



THE Tweed FOUNDATION

A Tweed Foundation Paper

SECTION 3.4: FISH DISEASES

1 UDN: Anglers still remember the great outbreak of Ulcerative Dermal Necrosis (UDN) of the 1960's. It was first seen on Tweed on two fish caught in the nets on the 14th March, 1967 (RTC Annual Report 1968) and "increased in severity until a flood in late May, after which it virtually disappeared until November". Some 13,694 Salmon, 6,535 Sea-trout and 1,549 other species found dead or moribund were removed from the river in 1967. Presumably many of the fish taken out in Autumn were the sort of fungus-infected fish found at the end of every year, but 2,789 dead Salmon were removed from the river in April 1967; 944 in May and 242 in June. However, as far as the Superintendent of the time could judge, spawning numbers were normal, though inhibited in smaller tributaries by a lack of rain.

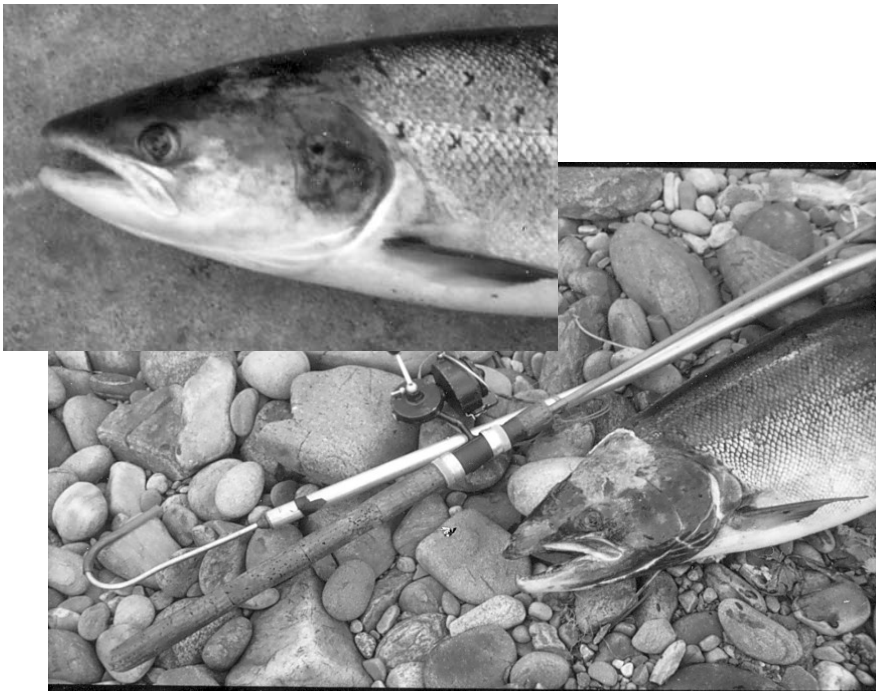


Photo 3.4.1: Signs of UDN on 1960's Spring Salmon. The upper photo shows the small spot on the head that was the usual first sign, and the lower, the spread of the ulceration over the head. This raw, exposed, area then becomes infected with fungus.

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



THE Tweed FOUNDATION

A Tweed Foundation Paper

This epidemic began in rivers in South-west Ireland during 1964-65 but sick Salmon had been found in the River Wye in Wales in 1963. During 1966, it spread to rivers in Cumbria and around the Solway. A few fish with "blemishes" were seen in the Tweed in this year, although the actual outbreak started the following year. By the end of 1967 the disease had spread to all the East coast rivers other than the Forth and the Tay and diseased fish were being taken in sea-nets. Few juvenile salmon Parr or Smolts were ever found infected, though other species such as Grayling, Perch and Grey Mullet were susceptible (Elson 1968).

The first signs of this disease in Salmon are small, greyish, lesions (shallow ulcers) on the gill covers, above the eyes or on the snout – areas where there are no scales (Roberts & Shepherd, 1986). These either heal over, leaving a scarred area or spread over the head and ulcerate producing a raw, reddish wound which then becomes infected with fungus and / or bacteria, whose spores are always in the water. The fungus can then spread over the rest of the fish, making a UDN infected fish indistinguishable from fish infected with fungus from any other cause (Roberts & Shepherd, 1968). The white fungus so visible on fish, usually a *Saprolegnia* species, is *not* UDN as is often thought – this fungus is a secondary infection that colonises the fish once their skin, their first line of defence, is broken by UDN or some other cause, such as leaping at obstacles. It is the greyish lesions on the areas of the head and body without scales that are the diagnostic sign of UDN. The cause of UDN is as yet unknown. During the 1970's many attempts were made to experimentally infect healthy salmon with preparations of tissues and body fluids made from diseased fish, but all failed. Without such evidence of an agent - virus, bacteria or prion – it is possible that UDN is not a disease at all, but the effect of some environmental factor or condition on fish.

