A New Species of Salamander from Central California

By JOE GORMAN

Following the re-discovery and description of *Hydromantes shastae* (Gorman and Camp, 1953) from Shasta County, California, I became impressed by the edaphic conditions of the habitats of the four known species: mainly limestone caves in Sardinia, Italy[1], and northern California, but granite in the high Sierra Nevada of California. A limestone belt runs northerly on the western slope of the Sierra, at about 1,500-3,500 feet elevation in the "Mother Lode" (gold) country of California. The known commercial limestone deposits in California were mapped from Logan (1947), including caves from the lists of the Stanford University and Southern California Grottos of the National Speleological Society. On a routine trip to Yosemite Valley for ecological data at a new site of *Hydromantes platycephalus*, a stop was made at about the center of a triangle of three such deposits. The habitat seemed likely for *Hydromantes*, sheer walls with mossy cracks and dripping water, and talus. The most unlikely aspect was that this site was on all-year State Route 140 to the Yosemite Valley resorts.

After turning about 30 rocks, I found a juvenile *Hydromantes*. In a few minutes, I found two more, and had reached a point about 25-30 feet up the cliff. Meanwhile my wife searched the base of the cliff, finding a large adult salamander which at a distance I took to be an *Aneides lugubris*. In the laboratory the next morning, the "*Aneides*" was found to be the only adult *Hydromantes* obtained, a seemingly much different member of the genus.

Hydromantes brunus, new species

Type. Museum of Vertebrate Zoology, University of California, No. 59530, a female, collected by Gerry Gorman, February 24, 1952, under a small rock at the base of low cliffs beside State Route 140, 0.7 miles NNE Briceburg (confluence of Bear Creek and Merced River), Mariposa County, California (fig. 1). The elevation at the roadside is 1,285 feet.

Description of the type (measured after preservation). Total length, 105.6 mm.; snout-vent length, 63.9 mm.; tail length, 41.4 mm.; head width, 11.5 mm.; front leg, 16.7 mm.; hind leg, 17.9 mm.; 13 costal grooves, including one each in axilla and groin; adpressed limbs touch but do not overlap; five eggs in right ovary, two in left, averaging about 4.6 mm. in diameter. Color (in preservative), medium brown above, orange-cream below except anterior half of belly, which is gray over liver.

Paratype. MVZ 55939, a male, collected by Robert C. Stebbins, February 27, 1952, under a moss-covered rock on the hillside above the site described for the type. Elevation about 1,450 feet.

Description of the paratype (measured after preservation). Total length, 98.5 mm.; snout-vent length, 63.2 mm.; tail length, 34.4 mm.; head width, 11.6 mm.; front leg, 17.8 mm.; hind leg, 18.5 mm.; 13 costal grooves, including one each in axilla and groin; adpressed limbs

[1]Benedetto Lanza (letter, November 14, 1951) states that these salamanders sometimes occur in sandstone.

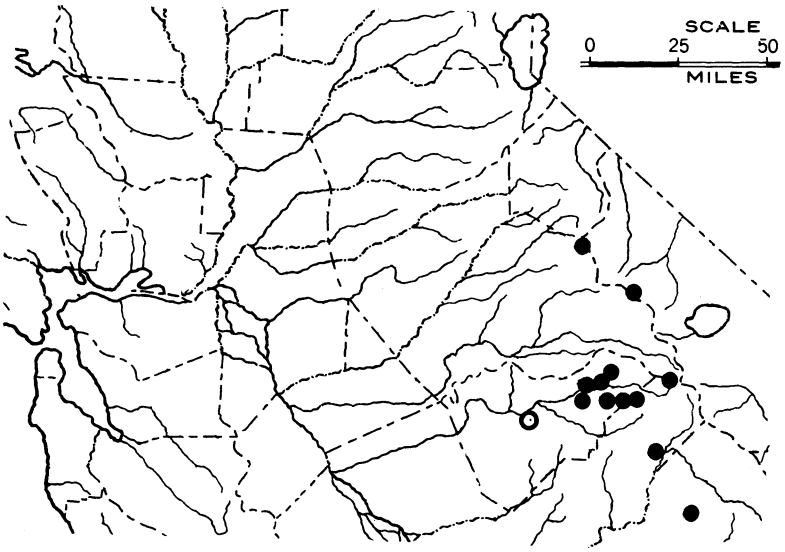


FIG. 1. Localities of *Hydromantes* in central California. Open circle shows the location of *Hydromantes brunus* at 0.7 miles north-northeast of Briceburg (confluence of Bear Creek and Merced River), Mariposa County, California. Solid circles show northern and most of known localities of *H. platycephalus.*

