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BODY TEMPERATURES AND LIVE WEIGHTS OF FIVE SPANISH AMPHIBIANS AND REPTILES

Response to temperature within a given thermal environment has received much attention but Brattstrom (1970) pointed out that body temperature data are conspicuously lacking for even the commonest amphibians from continents other than the Americas. Spellerberg (1973, 1974) reviewed critical minimum temperatures and influence of photoperiod and light intensity on lizard body temperatures using European lacertids. There are few other data available on the body and microclimate temperatures of European amphibians and reptiles.

Although live weight and size are routinely recorded for mammalian and avian specimens deposited in museum collections, these data are generally unavailable for amphibians and reptiles. The average body size attained by individuals in a population reflects the organism's nutritional state and relative competitive success. Moreover, as demonstrated by Zug, Lindgren and Pippet (1975:39), weight-length relationships are a reflection of differing nutritional regimes and food availability determined, in part, by microhabitat.

This report summarizes field data on the temperature and weight-length relationships for two amphibian and three reptilian species from Spain.

Body and microclimate temperatures were recorded in the field during 1975 using a Schultheis thermometer. Cloacal and microclimate temperatures (shaded bulb, 1.0 cm above substrate where the specimen was collected) were recorded to the nearest 0.1°C. Weights were recorded immediately after collection to the nearest 0.1 g using graduated Pesola spring field balances. Snout-vent length (SVL) was recorded to the nearest mm; weight-length regression equations were computed after cube root conversion of weights.

Alytes obstetricans was studied in Oviedo province, 12 km (by air) SE Cangas de Onís (43°21′N, 5°07′W, 800 m elev.), from 5 to 6 August. *Salamandra salamandra* were collected in León province on the road (C-637) 12 to 17 km S Oseja de Sajambre (43°08′N, 5°02′W, 800-1200 m elev.) on 14 August. *Lacerta monticola* from Ávila province at 10.5 km (by air) WNW Arenas de San Pedro (40°12′N, 5°05′W, 1600-2000 m elev.) were taken on 27 August. *Podarcis hispanica* (*sensu* Arnold, 1973) were obtained in Ávila province at San Martín de Pimpollar (40°22′N, 5°02′W, 1400 m elev.) on 21 August. *Psammodromus algirus* from Manzanares El Real (40°44′N, 3°52′W, 1300 m elev.) in Madrid province, 24 August, and Guisando (40°13′N, 5°08′W, 1600 m elev.) in Ávila province, 25 August, provided data from two different habitats which were later pooled after one way analyses of variance showed no significant temperature, SVL, or weight differences between the samples.

Specimens are deposited at the National Museum of Natural History, Washington, D.C., Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, and the Museo Nacional de Ciencias Naturales, Madrid, Spain.

Body temperatures of inactive *A. obstetricans* were taken from specimens under rocks in wet mud from 1930 to 2100 h (Table 1). Forty-eight adults with a SVL range from 23-41 mm ($\bar{x}$ = 34.8 ± 0.6) weighed between 1.0 and 5.0 g ($\bar{x}$ = 3.3 ± 0.1). Regression of cube root of weight (y) against SVL (x) results in the equation $y = -0.02 + 0.04 \times$ ($r^2 = 0.97$).

Salamandra salamandra body temperatures (Table 1) were recorded during heavy rain while the salamanders were crossing a paved road from 2214 to 2317 h. Sixty specimens with a SVL range from 55-100 mm ($\bar{x}$ = 80.8 ± 1.2) weighed between 4.0 and 26 g ($\bar{x}$ = 11.5 ± 0.6); the regression equation is $y = -0.16 + 0.03 \times$ ($r^2 = 0.95$).

Lacerta monticola body temperatures (Table 1) were recorded between 1130 and 1753 h while the lizards were active on rock faces during a clear day with moderate wind. These specimens ranged in SVL from 44 to 75 mm ($\bar{x}$ = 60.7 ± 2.8) and weighed between 1.9 and 9.4 g ($\bar{x}$ = 5.7 ± 0.7); the regression equation is $y = 0.05 + 0.03 \times$ ($r^2 = 0.96$).

Podarcis hispanica body temperatures (Table 1) were recorded for individuals active on rock faces under clear skies between 1005 and 1233 h. Nineteen lizards ranged from 49-64 mm SVL ($\bar{x}$ = 55.9 ± 1.1), weighed between 2.4 and 6.4 g ($\bar{x}$ = 3.9 ± 0.3); the regression equation is $y = 0.05 + 0.03 \times$ ($r^2 = 0.76$).

TABLE 1. Relationship between body and microclimate temperature among five Spanish amphibians and reptiles.

		Body Temperature (T_b°C)		Microclimate Temperature (T_a°C)		T_b-T_a (°C)	
	N	Range	Mean ± S.E.	Range	Mean ± S.E.	Range	Mean ± S.E.
A. obstetricans	22	20.4-25.0	22.5 ± 0.2	18.0-22.5	20.3 ± 0.3	0.4-6.0	2.3 ± 0.3
S. salamandra	34	13.3-16.0	14.5 ± 0.1	12.4-15.0	13.2 ± 0.2	−1.4 to +1.8	0.1 ± 0.3
L. monticola	14	25.8-34.5	31.8 ± 0.7	13.4-24.0	18.7 ± 0.9	7.7-18.5	13.1 ± 0.8
P. hispanica	16	25.4-38.4	34.0 ± 0.8	19.5-34.5	25.6 ± 3.6	−0.2 to +13.5	8.5 ± 0.9
P. algirus	27	30.4-40.6	35.4 ± 0.4	16.5-32.0	23.8 ± 0.7	5.9-19.4	11.5 ± 0.7

Psammodromus algirus body temperatures were recorded from 1007 to 1228 h under clear skies (Table 1) while the lizards were active on low shrubbery. This species ranged in SVL from 55-74 mm ($\bar{x}$ = 63.3 ± 1.0) and weighed between 4.2 and 13.5 ($\bar{x}$ = 7.7 ± 0.4); the regression equation is $y = 0.02 + 0.03\ X$ ($r^2 = 0.81$).

Strübing, using laboratory techniques, reports 18.6 ± 0.4°C (1954:378) as the preferred temperature for *S. salamandra* and 33.2 ± 0.5°C (1954:369) for *Alytes cisternasii.* The Spanish *S. salamandra* reported herein predictably fall below this figure as this sample was taken during rain at night while, although living in a habitat similar to *A. cisternasii, A. obstetricans* is inexplicably well below Strübing's estimate.

Spanish heliothermic lizards of three genera demonstrate body temperature means considerably higher than ambient mean, indicating the possibility of effective thermoregulation.

To my knowledge, the weight-length relationships reported here have no comparative data available in the literature. It would be interesting to see if congeneric or interspecific population differences are present and to determine the ecological and evolutionary bases for these differences.

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