



Navigating the Challenges of First Feeding in Atlantic Salmon

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DESCRIPTION

Embryonic development is a mesmerizing and complex process that marks the beginning of life for various organisms. Among these, the Atlantic salmon (*Salmo salar*) stands out as a species with a remarkable phase from egg to fry. The early stages of an Atlantic salmon's life are particularly delicate and essential for its overall survival. The Atlantic salmon, a species native to the North Atlantic Ocean, undertakes an extraordinary life cycle that involves both freshwater and saltwater environments. These fish are anadromous, meaning they migrate from freshwater rivers to the open ocean and then return to freshwater to spawn. The success of the Atlantic salmon life cycle begins with the development of its eggs. The life cycle of Atlantic salmon begins when adult fish migrate upstream to spawn in freshwater rivers. Female salmon, or hens, deposit their eggs in carefully chosen gravel nests called redds. The male salmon, or bucks, fertilize these eggs externally. Once fertilized, the eggs undergo a series of developmental stages that are highly sensitive to both genetic and environmental factors. The first stage of embryonic development is cleavage, where the fertilized egg undergoes rapid cell division, forming a blastula. During this process, the genetic material from both the mother and father combines, laying the foundation for the unique traits of the individual salmon. Gastrulation follows cleavage, and during this stage, the blastula transforms into a gastrula. This transformation involves the formation of germ layers, the ectoderm, mesoderm, and endoderm, which give rise to different tissues and organs in the developing embryo. The precision of this process is for the proper development of the salmon's body plan. As the gastrula continues to develop, neurulation takes place, marking the beginning of nervous system formation. The neural tube, which eventually becomes the spinal cord and brain, starts to develop. The proper development of the nervous system is essential for

the salmon's sensory and motor functions, influencing its ability to navigate its environment and respond to external stimuli. The subsequent stages of embryonic development involve organogenesis, where the major organs and structures begin to take shape. The heart, liver, and other vital organs form, setting the stage for the future physiological functions of the salmon. During this period, the developing embryo is particularly sensitive to environmental conditions, including water temperature and quality, which can significantly impact the health of the developing salmon. One of the most critical stages in the development of Atlantic salmon eggs is the eyed stage, typically occurring around 30 days to 60 days after fertilization. During this phase, the eyes of the developing embryos become visible as pigmentation develops. The eggs are highly sensitive to disturbances at this stage, and any adverse environmental conditions may result in deformities or developmental issues. Hatching marks the point where the developing salmon embryos transition into alevins, with the yolk sac still attached. The alevins remain within the protective layer until they absorb the yolk sac and become fry, ready to embark on their journey downstream. Hatching is a vulnerable stage, and the survival of the alevins is influenced by factors such as water flow, temperature, and the availability of oxygen. As the fry emerge from the gravel and begin their downstream migration, they enter the first feeding stage. At this point, the fry transition from relying on yolk sac reserves to actively seeking and consuming food. The availability of suitable prey and the quality of the freshwater habitat become vital factors influencing the survival and growth of the young salmon. Smoltification is a physiological process that prepares the young salmon, now called smolts, for the transition from freshwater to saltwater. This stage involves changes in body coloration, osmoregulation mechanisms, and adaptations to marine environments. The timing of smoltification is sensitive to environmental cues, and disruptions can affect the success of the smolts' migration to the open ocean.

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