



Part 10: Biosecurity

10A FISH DISEASES

The very greatest threat to the Salmon of the Tweed is still the parasite *Gyrodactylus salaris*, which has wiped out the salmon on more than 40 rivers in Norway. It has only been eradicated from a few with great difficulty and expense by poisoning whole rivers to kill all its possible fish hosts.

Good biosecurity practice and widespread awareness of the risks amongst anglers and canoeists is the best, and quite possibly, the only defence against this destroying the salmon, and the salmon fisheries, of the Tweed.

This parasite is **not** found only in Norway. It is now known to occur in Finland (Baltic and northern watersheds), Sweden, Russia (Baltic and White Sea watersheds [which includes the Kola peninsula]), Norway, Denmark, Germany, Spain and possibly in other European countries. The absence of records from other areas should not be taken as evidence of absence, as systematic surveys to demonstrate absence have only been undertaken by the UK, the Republic of Ireland and certain parts of Finland. Anyone fishing outside of the UK and the Republic of Ireland should therefore take precautions by cleaning and drying any equipment (including waders and clothing) used abroad before using it again within the UK and Ireland.

The UK leaflet on how to prevent the spread of *G. salaris* does not now appear to be available online, but the Irish leaflet can be found at:

<http://www.fisheriesireland.ie/documents/angling-1/general/295-a-guide-to-protecting-freshwater-fish-stocks-from-gyrodactylus-salaris-1.html>

10B ALIEN SPECIES

Rationale: The plants and animals that have evolved together in and along the waters of the Tweed catchment and of the Eye since the Ice Age, give a particular local character and interest to our area. Every time a non-native species establishes itself this local character is weakened and our rivers become more anonymous and generalised. If the process is unchecked both here and nationally, then the rivers of the British Isles will no longer be characteristic of their local areas but will simply be channels of water inhabited by a random collection of plant and animal species from around the planet. The aim of this section is therefore to “*keep Tweed, Tweed*”.

One of the most distinctive characteristics of our rivers and of the rivers of Scotland the North of England generally, is the lack of native fish species. Since there was no freshwater link between the northern parts of Britain and the continent, no purely freshwater species such as Pike, Perch or Carp species such as Roach, Rudd, Dace, Tench, Barbel etc. could colonise this area after the Ice Age. The only native species are therefore those that could cross salt water (Salmonids, Eel, Stickleback and Lampreys). This lack of native species is sometimes thought of as a deficiency to be remedied by introductions but it is actually one of the things that makes our rivers different from elsewhere and therefore of particular interest.

As well as the fundamental damage done to our local identity and ecology by the presence of non-native species, there is also the particular damage that can be done by individual non-native species. Signal Crayfish, for instance, exclude juvenile salmon from hiding places, making them more vulnerable to other predators and reduce the numbers of large invertebrates on which fish feed. Giant Hogweed and Japanese Knotweed can completely dominate banksides, excluding light and destroying all native vegetation underneath. While these particular situations are more dramatic and obvious and grab the headlines, the dilution of local ecological identity by the infiltration of non-native species that do not cause any particular damage is actually just as significant. What has to be remembered is that animal and plant *communities* can become extinct, not only individual species and the presence of even one alien species means that a community has become extinct, even if all the original, native, species are still present.



As it is difficult to eradicate a non-native species once it is established, the best course is to prevent the arrival of new species altogether. This not only means alerting and informing the public in general and bodies such as garden centres and aquarists shops in particular of the dangers of non-native species but also working with national and local agencies and bodies to support national policies aimed at exclusion or restriction of non-native species beyond the boundaries of the Fisheries District.

Up to date information on new non-native invasive species is available from the Website of the UK Non-native Species Secretariat (NNSS) at:-<http://www.nonnativespecies.org/alerts/index.cfm>