overlap about 1.5 costal grooves. Color, light grayish-brown above, yellowish-cream below.

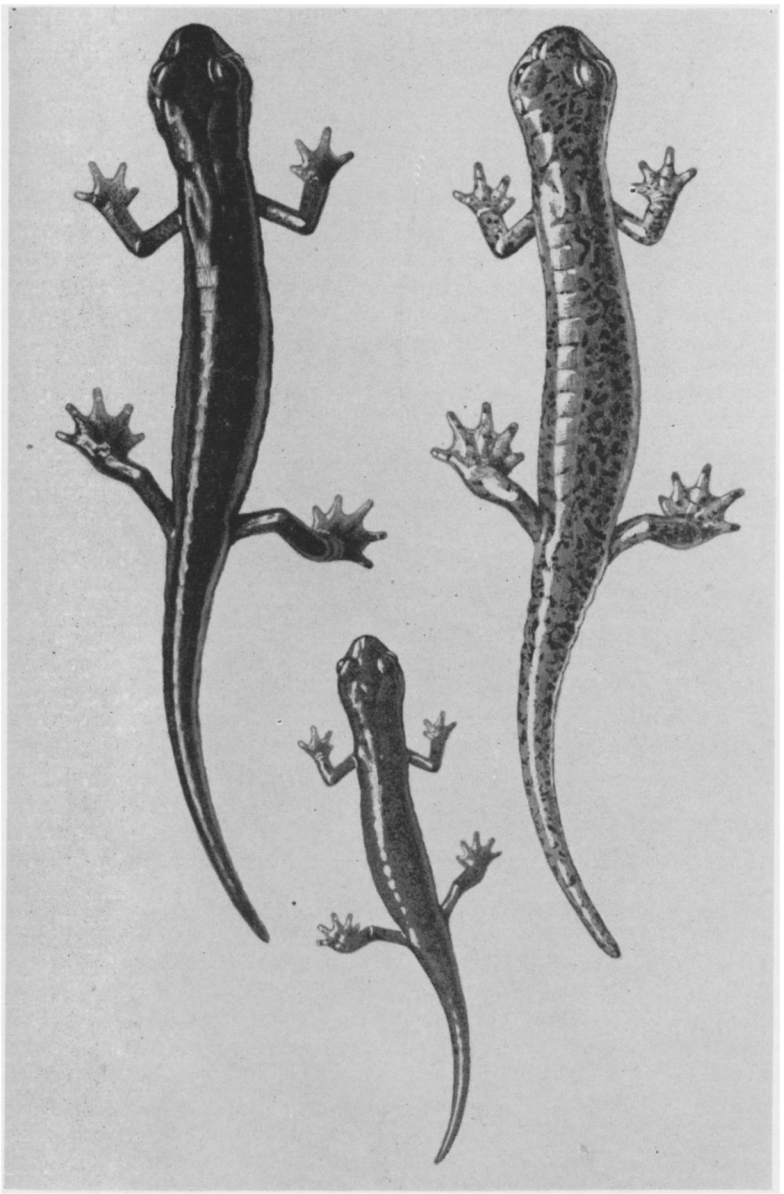
Comparisons. External characters establishing its generic identity (in California) with *Hydromantes platycephalus* and *H. shastae* are: the extensively protrusible tongue with tip a circular disc free all around, parasphenoid tooth patches separated, premaxillary teeth enlarged in adult males, toes blunt with webs extending less than halfway to tips, no palmar tubercles, tail blunt and subcylindrical, often carried free of substratum. The movements of the tail are synchronized with the animal's locomotion as described for *H. platycephalus* by Stebbins (1947).[2] Like *H. platycephalus, H. brunus* moves the tail from side to side, placing the tip on the substrate coincident with alternate movement of the hind legs, or on the down slope side when moving at an angle to the slope.

