SECTION 3.5: FISH PARASITES

1 Sea-lice (Tide-lice), *Lepeophtheirus salmonis* and *Caligus* species: The first of these are the flat, brown, lice well known to anglers and valued as indicating a fresh run Salmon or Sea-trout. The latter are smaller and yellowish and much less common here. As there are no Salmon farms near the mouth of the Tweed to generate vast numbers of Sea-lice larvae, as on the West coast, fatal infestation of outgoing Smolts is not an issue in this area. These parasites, at normal levels, are quite natural on salmon and Sea-trout and have no known adverse effects on their hosts. Most drop off after three to four days in fresh water, though survival for up to 14 days is known (Fryer, 1982)

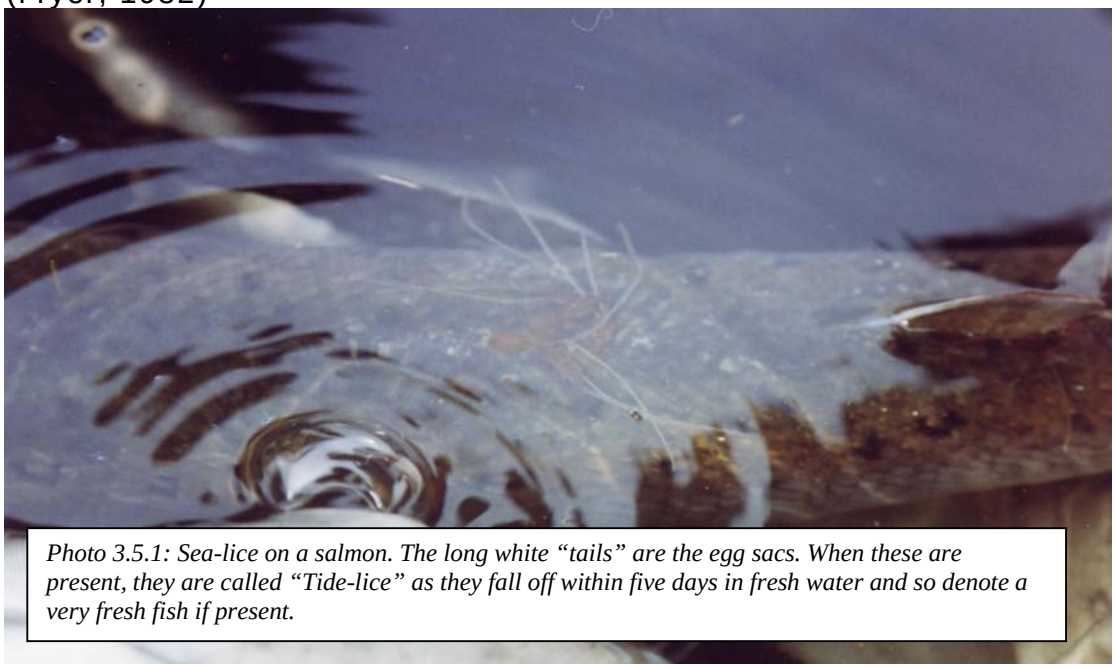

Photo 3.5.1: Sea-lice on a salmon. The long white "tails" are the egg sacs. When these are present, they are called "Tide-lice" as they fall off within five days in fresh water and so denote a very fresh fish if present.

2 Fish lice, *Argulus* species: The Fish-louse is present in the lochs at Bowhill, almost certainly brought in with trout for stocking from a hatchery. They look like Sea-lice, but are not as dark and have no "tails" (long, slender, egg-sacs). Generally, they do little harm in the wild, though the holes they make in fish can be sites for secondary infection by bacteria or fungal spores, which can then cause problems. In fish farms, where fish are concentrated, they can, however, cause severe difficulties. Once introduced to a water they can be very difficult and expensive to eradicate, so prevention is the best means of defence.

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While *Argulus* is generally regarded as a parasite of still waters, there is a reference in the RTC Police Committee Annual Report 1946-47 to them being found on fish in the river. Advice was sought from the then Inspector of Salmon Fisheries who replied :

> *"The parasite is a Carp Louse (Argulus), a crustacean parasite. It resembles Sea Louse, but relationship to that family is doubtful. It attaches itself to fresh water fish by large round suckers on the underside of the head temporarily. It sucks the blood of fish and drops off afterwards and can live independently. It probably does little harm except in the ponds of hatcheries*."

