

1. Historical versus Current Distribution.

Mt. Lyell salamanders (*Hydromantes platycephalus*) were discovered accidentally in the summer of 1915 when a male and a female were caught in a single snap-trap set for small mammals high on Mt. Lyell 3,292 m (10,800 ft) in Yosemite National Park, California (Camp, 1916b). For many years they were known only from the immediate vicinity of the park. Later they were discovered to the north at Sonora Pass and to the south at Silliman Gap in Sequoia National Park, but were considered to be restricted to the high southern Sierra Nevada (Adams, 1942). In recent years, isolated populations have been found at Smith Lake, in the Desolation Wilderness west of Lake Tahoe, and on the Sierra Buttes (Feder et al., 1982), near the northern end of the Sierra Nevada in Sierra County, the northernmost locality (ca. 39° 35'N). They have been found as far south as ca. 36° 25'N. The elevational range is from 1,220 m (at the base of Bridal Veil Falls, Yosemite National Park) to about 3,600 m. Salamanders tentatively assigned to this species occur in canyons along the east side of the Sierra Nevada as low as the floor of the Owens Valley (about 1,500 m).

2. Historical versus Current Abundance.

There is no indication that either the size of the range or the density of this species has changed recently. In fact, new discov-

eries continue to expand the known range at regular intervals. A fossil (Late Pleistocene) vertebra belonging to a species of *Hydromantes* was recovered from a woodrat midden found outside the southwestern margin of the range of this species in the lower Kings Canyon at 1,280 m. It may represent this species, and, if so, the range of the species was more extensive in the past (Mead et al., 1985).

3. Life History Features.

A. Breeding.

Reproduction is terrestrial.

i. Breeding migrations. Unknown and unlikely.

ii. Breeding habitat. Likely to be in cracks and crevices below the surface in moist or wet granite talus or in other subterranean cavities.

B. Eggs.

i. Egg deposition sites. Oviposition sites are unknown.

ii. Clutch size. Unknown.

C. Direct Development. Egg deposition has not been observed, nor has development, but its close relatives undergo direct development. Ovarian eggs are enlarged in females collected from late June to early August (Stebbins, 1951). Dates of hatching are unknown, but apparent hatchlings are found in early summer (Adams, 1942).

D. Juvenile Habitat. Unlikely to differ from adult habitat use. The most detailed account of the natural history of this species discusses juveniles, but notes no differences in ecology from adults (Adams, 1942).

E. Adult Habitat. Mt. Lyell salamanders commonly are found in talus slopes of

granite through which water is flowing. Granite boulders that are roughly quadrangular or flat, and resting on granite bedrock that have a thin film of flowing water are favored microhabitats. Favored habitats are downslope from melting snowfields, which persist long into or even through the summer in the high Sierra Nevada. Individuals also are encountered under rocks at the edge of streams; at low elevations, they may be found in direct contact with moist soil under rocks or occasionally under pieces of wood. Salamanders also are found under moss on wet rock faces (e.g., in Yosemite Valley). Usually the collecting sites are in the open, although stream-side localities may be shaded. Most of the range is in the elevational zone historically called "Hudsonian." Gorman (1988) reported that Mt. Lyell salamanders are active at lower temperatures than the other species of *Hydromantes* and that they become inactive as the temperature increases. Body temperatures have varied greatly, from -2.0°C to 11.5°C (mean 5.7°C) in the central Sierra Nevada (Brattstrom, 1963), and from 13.8–17.8°C (mean 15.0°C) on Sierra Buttes at 2,125 m (Feder et al., 1982). In a temperature gradient in the laboratory, specimens preferred 13–14°C (Brattstrom, 1963).

F. Home Range Size. Unknown. Gorman (1988) believed local populations to be small (on the order of 60 individuals) and reported the population on top of Half Dome as consisting of 120–130 individuals, but no supporting data were published.

G. Territories.

Unknown.

H. Aestivation/Avoiding Desiccation. As summer progresses into higher elevations, surface activity is curtailed as the animals move into below-ground microhabitats. Whether they aestivate or simply move away from the surface is unclear.

