This science is fishy

Terence Corcoran, Financial Post · Friday, Jun. 18, 2010

There's a national science battle underway over salmon. It is a battle over the fate of one part of the salmon industry, salmon farms, and the work of activists who claim to have scientific evidence that fish farms are killing wild salmon and are a threat to the very existence of wild salmon, ocean fisheries and ecosystems.

The science conflict, steeped in politics and green activism, has been raging for the better part of a decade. It has many facets, but it reached a climax of sorts n December, 2007, when researchers at the Centre for Mathematical Biology (CMB) at the University of Alberta published a paper that claimed sea lice from fish farms in British Columbia were contaminating wild pink salmon. In a sensational press release at the time, the University of Alberta's public relations crew declared the coming collapse of wild salmon: "Fish Farms Drive Wild Salmon Populations Toward Extinction." The release claimed the study -- headed by fisheries ecologist Martin Krkosek and including eco-activist Alexandra Morton -- proved that pink salmon populations have been rapidly declining for four years. "The scientists expect a 99% collapse in another four years or two salmon generations, if the infestations continue."

Nothing of the sort has happened. Today, officials report high levels of wild pink salmon in the areas of B.C. where a crisis supposedly loomed. The level of sea lice, a natural parasite, is also declining in both wild and farm salmon. The great salmon farming scare proved to be a false alarm. The CMB science was wrong.

Still, the extinction report lingers and dominates public opinion. The 2007 story received global coverage and the research paper, published in Science magazine, became the touchstone for anti-fish farm activists. Public opinion, revved up by junk science, NGO extremism, Hollywood stars and the David Suzuki Foundation, is now reportedly permanently and adamantly so opposed to salmon farming that no amount of counter-effort could possibly change the public mood.

Fish farming on a mass scale, using giant open-netted pens in natural waters, is a legitimate science controversy. The environmental issues are complex and a debate over the science is warranted and legitimate. Brian Riddell, a former federal fisheries official who debunked the 2007 extinction report as flawed science, nevertheless believes that fish farming may well be environmentally unjustifiable. "Five years ago, I would have been more optimistic that we can manage the impact of open-net aquaculture. I'm not sure I'm that optimistic any more," Mr. Riddell said in an inverview. Now head of the conservationist Pacific Salmon Foundation, he says the fish-farm message around the world is far from positive and, in his view, "we have more wild salmon to lose here in B.C. than they have dealt with anywhere in the world."

On the other side of the fish-farm issue is Ben Koop, Canada Research Chair in Genomics and Molecular Biology at the University of Victoria. Mr. Koop believes fish farming does have a future in B.C. and around the world. Fish farming, he said in an interview, can be managed. "If we are going to eat fish in the next 20 to 50 years, it's not going to come from the wild." Fish farms can protect and offset the damage done to wild fish by changing climates and overfishing. "That's a major issue, and that's partly why I'm at least partially supportive of aquaculture." One role of science, he said, is to minimize the impact of fish farming on wild fish stocks. Ideally, "science takes a lot of different perspectives and [then] combines and debates."

This fish farm science debate, however, never got out of the water in British Columbia. The battle was lost before science got around to working out the facts and reach conclusions. There is plenty of evidence that the sea lice extinction scare is an epic creation of junk science. Thanks in large part to the heroic persistence of Vivian Krausse, a lone self-funded B.C. researcher, there is also evidence of what looks like a trail of back-room financial and scientific manipulation that goes back almost 10 years. By Ms. Krausse's estimate, NGOs and other groups and associations supporting the anti-fish-farm effort have received $126-million in funding over the last decade from four U.S. foundations: the Pew Foundation, the Moore Foundation, the Hewitt Foundation and the Packard Foundation. The Moore foundation, for example, has provided backing to Brian Riddell's Pacific Salmong Foundation.

With all this financial backing hitched to a willingness to hype and exaggerate ill-founded science, it's no wonder the fish farm industry is under siege and the real science issues are all but lost in an avalanche of junk science.

We begin in the year 2000, when a staggering 3.1 million wild pink salmon returned to spawn in the Broughton Archipelago, a 5,000-square-kilometre area near the northern tip of Vancouver Island. Wild salmon returns are notoriously irregular. Two years later, the record 2000 return crashed to 147,000 fish in 2002. According to Fisheries and Oceans Canada (DFO), the exceptionally high return in 2000 was roughly eight times the historical average and higher than all previous returns observed in the past 50 years -- even though fish farms were established around the archipelago 13 years earlier. There are about a dozen active fish farms in the area.