Reports on UDN continued to be made in the RTC Annual Reports till 1976, though by the report of 1972, the then Superintendent was able to estimate that 80% of the *"large 1971 grilse run was hatched during the winter of the first incidence of UDN"* and in the Report of 1973 it was said *"It should be remembered that the very large stock of Salmon which entered the river during the year were nearly all the progeny of fish which spawned after the outbreak of UDN"* and in general the consensus of the time was that impact on stocks had not been severe.

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



THE Tweed FOUNDATION

A Tweed Foundation Paper



Photo 3.4.2 : Fungus on moribund salmon after spawning. This is often called "UDN" but is, in fact, a secondary infection of the sores and ulcers caused by UDN.

There was an earlier epidemic of Salmon disease which affected the Tweed particularly badly from 1879 to 1893 which was the subject of an investigation (Buckland *et al*, 1880). This could have been UDN as references are made to the first stages being white "spots" or "sores" on the front of the head or its sides and which were the sites where fungus grew. Some commentators (but not all) saw the difference between the lesions and the fungus "*It eats away the flesh like cancer in a manThe fungus ... is a growth supervening on the disease. It is an aftergrowth and not the disease itself*" (Evidence of Col. Alexander Learmonth, Dryburgh). Some of the witnesses to the inquiry could remember fungus growing on moribund fish or Kelts 40 or 50 years previously, but never on large numbers of fresh fish till the outbreak of the disease. There is a very full account of the investigations in the Eleventh Annual Report of the Fishery Board for Scotland, 1892.

The fact that the UDN outbreak of 1967 happened just as the river changed from being a Spring river to an Autumn one in terms of catches has led to suggestions that it might have played a part in causing that change. However, Autumn catches had started to rise some years earlier as can be seen from the graph of catches in Section 4.2. UDN was, though, a disease of the colder, earlier months of the year and would have impacted on Spring Salmon stocks more than on later running stocks. The outbreak in 1879, though persisting for around 20 years, did not prevent the change towards Spring running that started around 1910.

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



THE Tweed FOUNDATION

A Tweed Foundation Paper

2 Cauliflower Disease of Eels : During a Ph.D. study on Eels in the early 1980's, there was an outbreak of "Cauliflower Disease" in the Eel population of the Tweed. The disease gets this name because of the shape of the growths that it causes on the head of Eels (see photographs below). This disease was first recorded in the British Isles, in Yorkshire, in 1979 and was found in the Tweed in 1980. As the Leet and Eden had been sampled the previous year during this study without any diseased individuals being found, it can be assumed that the disease broke out in that year.

Table 3.4.1 (data from Hussein, 1983)

Numbers and Frequency of Eels with "Cauliflower Disease" found in the Tweed catchment

	LEET WATER		EDEN WATER		LEADER WATER		EDDLESTON WATER	
	<u>Number</u>	<u>%</u>	<u>Number</u>	<u>%</u>	<u>Number</u>	<u>%</u>	<u>Number</u>	<u>%</u>
1980								
Jan	9	0	79	0	NS	NS	NS	NS
Feb	96	0	71	0	NS	NS	NS	NS
Mar	39	0	75	0	15	0	41	0
Apr	63	1.6	73	6.8	37	0	37	0
May	56	0	65	10.8	54	0	60	0
Jun	70	1.4	54	0	73	0	54	0
Jul	49	6.1	61	6.6	74	8.1	39	0
Aug	48	4.2	66	12.1	61	8.2	58	1.6
Sep	102	8.7	77	19.5	69	4.3	31	0
Oct	28	7.1	69	11.6	81	2.5	30	0
Nov	61	8.2	53	3.7	NS	NS	NS	NS
Dec	26	3.8	35	5.7	13	0	14	0
1981								
Jan	29	3.4	NS	NS	19	4.3	16	0
Feb	NS	NS	NS	NS	15	0	74	0

NS = No sampling

From this table it can be seen that frequency of occurrence was significant at some times and places, reaching almost 20% of all the Eel sampled in the Eden Water in September. However, only a single infected individual being found in the Eddleston Water over this whole period, showing considerable geographical variation in the outbreak. There was also variation in the age of Eel infected, the great majority being under eight years old, though the oldest

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



THE Tweed FOUNDATION

A Tweed Foundation Paper

individual found infected was 18. Eels with only a small tumour were not much less in weight than uninfected fish, but those that had large tumours were emaciated and weighed much less than they should have. In some cases, the tumours completely blocked the mouth and no food was found in the stomachs of such individuals. It would appear from this that the disease would be fatal in severe cases. An account of this outbreak was published at the time (Hussein & Mills, 1982).



