previously reported for any snake species. Furthermore, I have observed this behavior only among the Texas A&M Research Annex population of western hognose snakes. I am uncertain whether or not these observations represent a general behavioral characteristic of this species or an aberrant characteristic of a local population. I cannot understand the adaptive significance or selective advantage of self-inflicted wounds. However, Klauber (1939) suggested that autohemmorhage in *Phrynosoma blainvillei* (= *P. cornutum*) may deter predation by mammalian predators. McCoy and Gehlbach (1967) suggested that hemorrhaging in *Rhinocheilus* could be a ". . . physiological side-effect of the other presumed defensive behavior [= vibration of tails and elimination of cloacal sacs]." They also suggested that cloacal hemorrhaging in snakes may be a response to stress leading to vasodilation of cloacal tissues. My observations of self-wounding during death feints of *H. nasicus* appear to support this hypothesis.

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EGG RETENTION IN SOME HIGH-ALTITUDE *ANOLIS* LIZARDS.—Developmental rates and survival of reptilian embryos are decreased at low ambient temperatures (Weekes, 1933; Licht and Moberly, 1965; Sexton and Marion, 1974). Viviparity provides one measure of independence from such problems in cold habitats since viviparous females, while regulating their own body temperature, simultaneously regulate that of their embryos. Not surprisingly, the repeated evolution of viviparity in reptiles is strongly centered in regions of high altitude and high latitude (Weekes, 1933; Sergeev, 1940; Neill, 1964; Packard, 1966; Greer, 1968; Greene, 1970). Nonetheless, some high-latitude and high-altitude reptiles are oviparous. Adaptive strategies potentially available to these reptiles include breeding only during the warmest time of year (Gorman and Licht, 1974), incubating eggs (Hutchison et al., 1966), ovipositing in the warmest microenvironments available (Neill, 1964), and retaining eggs in the oviducts until embryos reach advanced developmental stages, thereby reducing the duration of exposure of embryos to low ambient temperatures. Several oviparous reptiles at high latitude or altitude are known to contain eggs with advanced embryos (Weekes, 1933; Stebbins, 1954; Stille, 1954; Anderson, 1962), but no one has correlated the stage of embryonic development in different populations of a single species with altitude. Here I report such data for some *Anolis* lizards (Iguanidae), a genus which is always oviparous.

The anoles of the *A. cybotes* species complex form a distinctive evolutionary and ecological assemblage of several species on Hispaniola. Distributed from sea level to over 2200 m, these lizards are suitable for an examination of the relationship between altitude and egg retention.

I removed shelled eggs from females of several populations in late July and early August of 1974 and recorded the stage of embryonic development (Defaure and Hubert, 1961) within 24 hrs. If high-altitude females do retain eggs until embryos reach advanced stages, then the stage of embryonic development should increase directly with altitude. Using a probability of 0.95 as the minimum level of sig-

TABLE 1. PERCENTAGE OF EMBRYOS OF *Anolis* LIZARDS IN THREE DEVELOPMENT CATEGORIES AS A FUNCTION OF ALTITUDE (N = SAMPLE SIZE; ND = NO EVIDENT DEVELOPMENT; 23 = STAGE 23, SEE DEFAURE AND HUBERT, 1961). Vertical lines connect populations of *A. cybotes* which are homogeneous by STP analysis.

Population	N	Developmental State (%) ND	23	≥23
A. cybotes				
Playa Saladilla (sea level)	17	47.1	52.9	0
Jarabacoa (520 m)	18	38.9	55.6	5.6
Constanza (1150 m)	30	33.3	56.7	10.0
A. shrevei				
Valle Nuevo (2200 m)	13	23.1	30.7	46.2
A. armouri				
road to Furcy (c. 1600 m)	24	33.3	66.0	0

nificance, I analyzed independence among samples with 2-tailed G-tests (R × C and STP; Sokal and Rohlf, 1969).

Stage of embryonic development in several populations of *Anolis cybotes* on Hispaniola is summarized in Table 1. Populations of this species differ significantly ($P < .005$) with a trend toward more advanced embryonic development with altitude.

I also examined eggs from single populations of two additional members of the *cybotes* complex. Embryos of *A. shrevei* from Valle Nuevo, Dominican Republic (2200 m), the highest population sampled, were particularly advanced (Table 1). In contrast, embryos of *A. armouri* from near Furcy, Haiti (c. 1600 m) were not advanced (Table 1). This may reflect the close proximity of Furcy to the Caribbean which would buffer climatic extremes (A. R. Kiester, pers. comm.).

