OBSERVATIONS ON BODY TEMPERATURES OF SOME NEOTROPICAL DESERT GECKOS (REPTILIA: SAURIA: GEKKONINAE)

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Nocturnal Gekkonidae forage in the open at a body temperature (BT) lower and often more variable than those of diurnal species BTs (Licht et al., 1966; Bouskila, 1987; Huey et al., 1989). Their thermal physiology is of interest because some species maintain relatively high BTs during daytime (Arad et al., 1989), thermoregulating by direct, protected or indirect basking (Werner & Whitaker, 1978; Werner, 1990b). So, does gecko physiology operate best at daytime or night-time temperatures (Werner, 1972:172; Huey et al., 1989)? But although several geckos have had their BTs reported (Avery, 1982; Pianka, 1986; Dial & Grismer, 1992), few studies included both day- and night-time data (Werner & Whitaker, 1978:376) and the thermal biology of geckos has been studied relatively little (Avery, 1982; Huey et al., 1989). In particular, few reports concern desert species; and we know only one brief report on Neotropical geckos (Huey, 1979). Hence we present here our assorted data on BT in four species of nocturnal Gekkoninae (Kluge, 1967) of Neotropical deserts. These derive only from 106 animals recorded in the field but do enable some conclusions.

Our data are from adults or subadults. At night we searched with lamps for active geckos. In daytime, and sometimes at night, we searched under objects or in rock crevices. Geckos were hand-caught but a few were noosed out of crevices. We first measured rectal BT with a rapidly responding mercury thermometer (Schultheis or Weber- Miller); then air temperature 1 cm above the substrate (AT) and substrate temperature (ST) where the animal had been; and, where applicable, momentarily shaded substrate temperature in the sun, outside of the animal's shelter (OT); the time; rostrum-anus ("snout-vent") length (ra; Werner, 1971); and comments on microhabitat and situation (in sun, in shade, etc.); often also sex and whether visibly gravid.

For statistics we used the SAS package. After inspecting histograms of BT and AT, we tested the significance of differences between any two samples (Table 1) by two nonparametric two-sample tests (Wilcoxon; Median). The two results never differed in principle and we accepted the higher p-value. We studied the co-variation of BT with AT and with ST by Spearman-rank correlation tests (Table 2). Finally we tested for differences between species, in pairs, by Tukey's Studentized Range (HSD) Test. Values of $p>0.05$ were always considered insignificant.

The observed BT, AT, ST and BT-AT are summarised in Table 1, with the significance (Wilcoxon and Median tests) of BT-AT and of BT- ST. Additonal salient details are presented below by species.

Phyllodactylus kofordi Dixon & Huey, 1970, up to 45 mm ra: Data were taken mostly by Huey on 26-28 July and 1-5 Aug.

1968 near Bayovar, Dept. Piura; and some by Salas on 21 May 1989 at Cerro de la Vieja (7 km S Motupe, Dpto. Lambayeque). Most (n=17) individuals were found at night: most foraged on the ground near shrubs and few on shrubs (Dixon & Huey, 1970; Huey, 1979). Three were (at 1927-2211 h) under large stones (approx. 60x40x35 cm; one in a burrow under the stone); in the first two, BT>ST>AT. The mean BT (MBT) of geckos collected at night ($\bar{X}$=21.9°C; Table 1) was much lower than that of three individuals found in daytime under objects ($\bar{X}$=29.5°C.)

Phyllodactylus microphyllus Cope, 1876, up to 57 mm ra: Data (n=61) were taken in several lots: by Huey on 26-30 July and 1-9 Aug. 1968 (mostly at night) near Bayovar, Dept. Piura; by Salas and Werner on 27-29 Aug. 1987 (mostly in daytime) at Puerto Viejo, Leon Dormido, Quebrada Cruz de Hueso (6 km E Punta Negra), all S of Lima; and by Salas on 23 May 1989 at SE side of Cerro Campana (1 km N Trujillo), Dpto. La Libertad; and on 1 Sept. and 1 Oct. 1990 at Quebrada Cruz de Hueso. These geckos foraged at night mostly on open ground (Dixon & Huey, 1970; Huey, 1979; Carrillo de Espinoza et al., 1990). At the lowest BTs observed (18-19°C), the geckos could run quite rapidly. The highest BT (25.6°C) was recorded early in the evening (1930 h). In daytime the geckos were found under a wide variety of objects but one large individual was walking 5 cm from a burrow, at 1150 h, on a cloudy day (23 May 1989; BT=26.4, AT=23.1, ST=28.2°C). Those caught at night had lower BTs than those found in day time (Table 1). The differences in BT between night and day, and between BT and AT, were highly significant (p<0.0015).

