

The following plethodontids were observed: *Desmognathus wrighti* (2), *D. ochrophaeus* (6), *D. monticola* (6), *D. quadramaculatus* (2), *Gyrinophilus porphyriticus* (4) *Pseudotriton ruber* (28), *Eurycea bislineata* (3), *Plethodon cinereus* (5), *P. yonahlossee* (4), *Aneides lugubris* (2). These were compared with the terrestrial eft stage of the salamdrid *Notophthalmus viridescens* (18). Because the blue food coloring was most obvious on a light ground color most of the observations were on *P. ruber* and *N. viridescens*. All of the specimens were collected in western North Carolina. *Aneides lugubris* was obtained from California.

All plethodontid species examined drew water up costal grooves on the legs, tail, and head (Fig. 1A, B). The costal grooves branched causing the surface area covered to be much greater than that groove. There were also horizontal grooves joining adjacent costal grooves (Fig. 1C). Water transported up the network of grooves in the skin covered most of the surface of the salamanders tested. Water movement in the eft of *Notophthalmus viridescens* followed the fine channels associated with the epidermal granulations (Fig. 1D, E).

Water transport up the skin grooves or canaliculi was most complete and rapid when both salamander and substrate were "wet." Five efts were completely covered after from 3.5-5.0 min and five *P. ruber* were covered in from 2.0-7.0 min when both substrate and animal were wet. All species were covered more slowly when either the animal or substrate or both were dry (e.g. 5 *P. ruber* coverage of 10-25% in 3.0-8.0 min when both were dry).

Salamanders which were not anesthetized were covered more rapidly than those which were. Five anesthetized dried *P. ruber* placed on a wet substrate drew 20-100, \bar{x} = 50% in 3.5-5.75, \bar{x} = 4.45 min and six active *P. ruber* drew 100% in 1-2, \bar{x} = 1.2 min.

The grooves and finely granulated surfaces of salamanders do transport substrate water over that portion of the body not in contact with the substrate. This increased water transport over the skin may allow a salamander to be less restricted in its habitat requirements.

Skin moisture is important in water balance and thermoregulation in various anurans (Dole, 1967; Lillywhite and Licht, 1974) and it is reasonable to assume the same functions in terrestrial salamanders. This is suggested also by the marked changes in skin morphology between terrestrial and aquatic newts in which the skin changes from finely granulated to smooth when they become aquatic.

LITERATURE CITED

- Dole, J. W. 1967. The role of substrate moisture and dew in the water economy of leopard frogs, *Rana pipiens* 1967:141-149.
 Lillywhite, H. B. and P. Licht. 1974. Movement of water over toadskins functional role of epidermal sculpturing. *Copeia* 1974:165-171.

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1977 JOURNAL OF HERPETOLOGY 11(3):372-374

OBSERVATIONS ON ADDITIONAL SPECIMENS OF THE MEXICAN SNAIL-EATING SNAKE, *DIPSAS GAIGEA* (REPTILIA, SERPENTES, COLUBRIDAE)

Since *Dipsas gaigeae* was first described (Oliver, 1937), Peters (1960, 1964) redefined the type and commented on a second specimen, and Harris and Simmons (1967) noted a third, all from the state of Colima, Mexico. The recent acquisition of nine additional specimens extends the known range of this species 130 km north into the state of Jalisco, Mexico, and enables the description of scalation and pattern variation present in this larger sample. Reproductive data and notes on a captive hatched brood are also included.

TABLE 1. Summary of scalation and pattern variation in *Dipsos gaigeae* from new specimens and from literature records (Harris and Simmons, 1967; Peters 1960, 1964). Tooth counts were made *in situ*.

