

Pacific Lamprey (*Entosphenus tridentatus*)

It is the mosquito of the fish world, but unlike the insect which has the good manners to depart after a meal, the Pacific Lamprey stays around, hanging on with its jawless, toothy mouth. Small wonder that fisheries managers paid it little attention for so many years. Lacking the appeal of a salmon which, aside from feeding behavior, its lifestyle resembles in many ways, and thus as not exploited as the salmon has been, the Pacific Lamprey continued to swim the seas and return to the rivers. Yet even without intensive fishing its numbers declined. Unable to jump and swim like salmon, the lamprey's efforts to navigate altered rivers were most often futile. Adding to the stress, when its return journey to its natal river begins, the Pacific Lamprey releases its hosts, and thus its food source. Lacking sustenance for up to a year during this homeward migration, with each passing arduous day the lamprey's weight decreases, until at last, with a final burst of energy, the exhausted fish reaches its destination and spawns. Its mission fulfilled, the jawless Pacific Lamprey collapses, passing on the remains of its diminished body to the living organisms of its birth home.

Lacking scales, gill covers, and bones, Pacific Lamprey are members of the Petromyzontiformes order and the Petromyzontidae family, a moderate sized group that includes 43 species in 8 genera, most of them native to the Northern Hemisphere temperate oceans. The family name means "stone" ("petra") and "to suckle" ("myzo"), in reference to the parasitic lifestyle.

The Pacific Lamprey ranges from Japan, across the Pacific Rim, and down the coast to Baja California. Averaging approximately 16 inches (41 cm) in length, and weighing less than a pound, with records of 30 inches (76 cm) and 17 ounces, this is a moderate-sized lamprey. By contrast one of the largest, the Sea Lamprey (*Petromyzon marinus*), can measure 47 inches (120 cm) in length while the



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smallest lamprey, the Miller Lake Lamprey (*Entosphenus minimus*), is typically less than six inches: this freshwater lamprey was at one time considered extinct after intentional poisoning in its home range.

Pacific Lamprey spend most of their lives as toothless larvae less than six inches in length. Eyeless, these tiny creatures burrow into muddy substrates, often in the presence of many other larvae, where in calm waters they feed patiently for up to five or six years, munching, as much as their jawless mouth

allows, on algae and detritus from other organisms. Why they spend so long in their freshwater hatching place is a puzzle, as caloric intake cannot be much (hence a slow growth rate), and predation is always a danger. The wide ocean where they can feed on other sea creatures and grow to more than a foot in

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length seems a more appealing, less hazardous lifestyle. And although the adult female can lay 100,000 eggs before she succumbs, most of her offspring will not survive beyond the larval stage.

For, as with salmon which the spawning habits resemble, the Pacific Lamprey is a semelparous, anadromous fish, meaning it spawns once in its lifetime and dies soon after release of eggs and sperm. Yet time as an adult is only one-to-three years, a residence much less than the length of its larval stage, and the many months required for a return to freshwater also implies a limit on size. What possible evolutionary advantage can there be in existing without teeth or eyes for so much of their time on Earth?

Some researchers suggest that lamprey larvae may have had perfectly good, rounded eyes and teeth as well in the distant past. If so, those features were lost, as development occurs only after the long blind sojourn on freshwater river and lake bottoms. It doesn't take long by comparison to those quiet years to become a juvenile, complete with eyes, teeth, and a sucker-like mouth. Now the second phase of life begins as the growing lamprey makes its way downriver to the saltwater, feeding on small fish, trying out its teeth and mouth in traveling towards the ocean; here destiny dictates a life as a fluid-sucking parasite. Mammals as large as sperm whales provide nourishment, but fish, including salmon, are more often the prey.

As for danger to the lamprey in its marine home, sharks, sealions, and other large predators undoubtedly find the fatty old fish quite delicious, and against the attack of a large animal a lamprey can offer little defense.

