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NORTHWEST WILDLIFE PRESERVATION SOCIETY

Pacific Giant Salamander

Dicamptodon tenebrosus

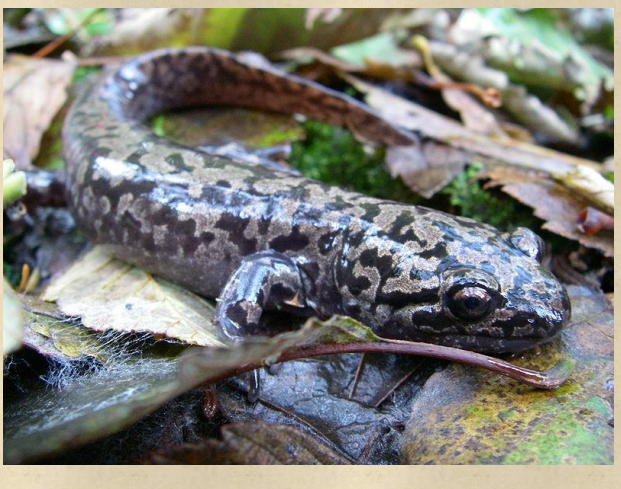

Photo credit: Jeffrey Marsten

By Kathryn Hatashita-Lee

The Pacific giant salamander is the largest terrestrial salamander in North America. Although it lives in a limited area of British Columbia's southwest, the Chilliwack River watershed, this species ranges along the U.S. Pacific coast from Washington to northern California, where it may be known as the Coastal Giant Salamander. Known for its "bark" and its bite if attacked, this amphibian has two phases of life: the larval state in an aquatic environment; and the metamorphosed adult state, in either an aquatic or terrestrial environment. The Pacific giant salamander is an "Endangered Species" in Canada and is on the "Red List" in British Columbia. The B.C. *Wildlife Act* protects the Pacific giant salamander by forbidding its killing, collection, or captivity without a permit.

Characteristics

The Pacific giant salamander can reach a total length of 33–35.5 cm (13–14 in.). The smooth skin of an adult often has a light tan, copper, gold or grey marbling against a dark brown or black ground colour. In British Columbia, the marbling effect is absent from the throat and underside of the limbs. It has four legs and a strong, distinct head with large eyes; it has teeth in both jaws. The tail is not round, but flattened laterally, like an eel, which aids in swimming.

The hatchlings, known as *larvae*, though usually of dull dark brown dorsal colour, can match the colour of their locality. Behind the eyes are light yellow stripes. The gill structure is short, red, and bushy. The streamlined bodies feature low tail fins with black markings.

In appearance, the adult Pacific giant salamander somewhat resembles the California Giant Salamander (*Dicamptodon ensatus)*, found farther south in the U.S. Pacific states with its brown and copper colour. The differences between the two species are physical: the Pacific species is brown and copper, has a smaller head, fewer teeth, and shorter limbs.

Life Cycle

Breeding occurs in spring and fall. The Pacific giant salamander mates as an adult, or as a *neotene*, a sexually mature larva that has not transformed into an adult. The males and females move from their terrestrial habitat closer to the stream headwaters in March–April.

The male courts the female with a nuptial dance. While in the water, the female receives up to 16 of the male's spermatophores through her cloacal lips. The eggs are fertilized internally. The female deposits a clutch of 100–200 eggs, singly side-by-side in a hidden underwater nest site. The nest chamber can attach to submerged logs or rocks.

One or both parents will tend to the eggs until hatching, at about 6–7 months, in September– October. This protection is especially important to prevent larvae and adults from devouring the eggs. The egg has a relatively large yolk that provides the early nutrition. The larvae will use this yolk for two or three months. When they are ready to feed, their teeth grasp the food that is sucked through their mouths. The parents do not tend to the rearing of the young.

The larvae metamorphose to adults in July and August during the second or third summer (at 18–24 months. A cool, well-oxygenated water habitat is essential for this larval period.

The exception to the metamorphosis process is the condition known as *neoteny*. The neotenes can reproduce without transforming into adults. Even without completing metamorphosis to the land stage, they can still attain full length.

As an adult, the Pacific giant salamander is sedentary and rarely seen by humans. In British Columbia, the adult population is about 13,000; the neotenic adult population is about 4500–9000. The adult lives from sea level up to 2160 metres (7000 feet) in elevation.

The survival rate from the larvae state to adulthood is 1–4%. Statistics on the life span of the Pacific giant salamander are scarce. One of the species is believed to have reached the age of 25 years.

Habitat

The Pacific giant salamander, as an amphibian, occupies both aquatic and terrestrial habitats during its life cycle.

During early life, the eggs and larvae occupy cold streams, creeks and lakes with stones and cobbles at the stream bottom. When the young larvae are ready to forage at night, their carnivorous diet can include aquatic and terrestrial insects, such as flies in the water. Larger larvae may eat tadpoles, fish such as sculpins, and even salamander eggs. The larvae in turn can fall prey to fish, snakes, and aquatic and terrestrial creatures. Fishers who fish in mountain streams occasionally catch the larvae.

The transformed adults live in a moist microsite, in nearby dense humid forests with older wood, e.g., British Columbia's southwestern region,and the Coastal Douglas Fir zone. With a voracious appetite, the adult salamanders feed on mammals and other amphibians. Their diet is both carnivore and invertivore, including larval and adult insects, snails, lizards and rodents, snakes and other salamanders.