The Current Situation: The main alien aquatic animal species that are of concern within the District at present are the Bullhead (*Cottus gobio* – see Appendix 9 for distribution map), a small fish and Signal Crayfish (*Pacifastacus leniusculus* – distribution map in Appendix 10B). Both species are small predators that can exclude juvenile salmon and trout from hiding spaces as well as eat them. Both, too, can reach very high densities, of hundreds per square metre. Predation by larger fish should be able to control their numbers to some extent, though the recent decline in Eels has probably reduced the effect of this. Both species have limited ability to pass upstream of instream structures of any size and this now needs to be considered in relation to the removal or easing of instream structures to improve passage of salmon and trout. Immediate threats are the arrivals of Chinese Mitten Crab (*Eriocheir sinensis*) which has been working its way up the East coast from Thames over the past century; “Killer Shrimps” (*Dikerogammarus villosus* & *Dikerogammarus haemobaphes*) – the latter is present in the Lancaster area; Zebra Mussel (*Dreissanea polymorpha*) which has been found at a site in Durham and recorded in Scotland and the Topmouth Gudgeon (*Pseudorasbora parva*) which has been found in the English Lake District. Of these, the most likely to be introduced in to the catchment by anglers and canoeists are the Killer Shrimps, which can get stuck in the soles of waders and the Zebra Mussel, which has a minute larvae. As people are the prime agents for the spread of aliens species it is important that all water users become aware of the issues and follow the basic “**Check, Clean, Dry**” procedure when visiting waters:-



STOP THE SPREAD

STOP THE SPREAD
INVASIVE AQUATIC SPECIES
CHECK-CLEAN-DRY

Are you unknowingly spreading invasive species on your water sports equipment and clothing?

Invasive species can affect fish and other wildlife, restrict navigation, clog up propellers and be costly to manage. You can help protect the water sports you love by following three simple steps when you leave the water.

CHECK Check your equipment and clothing for live organisms - particular in areas that are damp or hard to inspect.

CLEAN Clean and wash all equipment, footwear and clothes thoroughly. Use hot water where possible. If you do come across any organisms, leave them at the water body where you found them.

DRY Dry all equipment and clothing - some species can live for many days in moist conditions. Make sure you don't transfer water elsewhere.

For more information go to www.nonnativespecies.org/checkcleandry



More information on these species can be found on the website of the GB Non-native Species Secretariat (GB NNSS)

Signal Crayfish

<http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2498>

Chinese Mitten Crab

<http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1379>

Killer Shrimps

<http://www.nonnativespecies.org/alerts/index.cfm?id=3>

Zebra Mussel

<http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1250>

Topmouth Gudgeon

<http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2876>

The Bullhead is native to the south of England and so does not appear on the lists of the Non-native Species Secretariat, though it is a highly invasive alien in Scotland that is known to have completely eliminated trout from some streams in both the Forth and the Clyde districts.

Scottish policy and the legal position on invasive alien species can be found on the SEPA website at:-



<https://www.sepa.org.uk/environment/biodiversity/invasive-non-native-species/>

Consents for the stocking of fish within the Tweed and Eye Fisheries District are the responsibility of the River Tweed Commission and information on this is available from:-

http://www.rtc.org.uk/html/stocking_ponds.html

BIOSECURITY FOR EVENTS: bringing people into the District from all over the country and abroad is a particular risk as the equipment and clothing they use could be carrying fish eggs, crustacean and mollusc larvae, seeds, spores and fragments of plants. Advice for event organisers is available at:-

<http://www.nonnativespecies.org/index.cfm?pageid=596>

Policies for the 6th Edition of the Fisheries Management Plan

10A: FISH DISEASES

Policy 10A.1: Set up a system of “early warning” electric-fishing sites throughout the catchment (as per Policy 2C.1d)

- a) Monitor these for any sudden disappearance of juvenile salmon

Policy 10A.2: Maintain precautions against the spread of G. salaris

- a) Update the RTC’s contingency plan for the spread of *G. salaris* to the Tweed.
- b) Publicise the **Code of Practice to Avoid the Introduction of *Gyrodactylus salaris* to GB** available at <http://www.gov.scot/uploads/Documents/CoPGyrod.pdf>

10B: ALIEN SPECIES

Policy 10B.1: Train all TF and RTC staff, including temporaries, to be aware of biosecurity issues and the appropriate procedures to reduce risks

- a) As a minimum, all staff should complete the on-line training course for field workers provided through the NNS website at:
https://openeducation.blackboard.com/mooc-catalog/courseDetails/view?course_id= 1189_1
- b) Liaise with SEPA and other organisations to keep up to date with best practice.

Policy 10B.2: Provide information to local angling clubs and other water users on biosecurity issues

- a) Encourage local anglers to complete the online training modules for anglers provided through the NNS website at:-
<http://www.nonnativespecies.org//index.cfm?pageid=525>
- b) Encourage local anglers to follow the “Check / Clean / Dry” procedure, especially after fishing outside of the catchment, and to use the training module on this provided through the NNS website at
<http://www.nonnativespecies.org/checkcleandry/index.cfm>
- c) Check local Stillwater Fisheries are informing their anglers of biosecurity issues and precautionary procedures – this can be done through the RTC consents for stocking system.
- d) Increase public awareness of the issue through local publicity and the provision of materials to local schools and organisations.



