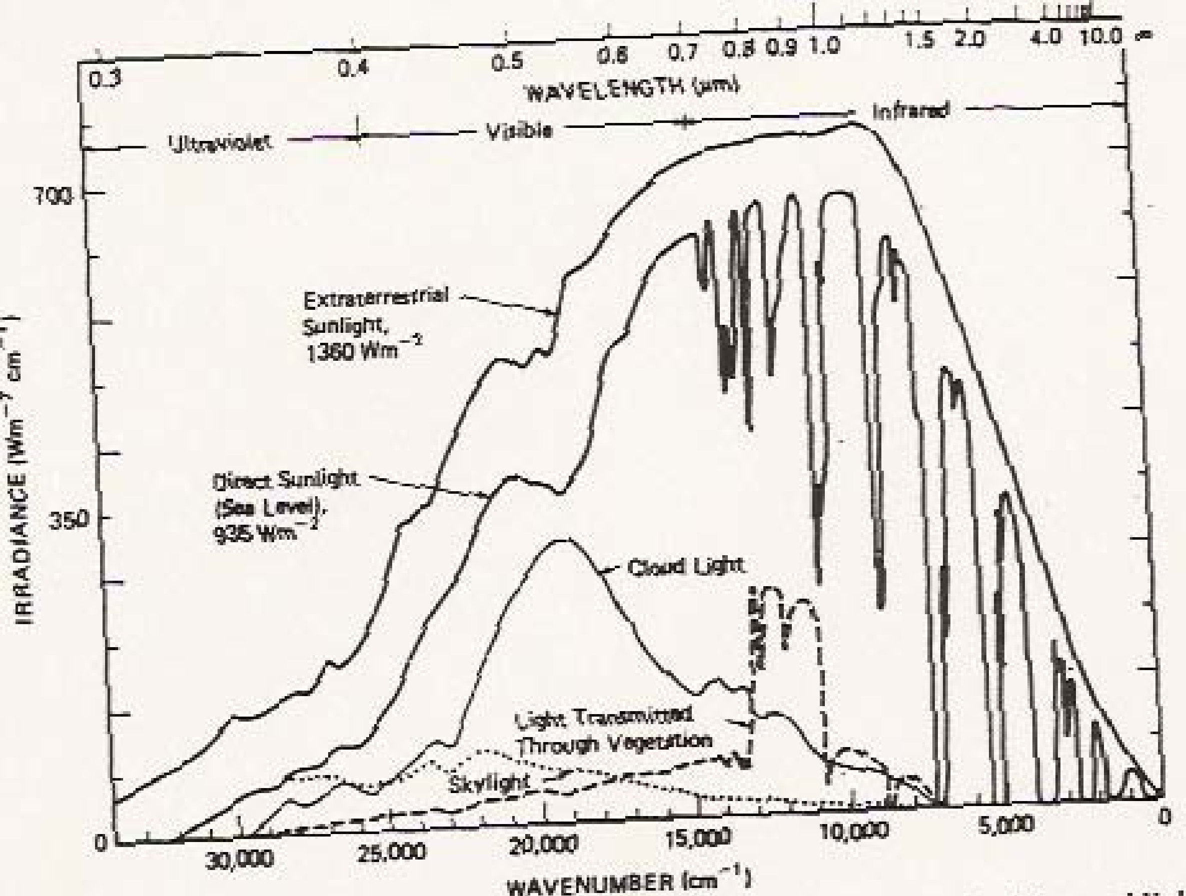


Figure 8.17. Spectral distribution of direct sunlight, cloud light, skylight, and light transmitted through a plant canopy received on a horizontal surface at the ground as a function of wavelength.