Adult *Hydromantes brunus* differ from *H. platycephalus* in their greater length. Proportionally the head is longer, eyes larger and less divergent, depth of maxilla greater, head width in males only slightly greater than in females, body less compressed dorsoventrally, tail and limbs much longer, and feet much larger with slightly less webbing between the toes.[3] Color differences are extreme (Pl. 1).[4]

[2]Tail movements were also described by Procter, 1921, for *H. genei.* She, however, considered the tip of the tail a tactile sense organ.

[3]The statistics upon which these statements are made concerning the morphology of species of *Hydromantes* will appear in a more comprehensive report.

[4]Illustration by Robert C. Stebbins.



PL. 1. Color differences between *Hydromantes brunus* from the type locality, 0.7 miles north-northeast of Briceburg, Mariposa County, California, and *H. platycephalus* from 3 miles west of the summit of Sonora Pass, Tuolumne County, California. Both adults are males. The juvenile, greenish in life, is the young of *H. brunus*. Measurements of snout-vent length of the individuals shown were, left to right, 64 mm., 31 mm., and 66.3 mm.

Hydromantes brunus adults almost entirely lack the bright guanoid coloring which gives *H. platycephalus* a mottled ash-gray, greenish-gold, to dull tawny or tan-beige color. Melanophores are extensively distributed, yielding a uniform light to dark brown dorsal coloring, lacking completely the varied chromophore[5]-melanophore patterns present in all other known species of the genus. Young, especially yearlings, of *H. brunus* differ markedly from the adults, and in some aspects of coloration seem intermediate between adult *H. platycephalus* and *H. brunus*. Like the adults the young also have weak development of melanin. In this respect they are readily distinguishable from young *H. platycephalus*. They have considerable guanoid coloring of silvery to greenish-gold. The latter color occurs where the guanoid chromophores are overlain by what appears to be a greenish yellow lipoid pigment. In resume, it seems that the basic color differences from *H. platycephalus* are the absence of the chromophore-melanophore pattern, ontogenetic loss of guanoid color, and the weak development of melanin.

Hydromantes brunus differs from *H. shastae* in its larger size. Proportionally, it differs from the latter in its longer tail, greater head width, smaller eyes, flattened head and body, shorter snout, and lack of a definite canthus rostralis. The feet are less webbed than in *H. shastae* and the toes are less blunt but longer. Color differences are analogous to the differences described for *H. platycephalus* and *H. brunus*.

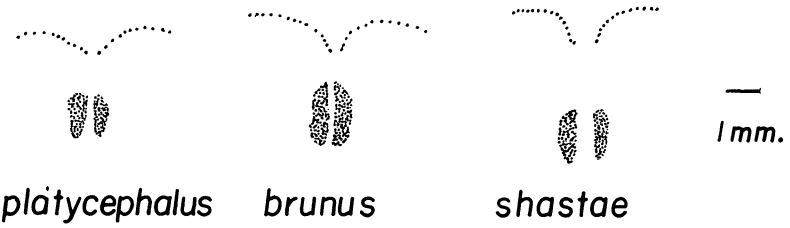


FIG. 2. Typical tooth patterns of California species of *Hydromantes*.

The typical tooth patterns of the California species of *Hydromantes* are shown in figure 2. The vomerine tooth rows of 10 *H. brunus* have 11-18 teeth on each side. Those of *H. platycephalus* have 9-18, and those of *H. shastae* 10-21 based on 10 individuals each. The rows do not meet in the midline and are less arched than in the other species. The premaxillary teeth of the male (not shown) are not so elongate in *H. brunus* as in *H. platycephalus* but more so than in *H. shastae*. The parasphenoid tooth patches in *H. brunus* are larger, less definite in shape, approaching but not meeting in the midline.