- e) Publicise the code of practice for holding events available at:- <http://www.nonnativespecies.org/index.cfm?pageid=596>
- f) Consult with other local organisations on the possibility of river bank signage about biosecurity.

Policy 10B.2: Maintain the appropriate facilities at the TF and RTC offices to allow biosecurity procedures to be followed

- a) Extend the net hanging area so that nets can be hung singly so they can dry more quickly and thoroughly
- b) Have two sets of colour coded electric-fishing stop-nets, so they are not used on consecutive days
- c) Maintain and improve boot and equipment washing and drying facilities.

Policy 10B.3: Ensure fieldwork sites are always visited in upstream to downstream order, so that animals and plants cannot be transported against the current and upstream of natural or man-made barriers that would otherwise restrict their spread.

- a) Extra caution should always be taken when sampling upstream of a barrier to use only checked and cleaned equipment so that species cannot be taken to areas they could not otherwise reach.
- b) Extra thorough cleaning of equipment should be carried out after sampling in areas known to contain Bullhead and Signal Crayfish.
- c) Care should also be taken not to spread the seeds or fragments of invasive riparian plants such as Japanese Knotweed or Himalayan Balsam. Checking for the presence of these species to be added to the risk assessment protocol for electric-fishing sites

The major natural barriers that restrict movement upstream are the Stichill Linn on the Eden Water and the Hethpool Linn on the College Burn. There are also smaller waterfalls such as the Linhope Spout and the Harthope Linn. The major man-made barriers are the large reservoirs: Fruid, Talla, Meggat and Whiteadder. Smaller reservoirs, such as Stantling Craig (on the Caddon Water) restrict access to smaller areas of the catchment. Caulds on the river system all have fish passes, but can restrict certain types of fish and other animals from spreading upstream. The Skinworks Cauld on the Gala in particular should be impassable to any animal unable to use the fish pass. Areas upstream of barriers form “refuges” and, in time, could be the only parts of the catchment that alien species do not reach. Particular care should therefore be taken when working in such areas –they should always be the first of the day to be visited.

Policy 10B.4: Coordinate work with the local INNS group and notify any sightings of INNS plants or animals to the appropriate bodies if it is thought that these are new locations

- a) Plants should be reported to the Tweed Forum
- b) Invertebrates and fish to SEPA

Policy 10B.5: Support the RTC's procedures for consenting to fish stocking

- a) Maintain a database of non-native fish populations within the Tweed and Eye catchments
- b) Advise the RTC on the levels of risk of the species for which applications are made
- c) Investigate the sources of fish that are the subject of applications for stocking consent and advise on any risks related to such sources
- d) Advise the RTC on the level of risk involved in consenting to applications
- e) If necessary, attend stocking occasions to confirm the identity and size of the fish



Policy 10B.7: Maintain checks on garden centres and aquarium shops within the catchment

- a) Check the knowledge of national codes at local garden centres and aquarist shops
- b) Maintain spot checks of local garden centres and aquarist shops
- c) Check that the local harbor authorities are aware of biosecurity issues and have appropriate procedures.

Information on Biosecurity for marine species can be found at:

<http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&ved=0ahUKEwio5fuggKXaAhUnCcAKHVtCYBtQQFghFMAQ&url=http%3A%2F%2Fwww.nonnativespecies.org%2FdownloadDocument.cfm%3Fid%3D1320&usq=AOvVaw3orVI5UkUa8c8udqwXjEiz>

Policy 10B.8: Monitor the effects and spread of established INNS species

- a) Maintain the monitoring of the Bullhead and other fish species at the site on the Langton Burn at Todrig (*every three years when the general survey work is on the Teviot catchment*)
- b) Maintain the monitoring of trout fry at the site on the Flodden Burn where there is a heavy infestation of Signal Crayfish (*every three years when the general survey work is on the Till catchment*).
- c) Undertake survey work to determine the extent of Bullhead and Signal Crayfish spread as and when resources are available.

Policy 10B.9: Identify opportunities for eradication

- a) Volunteer to help with any eradication work outside of the District to gain experience.