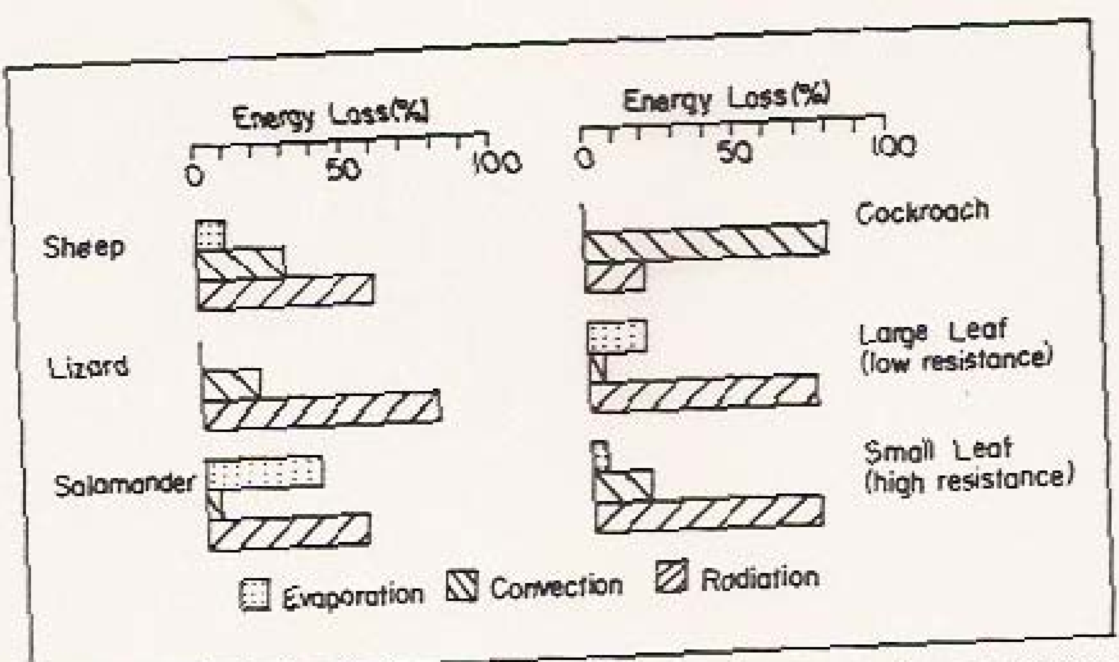


Figure 2.3. Approximate partitioning of energy loss from various organisms

Gates 1980

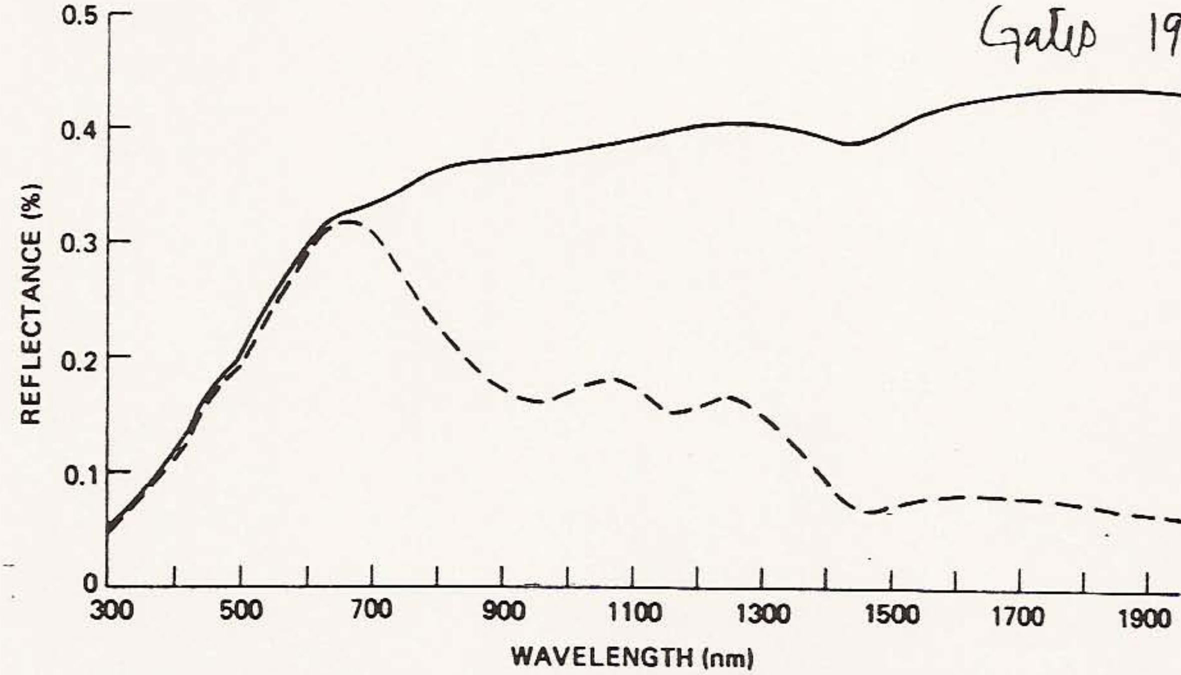


Figure 8.40. Spectral color match of (--) the fringed-toed sand lizard (*Uma scoparia*) and (—) the sand from its habitat. Temperature of the lizard, 36°C. (Redrawn from Norris, 1967.)