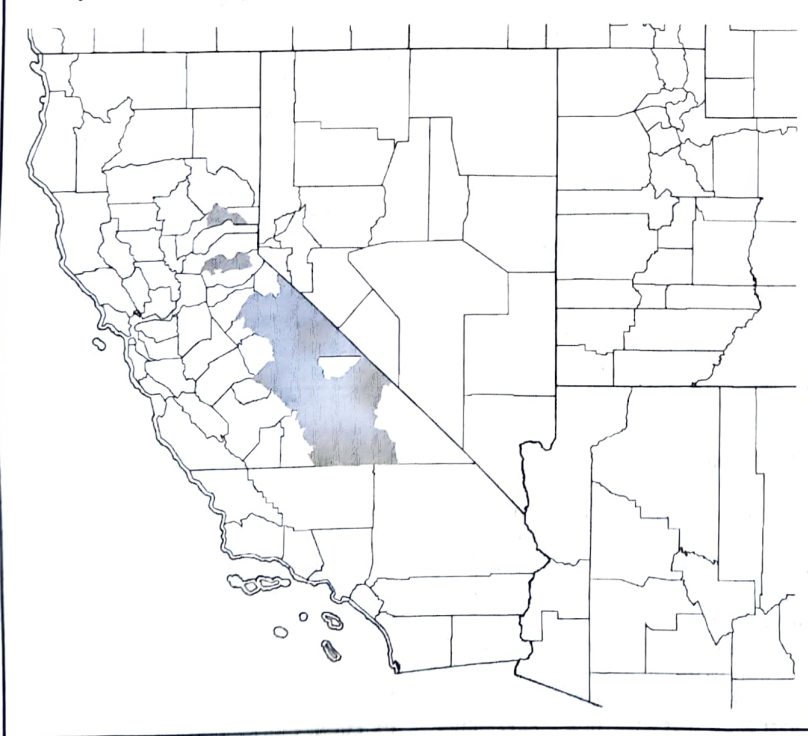
I. Seasonal Migrations. Unknown and unlikely.

J. Torpor (Hibernation). Unknown, but almost certainly occurs at high elevation as snow accumulates and temperatures drop.

K. Interspecific Associations/Exclusions. Unknown. In general, this is the only species of salamander in its range. However, Sierra Nevada salamanders (*Ensatina eschscholtzii platensis*) are known from Yosemite Valley and might be locally sympatric with low elevation populations of *Hydromantes*. At the southernmost localities in the Owens Valley, populations tentatively assigned to this species are locally sympatric with Kern Plateau salamanders (*Batrachoseps robustus*; Wake et al., 2002).

L. Age/Size at Reproductive Maturity. Unknown, but Adams (1942) presents size-frequency histograms for a population from the top Half Dome, Yosemite National Park, and argues that adults are

Mt. Lyell Salamander (*Hydromantes platycephalus*)



survivors of the first 2 yr of growth. He also argues that enlarged maxillary and premaxillary teeth, secondary sexual characters of males of this species, may serve as a guide to size and age at first reproduction, which he believes to be at approximately 2.5 yr of age.

M. Longevity. Unknown, but longer than 3 yr and possibly much longer.

N. Feeding Behavior. Members of this genus have highly specialized tongue projection capability and can project the tongue both far and fast (e.g., Deban et al., 1997). Adams (1942) reported that food includes mostly small, ground-dwelling insects, spiders, and centipedes.

O. Predators. Unknown.

P. Anti-Predator Mechanisms. Adults respond to being handled or being touched with a sharp object by raising the head and tail and depressing the body (Hansen, 1990; Stebbins, 1951). The skin contains toxins that have been reported to produce temporary (about 30 hr) blinding when introduced accidentally into human eyes (Hansen, 1990). García-París and Deban (1995) also reported that the salamanders produced a sticky, noxious secretion that burned the eyes. Adults also respond to simulated predator attacks by coiling the body and tail tightly, forming a spherical body that rolls downhill under favorable conditions (García-París and Deban, 1995). Mt. Lyell salamanders are adept at climbing and maneuvering on wet, sloping surfaces using their webbed feet and employing their short, blunt tail as an aid in locomotion (Stebbins, 1947).

Q. Diseases. Unknown.

R. Parasites. Unknown.

S. Comments. General species accounts have been provided by Stebbins (1985), Gorman (1964, 1988), Jennings and Hayes (1994a), and Petranks (1998). The three species of *Hydromantes* in California are close relatives, based on general similarities in allozymes, albumin (Wake et al., 1978), mitochondrial DNA sequences (Jackman et al., 1997), and morphology (Gorman, 1988, reported results from his unpublished doctoral dissertation), but Mt. Lyell salamanders differ markedly from the other species in occurring at much higher elevations and having more specialized habitat characteristics (being associated with granite rather than limestone).

4. Conservation.

Mt. Lyell salamanders enjoy protected status and appear to be in good condition. Much of their range is in National Parks and Wilderness Areas, so there are few threats from human activities, although road construction in the Sonora Pass region could harm excellent habitat, that occurs near roadside. They are protected as a species of Special Concern by the California Department of Fish and Game and may not be taken or possessed at any time.

