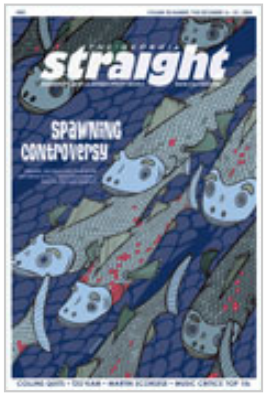


# Features

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## The Truth About The Science Of Fish Lice

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Publish Date: 16-Dec-2004


Seldom has a purely biological issue so captured public interest, and so polarized the stakeholders, as the current debate regarding sea lice in B.C.'s Broughton Archipelago, their possible source in salmon farms, and their potential to decimate the wild salmon populations there. There are two sides to every debate, and both sides would like to have the scientific evidence on their side, but attempts to align themselves in this way have resulted in some fairly serious misrepresentations (e.g., Patrick Moore's "The Science Is on Our Side" in the Vancouver Sun last May 22).

Pink salmon are born in freshwater streams and migrate to the sea as small fry, only a few centimetres in length. They return to spawn as adults the following year, producing the next generation; they have a two-year life cycle. Parasitic sea lice belong to a group of crustaceans called copepods. Their life cycle is fairly complex, involving a number of stages with intervening molts, when the animal sheds its skin and grows. The larval stages float about in the plankton until they find an appropriate host to which to attach. The parasite anchors itself with a special structure and grazes on the host's skin and mucous covering. It then goes through several stages before molting into a pre-adult and, eventually, an adult. These last two stages are mobile: the louse moves about on the host, feeding from its tissues through a specialized mouthpart. The adult females produce long strings of eggs continuously for the remainder of their life. The mobile stages are also capable of dropping off their current fish host and seeking out another, presumably better, one to feed from.

Alexandra Morton, a biologist who lives in the Broughton Archipelago, believes that net-pen salmon farms, by housing large numbers of Atlantic salmon in one place for extended periods, have provided a breeding ground for sea lice. As a result, lice larvae are present at high levels in the waters around the farms and attack juvenile pink salmon (and other species) as they move past on their way to the open ocean. The fish, being small and perhaps already stressed by their recent migration from freshwater to saltwater, are especially susceptible to the lice and die as a result of their infection. Thus, adult returns are greatly reduced and local stocks decline. Morton and others have published relevant evidence in the Canadian Journal of Fisheries and Aquatic Sciences, but it is still a hypothesis. Let's lay out the predictions it makes and see how they hold up to scientific scrutiny.

1. There are large numbers of reproducing lice on farmed Atlantic salmon: we do not have the data to answer this, as the industry considers such information proprietary and will not release it. (Stolt Sea Farm has only recently released monitoring data for their farms.)

2. There are large numbers of the infective stages of sea lice in the waters around a fish farm: we know this to be true from recent research.

3. There are greater numbers of lice on wild juvenile fish near active farms than

a. in the same area before the farms were established: we cannot be absolutely sure of this, because no pre-farm studies were conducted in the area (but no lice outbreaks had previously been reported there).

b. in similar areas of the coast without farms: Morton's work shows this to be true on coastwide and local scales, and no major outbreaks have been reported

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c. when farms are fallowed: Department of Fisheries and Oceans and independent studies agree that lice levels on wild fish were much reduced in 2003, when farms along a major salmon out-migration route were fallowed.

4. The lice on the fish are the same species as those on the farms, and have their immediate origin there: they are certainly of the same species (there are actually two present), and studies of genetic origin are under way to test the second part of this prediction.

5. Lice levels on salmon are higher downstream of farms than upstream of them: juvenile migrants upstream of farms do have lower lice loads than those who have migrated downstream past the farms.

6. Observed lice levels are lethal to small pink salmon

a. directly: this is supported by laboratory studies. Certainly, the very high numbers of lice on such small fish (which we have both personally witnessed in the field) suggest that this is likely, particularly given European studies, where fewer lice have been shown to kill much larger fish.

b. indirectly, through increased predation, osmotic stress, et cetera: these important ecological studies have not yet been done.

7. The mortality caused by the lice is sufficiently high as to cause a salmon-population decline: the large proportion of fish infected, coupled with the likelihood of mortality given the high levels of infestation, suggest that it can. And there is a strong negative correlation between juvenile infestation rates and subsequent adult returns (i.e., more lice on fish, smaller returns).

As can be seen from the above, the evidence is consistent with the hypothesis that sea lice produced on salmon farms are responsible for the high levels of infection on juveniles and declines of adult returns of wild salmon in the Broughton Archipelago. This is also consistent with well-documented studies in Europe, where the salmon-farming industry has had similar problems with sea lice. There is thus great cause to be concerned for the future of wild salmon populations in the Broughton, and elsewhere on the B.C. coast where salmon farms are being established. There is no hard proof, but much suggestive evidence, certainly enough to apply the precautionary principle with regard to the current industry and its future expansion.

The industry, and provincial and federal regulatory agencies, although they have rejected Morton's scenario, have not presented a coherent alternative. Nor have they published their data in scientific journals. Instead of being lauded for having brought to our attention a huge potential problem for the wild-salmon fisheries of B.C., Morton has been vilified and her scientific credentials have been questioned. It is time to quit the name-calling, implement the precautionary principle, and get down to filling the gaps in the scientific studies that Morton and others have initiated.

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