Media backgrounder

Farmed salmon, sea lice and wild salmon

What is the principal article to which this backgrounder refers?

Orr, C. 2007. Estimated Sea Louse Egg Production from Marine Harvest Canada Farmed Atlantic Salmon in the Broughton Archipelago, British Columbia, 2003–2004, *North American Journal of Fisheries Management* 27:187–197.

Why are people so concerned about sea lice?

Sea lice are small marine parasites, which occur naturally throughout the world's oceans, where they feed on the skin of fish. Lice normally do not harm adult salmon; however, small numbers of lice may kill juvenile salmon (1).

Historically, migrating wild juvenile salmon did not encounter high levels of sea lice in the spring. In recent years, they have (2). The millions of salmon in fish farms produce the lice which infect and kill juvenile wild salmon. Studies have shown that farm salmon produce 78-97% of all sea lice in the marine waters of Scotland, Ireland and Norway (3).

A 2006 report on the interactions between aquaculture and wild fish in the coastal waters of European Union (EU) countries "confirms that cultured salmon can have significant negative impacts on the wild stocks," with sea-lice parasitism one of the principal causes (escaped fish being another) (4).

Orr's February 2007 article in the *North American Journal of Fisheries Management* is the first to estimate how much salmon farms amplify sea lice populations in BC waters.

Research conducted between 2001 and 2006 shows that parasitic sea lice infected 36-98% (5, 6) of all wild juvenile pink salmon passing seaward through the Broughton Archipelago—an area between northern Vancouver Island and the mainland. High rates of sea-lice parasitism, coupled with rapid declines of wild salmon stocks, have focused attention on the area's fish-farming industry and its role in the declines.

Research also suggests that the impacts of lice on wild juvenile pink and chum salmon in the Broughton Archipelago may be more severe than on wild salmon in the coastal waters of EU countries (7), owing mainly to the exceptionally small size of Pacific salmon, and the confined nature of the Broughton's marine passages. Millions of juvenile pink salmon, which weigh less than 1 gram and measure less than 3 centimetres (5), normally leave Broughton rivers in early March and enter coastal waters now inhabited by farmed salmon.

Serious questions are raised by the fact that Canada lags far behind the EU in regulating and reporting the connection between salmon farms, sea lice, and the decline of wild salmon (8).

What's being done about sea louse parasitism?

Marine Harvest Canada became the first and only salmon farming industry in western Canada to publicly report on lice numbers on farmed fish (starting in September, 2004); those data form the basis of the lice egg production levels Orr reports in his *North American Journal of Fisheries Management* article.

In 2003, British Columbia enacted a one-time-only "sea lice action plan" which required farms to reduce sea lice numbers by early harvesting and chemical treatment (with Slice) of farmed salmon lice "hosts" (9). As reported by Orr, this plan significantly reduced the estimated sea louse egg production, and the observed parasitism of wild juvenile salmon.

In January 2006, the nine member groups of the Coastal Alliance for Aquaculture Reform (CAAR), and Marine Harvest Canada (MHC), negotiated a "dialogue framework" with plans to collaborate on sea lice monitoring and research (10). Lice were counted weekly at two farms by CAAR and MHC between March 3 and June 30, 2006.

Substantial research on sea lice is planned for the Broughton in 2007 and 2008 through funding provided by the Pacific Salmon Forum and separately through the CAAR-MHC agreement. CAAR and MHC are also negotiating terms of reference to initiate collaborative research and development of closed-containment technology.

The Musgamagw Tsawataineuk Tribal Council (a member of CAAR) is planning to monitor lice again in 2007, with the assistance and cooperation of Marine Harvest. The data should contribute to a clearer understanding of the nature and severity of sea louse parasitism related to salmon farming in Canada and elsewhere.

CAAR member organizations also provide financial and in-kind support for continued research on sea lice by graduate students at Simon Fraser University, University of Victoria and University of Alberta.

(1) Morton, A. and R. Routledge. 2005. Mortality rates of juvenile pink *Oncorhynchus gorbuscha* and chum *O. keta* salmon infested with sea lice *Lepeophtheirus salmonis* in the Broughton Archipelago. Alaska Fishery Research Bulletin 11:143–149.

Morton, A. and R. Routledge. 2006. Fulton's condition factor: is it a valid measure of sea lice impact on juvenile salmon? North American Journal of Fisheries Management 26:56-62.

(2) Krkosek, M., M.A. Lewis, A. Morton, L.N. Frazer, and J.P. Volpe. 2006. Epizootics of wild fish induced by farm fish. Proceedings of the National Academy of Sciences 103:15506-15510.

(3) Butler, J.R.A. 2002. Wild salmonids and sea louse infestations on the west coast of Scotland: sources of infestation and implications for the management of marine salmon farms. Pest Management Science 58:595-608.

Heuch, P.A. and T.A. Mo. 2001. A model of salmon louse production in Norway: effects of increasing salmon production and public management measures. Diseases of Aquatic Organisms 45:145-152.

Tully, O. and K.F. Whelan. 1993. Production of nauplii of *Lepeophtheirus salmonis* (Krøyer) (Copepoda: Caligidae) from farmed and wild salmon and its relation to the infestation of wild sea trout (*Salmo trutta* L.) off the west coast of Ireland in 1991. Fisheries Research 17:187–200.

(4) Hansen, L.P. and M. Windsor. 2006. Interactions between aquaculture and wild stocks of Atlantic salmon and other diadromous fish species: science and management, challenges and solutions. – NINA Special Report 34. 74 pp.
(5) Morton, A., R. D. Routledge, and R. Williams. 2005. Temporal patterns of sea louse infestation on wild Pacific salmon in relation to the fallowing of Atlantic salmon farms. North American Journal of Fisheries Management 25:811–821.
(6) Krkosek, M., M. A. Lewis, and J. P. Volpe. 2005. Transmission dynamics of parasitic sea lice from farm to wild salmon. Proceedings of the Royal Society of London B 272:689–696.
(7) Report of proceedings (Hansard Blues) Special Committee on sustainable aquaculture, Monday, January 29, 2007. http://www.leg.bc.ca/cmt/38thparl/session-2/aquaculture/hansard/W70129x.htm.
(8) Heuch, P. A., P. A. Bjørn, B. Finstad, J.C. Holst, L. Asplin, and F. Nilsen. 2005. A review of the Norwegian Action Plan against salmon lice on salmonids: the effects on wild salmonids. Aquaculture 246:79–92.
(9) British Columbia Ministry of Agriculture, Food, and Fisheries. 2003. Strategic fallowing plan. http://www2.news.gov.bc.ca/nrm_news _ releases/?11 2003AGF0004–000137.htm.
(10) Simpson, S. 2006. Partnership signals truce to salmon wars. Vancouver Sun (January 13).