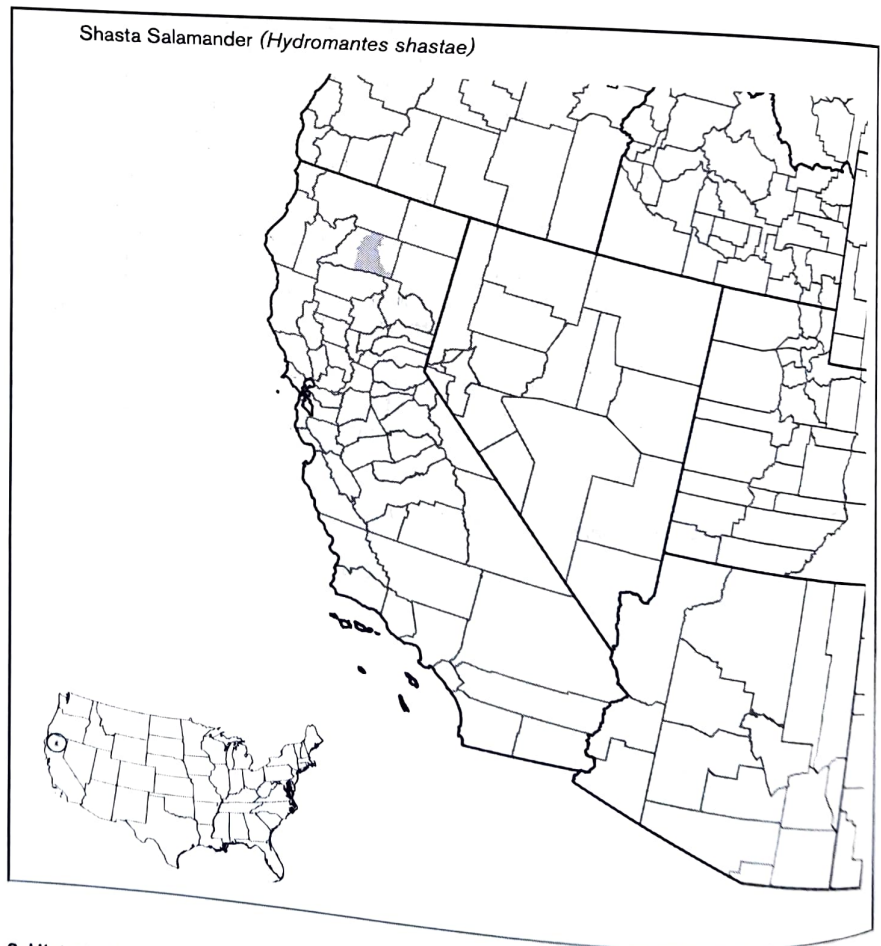
Hydromantes shastae Gorman and Camp, 1953

SHASTA SALAMANDER

David B. Wake, Theodore J. Papenfuss

1. Historical versus Current Distribution.

Shasta salamanders (*Hydromantes shastae*) were discovered prior to 1915 but not described formally until their rediscovery in 1950 (Gorman and Camp, 1953), north of the current Shasta Reservoir in northern California. Subsequently, they have been found in a number of sites in the vicinity of the reservoir, east and west of the Sacramento River, and both north and south of the Pit River arm of the reservoir. However, the total range of the species is <35 km in greatest dimension. The species ranges between about 300 and 900 m in elevation.



2. Historical versus Current Abundance.

There is no indication that either the size of the range or the density of this species have undergone any substantive changes, although construction of Shasta Dam, road building, and mining all have impacted the species in the past. Development, mining, and other human activities continue to threaten the species, but most of the range of the species is on national forest lands that have little timber value.

3. Life History Features.

A. Breeding. Reproduction is terrestrial. i. Breeding migrations. Unknown and unlikely.

ii. Breeding habitat. Caves have been the only sites where eggs have been found (Gorman, 1956); it is not known whether salamanders breed in other areas.

B. Eggs.

i. Egg deposition sites. Egg deposition has not been observed. The only eggs discovered were deposited in a cave (Gorman, 1956).

ii. Clutch size. Gorman (1956) studied two clutches of nine eggs each.

C. Direct Development. Gorman (1956) described late stages of development. Hatching of these clutches would have occurred in late October to early November had the eggs been left where found.

D. Juvenile Habitat. Unlikely to differ from adult habitat use. Juveniles and adults are found together on the surface during the winter.

E. Adult Habitat. Although the species was originally described from a cave and considered to be a cave species, individuals are commonly encountered on the surface from late autumn to early spring. Most populations occur in areas where limestone outcrops occur, and individuals