Photographs : D.H. Mills

Photos 3.4.3a & b : Eels with Cauliflower disease.

The disease is still present within the Tweed, occasional individuals are found. One small Eel with a tumour was found in July 2006 during electric-fishing at Drygrange on the Leader, for instance. No causative agent has been confirmed yet, though there is some evidence that a virus is involved.

3 *Furunculosis* ("Strawberry Disease"): This is probably the most common disease that is noticeable amongst the fishes of the Tweed. It is caused by the bacterium, *Aeromonas salmonicida* and was introduced to Britain when Rainbow Trout were imported from Denmark in the 1920's. As a new disease it had a devastating impact leading to investigations by the then Public Health Laboratory. The Fish Health Act of 1937 was passed in order to

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



THE *Tweed* FOUNDATION

A Tweed Foundation Paper

control its spread and it has since acclimatised and become less destructive - or fish have developed some immunity to it. It is now endemic and widespread throughout Britain and Ireland. Fish can carry it without effect or harm but if stressed, by water temperature, spawning or other factors, it can "break out" and be fatal. In fish farms, a test for *Furunculosis* is to stress fish by handling them – if the disease is present, it will break out a few days later. Spawning is a stressful time for fish, so it is not uncommon to see Grayling dead with *Furunculosis* in April, after their spawning, and it must now contribute to the death rate of Salmon and Sea-trout Kelts. Handling during catch and release is also stressful for fish and could lead to *Furunculosis*. Fish often die before the disease becomes obvious externally. A "blushing" at the roots of the fin rays may be all that is apparent on the surface. If the disease develops, the "*furuncles*" (abscesses) can reach the surface and become very apparent.

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

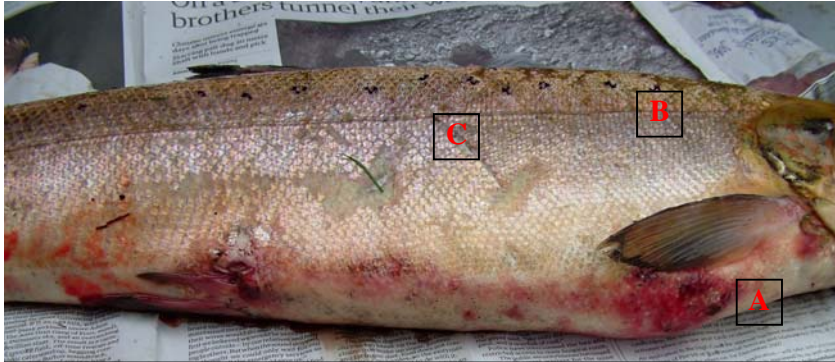
© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



