A Brief Response to the January 2008 report, "Overview of Sea Lice Issues and Risks for Farmed and Wild Salmon in British Columbia," authored by Sonja Saksida, DVM, M.Sc., BC Centre for Aquatic Health Sciences, and Elan Downey, B.Sc., BC Centre for Aquatic Health Sciences.

Comments by Stan Proboszcz, Fisheries Biologist, and Craig Orr, Executive Director, Watershed Watch Salmon Society, July, 2008

An incredible amount of research has been published in recent years clarifying our understanding of the dynamics of sea lice parasitism on farmed and wild salmon.

Saksida and Downey's 2008 report for Cermaq analyzes some of the recent research, promises to "provide a balanced view of the sea lice debate in British Columbia," and directs inordinate attention toward the peer-reviewed research by Morton and Krkosek. One such criticism is that Morton et al. (2005) and Krkosek et al.'s (2005; 2007) findings are somehow tainted because they "ignored" using publicly-available louse data. This criticism is hard to understand given the fact that industry and government do not release raw louse data to the public. Farms currently report to a central database overseen by the BC Salmon Farmers Association (BCSFA), which then provides monthly reports summarising sea lice abundance to the BC Ministry of Agriculture and Lands (BCMAL). Only one company—Marine Harvest Canada—publicly reports lice data on line. But even these data, and those eventually shared online (http://www.agf.gov.bc.ca/ahc/fish%5Fhealth/Sealice_monitoring_results.htm), are extremely coarse in nature (i.e., reported as averaged values only once a month from many farms across a wide geographical area), and are thus of limited use in statistical analyses (Orr 2007).

Meaningful analyses require raw data from all sampled pens, along with data on louse treatments. Without access to such data it is nearly impossible to assess the veracity of claims by Saksida et al. (2007) and Saksida and Downey (2008) that sea lice levels in BC "appear to be lower (than European levels) and require fewer treatments to maintain these low levels." Such qualitative statements (higher or lower lice levels) also lack ecological context. Since BC's wild salmon are much smaller (by nearly an order of magnitude) than their EU counterparts (Atlantic salmon and sea trout), BC's wild salmon will be far more vulnerable to lice, even at "relatively lower" levels of lice infestation. (How much so, and at what levels of infestations on farmed and wild fish, remains to be determined.) These higher levels of susceptibility also raise many unanswered questions on the ecological relevance of current government mandated triggers for treatments of lice on BC's farms.

Saksida and Downey also re-visit the view that lice may be originating from marine sticklebacks, but neglect to mention (1) recent agency research showing that lice on this fish have never been able to complete their lifecycle in either the lab (Jones et al., 2006a) or in the wild (Jones et al 2006b), (2) research by Craig Losos indicating that sticklebacks act as a 'sink' rather than 'source' of lice, and (3) estimates (Orr 2007) of louse

production on farmed salmon in BC which appear to overwhelm all other possible sources of lice combined. Furthermore, recent agency research by Jones and Hargreaves (2007) seemingly supports the conclusions of Morton et al. (2004) and Krkosek et al. (2005, 2006) on the overwhelming contribution of farm-source lice:

> "Other studies have concluded that local elevations in the abundance of *L. salmonis* and *C. clemensi* resulted from the proximity of the captured fish to salmon farms (Morton et al., 2004; Krkosek et al., 2005, 2006). Although the conclusions drawn in the latter studies remain controversial (e.g., Brooks and Stucchi, 2006), it is well established from coastal regions of Scotland, Norway, and Ireland that the local abundance of planktonic and parasitic stages of *L. salmonis* is elevated when farmed salmon populations that occupy the same water body are known to be infested with egg producing female *L. salmonis* (McKibben and Hay, 2004; Penston et al., 2004; Heuch et al., 2005). Thus, the present work [i.e., Jones and Hargreaves, 2007] is consistent with earlier studies [i.e., Morton et al., 2004; Krkosek et al., 2005, 2006] in identifying spatial patterns in the variation of *L. salmonis*."

Saksida and Downey could have also offered a more complete analysis of the contribution of management actions to reducing lice infestations in BC. In commenting on the 2003 partial fallow of farms (a management action triggered by the collapse of returning pink salmon in 2002), Saksida and Downey question claims by Morton and colleagues that an observed reduction in louse parasitism on wild fish in 2003 was attributable to fewer farmed fish and lice. Saksida and Downey question this claim by suggesting that the total number of salmon in the Broughton changed little during this fallowing (compared to before and after). While strictly true (equal numbers of fish in each year), farmed fish were distributed unevenly in 2003 relative to the risks lice may pose to wild fish; some 800,000 fewer adult Atlantics and only half as many lice as normal were present then during the crucial out-migration period of wild juvenile salmon (Orr 2007).

Such details are inordinately valuable if we are truly interested in understanding the complex dynamics of wild and farmed salmon. In summary, Saksida and Downey miss many key points in their review and do not present an accurate and balanced view of the sea lice debate in British Columbia.

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