

Epidemiological aspects of the infectious hematopoietic necrosis (IHN) outbreak in Finland

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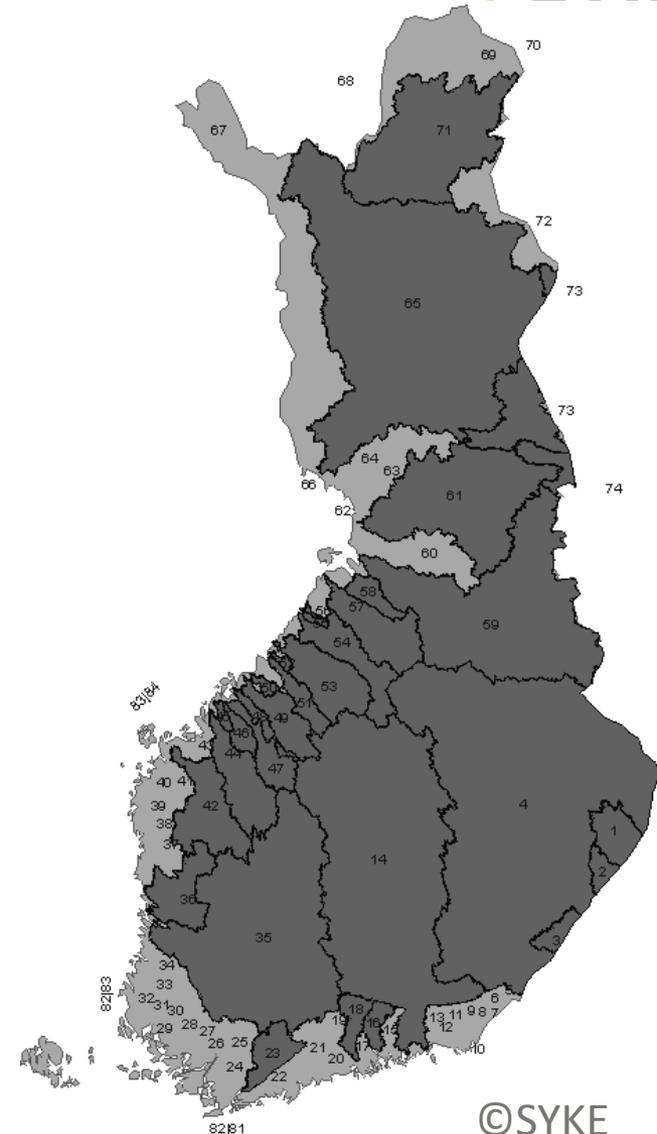
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Fish farming in Finland

- the structure of the Finnish fish farming industry has protected the farms from the most serious diseases in the past
- juvenile production for the on-growing in the sea area is almost entirely situated in the inland area allowing one-way movement
- strict limitations of moving any live fish or eggs from the sea to the inland area.
- some contagious diseases like IPN virus and bacterial kidney disease BKD appeared also in the continental farms, most probably originating from the sea area.



Epidemiological investigation of the IHN outbreak

- when IHN virus was detected in a cage farm in the Bothnian bay, the first suspicion of the route of infection was through vector-borne transfer or migrating salmon.
- the origin of the sea farm infection was tracked to a state owned continental fish farm selling juveniles widely for on-growing and stocking for fishing ponds and angling sites.
- sampling: contact farms and ponds, farms in the containment zones
- in the sampling effort of all the contacts, a few infected ponds were detected.
- due to the winter period and the small size of most of the contacts not all sites could be sampled immediately
- especially the stocking in the wild for the purpose of angling presents a challenge for the sampling

Compartmentalization

- Initially the whole water catchment area of the continental farm (36 930 km²) was set under a restrictions
- this area comprises nine sub-catchments and about a hundred divisions
- forms one of the main juvenile production areas
- After initial control and sampling of the farms in this area, compartmentalization was applied and the containment zone restricted to the sub-catchment area of the infected farm
- The estimated time for a particle to travel from the infected farms to the next farm with susceptible species downstream is between 15-27 months, and estimated IHNV survival is for max 7 weeks in lake water
- No susceptible wild species, vector species local



- the same principle was applied to the detections of the IHN infection in two small fishing ponds in another main water catchment area.
- Specific problem with this water catchment: endangered population of landlocked salmon



Possible entry routes

- In spite of tedious searching for the entry route of the virus into the continental farm, the origin of the infection could not be verified
- Index case either the continental farm or the fishing pond nearby
- Estimated time of introduction late May 2017
- taking in the account the type of the virus, most probably there has been an unknown contact with Russia
- there is some export of live fish to Russia, but not from this farm
- no connection could be found with the transport vehicles that are used to export fish
- near the farm is an angling site and the positive pond was stocked from the farm and frequented by Russian fishing tourists. Failing biosecurity with this connection remains an open question

Stamping out

- Challenges of the winter period: ice cover, or not strong enough ice
- Finding an effective euthanizing method
- Fish to be processed about 230 t, about one fourth could be slaughtered for human consumption
- Estimated cost of stamping out 1,9 million euro



Photos: Hanna Lounela

Disinfection and fallowing

- To be treated: two sea cage farms, the continental farm with earthen raceways and inside tanks, three smaller fishing ponds

