

# FAQ's – Salmon



## Do all Atlantic Salmon migrate to sea?

No. Although most Atlantic salmon spend part of their lives at sea there are some which are non-migratory. In several lakes in eastern North America there is a form known as a land-locked salmon, *Salmo salar sebago* (Girard), though their access to sea is not barred. The fish is popularly called Ouananiche (Lake St. John) or Sebago salmon (Nova Scotia, Quebec, New Brunswick, Newfoundland and the New England States). In Lake Vänern in Sweden there is a non-migratory form of Atlantic salmon called "blanklax". Land-locked Atlantic salmon also occur in Lake Ladoga in Russia and in Norway in Lake Byglandsfjord. There are also land-locked Atlantic salmon in South Island, New Zealand.

## What problems affect Salmon stocks?

There are a number of factors which have had an adverse effect on salmon stocks, as shown in detail on the following pages. Some, such as predation by other species, have already been mentioned. Others include:

- Pollution of rivers and silting up of spawning gravels
- Obstacles to migration, such as dams
- The effect of fisheries which inadvertently take salmon ("by-catch") or which remove the salmon's natural food in the sea.
- Climatic changes which are affecting the salmon's ability to grow and survive during its time in the sea.
- High seas and coastal "interceptory" mixed stock fisheries which take fish from more than one river population, thus denying the ability to manage the exploitation of individual river stocks on a local basis to maintain stock levels.

## When do Salmon spawn?

Spawning time varies between rivers and may be influenced by the water temperature and amount of daylight. Generally spawning will occur during the period November-December in Great Britain and Ireland but may extend from October until late February in our larger rivers.

## What do parr feed on when they are in fresh water?

The larvae of aquatic insects and other aquatic invertebrates together with terrestrial insects which fall into the water.

## Do Salmon feed in fresh water?

As juveniles, salmon feed in their native rivers, and after smolting and migration to sea they continue to feed, principally on crustaceans and fish. Adult salmon do not feed in fresh water, although, very rarely, parr have been found in their stomachs at spawning time.



## **What is a Grilse?**

A grilse is an Atlantic salmon which has spent only one winter at sea before returning to the river. Salmon grilse are often indistinguishable from multi sea winter (MSW) salmon except by scale reading. They are smaller on average (2-3lb in May, 5-7lb in July) but when they enter rivers in September often attain 8-10lb and in October 12-15lb.

## **What influences the upstream movement of Salmon in a river?**

A number of factors affect the movement of salmon up the river. In the spring, water temperature is of great importance, and until the water temperature reaches 42°F (5°C) there is little upstream movement of fish over obstacles. Later in the season movement is affected by river flow and climatic conditions.

## **Do all Salmon die after spawning?**

About 90-95% of all Atlantic salmon die following their first spawning, but some survive to spawn two or three times: as many as four spawnings have been reported. The survivors, predominantly female, return to sea to feed between spawnings.

## **Is there just one species of Salmon?**

When we speak of "salmon" we are referring to either Atlantic salmon or Pacific salmon. There is only one species of Atlantic salmon: *Salmo salar*. There are six species of Pacific salmon: pink (*Oncorhynchus gorbusha*), chum (*O.keta*), chinook (*O.tschawytscha*), coho (*O.kisutch*), sockeye (*O.nerka*) and Masou (*O.masou*).

## **Are wild Salmon attacked by diseases or parasites?**

Salmon, both in the wild state and in fish farms, are vulnerable to bacterial and viral diseases, and also to infestation by parasites, particularly sea lice.

A common bacterial disease is Furunculosis. The furuncles or boils, which are usually fatal, are most likely to appear in wild fish in warmer months when river levels are low and fish collect in pools while waiting for more water to allow their upstream journey to continue. It has been controlled in salmon farms by vaccination.

Ulcerative Dermal Necrosis (UDN) was rife among wild fish in the late 1960s and early 1970s. Although the causative organism has never been identified, it was almost certainly a virus. It showed itself first in the appearance of small bleached areas on the head, back and tail, which were then covered in a slimy bluish-grey growth. The affected areas were vulnerable to ulceration and infection by fungus.

Infectious Salmon Anaemia (ISA) is another viral disease to which wild fish are vulnerable; it has been endemic for some years in salmon farms in Norway, and was first detected in a number of Scottish farm sites in 1998.

Sea Lice, which can only survive in salt water, are naturally occurring parasites whose presence in small numbers indicates that a salmon in the river is fresh from sea. However, they multiply exceedingly when large numbers of farmed salmon are concentrated in sea cages, and can infest wild salmon smolts encountering them in inshore waters during their seaward migration, with highly damaging results. Sea trout smolts and adults are even more seriously affected because, unlike salmon, they spend much of their life at sea close inshore.

Gyrodactylus salaris is a skin parasite on parr. Endemic in the Baltic, where native salmon stocks are immune, it reached Norwegian rivers via local hatcheries which had received Swedish fingerlings, with devastating results, and has since been detected throughout much of continental Europe. The parasite can live for some time in damp conditions, and stringent cleaning and disinfection of fishing tackle and clothing used abroad are necessary to prevent its ingress into the United Kingdom.

