

## The Fish in the Forest: Salmon and the Web of Life

By Dale Stokes, Photographs by Doc White. 2014. University of California Press, (California-Princeton Fulfillment Services), 1445 Lower Ferry Road, Ewing, NJ, USA, 08618. 159 pages, 29.95 USD, Cloth.

“The story of the Salmon Forest is a story of the interconnectedness of the sea and land and a fish that has evolved and become entwined in a landscape, a story that serves as a metaphor for all of life on earth.”

These lines set the tone for Dale Stokes’ book on the natural history of salmon and their environment in the north Pacific. In just under 150 pages, Stokes describes in careful detail how the ‘King of Fish’ is an important ecosystem engineer in the forests of the north Pacific, particularly the coasts of British Columbia and Alaska. He does so with a tangible passion that sometimes edges into reverence – Stokes clearly loves this fish, and uses this book to tell us why we should too. *The Fish in the Forest* is not short on scientific terminology – we’re treated to a whole host of Latin species names and biological details. But Stokes’ obvious excitement for the subject saves it from being a dry textbook – it feels more like listening to a passionate teacher lecture on his favourite topic, for example: “Taken from the Latin, *semelparous* means ‘begotten once,’ a reference to their lyrical existence: they die soon after they reproduce.”

Stokes routinely sees the poetic in everything, which can get a little grating at times and overly anthropomorphic. Female salmon sound heroic when he describes the final stages of their life cycle: they “invest their last metabolic energy in egg production and in guarding their nests until they become too weak and battered to hold their position in the current, and they drift away to die.” All technically true, but the language almost makes the salmon sound like martyrs – not the most apt analogy, as fish do not have the power of free will. Still, Stokes’ writing style makes for a very enjoyable and informative read. The full colour photographs by Doc White are definitely assets – my favourites are the underwater shots of glistening salmon. White’s photos bring to life the whole Salmon Forest, from delicate riparian vegetation to ancient cedars towering over gravely creeks, and powerful apex predators to gelatinous fish eggs.

Stokes begins this story by precisely defining key terms and addressing basic questions: What is a fish, a salmon, the Salmon Forest? For the most part, all fish are aquatic, poikilothermic (a fluctuating internal body temperature) vertebrates with gills. There are five species of salmon that frequent the Pacific Northwest: large Chinook (up to 50 kg); vibrantly striped Chum or Dog; small and abundant Pink; Coho or Silver, which spend the most amount of time in freshwater; Sockeye, the ‘fish of fishes’, with the longest spawning run and the ability to battle raging rapids head on, and the fresh water variant Kokanee, which live their entire life cycle in landlocked streams and lakes. The Salmon Forest is defined geographically as the coastal forests

from northern California through to British Columbia and Alaska, and across the Pacific to Russia, Japan and Korea.

In chapter 2 we learn about the life cycle of the salmon, and the biological traits that set these fish apart and contribute to their special role in the forest. Two of the defining traits of salmon are semelparity and anadromy. Semelparous organisms die after one reproductive cycle, and invest all of their metabolic energy into the survival of their offspring. Anadromous fish migrate upstream to spawn, either from marine to freshwater environments, or further upstream if they are exclusively freshwater species. In salmon, this ensures that valuable marine nutrients are brought into the forest systems surrounding freshwater streams. These really are fascinating fish – their ability to return to their natal streams is particularly incredible, and it’s believed that tiny particles of magnetite in their skulls act as a sort of compass to guide them home, in a process called olfactory homing – not dissimilar to the experiences of migrating birds.

In chapter 3 we learn about how the very small – the isotope signatures in salmon flesh – impact the environment in a large way, leaving their mark throughout the entire forest ecosystem. Since the development of the mass spectrometer, scientists are able to trace a species’ isotope signature through the environment. In this case, salmon flesh leaves a distinct trace of marine-derived nutrients, which has been found throughout the Salmon Forest, from the needles of giant cedars to the bones of coyotes.

Entitled ‘Salmon Gestalt’, chapter 4 covers several concepts of ecological study, including the niche theory, trophic levels, food webs and keystone species. At first it seemed unnecessary to discuss the history of ecology, but by the end of the chapter it was interesting to see how Stokes linked the study of salmon to the study of all life.

After defining the salmon and how we might see its signature throughout the Salmon Forest, Stokes uses chapter 5 to look at the natural history of the diverse flora and fauna that call this ecosystem home. Of particular interest are the examples of plant and insect phenology that are tightly linked with the salmon life cycle, such as the case of the blowfly and kneeling angelica (*Angelica genuiflexa*). The riparian angelica blooms approximately ten days after salmon spawning begins, when adult blowfly are around to pollinate their flowers. After feeding on the blooms, the blowflies lay their eggs in the recently spawned salmon carcasses. Stokes demonstrates how the forest is dependent on an indescribably complex series of relationships between predator and prey, biogeochemical cycles and biotic/abiotic

interactions. There is simply no way to understand the whole by prying apart the individual threads.

The concluding chapter brings us full circle, and discusses the role of salmon as ecosystem engineers, inevitably leaving their mark on every aspect of the forest landscape in the Pacific Northwest, including the people that call the region home. Although Stokes does not go into great detail about recent ecosystem destruction, it is certainly implied that although resilient, these species and this environment are nonetheless vulnerable to our rapacious appetites for salmon, and our unfortu-

nate habit for resource exploitation. It's almost impossible to quantify the importance of a keystone species like the salmon, but according to Stokes, "if we truly valued the intrinsic worth of the salmon as a part of the Salmon Forest, perhaps we'd realize that we can't afford to exploit them – and we wouldn't want to."

I would certainly recommend this book to anyone interested in natural history, and the beauty of the intricate connections between a fish and its forest.

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