In daytime females had higher BT than males (Table 1) but this and other thermal differences were not significant (BT, p=0.09; AT, p=0.58; BT-AT, p=0.25; ST, p=0.12; BT-ST, p=0.66). Because several females were ovigerous, and in some other geckos gravid or ovigerous females maintain elevated BTs, we suspect that the difference was real but our sample was too small (Werner, 1990a).

Phyllodactylus reissi Peters, 1862, up to 75 mm ra: Data (n=17) were taken in the Sechura desert, NW Peru, in several lots: by Huey on 26-28 July and 1-5 Aug. 1968 (at night), near Bayovar and at Las Lomas, both Dept. Piura; by Werner on 31 July-1 Aug. 1983 and by Salas on 21 May 1989 (most in daytime), at Cerro de la Vieja (7 km S Motupe, 60 km N Lambayeque). At night these scansorial geckos foraged on rocks, trees and shrubs. In daytime (1215-1600 h) all were caught in crevices (near their down-facing entrances) under exfoliations of large granite boulders, all on the shady side of the boulders. In this species too, BT of geckos caught at night ($\bar{X}$=22.3°C; Table 1) were lower than those of animals noosed out from the shady crevices in daytime ($\bar{X}$=29.8°C).

Homonota underwoodi Kluge, 1964, up to 51 mm ra: Data (n=8) were taken by Videla and Werner on 8-9 Sept. 1987, north and south of Reserva Talteca, NE of Mendoza, Argentina. At night, from sunset at 1915 h (AT=21°C) to moonrise at 2045 h (AT=18.5°C), we searched for 4.5 person-hours and found no geckos, possibly due to the wind. In daytime, 0740 (=sunrise, AT=13.5°C) to 1530 h, we found almost all individuals under the dry plate-like feces of cattle. The BT of these geckos ranged widely (Table 1). The two highest BTs, 31.8 and 30.0°C, were encountered late, at 1420 and 1501 h, respectively. All BTs were higher than STs under the feces (Table 1), some of which were moist on the underside, but much lower than OT, which ranged 20.0 (at 1000h)-42.8°C (at 1355h).

Did these small samples indicate any interspecific differences? At night there were no BT difference among the three *Phyllodactylus* species, confirming Huey's (1979) observation. In daytime the one significant (p<0.05) difference was between *Homonota underwoodi* and *Phyllodactylus microphyllus*;

Species and subsample	°C X + SE (and range)					
	n	BT (range)	AT	BT-AT	n	ST (range)
Phyllodactylus kofordi	20	23.0+0.70 (20.0-30.0)	21.1+0.82 (16.5-32.2)	1.9+ 0.39* (-2.2- 5.0)	3	21.8+0.19 (21.4-22.0)
night	17	21.9+0.37 (20.0-24.8)	19.8+0.37 (16.5-22.4)	2.05+0.39** (-0.8- 5.0)	3	21.8+0.19 (21.4-22.0)
day	3	29.5+0.50 (28.5-30.0)	28.6+1.84 (26.0-32.2)	0.8+ 1.52 (-2.2- 2.5)	0	
Phyllodactylus microphyllus	61	23.0+0.52 (18.3-33.7)	21.1+0.35 (17.3-30.4)	1.8+ 0.38* (-2.7-10.0)	27	25.3+0.88
night	33	20.4+0.24 (18.3-25.6)	19.8+0.22 (17.3-22.2)	0.56+ 0.29 (-2.3- 7.6)	2	19.9+0.55 (19.4-20.5)
day	28	26.1+0.77 (19.4-33.7)	22.7+0.59 (18.0-30.4)	3.36+0.65** (-2.7-10.0)	25	25.7+0.90 (19.2-35.2)
day: males	8	23.3+1.21 (19.4-29.8)	21.0+0.77 (18.4-25.0)	2.35+0.89 (-0.2- 7.5)	8	23.7+1.61 (19.2-32.6)
day: females	14	27.0+1.04 (20.8-33.7)	22.4+0.70 (18.0-27.6)	4.57+1.03** (-1.2-10.0)	14	26.9+1.03 (20.0-35.2)
Phyllodactylus reissi	17	24.5+0.93 (20.0-32.0)	23.8+1.08 (18.9-31.5)	0.7+0.38 (-2.0- 4.2)	2	24.8
night	12	22.3+0.48 (20.0-24.8)	21.2+0.48 (18.9-23.5)	1.1+0.47 (-1.5- 4.2)	1	20.5
day	5	29.8+0.64 (28.0-32.0)	30.1+0.69 (27.8-31.5)	-0.3+0.45 (-2.0- 0.5)	1	29.1
Homonota underwoodi	8	23.9+ 2.5	21.4+ 1.8	2.5+ 1.05	7	19.3+ 2.3
day		(13.8-31.8)	(13.5-28.0)	(-1.2- 7.5)		(12.0-26.0)

Table 1. Summary of body (BT), air (AT) and substrate (ST) temperatures. Significance levels: * = p<0.05; ** = p<0.01 (the difference BT-ST was never significant).