Specimen No.	Supra-labials	Infra-labials	Oculars	Temp-Dorsal orals	Scale Reduction Formulae	Ventrals	Caudals	Snout-vent length (mm)	Tail length (mm)	Maxillary teeth	Dentary teeth	Body bands	Tail bands
Males:													
UMMZ 80221	$\frac{8(3-5)}{7(3-5)}$	$\frac{7(1-4)}{8(1-5)}$	$\frac{0+2}{1+2}$	3+4	$\frac{1+2(5)}{1-2(5)}$ $\frac{1+2(8)}{15-1+2(8)}$ $\frac{13}{13}$	162	71	214	67	10	—	11	4
USNM 160938	7(2-4)	8(1-4)	0+2	3+4	$\frac{1+2(7)}{15-2+3(6)}$ $\frac{13}{13}$	163	67	243	67	—	—	12	5
UAZ 37809	7(3-4)	8(1-5)	0+2	$\frac{3+4}{3+5}$	$\frac{2+3(5)}{2+3(4)}$ $\frac{3+4(6)}{3+4(7)}$ $\frac{13}{13}$	156	68	304	101	—	—	10	4
UAZ 35458	7(3-4)	$\frac{7(1-4)}{8(1-4)}$	1+2	$\frac{3+4}{2+4}$	$\frac{2+3(7)}{2+3(5)}$ $\frac{2+3(12)}{2+3(13)}$ $\frac{13}{13}$	162	65	138	39	—	—	9	3
UAZ 35461	7(3-4)	8(1-4)	0+2	3+5	$\frac{3+4(6)}{2+3(6)}$ $\frac{2+3(9)}{2+3(15)}$ $\frac{13}{13}$	160	67	130	36	—	—	8	3
Females:													
AMNH 82017	7(3-4)	8(1-4)	0+2	3+3	$\frac{1+2(10)}{15-1+2(10)}$ $\frac{13}{13}$	165	58	370	103	—	—	10	3
UAZ 27035	8(3-4)	$\frac{8(1-5)}{8(1-4)}$	0+2	3+5	$\frac{3+4(4)}{2+3(5)}$ $\frac{2+3(6)}{2+3(7)}$ $\frac{13}{13}$	162	58	448	131	—	—	11	4
UAZ 35167	$\frac{8(4-5)}{7(3-4)}$	$\frac{8(1-5)}{9(1-4)}$	0+2	3+4	$\frac{2+3(5)}{2+3(5)}$ $\frac{2+3(11)}{2+3(11)}$ $\frac{13}{13}$	158	58	413	119	$\frac{10}{8}$	4	12	4
UAZ 35459	7(3-4)	8(1-4)	0+2	3+4	$\frac{2+3(4)}{2+3(7)}$ $\frac{1+2(10)}{15-1+2(13)}$ $\frac{13}{13}$	155	61	130	32	—	—	9	4
UAZ 35460	7(3-4)	$\frac{8(1-4)}{8(1-5)}$	0+2	3+4	$\frac{3+4(6)}{2+3(5)}$ $\frac{2+3(10)}{2+3(13)}$ $\frac{13}{13}$	152	53	129	30	—	—	8	3
SRSU 3565	7(3-4)	8(1-4)	0+2	3+5	$\frac{2+3(5)}{2+3(5)}$ $\frac{2+3(8)}{2+3(9)}$ $\frac{13}{13}$	157	60	402	119	4	$\frac{4}{5}$	9	3
SRSU 3611	7(3-4)	$\frac{9(1-4)}{9(1-5)}$	0+2	3+4	$\frac{2+3(5)}{2+3(7)}$ $\frac{1+2(13)}{15-1+2(13)}$ $\frac{13}{13}$	155	60	320	91	4	10	10	5
					157.7	58.3						9.9	3.7
					(152-165)	(53-61)						(8-12)	(3-5)

The five Jalisco specimens (and the brood discussed below) are deposited in the herpetology collection of the University of Arizona (UAZ), and the herpetology collection of Sul Ross State University (SRSU). The new localities for *Dipsas gaigea* are: 8 km NW Cihuatlan on Mex. Hwy 200, 24 July 1967 (UAZ 27035), collected by C. J. Cole and R. L. Bezy; 75 km NW Mex. Hwy 80 on Mex. Hwy 200, 7 August 1972 (UAZ 35167), collected by the author and R. N. Johnson; 39 km NW Mex. Hwy 80 on Mex. Hwy 200, 3 August 1973 (UAZ 37809) collected by the author, P. H. Gegenheimer and T. Greenwood; 16 km NE La Barra de Navidad on Mex. Hwy 80, 18 July 1973 (SRSU 3565); and 42 km NW Mex. Hwy 80 on Mex. Hwy 200, 26 July 1975 (SRSU 3611) collected by D. Miller.