## **How have Salmon stocks changed over the years?**

All around the North Atlantic, stocks have been in general decline over a number of years. Some stock components, such as early-running or 'spring' fish, have suffered particularly badly. Actual stock levels are difficult to estimate, except on rivers with reliable counting facilities, but catch figures can be used to give an indication, particularly of trends.



### **How do Salmon navigate?**

Salmon navigation is one of the marvels of nature. While the full answer is not yet clear, a number of mechanisms may guide salmon at sea. These include guidance by the stars as well as use of receptors sensitive to local differences in the earth's magnetic field. Ocean currents may also play an important role. Near the coast and in the rivers, salmon are guided by a chemical memory which apparently allows them to recognise and home to substances, including pheromones, present in the water in very minute traces.

### **How big can a Salmon grow?**

Atlantic salmon can grow to a very large size and the biggest, which have reached up to around 70lbs (32kg), are usually caught in Norway and Russia. However, some very large fish have been recorded in Scottish rivers. It is generally accepted that the largest one caught on rod and line in the UK was taken by Miss Georgina Ballantyne in the River Tay in 1922: it weighed 64lbs (29kg). There is an 1891 report of a huge salmon of 70lbs, also caught in the River Tay, but on this occasion in a net.

### **Do Atlantic Salmon have a worldwide distribution?**

No. Except for the land-locked varieties, they are naturally limited to the waters of countries bordering on the North Atlantic Ocean and Baltic Sea. The following countries presently have Atlantic salmon, in varying numbers: Canada, Denmark, England and Wales, Faroes, Finland, France, Greenland, Iceland, Ireland, Norway, Poland, Portugal, Russia, Scotland, Spain, Sweden, United States.

### **What is the largest Atlantic Salmon ever recorded?**

The largest recorded Atlantic salmon, a male caught in Norway's Tana River, weighed 35.89 kg. and was over 150 cm. in length.

### **How high can a Salmon jump?**

The highest jump a salmon has been known to make in Scotland is a vertical one of 12ft (3.7m) at the Orrin Falls in Ross-shire. The height a salmon can achieve depends upon the relative depth of the water at the foot of the fall and the position of what is referred to in engineering terms as the "standing wave" or hydraulic jump.

### **Time course of the salmon's acclimation responses?**

The behavioral (drinking or not drinking) and physiological changes a salmon must make when moving from fresh water to salt water — and vice versa — are essential, but cannot be accomplished immediately. Thus, when a young salmon on its seaward journey first reaches the saline water at the mouth of its home stream, it remains there for a period of several days to weeks, gradually moving into saltier water as it acclimates. During this time, it begins drinking the water it's swimming in, its kidneys start producing a concentrated, low-volume urine, and the NaCl pumps in its gills literally reverse the direction that they move NaCl (so that they're now pumping NaCl out of the blood and into the surrounding water).

Likewise, when an adult salmon is ready to spawn and reaches the mouth of its home stream, it once again remains in the brackish ( i.e. less concentrated than full-strength sea water) water zone of the stream's mouth until it is able to reverse the changes it made as a juvenile invading the ocean for the first time.

### **What is osmoregulation?**

Osmoregulation is the control of the levels of water and mineral salts in the blood. All fish which migrate from fresh water to salt water during their life cycle must go through this process.



The salmon is an excellent osmoregulator. However, like virtually all osmoregulators, the salmon is never in true equilibrium with its surroundings. In the ocean, the salmon is bathed in a fluid that is roughly three times as concentrated as its body fluids, meaning that it will tend to lose water to its surroundings all of the time. And, because the composition of its body fluids is so different from the ocean water, the salmon will be faced with all manner of gradients that are driving exchanges that will continuously tend to drive its body fluids' concentration and composition beyond homeostatic limits. In particular, the very high concentration of NaCl (sodium chloride) in the ocean water relative to its concentration in the salmon's body fluids will result in a constant diffusion of NaCl into the salmon's body. Unless dealt with effectively, this NaCl influx could kill the salmon in a short time. In sum, a salmon in the ocean is faced with the simultaneous problems of dehydration (much like a terrestrial animal) and salt loading.

However, in fresh water, the problem is basically reversed. Here, the salmon is bathed in a medium that is nearly devoid of ions, especially NaCl, and much more dilute than its body fluids. Therefore, the problems a salmon must deal with in fresh water environments are salt loss and water loading.

