



A Backgrounder from

Atlantic Salmon Federation

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EUROPEAN STRAINS of Atlantic Salmon found by ASF in a New Brunswick River - *Questions & Answers*

1. Why should we worry about European strains of Atlantic salmon in North American rivers?

Wild Atlantic salmon are experts at adapting to local conditions. They precisely return to their river of origin after ocean feeding migrations of several years duration and thousands of kilometers distance, to spawn with other fish from the same river. These fish live their freshwater life in the environmental characteristics of their home rivers, and through natural selection genetically adapt to them. Thus in Canada the fish have evolved to survive very cold winters, and short growing seasons. By contrast, fish from Europe are adapted to much warmer conditions and longer growing seasons. Should European strains of fish escape to the wild in Canada and begin to interbreed with Canadian fish, the resulting juveniles will not have the best suite of genetic adaptations possible for surviving in North America. This could contribute to declines in already stressed North American salmon populations.

2. How do we know these are European strains of Atlantic salmon? Is this the first time they have been identified here?

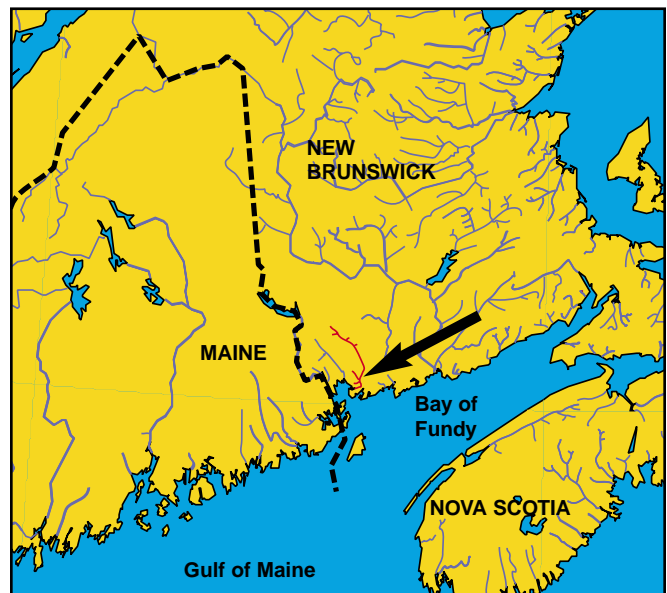
The DNA of European and North American salmon differs, and is routinely used by scientists to differentiate the fish from these two continents. ASF used DNA techniques to examine the fish from the Magaguadavic River. This is the first time ASF has tested for European strains, and the first time they have been found in a Canadian East Coast river.

3. How were these salmon discovered, and where were they actually found?

The fish ASF tested were all captured in the Magaguadavic River, which enters Passamaquoddy Bay, New Brunswick, near St. George, NB. ASF tested wild fish (30 smolts heading out to sea from fresh water; 58 adults returning from the sea), and escaped farmed smolts (35) and adults (53). The farmed smolts in the river escaped from one or more of the three commercial hatcheries within the watershed producing fish for the salmon farming industry. The escaped farmed adults had left sea cage sites, and were captured while entering fresh water in the river.

Adult fish, both wild and escaped farmed fish, must pass through a fish ladder on the Magaguadavic River in order to enter fresh water. All adults are trapped, examined, and sampled.

Smolts (both wild and farmed) in the river are sampled at two locations. Near the head of the tide, ASF captures them in a live trap placed in the fish bypass channel for the St. George hydroelectric facility. The second trap is a "smolt wheel" located at Lee Settlement, about 15 km upstream from the river's junction with the ocean.



Map showing location of the Magaguadavic River in south-west New Brunswick, and flowing into the Bay of Fundy.

None of the wild fish ASF tested showed any signs of European ancestry. By contrast, four of the escaped farmed fish had some level of European ancestry. Two farmed smolts, and one farmed adult appeared to be hybrids of European fish with North American parents. One "postsmolt", a fish that had left a river in the spring but returned in the autumn of the same year for spawning, seemed to be largely, if not wholly European in origin.

4. What does it mean when the term European strain is used?

These are Atlantic salmon which have evolved in rivers in

Europe, and which have a characteristic DNA pattern that is typical of fish from European rivers and differs from DNA patterns of fish from North America.

5. Are there real differences between salmon from Europe and North America?

Atlantic salmon from Europe and North America are the same species, but they have different genetic characteristics. This is similar to the situation with domestic dogs that are of one species, but a Labrador retriever is very different from a dachshund.

6. How did the European strains of Atlantic salmon first get to North America?

Occasional wild stray Atlantic salmon from Europe may have entered North America instead of returning to their home rivers after their ocean migration, but this is believed to be rare. Otherwise we would not see the genetic differences we observe between the Atlantic salmon from the two continents.

When Atlantic salmon farming began in Norway in the 1970's, wild fish were removed from a number of European rivers, and an artificial breeding program established in order to create good performing domesticated strains of salmon for the culture industry. Salmon farming began in North America in the late 1970's and early 1980's. Some of these European strains were brought over for use in the USA East Coast industry. While importations are no longer occurring, fish of European ancestry from the initial importations are still under culture.

7. How did these European strains get into the Magaguadavic River, and who in particular might have been responsible?

All these European ancestry fish escaped from fish farms. In the case of the adult and the post-smolt that entered the river from the sea, they could have originated from a farm anywhere in the Bay of Fundy region, including the salmon farming operations in Northern Maine. The two smolts must have escaped from a hatchery in the Magaguadavic watershed.

The characteristics that confirmed them as hatchery fish included the presence of eroded fins. In addition, these smolts were aged about 1 year or less. Wild smolts are never less than 2 years in this part of the wild Atlantic salmon's range.

8. Does their presence in the Magaguadavic River indicate laws have been broken?

The NB Government has full responsibility for granting sites, and the only strain of salmon authorized for commercial salmon culture in New Brunswick is Saint John River (NB) strain.

In Maine, European strains were initially legally imported for use in their industry. The National Marine Fisheries Service now has a strong regulatory position against any use of European strains. But while the importations have been stopped, fish of European ancestry continue to be cultured in Maine.

The National Academy of Sciences noted in its recent report on the genetics of Maine wild salmon that growers have lost track of these European origin fish. It is conceivable that fish believed to be of Saint John River strain imported into Canada from the USA have unknowingly been hybridized with European strains. No matter how it came about, the growing of salmon with a European genetic component in New Brunswick breaks regulations.

9. Can we expect the European strain salmon to increase, both within the Magaguadavic, and in other North American river systems?

If these fish are, as we believe, poorly adapted to wild North American river conditions, then they will probably not increase. However, if they breed with wild North American fish, they could contribute to declines in local wild populations because the hybrid progeny will not survive. This would be bad for the already depressed river systems.

10. What should we do to address issues raised by the presence of Atlantic salmon of European genetic origin?

Lines of salmon presently being raised in commercial hatcheries in Canada can be screened for the presence of European-ancestry fish, and they can be eliminated before they move out to sea cage sites. Sterilization of all fish used in sea cage sites would stop the interbreeding of escaped farmed salmon with wild salmon. Better procedures to keep fish from escaping from cages and hatcheries will also reduce the danger of hybridization.

In Maine, the tolerance for European strains is rapidly fading. Permitting by the U.S. Corps of Engineers stipulates that no European strains will be grown, and enforcement of this provision is being stepped up. In the captive broodstock program for the endangered Downeast river populations, some European genes were present due to escapes. Any fish with European genes is being culled from this program. The presence of European genes in Maine rivers now is seen as a very important issue.

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