At sea, the Pacific Lamprey is bluish-black or green in color, with a pale underside. When the right size is attained, or perhaps a triggering mechanism such as a certain number of months spent at sea, lampreys, like salmon, answer the primordial call to breed, and so begins the long return to freshwater streams and rivers. While the lamprey swims landward, it lets go of its host, ceasing to feed altogether. Without sustenance, a long drain begins on its stored resources, as the return to freshwater can consume a year of their lives. And when they enter a river mouth or estuary it is not necessarily the same one where they were born. Rather than site fidelity, Pacific Lamprey adults are apparently attracted by pheromone-like compounds released by ammocoetes, the stream-bound larvae. This tendency to choose based on chemicals implies that the lamprey is genetically well-mixed.

Entering a stream or river, typically between March and July, the tired, depleted Pacific Lamprey begin the spawning process. Unlike the salmon, in which the female alone constructs the nest (redd), both the male and female lamprey scour a depression, sometimes moving good-sized rocks, often with their sucker-like mouths, now put to a much different purpose. The redd tends to be rounded, and lacks the tail spill deposits made by salmon. Within a few days after spawning, both adults die, the nutrients of their bodies now contributing to the ecosystem of their freshwater resting place. Within 19 days or so, the new generation is born, a tiny replacement, like its parents destined to spend most of its life nearly invisible, perhaps very close to the redd so carefully constructed by the sacrificial adults.

In their native stream the larvae, if lucky enough to emerge at all from their tasty eggs, will provide nutrition for young salmon, perhaps hatched not far away. And thus, a life story that began perhaps 400 million years ago is repeated by a related, more recently evolved species, yet with a primitive form that hints at their beginnings so very long ago. The family line has withstood extinctions, fluctuations in water temperature, the remaking of seas as continents drifted, and predators that also evolved in response to the dynamic environment. At no time during its long sojourn on Earth, however, did the lamprey and its ancestors deal with the habitat-altering changes that could threaten its future in less than a century.

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Decline and hope

Lacking the interest of the more attractive (from a human point of view) salmon and other fish, the Pacific Lamprey had not until recent years received the awareness and subsequent attention over diminishing numbers and even the possibility of local population extinction in their freshwater homes. Traditionally fished by indigenous peoples in the Pacific Northwest, it was concerned members of several tribes that would sound the alarm over the decrease in lamprey numbers. Impacts that affected salmon, such as dams on large rivers and overfishing, were one of the most obvious factors to scrutinize. Weak swimmers, the undulating motion of the Pacific Lamprey is not sufficient to overcome high velocity waters that salmon may easily navigate.

Thus, the lamprey's reaction to dams, the impact of commercial harvest, dredging, stream culverts, the exploitation of prey fish, and even fish ladders, which are constructed to accommodate the strength of salmon would, in hindsight, indicate an inevitable decline.

Much of the concern and planning for Pacific Lamprey recovery has been conducted by tribes and various federal and state agencies particularly concerned with the reduced populations in the Columbia River. Once abundant like the salmon, the lamprey's decline was also rapid. In the Salish Sea, management plans were also a reaction to the concern over the lamprey, as studies began, and conservation issues were addressed. Documents acknowledge that Pacific Lamprey have not been a "management priority." Sampling of populations raised the concern that this less-noticed creature of the river and sea, like the salmon, was also in peril. Yet in many areas, assessment of populations has not been done, so that by 2019 the surveys were deemed inadequate to determine how threatened the Pacific Lamprey had become. In coastal rivers where more data had been collected, the ancient fish was considered "Critically Imperiled." And most recovery efforts are admittedly linked to those intended for salmon with the hope that the lamprey will also benefit.

At least one sign of hope is present in the free-flowing Elwha River. Since the removal of the two dams on the river in 2011 and 2013, Pacific Lamprey numbers have increased 12-fold. They are particularly common in Indian Creek above the Elwha Dam on the lower river, but some have made their way upriver to Boulder Creek, above the upper Glines Canyon Dam site. Their return is welcomed by many, including the Elwha Klallam tribe, fishery managers, and concerned members of the public. Perhaps their tendency to travel rivers outside their natal home is proving beneficial to the lamprey. In any case, it is a welcome if unexpected return to the once fettered Elwha.

Less appealing in lifestyle or looks than salmon and other swift fish, the Pacific Lamprey nevertheless has played an important role in the health of ecosystems of its native rivers, streams, and saltwater homes. Knowledge of its distribution in the Strait and its rivers will provide an aid to not only local efforts but also to understanding of this culturally important, most ancient denizen of the Pacific waters.