	BT & AT			BT & ST		
Species and subsample	**n**	**r**	**p**	**n**	**r**	**p**
Phyllodactylus kofordi	20	0.58	0.0073	3	0.50	ns
night	17	0.32	ns	3	0.50	ns
day	3	0.87	ns	0		
P. microphyllus	61	0.68	0.0001	27	0.86	0.0001
night	33	0.48	0.0049	2	1.00	ns
day	28	0.56	0.0020	25	0.86	0.0001
Phyllodactylus reissi	17	0.80	0.0001	1		
night	12	0.45	ns	1		
day	5	0.46	ns	0		
Homonota underwoodi day	8	0.76	0.0280	7	0.85	0.0137

Table 2. Spearman rank correlation of body temperature (BT) with air (AT) and substrate (ST) temperatures.

the former's BT approximated 4.5°C above ST; the latter's - only 0.5°C.

We conclude that the Peruvian geckos reported here show a distinct diel-cyclic bimodality in BT - low at night, high during the day. This pattern has been observed in other nocturnal geckos and appears general: *Ptyodactylus* spp. (Werner, 1965; Werner & Goldblatt, 1978); *Gehyra variegata* (Bustard, 1967, 1968; Werner & Werner, unpublished); *Pachydactylus bibroni* (Pianka & Huey, 1978); *Hoplodactylus maculatus* (Werner & Whitaker, 1978); *Phyllodactylus europaeus* and *Tarentola mauritanica* (Delaugerre, 1984). Geckos may be thermoregulating under cover by day (Bustard, 1967, 1968; Werner & Whitaker, 1978; Dial & Grismer, 1992; Autumn et al., 1994).

Thus a single MBT combining day and night BTs conveys little information on the thermal biology of geckos. Such an average, intermediate, value is rarely experienced by the geckos. A better portrait of the 24-h thermal experience of geckos would require separate daytime and night time MBTs. Of course, diurnal lizards, too, experience low BTs at night (Stebbins & Barwick, 1968). But a key difference is that diurnal lizards forage in the open when their BTs are high, whereas nocturnal lizards forage in the open when their BTs are low. Nevertheless, potential differences between the thermal sensitivity of diurnal vs. nocturnal lizards have rarely been explored (Campbell, 1969; Werner, 1983; Huey et al., 1989).

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AMPLIACIÓN DEL ÁREA DE DISTRIBUCIÓN DE *WAGLEROPHIS MERREMII* (WAGLER, 1824) (SERPENTES: COLUBRIDAE) SOBRE LAS PROVINCIAS DE ENTRE RÍOS, SANTA FE Y BUENOS AIRES, ARGENTINA

JORGE ANÍBAL VUOTO

Adscripto ad. h. al Área de Investigación en Cs. Naturales del Museo de Cs. Nat. y Antropol. "Prof. Antonio Serrano" Avda. Rivadavia 462 - C.C. 71. C.P. 3100 - Paraná, Entre Ríos.

En la lista preliminar del proyecto de actualización de los ofidios de Entre Ríos, (Vuoto, 1994) se cita la especie para la provincia, y se la ratifica posteriormente en nuevos aportes (Vuoto, 1995).

La bibliografía vigente sobre ofidiofauna argentina -Williams & Francini (1991); Cei (1993)- , no registra la especie en la provincia de Entre Ríos y para Santa Fe consigna un reducido territorio N.O.(Cei, 1993).

Berg (1898) cita como probable su existencia en Entre Ríos.

Koslowsky (1898), ya la cita para Misiones, Corrientes, Entre Ríos, "Gran Chaco", Santa Fe y parte septentrional de provincia de Buenos Aires.

Posteriormente Serié (1921) cita la especie para Entre Ríos, y además, para Santa Fe, Chaco, Corrientes, Misiones, Santiago del Estero, Tucumán, Salta y San Juan, datos ratificados por el mismo en 1936 como *Ophis merremii* Wagler, con ampliación del territorio de distribución a Córdoba, Jujuy, "Los Andes" y San Luis.

Freiberg (1939), cita la especie mencionando cuatro ejemplares de la colección del Museo de Entre Ríos, encontrándose, en la actualidad, en buen estado de conservación. A los mencionados se incorporan posteriormente 4 nuevos ejemplares colectados en la provincia.

Siendo evidente que entre el área de distribución mencionada por la bibliografía vigente y los registros de Entre Ríos citados queda interpuesta una franja sin registros, formada por gran parte de Córdoba, Santa Fe y Corrientes, se investiga la posible presencia de la especie en el resto del territorio santafecino, verificándose la existencia de ejemplares en la colección del