# Does *Batrachoseps* Occur in Alaska?

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The Alaska worm salamander, *Batrachoseps caudatus* Cope, 1889, was collected only once, in 1882, on Annette Island, one of the southernmost islands in Alaska (Cope 1889). The species is known from a single specimen (USNM 13561) preserved in the National Museum of Natural History, Washington, D.C. The specimen was sent to the Museum by Lt. H. E. Nichols, in command of the ship "Hassler," which worked in Alaskan waters in 1882. The specimen, supposedly collected at Hassler Harbor on Annette Island, was catalogued into the collections of the National Museum of Natural History along with other specimens of species known to occur in southeastern Alaska, but also with specimens that occur in the vicinity of Mare Island, near San Francisco, California (we are grateful to R. Crombie for providing archival information). A morphologically similar species, the California slender salamander, *Batrachoseps attenuatus* (Eschscholtz 1833), occurs in the vicinity of Mare Island, and a California animal may have been mixed with Alaskan material. The species may not exist in Alaska at all (Wake 1993). However, Lt. Nichols was known to have been careful and precise, and perhaps there has been an inadequate search in this area (Hendrickson 1954; Hodge 1976). While it would seem unlikely that an amphibian species would be endemic in Alaska, recent discoveries have led to suggestions that there may have been Pleistocene refuges, or even an ice-free corridor along the North Gulf Coast of present-day southeastern Alaska (MacDonald and Cook 1997). Accordingly, we decided to make a careful search for these salamanders. Such activity seemed appropriate, given the rapid changes taking place in southeastern Alaska due to forest harvest and other human activities. If there is an endemic salamander in Alaska, care should be taken to make certain that it survives.

Through the courtesy of Jim and Pat Beal of Metlakatla, Alaska, we were able to visit a number of sites on Annette Island between August 4 and August 10, 1996. We failed to find any *Batrachoseps*, although in our collective judgement the environmental conditions for such an occurrence were favorable.

Annette Island consists of two distinct parts. There is a low southeastern peninsula that is the population center for the island, including the village of Metlakatla, a now largely abandoned army camp and large airport, a fish hatchery, dump, radio towers, fish cannery, and boat harbor. The population of the island is something less than 2000 people, all of whom live on this peninsula. The peninsula is relatively flat, with one 150 m hill and many inlets, bogs, and ponds. The remainder of the island is high, rocky, and rough, with a number of old logging roads. The highest point on the island is 1094 m. Rock, most of it Paleozoic (mainly Silurian), dominates the main part of the island; in the north and east portions of the main island upper Triassic and middle to upper Jurassic rocks are exposed (Berg 1972). The youngest rocks on the island are Cretaceous, dated at 87 myr, and these are extremely limited in extent. There is a rich and dense fringing forest around the entire island, sometimes extending well inland. However, the forest is usually not more than a few hundred meters wide, and

often narrower than that. Then the forest breaks up into muskeg in the interior and at higher elevation.

We traveled by boat, stopping at various places and going ashore in a Zodiac. We made brief stops in several areas, but four sites deserve special mention:

1. Hassler Harbor (55°07.75'N, 131°35.00'W), northeast side of Annette Island, between Nedzaheen Cove and Harbor Point. This was our main destination and we spent the largest amount of time here, visiting the area twice. The Harbor itself is small but well protected, and it is easy to see why it was an anchorage for the "Hassler" (which is known to have been here on August 10, 1882; Hodge 1976). It is protected by the very small but forested Pow Island. The forest fringing Annette Island near the Harbor is narrow, but the habitat appears suitable for plethodontid salamanders. The understory vegetation is dense and diverse, and several species of huckleberries (*Vaccinium* spp.) were especially abundant. There is abundant downed timber, some of it well rotted, and loose rocks were abundant along creeks and where the creeks cut through underlying rock, which in this region is upper Triassic and middle to upper Jurassic (Berg 1972). We also worked small talus zones, although they are not abundant in the forested zone where we concentrated our work. The soil was moist and seemingly ideal for salamanders, and temperatures in the shade at mid-day on sunny days reached 21°C.

