a million salmon lost from cages threaten Scotland's wild stocks with extinction," The Mail on Sunday, April 14, 2002, <http://list.zetnet.co.uk/pipermail/seatrout-rev/2002-April/000159.html>; See also Salmon and Trout Association, "The great escape – the figures the government don't want you to see," Press release, Salmon and Trout Association and Friends of the Earth Scotland, 2000, <www.foe-scotland.org.uk/press/pr20000604.html>.
<www.westcoastaquatic.ca/article_fishfarms_problems_muchalat0205.htm>.
[7] D. Sotto et al., "Escaped salmon in the inner seas, southern Chile: facing ecological and social conflicts," Ecological Applications 11 (2001), pp. 1750-1762.
[8] J. W. Carr et al., "The occurrence and spawning of cultured Atlantic salmon (Salmo salar) in a Canadian river," ICES Journal of Marine Science 54 (1997), pp. 1064-1073.
[9] M. J. Lough and P. D. Law, "The occurrence of Atlantic salmon in coastal streams of southern British Columbia during 1994," BC Ministry of Lands and Parks. Nanaimo, British Columbia, 1995. See also J. P. Volpe, "Super unnatural – Atlantic salmon in BC waters," David Suzuki Foundation, Vancouver, BC, 2001, <www.davidsuzuki.org/files/Super_Un_natural.pdf>.
[10] "Infectious Salmon Anaemia now detected in aquaculture escapees and wild fish, Atlantic Salmon Federation, October 1, 1999, <www.georgiastrait.org/Articles2001/salmlegarticle01.php>.
[11] Salmon Farm Protest Group, "Mass fish farm mortalities and escapes threaten the survival of wild salmon," Salmon Farm Protest Group press release, August 1, 2003, <www.salmonfarmmonitor.org/pr010803.shtml>.
[12] Naylor, op. cit., p. 430.
[13] M. A. Matthews et al., "Incidence of hybridization between Atlantic salmon, Salmo salar L., and brown trout, Salmo trutta L., in Ireland," Fisheries Management and Ecology, 7 (2000), pp. 337-347.
[14] P. McGinnity et al., "Fitness reduction and potential extinction of wild populations of Atlantic salmon, Salmo salar, as a result of interactions with escaped farm salmon," Proceedings in Biological Science, 270:1532 (2003), pp. 2443-50, <www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14667333&itool=iconfft>.
[15] J. R. A. Butler et al., "The prevalence of escaped farmed salmon, Salmo salar L, in the River Ewe, Western Scotland, with notes on their ages, weights and spawning distribution," Fisheries Management and Ecology, 12 (2005), pp. 149-159, <www.blackwell-synergy.com/links/doi/10.1111/j.1365-2400.2005.00437.x/abs/>.
[16] North Atlantic Salmon Conservation Organization, Web site, <www.nasco.org>.

10. Extracts from the NZFFA Submission against the commercialisation of trout. March 1999

11. Reel life Fish & Game NZ November 2009

12. Findings of the Government Select Committee on the commercialisation of trout in NZ. NZ Govt.NZ

13. Financial Times Published: January 26 2010

14. NZFFA Submission to the Fisheries Select Committee on Trout Farming 1970

15. Detection and New Zealand distribution of *Myxobolus cerebralis,* the cause of whirling disease of salmonids. New Zealand Journal of Marine and Freshwater Research, 1993: Vol. 27: 431-436
16. NZ Fly shop (www.flyshop.co.nz)
17. Rural News 12/1/2010
18. CBC News 18/2.10
19. Submission On Consultation Document On Fisheries Research Services Proposed For 2004/05 And 2004/08 Statement Of Intent Including Output Plan For 2004/05 *Pau2 Industry Association Inc.*