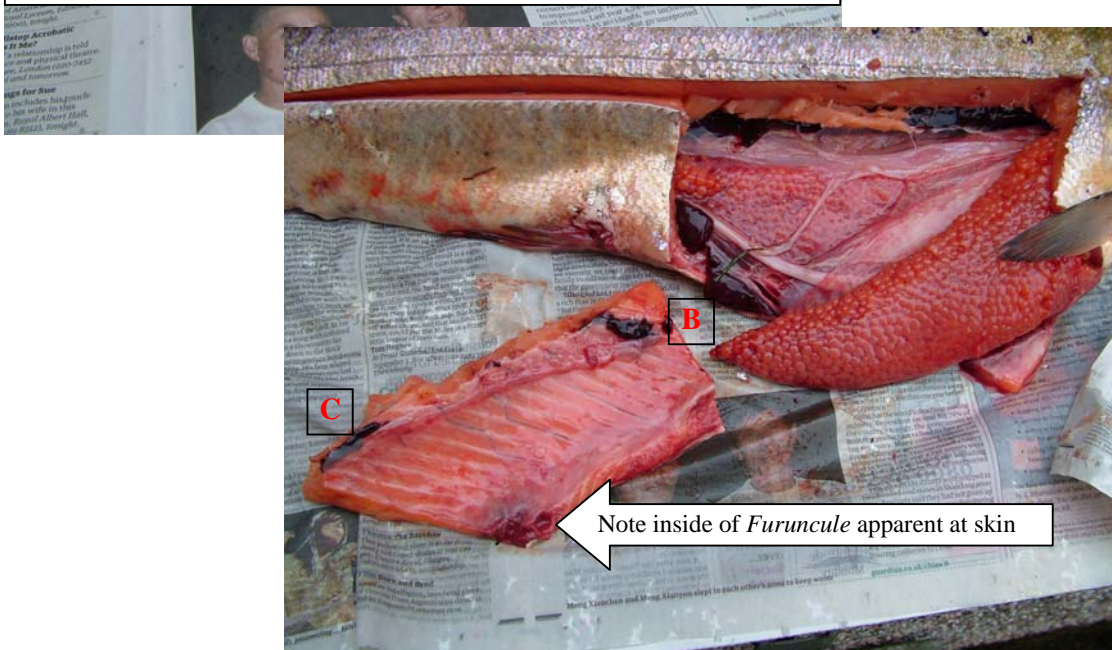
THE Tweed FOUNDATION

A Tweed Foundation Paper

Photos 3.4.3a & b shows a salmon (from Boleside on the 28th September, 2005) with a *Furuncule* apparent on the surface but two others still below the skin.



A = Red *Furuncule* or abscess near the surface. Note there are no signs of others at B & C – but when dissected (photo below) there were two others at these points



Photos 3.4.4a & b: External and Internal signs of Furunculosis

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

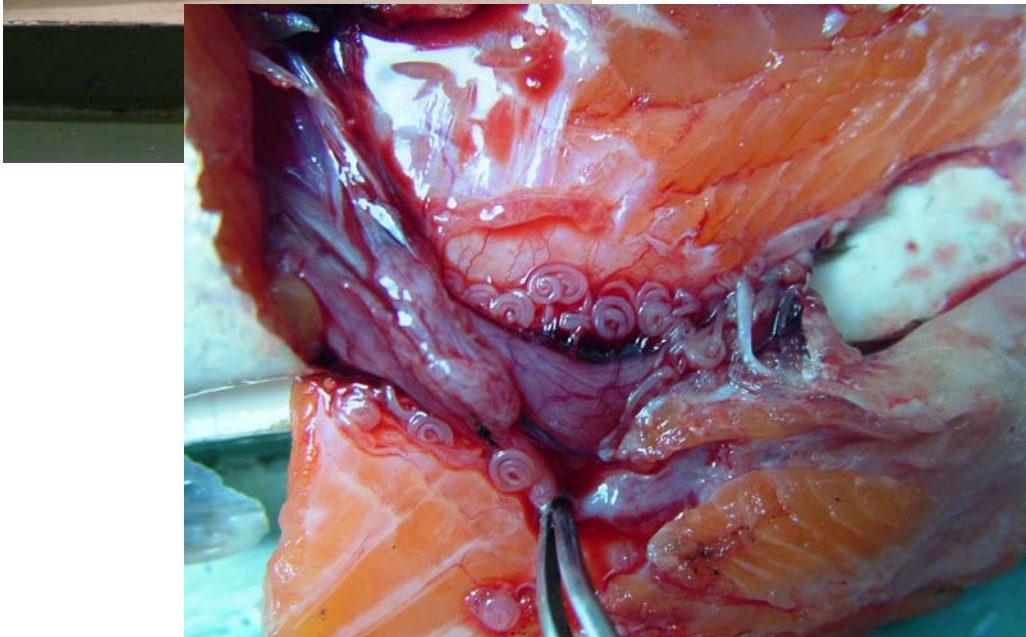
© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



THE Tweed FOUNDATION

A Tweed Foundation Paper

6 “Red Vent Disease” of salmon: In 2007, a high proportion of Grilse caught by both net and rod in the Summer throughout the country had bleeding or bloody vents, as shown in the photographs below. Some cases had also been noticed in 2006 but at a much lower level. Fish showing this symptom had significant infestations of a Nematode worm called *Anisakis*, which could be found in and around the damaged vents. However, it was not clear if the worms were the primary cause of the damage or were a secondary or associated factor.



Photos 3.4.4a & b: The external, “Red Vent” symptom and the infestation of Nematode worms inside.

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE



THE Tweed
FOUNDATION

A Tweed Foundation Paper

By the end of the Summer of that year cases had disappeared and reports from places where fish are stripped for stocking were that healed vents on fish could be seen and that stripping from such fish was not a problem.

Wild Fish Health Surveys : From time to time, the Fish Health Inspectorate carry out Wild Fish Health Surveys of the country. Samples of Salmon and Trout from the Tweed were tested in 1995, 1999 and 2006. No notifiable diseases were confirmed from any of these samples.

THE TWEED FISH CONSERVANCY CENTRE, DRYGRANGE STEADING, MELROSE, ROXBURGHSHIRE TD6 9DJ
Tel: EARLSTON (01896) 848271 Fax: EARLSTON (01896) 848277
email: info@tweedfoundation.org.uk
Charity No. SC011055

A charitable trust established by the River Tweed Commission to promote the development of fish stocks in the Tweed River System

© All information contained within this paper is Copyright and must not be reproduced without the prior permission of The Tweed Foundation. E&OE