2. Crab Bay region (55°07'N, 131°22'W), east side of Annette Island. This was among the most favorable habitats we investigated. We spent a full day here. Large cedar, spruce, and hemlock trees occur on a relatively flat base with abundant cover, appropriate for plethodontids. Metamorphosed limestone outcrops are found (upper Triassic in age, Berg 1972), and there are several small caves. We investigated a wide range of habitats, including creek margins and caves. Many of the invertebrate associates of plethodontid salamanders found in Washington, Oregon, and California were present, including snails, slugs, snail-eating beetles, millipedes, and earthworms. We found newts (*Taricha granulosa*) in the creek, and one under a piece of bark.

3. Peninsula north of Annette Bay near landing (55°15.2'N, 131°31.3'W), extreme northwest Annette Island. This was excellent habitat, with some fine forest, notable for the size of the yew trees. The trees were especially large and understory vegetation was dense on the slopes along the north shore of the Bay. However, we did not penetrate very far into the woods (ca. 200 m) before we encountered rock (the entire peninsula is middle or upper Jurassic in age [Berg 1972]) and muskeg. Newts were common in this area.

4. Tamgas Harbor, along the east side on main part of Annette Island, just above Creek Point. This is near the fish hatchery. The forest in this protected area is excellent—large spruce, hemlock, and cedar trees. This is near the southern end of the island, and rocks in the area are all Silurian or older in age (Berg 1972). The habitat appears to be ideal for salamanders, but we found none.

5. Metlakatla Peninsula. This area is highly disturbed by all kinds of activities, especially those associated with the now nearly abandoned airport. There are numerous ponds, and at night we found toads (*Bufo boreas*) to be relatively common on the roads. We did not spend much time in this area because it did not look appropriate for plethodontid salamanders.

Abundant habitat exists on Annette Island for plethodontid salamanders, and many of the animal and plant associates of plethodontids further to the south are found here. For Alaska, the climate is mild, and plethodontids should be able to survive the winters easily. We found two species of amphibians, and local residents described a third, possibly *Ambystoma gracile* or *A. macrodactylum*. However, no one, including good amateur naturalists with whom we spoke, described a salamander that might have been a plethodontid. They were familiar with newts and toads, however.

We are not certain that the "Hassler" spent more than a single day anchored at Hassler Harbor. If it really was as short a time as a day, it seems unlikely that three experienced salamander collectors working under ideal conditions at the same time of the year for five days would fail to find the species. However, we did fail to find one species that local residents described to us, and of course it is risky to make positive statements on negative evidence under any circumstances.

Plethodontid salamanders probably do not occur in Alaska, although they might come relatively close. However, these are not members of the genus *Batrachoseps*, but rather of *Ensatina*. There are no authenticated records for salamanders of the genus *Batrachoseps* north of the Columbia River. Furthermore, the absence of Cenozoic rocks on Annette Island suggests that more recent strata were ground off by Pleistocene glaciers. If so, it is likely that there was no Pleistocene refugium on Annette Island. The limestone outcrops generally are highly degraded and the little exposed limestone that contains caves does not have sufficiently large caves to have formed long-term refuges. It seems unlikely that plethodontid salamanders would have survived the Pleistocene glaciation on this island. The toads and newts have most likely arrived recently. Allozymes and mitochondrial DNA sequences of Alaskan newts are very similar to those from populations from the state of Washington (Tan 1994); this suggests that the newts made it to Alaska after the glaciers receded.

Some parts of southeastern Alaska may have escaped Pleistocene glaciation, and it may be that the specimen in the National Museum of Natural History came from one of these areas and was mislabeled. However, if we admit to the possibility of mislabeling, it seems most likely that the salamander came from the vicinity of the California port of the "Hassler," Mare Island, near Vallejo, Solano County, California. The species *Batrachoseps attenuatus* is common in the Vallejo area, and the holotype of *Batrachoseps caudatus* (which has been examined by DBW) cannot be distinguished from large members of that species.

In summary, we found no plethodontid salamanders on Annette Island, although conditions appeared to be favorable. Given the good conditions and the favorable environment, the fact that three experienced collectors failed to find any *Batrachoseps* seems significant. The geological evidence together with the great geographic separation from other *Batrachoseps* makes it unlikely that the genus occurred on Annette Island in 1882, and the virtual identity of the specimen to members of *Batrachoseps attenuatus* suggests that the holotype is a mislabeled specimen of that species. We conclude by concurring with other authors (e.g., Schmidt 1953) that *Batrachoseps caudatus* Cope, 1889, should be considered a subjective junior synonym of *Batrachoseps attenuatus* (Eschscholtz, 1833).

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