Habitat. The Briceburg habitat, the only known one, is an indistinct draw on a northeast slope, ending at cliffs formed mainly by a road cut. The hillside is chiefly limestone with numerous outcrops; however, the rocks at the base of the road cut are slate. Structurally, this habitat lacks the sheer walls of that of *Hydromantes platycephalus* or the cliffs and caves of *H. shastae*. I am reminded of the hillside sites of Central Ameri-

[5]Non-melanic chromatophores (see Gorman and Camp, 1953: 39).

can salamanders described by Dunn (1926) and Taylor and Smith (1945). *Hydromantes brunus* has been found only in an area not more than 100 yards across and about 1,200 yards along the slope, between 1,285 and 2,500 feet elevation. On several occasions, search has been made in equally likely looking habitats east on State Route 140 into Yosemite Valley.

The habitat is in the Upper Sonoran Life-zone. Digger pine (*Pinus sabiniana*), toyon (*Photinia arbutifolia*), California laurel (*Umbellularia californica*), manzanita (*Arctostaphylos* sp.), chamise (*Adenostoma fasciculatum*), buck brush (*Ceanothus cuneatus*), yerba santa (*Eriodictyon californicum*), Phacelia (sp.), and California wood fern (*Aspidum rigidum*) are the dominant flora, a chaparral association.[6]

Associated amphibians are *Aneides lugubris, Batrachoseps attenuatus* (*Ensatina eschscholtzi xanthoptica* occurs less than two miles south), *Taricha torosa sierrae*, and *Rana boylei*. The first two species occur with *Hydromantes brunus*, often being found at the same time under the same rock. In captivity, *Hydromantes brunus* has eaten *Batrachoseps attenuatus*.

In two years of intensive search for *Hydromantes* throughout California, including areas adjoining the Briceburg locality, I have found only the one *H. brunus* site. A special effort has been made to link *H. brunus* with *H. platycephalus* in Yosemite Valley, 25 miles east. Biosystematic studies of the genus, now nearly completed, suggest that *H. brunus* in some respects may be more generalized than any of the other species and hence (inferentially) the primitive species, represented by a few (or one?) relict populations. Until another population is found, I urge that collecting be done most sparingly. Furthermore, the population is under field study, individuals having been marked for future recognition. A minimum of disturbance is desirable. If marked animals should be recovered, I would appreciate obtaining data concerning them.

I am grateful to Dr. Robert C. Stebbins for his help and encouragement.

[6] I am indebted to the Herbarium, University of California, for aid in identification of plant specimens.

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Neutralization of Snake Venom in Vitro by Serum from the Nonvenomous Japanese Snake *Elaphe quadrivirgata*

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During the author's tour of duty in Japan as an Army Medical Officer, it was learned that in the city of Tokyo there are some 75 snake shops that sell extracts of various organs and tissues of snakes for medicinal purposes. Among these preparations are powdered snake hearts, powdered snake flesh, strong rice wine containing a poisonous snake, and freshly drawn blood from the non-poisonous snake, *Elaphe quadrivirgata* Boie. These preparations are not prescribed and in fact are scorned by the reputable members of the Japanese Medical Profession. They are, however, used by many people in Japan for such a wide diversity of ailments as tuberculosis, heart disease, gastric ulcer, and nervous disorders.

Experimental evidence of the antivenin action of the serum from certain North American snakes (Philpot *et al.*, 1950) together with references to similar experiments using the serum of certain European snakes (Peterson and Koivastik, 1942, 1945; Phisalix, 1927) has previously been published. The present work was performed to test the antivenomous property of serum from the blood of *Elaphe quadrivirgata*.

Materials and Methods

The venoms used were from the North American copperhead (*Agkistrodon contortrix*) obtained through the courtesy of Wyeth, Inc., from Ross Allen's Reptile Institute, and the Japanese Habu (*Trimeresurus flavoviridis*) obtained through the courtesy of the National Institute of Health in Tokyo. These were kept in dry powdered form or frozen in solution of isotonic (.9%) sodium chloride until used.

The specimens of *Elaphe quadrivirgata* were purchased from snake shops in Tokyo. A portion of their tails was cut off and the blood