Red Vent Syndrome (RVS) in Wild Atlantic Salmon

Background
Reports of wild Atlantic salmon (Salmo salar) returning to Scottish rivers with inflamed, swollen bleeding vents were received in early June 2007. By the end of July over 50 rivers had reported similar observations. Apart from the affected vent, the fish appear to be in good physical condition. So far, the syndrome appears to be mainly restricted to adult male and female Atlantic salmon one sea-winter fish (i.e. grilse), and particularly prevalent among ‘fresh run’ fish. A smaller number of two sea-winter fish were also reported showing signs of the condition. Neither sea trout (S. trutta) nor farmed Atlantic salmon have been affected by the condition. Investigations were carried out by Fisheries Research Services (FRS) in an attempt to establish the cause and extent of the problem.

External signs
The following series of photographs show the condition in varying degrees of severity and at different times following return to rivers.

- Normal vent for comparison
- Mildly affected fish might show a number of small red spots (petechial haemorrhage) and reddening around the vent.
- Moderately affected fish show an obvious widespread redness surrounding the vent and initial swelling; haemorrhage, skin erosion and scale loss might be observed.
- Severe cases show pronounced swelling and obvious erosion; tissue may protrude from the vent and bleeding may occur if gentle pressure is applied.

Samples analysed a few weeks after fish had entered fresh water show some recovery of the skin. Focal reddening, developing scar tissue and some localised scale loss is common, but no erosion or deep swelling is evident.

After 6-8 months in fresh water the vent area of a spawned female fish (i.e. a kelt) is raised and slightly protruding, but with no reddening, and full recovery of the skin.
Investigation into the cause
All fish examined by FRS were screened for fish pathogens. The results from a suite of bacteriological, virological and molecular tests were all negative. However, parasites were found both in the body cavity and particularly in the vent region. The parasite is a small round nematode called Anasakis, which can be observed with the naked eye and resembles a watch spring, measures a few millimetres in diameter, but up to 200mm long when uncoiled (Plate 7).

Anasakis larvae were consistently found in the region of the vent of all fish examined and in very high numbers, embedded in the dermal, sub-dermal and muscle tissues within the vent. Microscopically, changes include epidermal erosion, scale loss, encapsulation, severe dermatitis, inflammatory response and haemorrhage, which all contribute towards the appearance of the vent externally.

Conclusions
The very high number of Anisakis larvae within the discrete region of the vent, and the associated tissue reaction correlates with the externally observed ‘red vent’, and is considered to be the most likely causal agent of the Atlantic salmon ‘red vent syndrome’. Otherwise, all of the fish examined showed a good general health status, and there is no evidence of any bacterial, viral or fungal agent. Moreover, all internal organs and tissues other than the vent appeared to be in a normal healthy condition.

The presence of Anisakis larvae in wild adult salmon is not novel as the parasite occurs naturally in many fish species. However, the concentration of parasites in the vent tissues is unusual. The impact of the parasite on the fish is not fully known, but from the first years observations, there is no evidence that the condition has either led to mortality, or prevented salmon from spawning successfully. Consequently, there is no basis to recommend that fish showing signs of RVS are removed or killed.

The final natural host of the Anisakis worm are marine mammals such as whales, dolphins or seals. However, the parasite may also affect humans who become infected from eating raw fish (for example sushi) or fish that is under-cooked. For more information see: [http://www.food.gov.uk/multimedia/pdfs/guidesalmonanisakis.pdf](http://www.food.gov.uk/multimedia/pdfs/guidesalmonanisakis.pdf)

Contact us
Anyone concerned about RVS should contact the Fish Health Inspectorate at FRS Marine Laboratory. Telephone 01224 876544 and ask for the Duty inspector. Alternatively e-mail: fishhealth@marlab.ac.uk.