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*Recent changes detected in the salmon environment
in Icelandic rivers and in the sea.*

Potential threats to the abundance of Icelandic salmon.

Introduction

In the last decade environmental changes have been observed that might have effects on survival of salmon stocks in Iceland. These changes have been linked to global warming as an acronym. The mechanisms of global warming on salmon stocks are not known in details but should be taken seriously and investigated. Some of these changes are hereby listed as examples.

The decline in the Icelandic two sea winter salmon stock component. In the 1970's the number of one sea winter salmon (1SW) and two sea winter salmon (2SW) was close to equal number in the salmon run as well as in the salmon catch. (Gudni Gudbergsson 2008). A steep decline in the Icelandic salmon stocks were detected in the early 1980's. The 1SW salmon recovered in the mid 1980's but since then there has been an ongoing decline in the 2SW salmon stock component. This has led to the urge by the Institute of Freshwater Fisheries and the union of River owners to anglers to release all 2SW from the angling fishery. Catch and release has been increasing and at the average 48,2% of all naturally produced 2SW salmon are now released. It should be admitted that the mechanisms of the decline of 2SW salmon are not known but lowering of the exploitation rate is the only available tool to protect the 2SW salmon component in Iceland.

Red vent syndrome

In 2007 incidences of Red vent syndrome (RVS) were detected in several Icelandic salmon rivers (Ices 2008). It is caused by the parasite *Anisakis simplex* that accumulates in or close to the salmon gut causing bleeding wounds often detected by anglers. The incidences of RVS were lower in 2008 than the previous year. The sudden RVS increase is not known although it can be linked to changes in to the salmon diet since amphipods that are known as vectors for *Anisakis* larvae are part of the salmon diet. With changes to the species composition or abundance of available food for salmon might have affected incidences of RVS in Icelandic salmon.

Flounder (*Platichthys flesus*) have been seen in Icelandic waters for decades. In 1998 it was first caught in freshwater in a river estuary in SW Iceland. Since then it has been steadily spreading and can now be found in estuaries of rivers from East Iceland, South, West and northwest Iceland. The occurrence of the Flounder is of concern for river owners and anglers through potential predation and/or competition.

Sea lamprey (*Petromyzon marinus*) has recently been detected in rivers on the Iceland coast leaving suck marks on Atlantic salmon and Sea-Trout. The incidences of these two new fish species in Icelandic fresh water may be linked to environmental changes and should be taken seriously.

The parasite *Ichthyophonus hoferi* is a Choanoflagellata that was detected in Icelandic herring in 2008/2009. On some occasion high proportion of herring at the Icelandic south coast were infected causing ulcers on the fish skin. It is known that infections of *Ichthyophonus* can also occur on other species including Atlantic salmon and herring and salmon are often found in the same areas. This could be a potential factor increasing

salmon mortality in the sea.

<http://www.mast.is/flytileidir/dyrogbufe/dyrasjukdomar/ichthyophonosisild>.

The algae *Didymosphenia geminata* was detected in the Hvita River system in 1994 (Jonsson, et. al 2008). In the next two years the *Didymosphenia* spread up river to the higher regions. In the next few years it was found in more fertile areas of rivers in Iceland. The algal bloom covers the gravel at the river bottom making a few cm thick algae carpet. It is, to date, not known to what extent *Didymo* can affect salmon fry and parr abundance in rivers. The bottom coverage could easily support that on the first look. It should be noted that the mass of *Didymo* is usually highest in the first few years after detection with a gradual lowering but fluctuating coverage between years. An investigation analyzing occurrence and densities of *Didymo* and density of salmon parr are now being conducted in Iceland.

It should be noted that *Didymo* can be spread with fishing tackle and or waders by anglers between rivers and possibly countries. All precautionary measures should be taken to minimize the risk of spread of algae as well as parasites, bacterial and viral diseases that can be transmitted by fishing tackle.

Referances

Gudbergsson, G. 2008. Icelandic salmon trout and charr catch statistics 2007. Institute of Freshwater Fisheries (Veidimalastofnun) report, VMST/08024. 26 pp.

Jonsson, I.R., Jonsson, G.S. Einarsson, S.M. and Antonsson, Th. 2008. Occurrence and colonization pattern of *Didymosphenina geminate* in Icelandic Streams. Pages 41-44. In: Proceedings of the 2007 International Workshop on *Didymosphenia geminate*. (M.L Bothwell and S.A. Spaulding (co-editors). Canadian Technical Report of Fisheries and Aquatic Sciences 2795.

Ices 2008. Report of the Working Group on North Atlantic Salmon (WGNAS). 1 – 10 April 2008. Galway, Ireland. ICES CM 2008/ACOM:18. 235 pp.