Reproduction.—SRSU 3565 contained three ovarian oocytes measuring 38 mm X 12 mm for the anterior one, 30 mm X 12 mm, and 28 mm X 13 mm for the next two, respectively. On 16 September 1972, UAZ 35167 deposited four eggs. Following recommendations given by Zweifel (1961), the eggs were incubated in a sand medium at a temperature of approximately 23°C. The newly hatched young (UAZ 35458-61) were first noticed on 26 December. They were measured, weighed and preserved on 28 December. These individuals weighed 1.8-2.0 g (\bar{X} = 1.87 g). Other data for the brood are incorporated into Table 1.

Scalation.—Table 1 reviews scalation and pattern data from all known specimens of *Dipsas gaigae* including the three previously reported specimens. The position of the umbilical scar in juveniles is sexually dimorphic, being at the 130th and 134th ventrals in males (UAZ 35458, 35461) and at the 121st and 124th ventrals in females (UAZ 35459, 35460). The caudodorsal scale formulae for the specimens examined in this study also show sexual dimorphism:

Males (4): $\underline{8}$ 3+4 (4-8) $\underline{6}$ 2+3 (16-23) $\underline{4}$ 1+2 (42-59) $\underline{2}$ (65-71)

Females (5): $\underline{8}$ 3+4(3-6) $\underline{6}$ 2+3(10-15) $\underline{4}$ 1+2(42-49) $\underline{2}$ (53-61).

UAZ 35459 has numerous additions and deletions of scale rows between the 36th and 105th ventrals involving the vertebral and paravertebral rows. These result in counts from 13-16 scale rows in this area and are not shown in the dorsal scale reduction formulae in Table 1.

Pattern—The pattern of *Dipsas gaigeae* consists of dark brown to black rings on a light background. Oliver (1937) described the dorsal ground color as "a light reddish color," while Harris and Simmons (1967) called it "light yellowish." The ground color of UAZ 35167 in life was light yellow dorsally and laterally, merging into whitish yellow on the belly.

The most anterior body ring is usually the longest (15-20 scales long, \bar{X} = 18). Succeeding rings decrease uniformly in length to the most posterior body ring (5-11 scales long, \bar{X} = 7.8). The body rings narrow laterally. This characteristic is most evident anteriorly, where the ventral length of the ring is 3-6 (\bar{X} = 4.6) scales less than the vertebral length. Posteriorly, the length of the rings is nearly uniform from the dorsum to the venter. Each dorsal scale of the light interspaces, except those immediately bordering the ring, may be tipped with black. In some specimens, the scales of the anterior most light interspaces lack black tipping, but these scales gain black tips with each succeeding light interspace. The belly color in the light interspaces ranges from immaculate to possessing varying degrees of black stippling, increasing posteriorly. The specimens with the most intense stippling are also those in which the black tipping of the dorsal scale is most prominent. This characteristic is not ontogenetically related, since some hatchlings have much stippling, while others have none. The anal scale is always light in color, even when included in a dark body ring.

ACKNOWLEDGMENTS.—I express appreciation to Michael D. Robinson and John Cross, University of Arizona, for their aid and suggestions, and to Dr. James F. Scudday, Sul Ross State University, for providing specimens. Special thanks are due to Paul H. Gegenheimer, Tom Greenwood, and Randall N. Johnson for their aid with field work. Thomas R. Van Devender read and made valuable comments on the manuscript; Betty Fink edited and typed the manuscript.

LITERATURE CITED

- Harris, H. S. and R. S. Simmons. 1967. Another *Dipsas gaigeae* (Oliver) from the State of Colima, Mexico. *Herpetologica* 23:234-235.
- Oliver, J. A. 1937. Notes on a collection of amphibians and reptiles from the State of Colima, Mexico. *Occ. Pap. Mus. Zool., Univ. Michigan* No. 360:1-28.
- Peters, J. A. 1960. The snakes of the subfamily Dipsadinae. *Misc. Pub. Mus. Zool., Univ. Michigan* No. 114:1-224.
- . 1964. Supplemental notes on snakes of the subfamily Dipsadinae (Reptilia: Colubridae). *Beitrage zur Neotropischen Fauna*, IV (1):46.
- Zweifel, R. G. 1961. Another method of incubating reptile eggs. *Copeia* 1961:112-113.

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1977 *JOURNAL OF HERPETOLOGY* 11(3):374-377

