

# ATLANTIC SALMON



**A**tlantic salmon are anadromous, or “sea-run”, meaning adults return from sea to “run” up their natal rivers to spawn. Over time, some populations have become “landlocked” and complete their life history entirely in freshwater. Wild, hatchery-reared and farmed forms of both anadromous and landlocked varieties have ecological, economic, cultural and recreational value.

## Wild

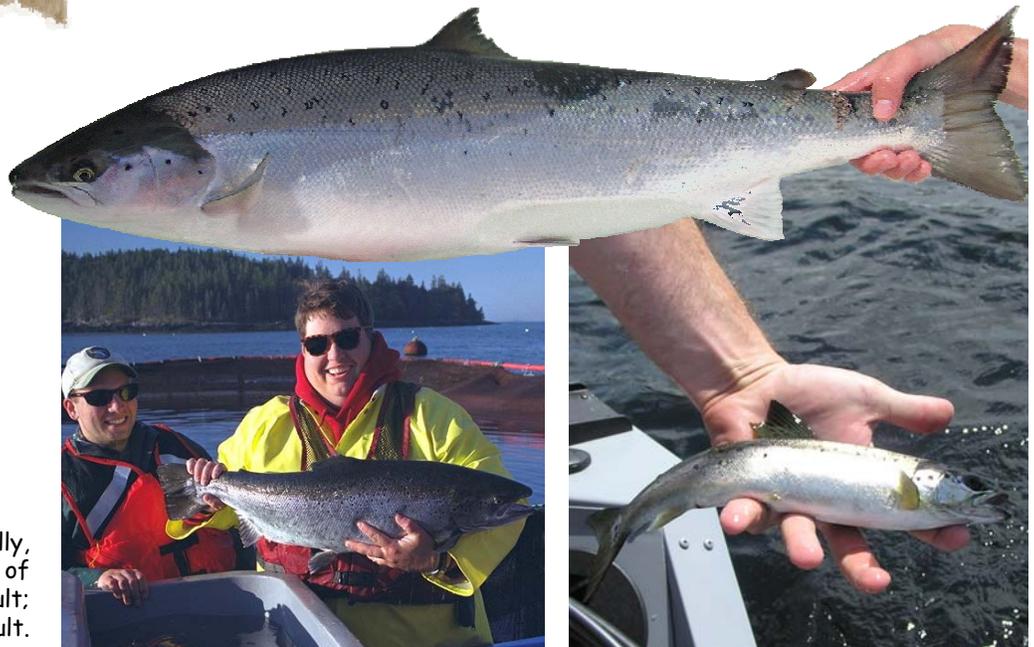
The wild anadromous stocks that inspired the title “King of Fish” are now scarce. State and federal agencies, as well as non-governmental organizations, are working to recover wild Atlantic salmon. A truly wild individual is a link in an unbroken chain of ancestors that all completed their entire life cycle under natural conditions. Today, a more practical definition is an individual that spends its entire life cycle (from egg to adult) in its natural environment and whose parents were naturally spawned and reared as well.

## Hatchery-reared

State and federal conservation hatcheries intervene in certain phases of the natural life history of Atlantic salmon to help prevent genetic extinction of wild anadromous forms and create/enhance recreational fishing opportunities for landlocked salmon. Fish raised in conservation hatcheries are released (stocked) into their natural environment.

## Farmed

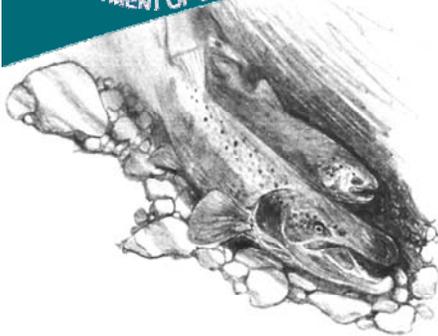
Over the past several decades, the “farm raising” of anadromous Atlantic salmon for food has expanded globally. As farmed salmon are raised from egg to adult in captivity, natural selection for survival in the wild has been replaced by domestication. Domesticated forms are now widely available, arriving fresh to markets and restaurants from commercial aquaculture sites off the coasts of Maine, Canada, Norway and now even Alaska and Chile.



**Clockwise from above:** historically, wild forms inspired the title “King of Fish”; a wild adult; a landlocked adult; a farm-raised adult.



## ANADROMY: *IN FOCUS*



Anadromy has numerous advantages, most notably enabling the use of a variety of habitat types and food sources. However, adults are susceptible to over-fishing both at sea *and* when they return to freshwater to spawn. Anadromous fishes are also very vulnerable to habitat fragmentation. At various stages in their development, in-stream barriers can impede migration or general movement between the different habitat types they utilize.

Despite efforts throughout New England to sustain wild anadromous salmon (starting as early as the mid-1800s), local and regional extinctions are increasingly common. This suggests that present rates and forms of environmental changes are exceeding the ability of Atlantic salmon to adapt.

Fortunately, Atlantic salmon show a remarkable degree of resilience, a trait that fosters optimism in the face of long-standing declines and local/regional extinctions. Recent studies also suggest that Maine's distinct population segment still possesses substantial levels of genetic diversity, thanks in part to conservation hatcheries.

### • Typical life history of U.S. Atlantic salmon

*Unlike their Pacific Northwest counterparts, Atlantic salmon are capable of spawning more than once. Adults spawn in late autumn and eggs are buried under 5-8 inches of gravel in redds (areas of disturbed gravel in flowing riffles that contain multiple nests).*

*Due to the Northeast's cold winters, eggs incubate slowly and do not hatch until March or April. Alevin, or sac fry, remain hidden in redds until they deplete their yolk sacs in mid-May. They emerge as fry and begin feeding on aquatic insects. As fry grow, they develop lateral "parr" markings for camouflage (individuals in this life stage are called parr). Parr typically inhabit flowing stretches until they undergo a transformation called smoltification that prepares them for life at sea.*

*Smolts migrate seaward from late April to early June, reaching Newfoundland and Labrador by mid-summer. Spending their first winter south of Greenland, they take advantage of productive feeding grounds and enter adulthood at sea. The majority spend two winters at sea.*

*Not all individuals follow this life history to a tee. For example, some male parr opt to stay in freshwater rather than migrate to sea. While these "precocious" parr are smaller and less able to compete with big males that have returned from sea to spawn, they avoid the dangers and uncertainty associated with life at sea. Likewise, a small percentage of adults return to spawn after only one sea winter; others return to spawn after spending three winters at sea. Adults that have stayed at sea longer grow larger and are more attractive as mates when (and if) they return.*

### Recovery hinges on creating opportunities for diversity.



Survival is a game of tradeoffs. Life history flexibility, or *plasticity*, is a bet-hedging strategy that ensures at least some members of a population will persist through the entire range of environmental circumstances, including those that are particularly unfavorable.

In addition to mending critical ecological linkages between freshwater and marine environments, small and large efforts that restore habitat accessibility and/or suitability will create more opportunities for natural selection to operate and specialization occur. This is the cornerstone of diversity and the foundation of recovery.

*The Northeast Salmon Team (NEST) is comprised of Northeast Regional Office (NER) managers and Northeast Fisheries Science Center (NEC) scientists. NER administers NOAA's Programs in the Northeastern United States to manage living marine resources for optimum use while NEC is the research arm of NOAA Fisheries in the region that plans, develops, and manages a multidisciplinary program of basic and applied research.*

*Please visit the NEST website at: <http://www.nefsc.noaa.gov/salmon/>*