Autecological Observations on the Endemic Central Chilean Lizard Pristidactylus volcanensis
Author(s): Herman Núñez, Juan Sufan, Hugo Torres, John H. Carothers and Fabian M. Jaksic
Source: *Journal of Herpetology*, Vol. 26, No. 2 (Jun., 1992), pp. 228-230
Published by: Society for the Study of Amphibians and Reptiles
Stable URL: http://www.jstor.org/stable/1564870
Accessed: 26-12-2017 18:49 UTC

dom-floats allowed a greater certainty of hatchling fates; only predation by subsurface predators could submerge condom-floats. Because no hatchling towing a lighted condom-float at night was predated, it is certain that the light source did not increase predation in this group. However, condom-floats prevented hatchlings from making deep dives, which were only observed when turtles towed balsa-floats. This diving behavior may minimize predation by birds and other predators by allowing hatchlings to maneuver underwater. The deep dives we observed when birds or other objects passed over swimming loggerheads were also reported by Frick (1976) for green turtles. Frick also assumed that this behavior was an antipredatory response.

LITERATURE CITED

BUSTARD, H. R. 1979. Population dynamics of sea turtles. In M. Harless and H. Morlock (eds.), Turtles: Perspectives and Research, pp. 523–540. John Wiley and Sons, New York.

FRICK, J. 1976. Orientation and behavior of hatchling green sea turtles (Chelonia mydas) in the sea. Anim. Behav. 24:849–857.

HIRTH, H. F. 1971. Synopsis of Biological Data on the Green Turtle Chelonia mydas (Linnaeus) 1758. FAO Fisheries Snyopsis No. 85.

MROSOVSKY, N. 1968. Nocturnal emergence of hatchling sea turtles: control by thermal inhibition of activity. Nature 220:1338–1339.

RICHARDSON, J. I., AND T. H. RICHARDSON. 1982. An experimental population model for the loggerhead sea turtle (Caretta caretta). In K. A. Bjorndal (ed.), Biology and Conservation of Sea Turtles, pp. 165–176. Smithsonian Institution Press, Washington, D.C.

SALMON, M., AND J. WYNEKEN. 1987. Orientation and swimming behavior of hatchling loggerhead turtles Caretta caretta L. during their offshore migration. J. Exp. Mar. Biol. Ecol. 109:137–153.

STANCYK, S. E. 1982. Non-human predators of sea turtles and their control. In K. A. Bjorndal (ed.), Biology and Conservation of Sea Turtles, pp. 139–152. Smithsonian Institution Press, Washington, D.C.

WITHERINGTON, B. E., BJORNDAL, K. A., AND C. M. MCCABE. 1990. Temporal pattern of nocturnal emergence of loggerhead turtle hatchlings from natural nests. Copeia 1990:1165–1168.

Autecological Observations on the Endemic Central Chilean Lizard *Pristidactylus volcanensis*

HERMAN NÚÑEZ,[1] JUAN SUFAN,[2] HUGO TORRES,[2] JOHN H. CAROTHERS,[3] AND FABIAN M. JAKSIĆ,[2] [1]Sección Zoología, Museo Nacional de Historia Natural, Casilla 787, Santiago, Chile; [2]Departamento de Ecología, Universidad Católica de Chile, Casilla 114 D, Santiago, Chile; and [3]Department of Biology, Cabrillo College, Aptos, California 95003, USA.

The genus *Pristidactylus* (formerly in the Iguanidae, currently in the Polychridae; Frost and Etheridge, 1989) is represented in temperate Chile by four species (Etheridge and Williams, 1985; Lamborot and Díaz, 1987; Veloso and Navarro, 1988). *Pristidactylus torquatus* is the most widely distributed, from 37 to 43°S (including Chiloé Island), and is always associated with cool broadleaf forests (Donoso-Barros, 1966). The remaining three species have very restricted distributions within the aforementioned latitudinal range. *Pristidactylus valeriae* is only found within the *Nothofagus* (austral beech) forest of Cantillana Mountain, to the south of Santiago (Donoso-Barros, 1966). *Pristidactylus alvaroi* is similarly restricted to the *Nothofagus* forest of a single mountaintop, El Roble, to the northwest of Santiago (Donoso-Barros, 1966). The most recently described species (Lamborot and Díaz, 1987), *P. volcanensis*, is known from a single locality, El Volcán, to the southeast of Santiago. Autecological information on the former three species is scant and anecdotal (cf. Donoso-Barros, 1966), and virtually nil on the latter (Lamborot and Díaz, 1987). Here we document information obtained from late spring to early autumn on activity time, microhabitat use, activity field temperature, and diet of *P. volcanensis* from its type-locality.