### **How Does The Salmon Solve Its Osmoregulatory Problems?**

Fortunately, the salmon has some remarkable adaptations, both behavioral and physiological, that allow it to thrive in both fresh and salt water habitats. To offset the dehydrating effects of salt water, the salmon drinks copiously (several litres per day). But in fresh water (where water loading is the problem) the salmon doesn't drink at all. The only water it consumes is that which necessarily goes down its gullet when it feeds. Of course, when an ocean-dwelling salmon drinks, it takes in a lot of NaCl, which exacerbates the salt-loading problem. Kidney function also differs between the two habitats. In fresh water, the salmon's kidneys produce large volumes of dilute urine (to cope with all of the water that's diffusing into the salmon's body fluids), while in the ocean environment, the kidneys' urine production rates drop dramatically and the urine is as concentrated as the kidneys can make it. The result of this is that the salmon is using relatively little water to get rid of all of the excess ions it can.

### **When do Salmon leave the river?**

The young fish, now called "smolts", leave the rivers during the late spring. Most will be gone by June.

### **Where do smolts go?**

Smolts are believed to move in schools while heading off to deep-sea feeding areas. While the best-known feeding locations are in the Norwegian Sea and the waters off Southwest Greenland, there are known to be many other sub-arctic feeding areas. Salmon that remain at sea for more than one winter undertake the longest migrations, but grilse tend not to travel beyond the Faroe Islands and the southern Norwegian Sea.

### **How many eggs does an Atlantic Salmon deposit?**

Female salmon in most areas produce 450-750 eggs per pound of body weight but the number may rise, for example in Iceland, to 900.

### **What are the Salmon's natural enemies?**

At different life stages, the principal predators of salmon are goosanders and red-breasted mergansers, cormorants, gulls, pike, pollack, cod, sharks, seals and otters.

### **What does anadromous mean?**

The Atlantic salmon and sea trout is referred to as being anadromous because of its habit of migrating from the sea into fresh waters to spawn. This is the exact opposite of the common eel which leaves fresh waters to spawn in the Sargasso Sea, and is therefore called catadromous.



### **Can male and female Salmon easily be identified?**

When they arrive fresh from the sea it is difficult to distinguish the sex of salmon externally. Later the head of the male becomes elongated and grows a protuberance called a “kype” from the tip of the lower jaw. At this stage male and female are easily distinguished.

### **Is the growth of salmon farming significant for wild Salmon and Sea Trout stocks?**

Farmed salmon production in the North Atlantic area has increased dramatically, particularly in Norway, but also on the west coasts of Ireland and the Scottish Highlands.

A number of problems have resulted, which include:

- High concentrations of sea lice, which multiply in the confined conditions of sea rearing cages. As explained earlier, migrating sea trout and salmon smolts can be very vulnerable to attack by these lice. In some rivers, wild stocks have virtually collapsed.
- Escapes of farmed fish, which are known to be able to interbreed with wild fish. Since stocks in individual rivers are locally adapted to optimise their survival, this interbreeding has been shown to reduce the fitness of wild stocks for their local environment.
- Pollution of the water environment, by uneaten food, fish faeces, or medications used to treat farmed salmon in their cages.
- The risk of the spread of disease or parasitic infestation, such as Infectious Salmon Anaemia and *Gyrodactylus salaris*.

### **What is a Salmon smolt?**

Salmon remain in their natal stream as parr for one to three years before becoming smolts, which are distinguished by their bright silvery colour with scales that are easily rubbed off. It is estimated that only 10% of all salmon eggs survive to this stage. The smolt body chemistry changes, allowing them to live in salt water. Smolts spend a portion of their out-migration time in brackish water, where their body chemistry becomes accustomed to life in the ocean via the process of osmoregulation.

### **What do Salmon feed on in the sea?**

The salmon feed on a variety of small fish including capelin, herring, sand eels and sprats and the larger animals found in plankton, especially surface-living crustaceans.

### **When do the Salmon’s eggs hatch?**

The incubation time depends upon the water temperature. Hatching usually occurs in early spring and the young fish (called “alevins”) remain in the redd for a few weeks., nourished by the attached yolk sac. When they emerge from the gravel in April or May, they are about one inch in length. As they grow, the young fish develop prominent markings on their sides and are then known as parr.

### **What should fishermen look out for particularly in connection with any salmon or sea trout they catch?**

Biologists who work with salmon and sea trout often mark the fish that pass through their hands in any of the ways depicted below. Capture of a marked salmon should be reported at once to the appropriate fishery authority. Frequently the address is on the tag or mark. Usually the information required is: date, place and method of capture; length, weight and sex of fish and a sample of scales taken from between the dorsal and anal fins at above the lateral line.

### **How long do young Atlantic Salmon stay in the river before migrating to sea?**



This is dependent upon the water temperature and the availability of food. The length of stay varies very much, from one year in the southern portion of the salmon's range to five or more years in the more northern, colder regions.

### **How long do Salmon stay at sea?**

They remain in the ocean from just over a year to three or four years. Salmon feeding off Greenland generally stay at sea for two or three years.

### **Where are the Salmon's eggs deposited?**

They are laid in depressions called "redds" excavated by the female fish in the gravel of the river bottom. After the eggs are deposited they are immediately fertilised by an accompanying sea-run male, and often by mature male parr, and then covered with gravel by the female.