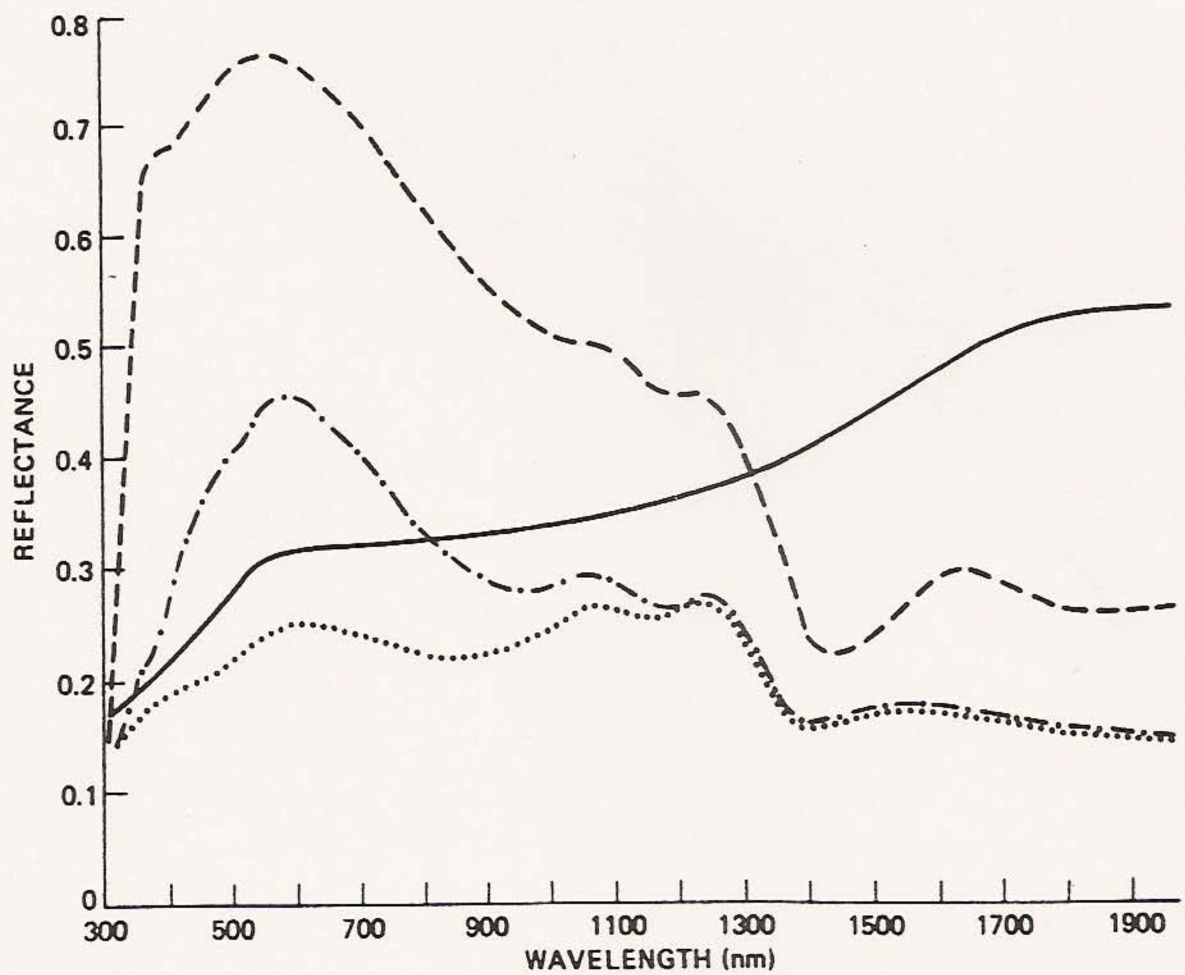