Part 11: Fish Health

The Current Situation:

Fish are susceptible to a wide range of diseases, caused by both viruses and bacteria. They also host many parasites that are native to this part of the world and which can, at times, also cause problems. The most recent example of this has been “Red Vent” syndrome caused by *Anisakis* nematode worms. These have always been present in salmon populations but about ten years ago greatly increased in both number and severity of infections, producing distended and bloody vents. The fish start to heal when they come in to fresh water and will spawn normally, so they do not appear to be a fish health issue, though they are for human health – precautions have to be taken when infected fish are eaten or smoked.



A severe case (Grade C) of “Red Vent” on a fish caught at the Paxton nets in August 2013

Fungus:

The most visible disease on the river has always been the white fungus, *Saprolegnia*, characteristic of dying kelts. However, almost every year there are cases of fresh Spring salmon dying with fungus on them as well as occasional reports of smolts with fungus. While physical breaking of the skin always carries the risk of fungal infection, there is a question over whether all the Spring salmon that die with fungus on them have had such physical damage and this is an issue that needs further investigation, as does the appearance of fungus on smolts.



Two smolts found in May 2013 with fungus around their heads. A bird had obviously attacked the top one, from Carham and resulting damage to the head could have allowed the fungus to infect. There was no sign of damage on the lower one, from the Whiteadder, but this could have been hidden under the fungus. Predator attacks could explain some of the smolts found with fungus, but whether this is the explanation for all is unknown.



Another smolt with fungus from May 2013, from The Lees. This shows the infection to be in the gills. It always seems to be gills and the head that get infected with fungus with smolts. This could indicate some physical damage, perhaps from smolts being caught by anglers.



Three dead Spring Salmon collected from six seen dying at Chirnside on the Whiteadder in May 2016. These deaths of fresh, good conditioned, Spring Salmon cannot be explained as yet. Each one found is examined for signs of having been caught and released but as yet none have shown the marks in the mouth and other signs that would indicate this.

UDN:

Fungus is often called “UDN” but this is not the case. There is no evidence as yet that UDN is actually an infectious disease, and it is best described as a “syndrome”. Its name is simply a description of its symptoms – **U**lcerative **D**ermal **N**ecrosis (meaning skin dying due to ulceration). There were outbreaks on the Tweed in the second half of the 1960s and in the 1880s, with occasional examples at other times and a heightened level in the Spring of 2012. It is of marine origin and restricted to the early part of the season when temperatures are low. The fish come in to fresh water with the ulcers, usually on the head, which can then become infected with fungus, which is often, incorrectly, thought to be UDN. It is the further destruction of the skin by the fungus that can prove fatal, as fish with UDN can heal as the water warms up and carry on to spawn normally. The puzzle over its nature is due to the failure of experiments to infect healthy fish with materials taken from sick fish – a virus or bacteria should be transmittable by these means and should then reproduce the symptoms in the healthy fish.



A fish with the characteristic head lesions of UDN

The RTC Annual Reports during the 1960s outbreak report good levels of spawning stocks despite the large numbers of dead fish removed from the river and the outbreak was followed by very large runs of Grilse, spawned during the worst seasons.

Cauliflower disease of Eels:

There was an outbreak of this on the Tweed in the late 1970s / early 1980s and a few examples have been found since. It is a viral disease that characteristically causes "cauliflower" like tumours on the heads of eels which, when large enough, prevent them from eating by closing the mouth and / or seeing by obscuring the eyes. It is thought to have spread from the Baltic area some time between the 1940s and the 1960s.



An Eel from the Whiteadder, with the characteristic growth of "Cauliflower disease" on its mouth. As these grow, they block the mouth preventing feeding so the fish starves to death as can be seen from the photo of the body below:





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.

Policies for the 6th Edition of the Fisheries Management Plan

Policy 11.1: Collect records and information on past outbreaks of fish diseases and of parasites within the District

Policy 11.2: Monitor parasites on Salmon and Sea-trout entering the Tweed

- a) Continue to record Sea-lice numbers on Salmon and Sea-trout caught at the Paxton nets
- b) Continue to record the number and severity of cases of Red Vent on Salmon caught at the Paxton nets.
- c) Monitor the fish for any new or unusual signs of parasites or disease

Policy 11.3: Investigate and record incidences of fish affected by disease

- a) Maintain the database of photographs and descriptions of diseased fish.
- b) Cooperate with any national surveys or investigations of wild fish diseases.



The *Tweed* Foundation

for the *good* of the river