Sampling of contacts on-going

- Small scale put and take fisheries
- Large angling ponds/lakes
- Angling sites

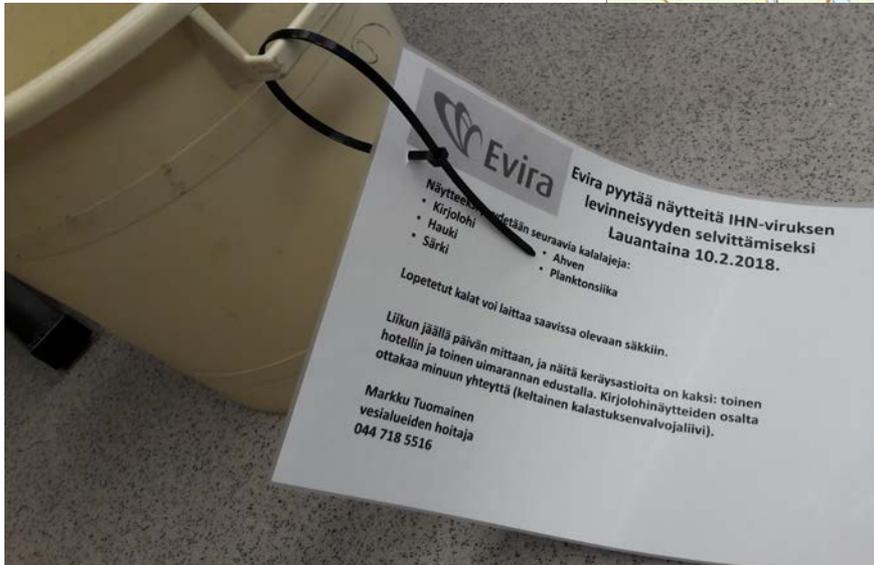
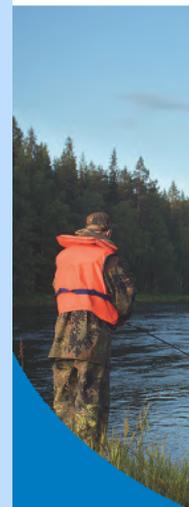
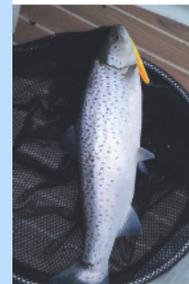


Photo: Satu Viljamaa-Dirks

Instruction for fisheries

- General instruction for fishermen about disinfection of the gear
- Instructions for gathering samples
- Recommendation for no restocking in 2018
- In case of restocking, separate plans for sampling



Instructions for recreational fishermen

TREATING INSTRUCTIONS FOR FISHING GEAR in areas with detected or suspected cases of IHN virus infection

Dead fish or their entrails must not be left on the ice or the shores of lakes or rivers. They must be disposed of with organic or mixed waste, or buried in the ground.

Any equipment or fishing gear that has been in contact with the fish or waters must be treated either by drying or heating them, or by using a disinfectant. The treatment is performed after the gear has first been cleaned mechanically in such a way that there are no visible remnants of fish or bait or dirt left on them.

Drying

- ▶ 24 hours in +20 °C. Heat accessories that are difficult to dry.

Heating

- ▶ One hour in +60 °C sauna.

When you are heating large fishing gear, such as nets, please note that the gear itself should reach the temperature of +60 °C and keep it for one hour or 5 minutes in hot steam.

Disinfectant suitable for the purpose

Please note that disinfectants corrode metals and there is no knowledge of the impacts of all of them on, for example, fly fishing lines. Careful removal of disinfectants by rinsing after their duration of action usually helps prevent severe corrosion. Naturally, the rinsing should always be performed using clean water and not water taken from, for example, the same fishing area where the viruses the spread of which you are trying to prevent are found. The list below gives some examples of commercial products for disinfecting, but also other similar products can be used.

Product	Concentration	Time of treatment
Hygisept, Virkon S	1% solution	30 minutes
Parvocide H-Plus	1% solution	1 to 2 hours
Alcodes, Desipower Alkoholi-12 80% (Alcohol-based disinfectants with alcohol concentration of approximately 70%)		Used according to the manufacturer's instructions, allowed to evaporate after use. Suited for disinfecting easily corroding objects.
P3, Suma Bac D10 (Quaternary ammonium cations, or quats)		Used according to the manufacturer's instructions.
P3-Oxonia Aktiv, Divosan Aktiv, F 268 AiroI (Peroxide and peracetic acid compounds)		Used according to the manufacturer's instructions.

Freezing does not destroy the virus, as in laboratories the virus is specifically stored in a freezer.

Sampling

- Differences in susceptible species lists EU and OIE
- Real vector species? Species preference for wild fish: salmonids, pike-perch, pike, eel, cyprinids (roach)
- Lake trout, whitefish, vendace?
- To be sampled tissue. EU: heart or brain, spleen and anterior kidney
- Canadian advice: preferably brain, and kidney and if possible gills
- Number of fish by sampling and number of fish to be pooled
- Sampling wild salmonids: fishing act prohibits certain times and sizes of fish, needs extra licencing

Follow-up

- The sampling of farms now considered in high risk will be intensified, while the initial sampling of the wild fish in ponds and fishing sites that received fish from the continental farm will continue.
- Inspection and testing of farms twice a year for a period of two years:
- Farms located on the coast at a distance of less than 100 km from the infected site
- Farms located at a distance of less than 100 km from the infected site in the same WCA, unless located upstream behind a barrier preventing the migration of wild fish
- Other farms considered at risk, based on epidemiological investigation
- The surveillance program for regaining the IHN free status for the whole country, the details still open



**Thank you for your
attention!**