During the third week of the month, from November 1988 (late spring) through February (late summer) 1989, and from January through March (early autumn) 1990, we made eight one-day field trips to El Volcán (33°49'S; 70°10'W), 60 km SE of Santiago, 1416 m elevation. This locality is in an Andean valley, with sparse scrub vegetation dominated by sclerophyllous shrubs. Daytime freezing temperatures prevail from April to September of each year, and no lizards are generally seen during this period. The area where *P. volcanensis* was most frequently seen was characterized by the presence of medium height (1.5–3.0 m) shrubs of *Colliguaya intergerrima*, *Schinus polygamus*, *Gundilia trinervis*, and *Salix* spp. During each field trip, observations were made by slowly walking along the transect on an hourly basis from 0800 to 2000 h, along the same 300 m transect. For each individual detected, we recorded substrate where perched (before the lizard moved) and time of day. When captures were made quickly (using a hand-held noose), we recorded the lizard's cloacal temperature, the substrate temperature, and the air temperature (2 cm above the substrate) with a quick-reading Schultheis thermometer. Individuals were subsequently sacrificed and

their stomach contents identified under a dissecting microscope.

Sixty-two individuals were observed at the following times of day: six (10%) between 0800–0959 h; 45 (72%) between 1000–1459 h; and 11 (18%) between 1500–1959 h. The activity of *P. volcanensis* thus appeared to be unimodal, centered at noon. Perches used by these same individuals were, in decreasing frequency: shaded rock under or close to shrub (83%); shaded rock crevice (8%); shaded fallen log (3%); on low and shaded shrub branch; on open and shaded ground, and on sunlit rock in the open (2% each). Based on cover measurements made along the same transect we determined that the study area had 28% surface area of the open (unshaded) ground. Thus, it appears that *P. volcanensis* prefers shaded areas for perch sites. This is unlike the two sympatric species of *Liolaemus* (*L. altissimus* and *L. nigroviridis*), which are heliophilic in their behavior, selecting sunny substrata for perch sites. In another behavioral divergence from *Liolaemus* species, *P. volcanensis* responds to the approach of predators (humans) by either standing its ground or making a short, slow movement away. An open-mouth threat, sometimes accompanied by the release of air in a hissing sound, may also occur. Similar behaviors are exhibited by *P. torquatus* (F. Jaksić, pers. obs.).

Cloacal temperatures ($\bar{x}$ ±2 SE) were 26.7 ± 3.0 C for six males, and 28.2 ± 1.7 C for 14 females. These temperatures are not statistically different (Student's t test; $P > 0.50$). Pooling these data with those recorded from 11 unsexed individuals renders a mean activity temperature of 27.8 ±1.2 C for 31 individuals. *Pristidactylus volcanensis* thus is active at substantially lower body temperature than are the two sympatric species of *Liolaemus*, whose mean activity field temperature is 35 C (Fuentes and Jaksić, 1979). Substrate temperature (primarily shaded rock surfaces) where the lizards were captured averaged 27.4 ±1.4 C (n = 28), and air temperature was 27.3 ±1.4 C (n = 28). There were strong positive correlations between field activity temperature of the lizards and both substrate temperature (r = 0.95; n = 28; $P < 0.01$; T_b = 3.4 + 0.90T_s) and air temperature (r = 0.95; n = 28; $P < 0.01$; T_b = 4.5 + 0.86T_a). None of the slopes of these equations differed significantly from 1.0 (Student's t test; $P > 0.50$). Thus, *P. volcanensis* apparently is a thermoconformer once perched on its preferred microhabitat. As noted above, these observations cover only five months of the year (from November to March). However, they represent a substantial part of the activity season of *P. volcanensis* because by April and throughout September freezing temperatures prevail in the locality.