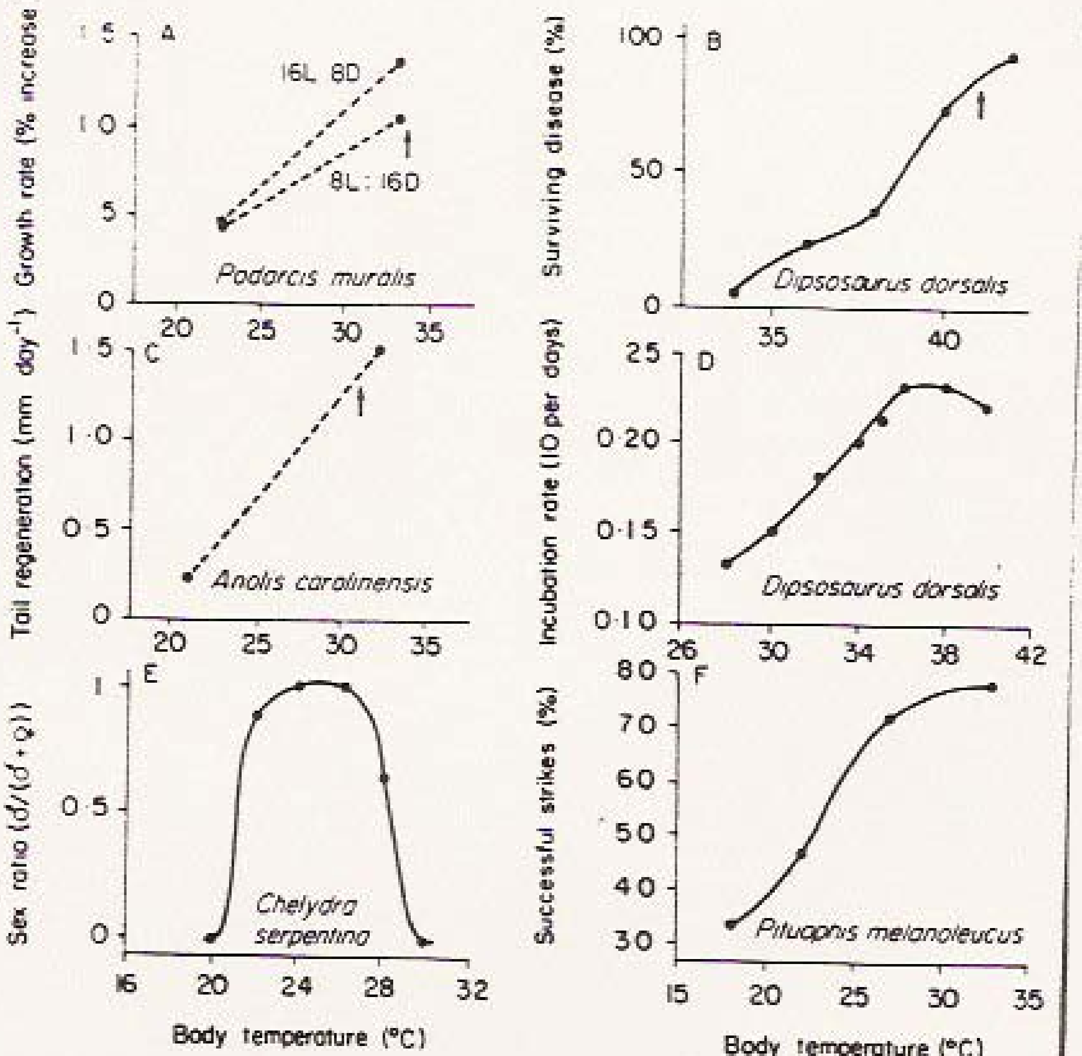


