

## NORTHWESTERN SALAMANDER

*AMBYSTOMA GRACILE* (BAIRD, 1857)

NATURAL HISTORY SUMMARY BY BENNET BUGBEE

### Classification

**Kingdom:** Animalia

**Phylum:** Chordata

**Class:** Lissamphibia

**Order:** Caudata

**Family:** Ambystomatidae

**Genus:** *Ambystoma*

**Species:** *A. gracile*

### Description

The Northwestern Salamander (*Ambystoma gracile*) can be identified by its dark brown, gray, or black dorsal and lighter brown ventral aspects, costal grooves on the lateral aspects along with a broad head and reduced eyes. Immediately posterior to the eyes are conspicuous parotoid glands that secrete an alkaloid, anti-predatory substance, common among other salamanders. The top edge of the tail is rounded while the lower edge is shaper and appears rougher from the granular glands present. Poison glands are present in both the parotoid gland and in the tail. Adults can grow up to 22 cm. Northwestern Salamanders can either undergo metamorphosis into a fully terrestrial form or remain neotenic (aquatic and retaining gills). This variation in adult body form has been linked to altitude (e.g., higher altitude salamanders metamorphose less frequently and retain the juvenile, neotenic form. The larval form has gills, long toes and a dorsal fin. Initially, larval coloration is typically darker, then ranges from brown to olive or yellow, often with blotches on the dorsal aspect. Terrestrial salamanders can have irregular body markings on the dorsal aspect but that is not a defining feature (Petranka 1998).

### Distribution

The northern limit of the Northwestern Salamander stretches as far north as southeastern Alaska with the southern limit around the Gualala River in Sonoma

County, California. The western edge includes the coast and some islands off of Washington and Canada. Eastward it extends no further than the Cascade mountain range (IUCN SSC Amphibian Specialist Group 2015). *Ambystoma gracile*'s [range map](#) is available at IUCN SSC Amphibian Specialist Group, 2015.

### **Diet**

Hatchlings feed on zooplankton and with growth, larvae will begin to feed on soft vertebrates like annelids, mollusks, flatworms and insect larvae. Terrestrial adults' diet is not well documented (Licht 1973).

### **Habitat and Ecology**

Neotenic forms increase in number as altitude increases while lower altitude adults are mostly terrestrial. For terrestrial species, surface activity typically occurs during wet periods and prior to breeding seasons they migrate from grasslands and mixed forests (near breeding ponds) where they are fossorial, under fallen logs and rocks, in generally moist soil. Aquatic forms typically coexist with larger fish species and some frogs who generally don't predate on the salamanders. A study on responses of the Northwestern Salamander to the removal of nonnative brook trout (*Salvelinus fontinalis*) in Washington Lake (Mount Rainier National Park) showed a large increase in the population of larvae/neotenes and egg masses, especially in the deeper areas. (Hoffman 2004). The Northwestern Salamander populations adapted to the presence of the brook trout and recovered in its absence. Due to the Northwestern Salamander's antipredator adaptations which allow for some flexibility as to where they can live spatially, this has been one of the few amphibian species able to persist with introduced fish. In habitats with fishes, the salamanders are nocturnal and only active in shallow complex areas of the lakes where the fish have trouble feeding. In lakes without fish they are active day and night and can inhabit any area. An enclosure experiment conducted in-situ, aligns with field studies demonstrating that the presence of brook trout with a limited gape size (unable to consume Northwestern Salamander larvae), still have a negative effect on larval growth. (Currens et al. 2007).

### **Reproduction and Life Cycle**

The Northwestern Salamander exhibits an r-selected life cycle, breeding in the springtime, with specific time variation depending on altitude, in aquatic habitats (e.g., small ponds, larger lakes, and pooling areas of streams). Mating is enacted via a courtship ritual with some variation across the geographic range of the species. Depending on the elevation, larvae typically begin to metamorphose in the spring, after 12 to 36 months. Fertilization is internal and eggs are deposited on vegetation. There is substantial plasticity regarding the location of oviposition and embryonic development which typically lasts about 2-9 weeks depending on water temperature (MacCracken 2007). Females oviposit around 40 to 270 offspring reaching sexual maturity in about a year. Hatching success was found to be greatest in intermediate ponds where overhanging shrubs were of greatest abundance; Northwestern Salamanders were thought to cue in on predator abundance by the presence and abundance of conspecifics. Studies with conspecifics, specifically *A. macrodactylum*, show that Northwestern Salamander growth is decreased with increased density of slow-growing conspecifics (Pearman 2002). This was thought to occur due to differing breeding phenology because *A. macrodactylum* develops slower and breeds earlier but is larger in its adult form compared to the Northwestern Salamander. Increased ultraviolet (UV) radiation has also been shown to lower the hatching success of embryos and the growth of the surviving larvae (Calfee et al. 2010).

### **Conservation Status**

Studies regarding population stability have not shown significant declines and the Northwestern Salamander's conservation status is listed as "Least Concern" by the International Union for Conservation of Nature Red (IUCN) List of Threatened Species. Potential threats include clear-cutting, introduced predatory fishes, UV-B radiation, and forest fragmentation from urbanization (IUCN 2015). Conservation efforts are focused on maintaining the forests near breeding areas and minimizing forest fragmentation.

### **Cultural Significance**

The Northwestern Salamander is of little economic or cultural significance. It can cause potential sickness or skin irritation to humans upon consumption or contact.

### **Specimen Specific Detail**

The Northwestern Salamander (*A. gracile*) specimen from the [Burton Ostenson Museum of Natural History](#) at Pacific Lutheran University was collected in 2008 in the Capitol State Forest, southwest of Olympia, in Grays Harbors and Thurston Counties, Washington by the Pacific Lutheran University Vertebrate Natural History class. The specific collector and collection date, were not recorded. It is of darker brown color, with an off-white underbelly and approximately 10 costal grooves along the lateral and ventral aspect of the body (between the forelimbs and hindlimbs). The forelimbs have four finger-like appendages while the hindlimbs have five. The eyes protrude dorsally from the head with a black strip moving posterior on the lateral aspect of the head. No gills appear to be present but the tail seems to resemble more of a transition between a dorsal fin to its terrestrial form.

### Literature Cited

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