3 "Gill Maggots", *Salmonicola salmoneus*: These are, like the Sea and Fish lice, Crustaceans that attach themselves to the gill filaments and suck blood. The infective larvae are produced by an intermediate stage of the parasite that lives in a freshwater Copepod (small, free-living Crustacean) and these attach themselves to the gills of adult salmon where they begin to grow. Juvenile salmon are too small for them – the larvae cannot get in to the gills from the front and the water current passing out from the back is too strong for them to get in from that direction. After five or six months on the gills, they mature and start to reproduce, so Kelts are generally the hosts of the mature, egg-producing stage. The "maggots" can survive in salt water, so a salmon that survives spawning, returns to the sea and then returns again to the river for a second time can have Gill Maggots even though fresh run. The presence of Gill Maggots on a fresh run fish is therefore a good indicator that it is a repeat spawner.

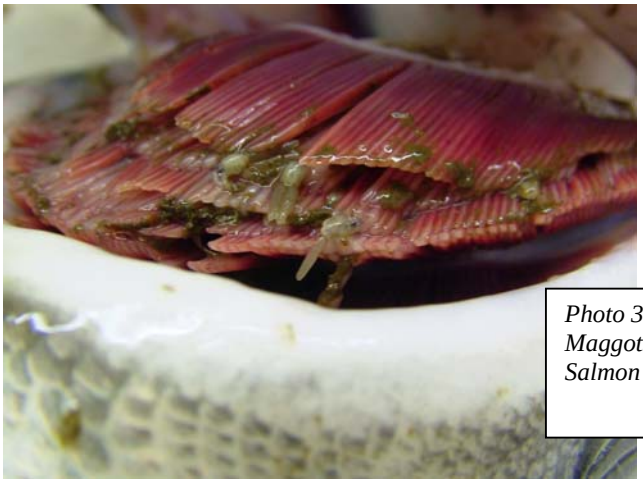

Photo 3.5.2a : "Gill Maggots" on a Salmon

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Photo 3.5.2b : Close-up of a Gill Maggot. The two long, fat, "tails" are the egg sacs.

4 Leeches, Hirudinea: From time to time, leeches are found on fish from the Tweed, which usually turn out to be the Fish Leech, *Piscicola geometra*. There seems to have been a minor outbreak of them in 1966-67 and an account was published of its occurrences (Mills, 1967). It was found on Sea-trout, Brown-trout and Salmon (mainly Kelts). Generally, there were from 1 to 15 leeches on a fish, though one Sea-trout Kelt had more than 100 on it. These leeches are little over 1" in length (2.5cm), with cylindrical bodies made up of muscular rings and have suckers at both ends. The sucker at the head end is larger, and makes that end of the animal broader.

There was a report of one of these leeches on a Spring Salmon caught at Wark on the 9th of February 2000 and trout infested with them were found in Kingside Loch in April 1994.

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5 Eye Fluke, *Diplostomum* species : These are Digenean flukes, which have a complicated life cycle. The adult, reproductive, stage lives in the guts of fish-eating birds and the eggs these produce pass out of the bird with its faeces into the water. The eggs hatch to produce a free-swimming stage, the *miracidium*, which invades freshwater snails. In the snails, another free-swimming stage is produced, the *cercaria* which finds and penetrates the flesh of fish. Once in the fish, they migrate through it to the eyes where they form cysts, called *metacercaria,* which can blind the fish, making them an easy prey for predators. The cycle is completed when the fish is eaten by a bird which then becomes infected and the parasite develops into its adult stage. Native Brown-trout are largely immune to Eye Fluke, but Rainbow Trout can be devastated by it.