What caused the 2002 decline in wild salmon? The Centre for Mathematical Biology (CMB) at the University of Alberta, in a 2005

paper, targeted fish-farm sea lice as the culprit. In a paper titled "Transmission dynamics of parasitic sea lince from farm to wild salmon," ecological statistician Martin Krkosek and Prof. Mark Lewis, a mathematical ecologist, claimed to produce evidence that farm fish created sea-lice conditions that were "four orders of magnitude greater" than natural conditions.

But the data were skimpy and the mathematical models widely criticized. Data from only one salmon farm were sampled. One critic, Scottish aquaculture consultant Alastair McVicar, said it is "bizarre in the extreme to make conclusions on the transmission of sea lice from farm to wild salmon without including any information on the status of the farm involved at the time of the study." Wild salmon in adjacent areas were sampled, and the data was then extrapolated via mathematical models to conclude that the farmed fish were forcing sea lice onto wild salmon.

Official criticisms of the 2005 CMB went largely ignored. The federal Department of Fisheries and Oceans scientists said the sea-lice findings ran contrary to their own surveys of the same areas during the same time periods. In 2006, the CMB produced another mathematical modelling paper and the conclusion that "farm-origin sea lice induced 9%-95% mortality in several sympatric wild juvenile pink salmon and chum salmon populations."

The 95% figure jumped out in media reports, even though the spread began at 9%, effectively rendering the 95% figure meaningless. But 95% fast became part of fish-farm folklore and the growing urban myth building around fish farming. The University of Alberta press release read, "Wild Salmon Mortality Caused By Fish Farms." The release said: "Recently published research has confirmed that sea lice from fish farms kill wild salmon.... The result is the death of up to 95% of wild juvenile salmon." The Globe and Mail picked up the headline verbatim: "Sea lice killed up to 95% of salmon, team finds."

Mr. Krkosek told USA Today, "We see them before they get to the farm with no lice, and then we see them being colonized with lice at the farm." But no sea lice were actually observed. The paper was in fact based on "mathematically coupled extensive data sets" and computer-generated hypothetical data. David Groves, an industry consultant (now retired), said the 2006 CMB study "appears to result not from mathematical errors...but from oversights, omissions and inaccuracies in the biological assumptions on which the model is based." The paper also assumes that sea lice and only sea lice are responsible for the fluctuations in wild salmon stocks, an unsupportable claim. Even less valid is the idea that fish farming is a cause of wild stock fluctuations, since huge changes in year-over-year wild counts go back 50 years.

The sea-lice science scare flared to dramatic levels in 2007, when the journal Science published a third, even more alarming CMB paper, "Declining Wild Salmon Populations in Relation to Parasites from Farm Salmon." It claimed that sea lice from salmon farms put wild salmon at risk of extinction. "If [lice] outbreaks continue, then local extinction is certain, and a 99% collapse in pink salmon population abundance is expected in four salmon generations." Mr. Krkosek told BBC World News: "It means that the probability of extinction is 100% and the only question is how long it is going to take." This conclusion, however, was based on some trick methods and cheap cherry-picking of dates and data.

Brian Riddell, in a formal response published by Science, said the 100% prediction "is inconsistent with observed pink salmon returns and overstates the risks from sea lice and salmon farming." Mr. Riddell also said Krkosek et al. cherry-picked the data. "Their conclusions follow directly from their data-selection process." He said the alarmist conclusion was the result of using 2000 as the starting point--the year of the largest wild salmon count in history (see graph) and then manipulated later data.

In an interview this week, Mr. Riddell said the projected, dramatic rate of decline in wild salmon was a logical outcome of fudging the data. "If you start from an all-time record high return [2000] and you go immediately to the all-time record low return [2002] and you add two other data points [2005 and 2006]. Any mathematical model with that extreme is going to be negative."

Aside from the selective data mining and wonky models, there's the problem with fish biology. Mathematical ecology is one thing. Actual fish science is another, says Ben Koop. "Do sea lice actually affect swimming ability? It's fine to make that statement, but it's another thing to do the tests that [show] that in fact is true." Do sea lice kill wild salmon? "Around farms, you are going to have an increased number of lice at various points. It's controllable, yes. But it's going to alter the natural scheme. Does that translate into dead natural stocks? That's a leap that has not been proven."

So the sea-lice scare is, essentially, a mathematical fabrication. It is inconsistent with the reality of the data and the science of sea lice. While supposedly heading to extinction, the fact is that wild salmon returns bounced back to an above-average 906,284 in 2009.

But none of this seems to matter. The activists' strategy worked. Real science was hijacked by junk science, leaving an industry and all Canadians as victims.

- For a comprehensive record of science and other documents related to the B.C. fish farm industry, along with the lively opinions of independent researcher Vivian Krause, visit www.fair-questions.com