



## Diseased Salmon in Autumn

1. Salmon in large rivers such as the Tweed generally die after spawning, only 1 or 2% surviving to return and spawn again. In short West Coast rivers, where the Salmon enter later and can return quickly to the sea, survival can be much greater.
2. The re-entry into freshwater and the development of spawning maturity are stressful times for Salmon. The hormone changes linked to sexual maturation appear to cause a reduction in the efficiency of the immune system (the defence mechanisms of a living body against infection).
3. The spores of aquatic funguses are everywhere in freshwaters, but are prevented from infecting fish by the barrier made by the fish's skin, scales and mucus (glaur/slime). The mucus contains antibodies and has some antiseptic properties.
4. If the skin surface is broken, the spores can take hold and develop into fungus. Common sites for fungal spores to do this are the fins and the top of the head. Fins can be scraped and broken by contact with the river bottom, when attempting to "run" the faces of caulds and in many other ways. The skin on the top of the head is not protected by scales and becomes weaker as an effect of the hormonal changes that take place in fully mature fish.
5. Sites where fungal spores can get hold can also be created by external parasites, such as lice, which hole the skin by clinging on and by sun-burn which can also damage skin. Fighting between cock fish at spawning time can result in loss of scales and overlying skin and therefore increase vulnerability to fungus.
6. Fungus can therefore appear on fish whose defences of skin and scales have been broken because of some physical damage - or because the processes of sexual maturation have so altered the structure of the skin in places such as the top of the head that the spores can invade.
7. The ulceration of skin known as "UDN" also creates sites for fungal invasions - but skin ulcers can also be caused by wounds and bacterial infections as said above.
8. UDN is a little understood phenomenon. As yet, researchers have failed to transmit it to uninfected fish using either water that infected fish had been in or even by injecting tissue preparations from infected fish into them. There is still therefore doubt as to whether UDN is actually an infectious disease or not. Its epidemics are limited to periods when Salmon numbers are very high and there could be some link with population density.
9. **The white fungus seen on fish is *not* UDN itself:** the signs of that disease are ulcers which first appear on the head and then on the back (see below for a description). The fungus comes later, once the UDN ulcers have exposed flesh for it to colonise and grow on. As outlined in (6), there are other ways in which fungus can start on fish, so its presence is not an invariable indicator of disease.
10. The fungal growths that are so obvious on fish are not themselves diseases (in the way that diseases are usually thought of); they are *secondary infections* able to gain hold on a fish through damage due to some other cause, either physical wounding or disease. Once established on the fish, they will destroy the skin and flesh around them and can physically prevent the fish breathing if they clog the gills.
11. The quicker the fish can repair damaged skin, the less exposed it is to fungal infection. Fish being cold-blooded animals, their body metabolism is at a low level in cold conditions so new protective skin is slower to grow over wounds and fungus infections have therefore more time to colonise the damaged areas. When the water is warmer, the fish's bodily functions run at a higher rate, and skin damage is repaired more quickly, giving fungus less time to invade a wound. Fishermen often notice a decline in the frequency of adult Salmon with fungus as the water warms up and an increase again as it cools in the autumn.



12. Some diseases do not always show external signs. *Furunculosis* (a bacterial disease) which causes lesions in the flesh has been found to be common in kelts. Unless these lesions are close under the skin and break it, they will not create sites for fungal invasions.
13. Fungus infection is not therefore a universal indicator of disease in a fish. Some fungus-bearing fish will have become infected because of physical damage and not because some other disease has first weakened or broken their defences, while other fish will be diseased but will not have fungus.
14. Fish diseases, like human diseases, spread most easily where there is close contact between individuals. Low water or obstructions that concentrate fish may therefore increase the risk of disease, and *Furunculosis* does appear to spread more in such conditions, particularly when the water is warmer.
15. Since many fish will have some breaks or weaknesses in their skin due to a great variety of causes, the more fungal spores there are in the water, the more likely fungal infections are to spread – and the more fish with fungus growths, the more spores there will be produced.
16. Under the conditions mentioned in (13) & (14) therefore, diseased fish or fish with fungus infections may increase the risk for uninfected fish. Only people authorised by the River Tweed Commission, or people with the right to fish for Salmon, or their agents, are legally allowed to take dead Salmon or Trout out of the water.
17. However, whilst the sight of dead and dying fish in the river may be unpleasant, in upland spawning areas, where streams tend to be chemically poorer, the carcasses of dead fish fertilise the water as they decay and so benefit the next generation of young Salmon.
18. A fish with a small amount of fungus, that has taken a lure and fought well is an active and healthy fish and can be eaten without concern. Obviously sick and dying fish should not be eaten - their taste will be very poor anyway.

#### **DESCRIPTION OF UDN**

From Pyefinch, K.E. & K.G.R. Elson, 1967: Salmon Disease in Irish Rivers,  
Scottish Fisheries Bulletin No. 26

*"The first signs of this disease are the appearance of small, bleached, areas of the skin on the head, along the back and near the dorsal fin and tail. As the disease progresses, areas of a bluish-gray, slimy growth develop over these bleached areas, making the fish very conspicuous in the water. The appearance of the fish at this stage has been likened to that of a fish heavily infected with fungus but, if the fish is taken out of the water, the affected patches show none of the woolly or fuzzy appearance which characterises a fungal infection; instead they resemble masses of sodden blue-grey blotting paper. Further, these slimy masses can be readily pulled away, revealing inflammation or shallow ulceration of the underlying skin.*

*As the disease progresses, more patches appear and the others spread, so that considerable areas over the head, back and "wrist" of the tail are affected and, at this stage, the head may be so badly affected that it seems largely covered by raw, reddish, areas. As often happens when the skin of a fish is damaged, fungus may infect these exposed areas but it is important to recognise that this fungal growth is a secondary effect, consequent upon the primary infection, and not a primary symptom. Once established, however, the fungus spreads and in the most advanced stages of the disease, the head and tail regions of the fish may be largely covered with fungus."*