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THE Tweed FOUNDATION

A Tweed Foundation Paper

PARASITE THREAT

Gyrodactylus salaris : This is the parasite that has wiped out 38 salmon rivers in Norway. It is native to the Baltic Sea, where the local salmon are immune to it, but when Salmon were taken from the Baltic to a fish farm on the Norwegian Atlantic coast, they took this parasite with them, with devastating consequences. If it were to reach the Tweed it would almost certainly mean the end of the salmon population here. Contingency plans are being worked out to put into operation if it does arrive. Precaution is very much the best way to deal with this threat and precautions are already required of anglers coming to fish the Tweed after having been abroad. A summary of the information on this parasite and its effects is given below :

1 *Gyrodactylus salaris* is a minute skin parasite (about half a millimetre long) of Salmonid fishes in fresh water. It can live on Rainbow and Brown Trout, Arctic Charr, Grayling and the Baltic form of Atlantic Salmon without, apparently, causing harm but has had a devastating effect on Atlantic Salmon on the West Coast of Norway.

2 The parasite attaches to fish skin with the hooks at its hind end, and when feeding, "glues" its mouth to the skin and everts its pharynx (throat) out through its mouth and onto the skin. It then secretes a solution that dissolves the skin and "sucks" up the liquidised tissue and fish mucus.

3 This results in many ulcers and lesions in the skin so the salt : water balance of the fish is upset. Secondary fungus infections can enter through these holes and the skin damage also reduces resistance to bacteria and viruses.

4 It is an hermaphrodite (is both sexes at once) and can reproduce both sexually and asexually. It gives birth to live offspring which are themselves already pregnant with pregnant offspring so a single parasite can contain three or four individuals of different generations. Only one is thus needed to spread the species, and a single *Gyrodactylus* can become thousands in a few days.

5 *Gyrodactylus* cannot swim, and spreads by direct contact between fish - fish farms are therefore ideal places for this species. It can also detach from fish and remain on the bottom for five or six days or until it makes contact with another fish. As it can live off fish, it can also be spread on moist materials - boats, boots, nets, fishing tackle and, possibly, wet fur or feathers.

6 It now usually spreads to new rivers through the stocking of infected fish, though migrating fish can also spread it, if they do not pass through fully salt water. It can survive a few days in brackish water, but is quickly killed in full strength salt water.

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7 The species was first identified in Norway in 1975 and is believed to have been brought to the western coast with live Baltic Salmon from Sweden that were imported for a fish farm. It has since spread to 38 rivers and 37 fish farms.

8 Typically in Norway, juvenile Salmon stocks start to decline two to five years after a river is infected and adult catches fall dramatically three years after. Salmon stocks in an infected river are virtually wiped out.

9 The only treatment available for infected rivers is for all fish to be killed off with poison and this has been done in 23 rivers in Norway so far. Some adult Salmon are captured and kept as broodstock to help re-stock with native fish and Salmon out at sea when the river is poisoned are another source for re-population. If the poisoning is timed correctly, eggs in the gravel will not be affected and will re-stock the river when they hatch.

10 Of the 23 rivers treated so far, 10 have now been clear for five years or more, 12 have not yet shown any signs of still being infected and treatment has failed in one river. This treatment is not regarded as being practicable for very large or complicated river systems, especially those with lochs on them (the Tweed would fall into this category).

11 By 1996 *Gyrodactylus* had spread to the northern rivers of Finland and Russia, to Germany, France, Spain, Portugal and the former Yugoslavia. In some cases it travelled with Rainbow Trout being transferred between fish farms.

12 A survey made between 1989 and 1991 examined fish from 250 sites throughout the U.K. but found no specimens of this parasite, suggesting that this species is not present here and therefore that British salmon stocks are unlikely to have any great resistance to it. To confirm this, Salmon from the Shin and the Conon were taken to Norway in 1991 and were found to be as susceptible to this parasite as Norwegian fish.

13 During these experiments it was, however, found that some individuals of these Shin and Conon test groups were able to tolerate infection, showing that there is potential for breeding resistant strains.

14 The advice to anglers given by the Scottish Exectutive to prevent the spread of this parasite to Scotland is that all fishing equipment used **outside Britain and Ireland** should be cleaned and treated by :-

a) Drying at a minimum temperature of 20 C for at least two days
or
b) Heating for at least one hour at a temperature above 60 C
or
c) Immersion in a suitable solution. Commercially available ones are Vikron (at a 1% solution); Wescodyne (at 1%); a 3% solution of common salt (Sodium Chloride) or a 0.2% solution of Sodium Hydroxide
or
d) Deep freezing for at least one day

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