The 31 individuals captured contained 64 prey items in their stomachs (Table 1). Insects were the main prey, particularly beetles; only a few spiders and scorpions were taken. Other items found in each of three stomachs were two rodent feces, *P. volcanensis* skin, and part of the tail of a *Liolaemus* sp. Thus, *P. volcanensis* seems to be an insectivore, in contrast to sympatric *Liolaemus altissimus* and *L. nigroviridis*, which are partly herbivorous (Donoso-Barros, 1966).

It is clear that more information is needed for all species of this poorly-understood genus. At present, no comparative ecological data are available for the

TABLE 1. Numbers of prey identified in 31 stomachs of *Pristidactylus volcanensis* captured during summer in El Volcán, central Chile.

Prey	No.
Insecta	5
Blattaria (adult)	6
Coleoptera (adult)	1
Tenebrionidae	
Nyctopetus sp. (adult)	2
Praocis sp. (adult)	19
Unidentified (larva)	1
Unidentified (adult)	1
Scarabaeidae (adult)	4
Carabidae (adult)	1
Buprestidae	
Ectinogonia buqueti (adult)	1
Diptera (adult)	2
Homoptera	
Issidae (adult)	3
Cicadiidae (nymph)	1
Hymenoptera	
Formicidae (adult)	5
Apidae	
Bombus sp. (adult)	1
Lepidoptera	
Lasiocampidae (larva)	1
Noctuidae (larva)	1
Geometridae (larva)	1
Unidentified (larva)	1
Orthoptera	
Gryllidae (adult)	2
Arachnida	
Aranea (adult)	4
Scorpionida (adult)	1
Total prey	64

remaining three Chilean species. However, the information presented herein indicates that these representatives of the newly-erected family Polychridae appear to differ markedly in physiology and behavior from sympatric members of the family (Iguanidae) with which they were formerly grouped.

LITERATURE CITED

DONOSO-BARROS, R. 1966. Reptiles de Chile. Ed. Univ. Chile, Santiago. 458 pp.
ETHERIDGE, R., AND E. E. WILLIAMS. 1985. Notes on *Pristidactylus* (Squamata: Iguanidae). Breviora 483: 1–18.
FROST, D. R., AND R. ETHERIDGE. 1989. A phylogenetic analysis and taxonomy of iguanian lizards (Reptilia: Squamata). Mus. Nat. Hist. Univ. Kansas Misc. Publ. 81:1–65.
FUENTES, E. R., AND F. M. JAKSIĆ. 1979. Activity tem-

peratures of eight *Liolaemus* (Iguanidae) species in central Chile. Copeia 1979:546–548.

LAMBOROT, M., AND N. F. DÍAZ. 1987. A new species of *Pristidactylus* (Sauria: Iguanidae) from central Chile and comments on the speciation in the genus. J. Herpetol. 21:29–37.

VELOSO, A., AND J. NAVARRO. 1988. Lista sistemática y distribución geográfica de anfibios y reptiles de Chile. Boll. Mus. Reg. Sci. Nat. Torino 6:481–539.

Accepted: 17 January 1992.

Acid Tolerance of Ambystoma texanum from Central Texas

BENJAMIN A. PIERCE AND DAVID K. WOOTEN, *Department of Biology, Baylor University, Waco, Texas 76798-7388, USA.*

A number of recent studies have examined the effects of low pH conditions on amphibian embryos and larvae. These studies have demonstrated that some amphibians, for example ambystomatids, are quite sensitive to acidity while others are relatively tolerant (Freda, 1986; Pierce, 1987; Freda et al., 1991). In a seminal paper that stimulated much of the current work on amphibian acid tolerance, Pough (1976) reported high mortality among *Ambystoma maculatum* embryos from temporary ponds with pH less than 6.0. Laboratory studies of embryos collected in the same area (Ithaca, New York) confirmed the extreme sensitivity of these salamander embryos to acidic conditions (Pough and Wilson, 1977). Additional studies have found that *A. maculatum* from some areas are much more tolerant of acidity (Clark and LaZerte, 1987; Blem and Blem, 1989; Portnoy, 1990).