Behaviour

The adult Pacific giant salamander leads a sedentary life, but can move a distance of 10–50 m (10.8–54 yds.) at a time in a short period of activity. Active at night, during the warm rainy season, the salamander can move across the forest floor, occasionally climb a short distance up the bark of trees, and burrow to a depth of 6 m (20 ft.).

To discourage predators, the salamander goes on the defence by arching its body and lashing its tail. The Pacific giant salamander can vocalize with a bark or a growl from snapping jaws. If threatened, the salamander can bite. Toxic skin secretions offer further protection.

Terrestrial hibernation occurs from November to February. Salamanders become more active in the late winter or early spring. Coinciding with the melting ice on lakes and ponds, the migration from land along damp routes to the aquatic breeding sites follows.

Threats

The Pacific giant salamander has a "Threatened" designation in Canada and appears on the "Red List" in British Columbia. The *B.C. Wildlife Act* protects the Pacific giant salamander by forbidding its killing, collection, or captivity without a permit.

Natural threats include desiccation and predation. When the amount of shade and objects such as logs, and leafy matter that cover the salamanders are reduced, this affects the oxygen and moisture available for dermal respiration. Natural predators include both land and water creatures such as snakes, fish, river otters, weasels, and other salamanders.

Human activity can threaten aquatic and terrestrial habitats through forest management (logging operations, canopy removal, and road construction) and recreational and urban development (such as housing on Chillwack valley mountainsides). Microclimatic changes, increased siltation and temperatures in streams can alter the stream habitat vital for the breeding sites and larvae development. For example, larvae are more abundant in streams near unlogged old growth and mature forests, rather than silted streams in young forests or logged stands. In recreation areas, restocking of gamefish in lakes could impact on the salamander population.

What We Can Do To Help

- Protection of the salamanders' habitat is essential for the continuation of the species. Much of the habitat is within Crown land that includes the old growth management areas that could support a higher density of salamander population. As the salamander generally hides during the daytime under forest debris, preserving these cover objects will help.

- Especially near the small headwater streams, the riparian or riverbank management zones should maintain channel stability and water quality. Ensuring the connectivity of streams and minimizing water diversion and sedimentation from harvesting are also important.

- Industry and the general public should avoid or minimize the use of pesticides and other chemical applications in the habitat.

- Parks and recreation areas offer some protection of the habitat, including the Chilliwack Lake Provincial Park where the large population of Pacific Giant Salamander live. There is a delicate balancing act, however, as the very recreation sites that allow the public to enjoy the outdoors and observe wildlife could also encroach on the ecosystems that support species such as the Pacific Giant Salamander.

Other Interesting Facts

- The salamander has a place in both animal folklore. Salamander translates from Greek as "Fire-lizard" (though it is not a lizard) Folklore attributes the salamander with the ability to survive a fire and even use its skin secretions to extinguish fire. In Chicago, Illinois, relief-carved salamanders adorn the entrance façade of a downtown building, recalling salamanders that survived the Great Chicago Fire of October 8-10, 1871.

- There are over 350 other species of salamander found mainly in temperate regions of the Northern Hemisphere, including most provinces of Canada. The Fire Salamander, species *Salamandra salamandra*, lives in central and southern Europe. Fire Salamanders are sometimes kept as pets or animal models in research.

- Amphibians are a unique group of vertebrates with about 6,000 known species. Although they have existed on Earth for about 300 million years, about a third of the species are threatened worldwide. About 18 species of amphibians are native to British Columbia.

Where & When to View the Pacific Giant Salamander

In British Columbia, the Pacific giant salamander's primary range is the Chilliwack River watershed, about 100 km east of Vancouver and 20 m north of the U.S.–Canada border. It is more widely distributed in Washington, Oregon, and northern California between the coast and the Cascade range.

Sighting an adult salamander is rare, especially during the day when the salamander hides under logs, forest debris and rocks. At night, the salamander takes advantage of low temperatures and high humidity or rainfall to be active on the surface. The salamander's skin requires water circulation for its respiratory gas exchange. By avoiding the day's dehydrating conditions that could prove fatal, the salamander can reduce its water loss.

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Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm 1983 Amphibians and Reptiles of the Pacific Northwest. (Moscow, Idaho: University of Idaho Press).

Orchard, Stan 1984 Amphibians and Reptiles of B.C.: An Ecological Review. (Victoria: Province of British Columbia. Ministry of Forests).

Web Resources:

Amphibiaweb: Comprehensive and very readable information on amphibians, maintained by University of California, Berkeley. Go to http://amphibiaweb.org and search the database for the common or scientific name. Includes photo gallery of Pacific Giant Salamander.

BC Government (Wildlife Branch): "Pacific Giant Salamander" Excellent 6-page general information brochure (1993) with photos. Specific to BC, especially Chilliwack habitat. http://www.env.gov.bc.ca/wld/documents/salamander.pdf

Livingunderworld.org. A non-profit educational site with extensive scientific and conservation information. Home page at http://www.livingunderworld.org/. See for instance the folklore information "Newt and Salamander" at http://www.livingunderworld.org/folklore/

NatureServe Canada: An authoritative national Canadian source (bilingual) for conservation information. It has links to provincial/territorial conservation databases and a national network. A central encyclopedia features more than 65,000 plants, animals, and ecosystems of the United States and Canada, with in-depth coverage for rare and endangered species. http://www.natureserve-canada.ca and link to the database at NatureServe Explorer or http://www.natureserve.org/explorer/

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