Within some populations of *Anolis* lizards of the *cybotes* species complex on Hispaniola, the stage of embryonic development is correlated with altitude, suggesting that high-altitude females retain eggs until embryos reach advanced stages. Egg retention can be a response which minimizes egg desiccation (Sexton and Marion, 1974). However, since lowland habitats were subjectively much drier than the montane habitats on Hispaniola, this explanation is improbable, despite the lack of short-term weather records from the localities sampled. More likely, egg retention by these high-altitude female *Anolis* is an adaptive response which shortens the exposure of eggs to low ambient temperature, thereby potentially increasing embryo survival.

Acknowledgments.—I thank P. Hertz, A. R. Kiester, P. Licht, J. Stewart, D. B. Wake, M. Wake and E. E. Williams for comments on the manuscript and P. Hertz, R. Holt and E. E. Williams for assistance in the field. Research supported by NSF GB37731X to E. E. Williams, Miller Institute for Basic Research (in Science), and the Museum of Vertebrate Zoology, (University of California, Berkeley).

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NOTE ON THE EMBRYONIC DEVELOPMENT OF THE DUSKY SALAMANDER, *DESMOGNATHUS FUSCUS* (CAUDATA: PLETHODONTIDAE).

Studies of the embryonic development of desmognathine salamanders have been limited to brief field observations (Organ, 1961:202) and one field-laboratory investigation by Tilley (1972), in which he attempted to stage the embryonic development *Desmognathus ochrophaeus* in North Carolina populations.

On 11 July 1975, a brooding female identified as *Desmognathus f. fuscus* (Raf.), the northern dusky salamander, and an egg clutch containing 17 eggs were removed from a large seepage bank above a small stream in the Cuyahoga River drainage in Portage County, Ohio. The condition of the clutch indicated that it had been only very recently deposited. To stage the subsequent development, I have assumed that the clutch was removed within 24 hours of deposition.

The clutch was kept on moist sphagnum moss in an environmental chamber at 14 C and a L:D 12:12 light regime. The clutch was gently turned and rinsed daily in an extremely dilute methylene-blue solution to retard fungal growth. Tilley (1972) noted that laboratory-reared larvae tend to hatch prematurely due to daily handling, and I have no reason to suspect that my larvae are excepted from the suggestion.

In the accompanying table, the embryonic development of this *D. fuscus* clutch is compared with that of nine *D. ochrophaeus* egg clutches found in the vicinity of Mt. Mitchell, Yancey County, N. Carolina, and subsequently staged by Tilley (1972). His clutches were found at an altitude of 914 m, while my clutch was found at 340 m. I have selected these clutches for comparison because they are well described in terms of visible development.

Tilley's Mt. Mitchell clutches were reared at 16 C and ranged from 28 to 57 days of age when collected. Of the seven clutches accurately counted, the eggs numbered from 14 to 23. In addition, Tilley assumed that neurulation occurred at 10 days as a minimum estimate. The *D. fuscus* embryonic development appears to be very similar to that of the Mt. Mitchell *D. ochrophaeus*.

TABLE 1. EMBRYONIC DEVELOPMENT OF ONE CLUTCH OF *D. fuscus* EGGS COMPARED WITH THAT OF NINE CLUTCHES OF *D. ochrophaeus* EGGS.

Stage	Age in days of deposition	
	Portage County, Ohio *D. fuscus*	Mt. Mitchell *D. ochrophaeus*
Neural fold	13–14	10–14
Neural tube	14–15	—
Eye vesicles	15–18	15–17
Prominent rhombencephalon	18–19	—
Tail bud	20–22	19–20
Pectoral limb buds	20–23	19–23
Ectodermal invaginations in the thorax	24–27	—
Dorsal pigmentation begins	24–26	24–29
Pelvic limb buds	26–28	24–25
Eye pigmentation begins	28–30	27–30
Dorsal larval spots	29–31	31–38
Noticeable movements	30–32	—
Limb pigmentation begins	30–32	34–40
Visible heartbeat	30–32	—
Gill buds	31–32	27–30
Branchial arteries	38–40	—
Larval spots on the limb buds	40–43	—
Toe buds	45–47	37–42
Completed dorsal pigmentation	50–55	—
Hatching	70–84	66–74

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TOLERANCE TO HIGH TEMPERATURE AND SALINITY BY TADPOLES OF THE PHILIPPINE FROG, *RANA CANCRIVORA*.

Amphibians as a group are considered to be rather intolerant of temperatures above 38 C,