

Life Cycle of the Atlantic Salmon

By **John Quinn MSc IT**, Published on November 26th, 2009

The life of the Atlantic salmon is precarious, relatively short and characterised by an unremitting struggle to survive against predation. From the moment it hatches right through to adulthood, the salmon in order to develop has to run the gauntlet of fish eating aquatic creatures and marine dwelling predators including gulls, cormorants, pike, pollack, cod, sharks, seals and otters. Having per chance reached adulthood, 90% to 95% (*The Atlantic Salmon Trust*¹) of salmon do not survive their first spawning. As a species survival strategy this seems fraught but perhaps the ostensibly indiscriminate slaughter of so many individuals is an indispensable price to pay for the endurance of the species as a whole.

Atlantic salmon spend their juvenile phase in the river before migrating to the sea to develop and grow. To complete their life cycle, they must return to their river of origin to spawn. Fish with this life cycle are called anadromous. In contrast fish that begin their life in the sea and migrate to rivers to spawn are catadromous; the eel is an example of this.

Spawning

Spawning typically occurs in the headwater and tributary streams of rivers. The migration to suitable habitat may start up to a year before spawning takes place in autumn and winter. During this period, salmon cease to feed preferring instead to direct their efforts solely to reproduction. Usually the female salmon will excavate a depression in the gravel with her tail, and deposit her eggs into this. One or more males discharge sperm over the falling eggs to fertilize. The eggs are then covered with gravel to a depth of several centimetres by the female. The parents then leave the eggs in the nest or and there is no further parental care.

Eggs

The eggs or ova begin developing right after fertilization, and will hatch after approximately 180 days at normal water temperatures. The eyes of the fertilized orange pea-sized eggs will become apparent in January to February, before hatching in March-April.



Alevins

Hatched fish are called alevins and have a yolk sac attached to their bodies from which they will feed until they develop fins to enable them to navigate and maintain their position in the fast flowing water.



Fry

These small fish must rise to the surface of the water to take a gulp of air with which they fill their swim bladder, giving them neutral buoyancy. This makes it easier to swim and hold their position in the water column. This so called swim-up period is crucial to survival as it exposes the young to dangerous predators for the first time. Once they begin to swim freely, they are called fry. Their survival is also temperature dependant and heavily prejudiced by predation and the struggle for food.



Parr

Fry quickly develop into parr with vertical stripes and spots for camouflage. They feed on aquatic insects and grow for one to three years in their natal stream. Once the parr have grown to 10-24 cm in body length, they undergo a physiological pre-adaptation to life in seawater while still in freshwater, by smolting. In addition to the internal changes in the salt-regulating mechanisms of the body, the appearance and behaviour of the fish also change. The smolts become silvery and change from swimming against the current to moving with it. This adaptation prepares the smolt for its journey downstream to the oceans.



Smolts

In spring, large numbers of smolts leave Irish rivers to migrate north along the slope current into the rich feeding grounds of the Norwegian Sea and the greater expanse of the North Atlantic Ocean. Here they feed primarily on fish such as capelin, herring and sand eel. As they grow fewer predators are able to feed on them. Their rate of growth is therefore essential to survival.



Adult Salmon

Some Atlantic salmon, called grilse will reach maturity after one year at sea and return to their river in summertime weighing from 1 to 4kg. If it takes two or more years to mature, the salmon will return considerably earlier in the year and larger at 3 to 15kg - becoming a highly prized fish for the angler but also a very rare one. Salmon exhibit a remarkable homing instinct as a very high percentage of them are able to locate their river of origin using the earth's magnetic field and the chemical smell of their river and pheromones or chemical substances released by other salmon in the river.



Having spawned, the salmon are referred to as kelts. Weakened by not having eaten any food since their arrival in freshwater and losing energy in a bid to reproduce successfully they are vulnerable to disease and predators. Mortality after spawning can be significant, especially for males but some do survive and commence their epic journey again. In exceptional cases, some Atlantic salmon are known to have spawned up to three times.

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Conclusion

The Atlantic salmon is a resilient though naive creature; conversely the sophisticated homing instinct combining chemistry and odour is intriguing. Notwithstanding this; it seems simplistic to observe that the predilection for reproduction of the male salmon to the exclusion of all else ultimately causes its downfall. Were the salmon to give equal weight to the pursuit of food, the species would perhaps be more successful. Food intake at this critical stage might well provide the strength to withstand predation and the endurance to migrate once again to the sea. The juvenile salmon is not so lucky and has no option but to endure the many hazards in an epic journey of up to 5000km ending in almost certain death. The lucky 5% or so will live to do it all again and the life cycle of the Atlantic salmon will continue.