Harte and Hoffman (1989) found that *A. tigrinum* embryos suffered increased mortality at pH 5.7 and below; they calculated an LC_{50} (condition at which 50 percent of the individuals are expected to die) of 5.6 for embryos of this species. Similarly, Punzo (1983) examined acid tolerance in embryos of *A. texanum* from adults collected in Illinois and observed large increases in mortality between pH 6 and pH 5. Additional studies of acid tolerance in these species have not been reported and thus the extent of intraspecific variation is unknown. This note reports tolerance to low pH of *A. texanum* embryos from central Texas and compares the acid tolerances obtained with values reported by Punzo (1983) for embryos of *A. texanum* from Illinois.

We collected adult *A. texanum* using funnel traps placed in a single temporary pond in McLennan County, Texas on 7–8 January 1991. At the time of capture we observed numerous spermatophores in the pond, but no eggs, suggesting that the salamanders had mated prior to capture. Following capture, we transported the salamanders to the laboratory and placed them in pond water at approximately 5 C for 12–24 h prior to egg deposition.

TABLE 1. The pH of RSW (Reconstitued Soft Water) solutions used for testing acid toxicity. Ending pH was the pH at the end of 24 h periods between solution changes. The average was calculated by converting pH to hydrogen ion concentration, taking the average, and then converting the average back to pH units.

Initial pH	Average ending pH	Ending pH range
7.2–7.8	7.54	7.36–7.75
5.5	6.08	5.91–6.40
5.0	5.45	5.18–5.74
4.5	4.61	4.47–4.82
4.0	4.05	3.99–4.13
3.5	3.57	3.54–3.63

We used three female salamanders to obtain eggs for our acid toxicity tests. Each female was placed in a plastic box containing five gallons of tap water treated with sodium thiosulfate to remove chlorine and cloramines. Twigs and dead grass stalks were placed in each box to provide sites for egg deposition. A male salamander was placed with two of the three females; the third female remained alone. The boxes were then placed in an incubator at 15 C on a 10 h light:14 h dark photoperiod. Overnight, all three female salamanders laid eggs.

Two hours after the first cleavage (approximately 12 h after egg deposition), we removed eggs from the twigs and grass stalks and placed them in test solutions. Test solutions consisted of reconstituted soft water (RSW), which contained 48 mg of $NaHCO_3$, 30 mg of $MgSO_4$, 30 mg of $CaSO_4 \cdot 2H_2O$, and 2 mg of KCl dissolved in one liter of deionized water (Stephen, 1975). Unaltered RSW has a pH of 7.2–7.8 and the pH was adjusted downward by titration with dilute sulfuric acid. Embryos were tested in RSW pH 7.2–7.8, RSW pH 5.5, RSW pH 5, RSW pH 4.5, RSW pH 4, and RSW pH 3.5. Ten to thirteen eggs were placed in a 400 ml glass beaker containing 300 ml of the test solution. Two replicates of 10–13 eggs from each of the three females were tested at each pH, providing six replicates and a total of 58–66 eggs at each pH. Prior to use, each beaker was washed with soap and water, rinsed with tap water, rinsed twice

TABLE 2. Average percent hatching success (± standard error) of *Ambystoma texanum* embryos exposed to different pH solutions. Six replicates of 10–13 embryos were tested at each pH; n is the total number of embryos tested; RSW = Reconstituted Soft Water.

Treatment	n	Average % hatching success
RSW pH 7.2–7.8	64	100.0 ± 0.0
RSW pH 5.5	58	92.8 ± 0.04
RSW pH 5.00	64	94.1 ± 0.03
RSW pH 4.50	66	97.1 ± 0.02
RSW pH 4.00	64	3.3 ± 0.03
RSW pH 3.50	63	0.0 ± 0.0