Figure 8.41. Spectral reflectance of the zebra-tailed lizard (*Callisaurus draconoides*) before and after treatment with ACTH together with the sand from its habitat: (—) sand; (- · -) dorsal surface, 44°C; (· · · ·) dorsal surface, 1 hr after ACTH; (--) ventral surface at 36°C. (Redrawn from Norris, 1967.)

Huey 19[illegible]



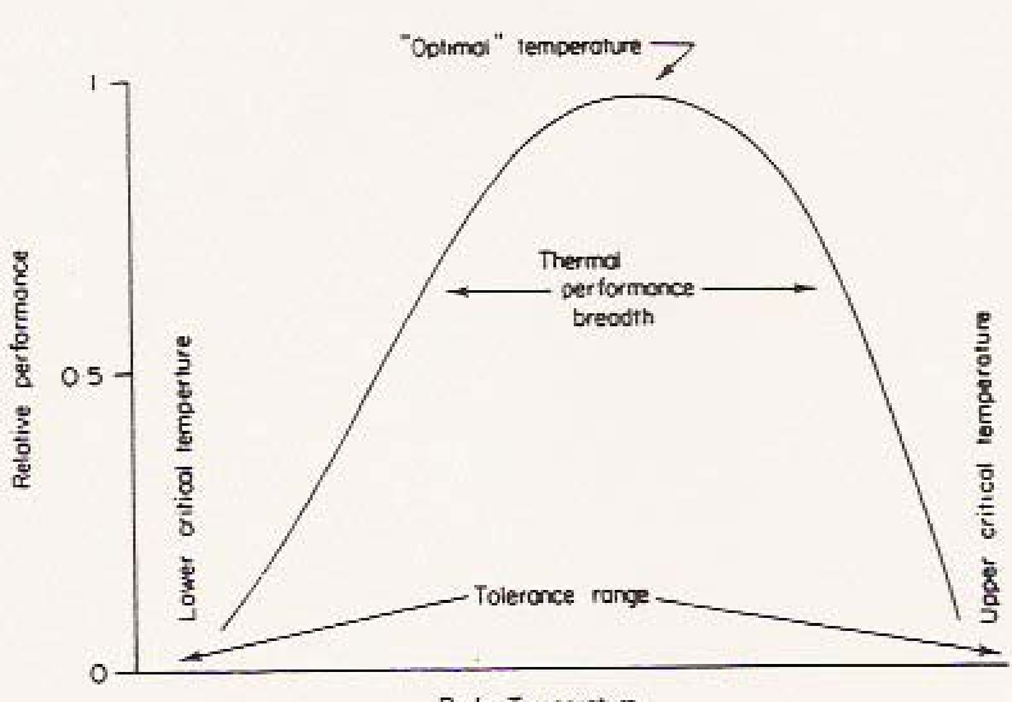


FIG. 2. Hypothetical performance of an ectotherm as a function of body temperature (Huey and Stevenson, 1979). (Copyright American Society of Zoologists.)

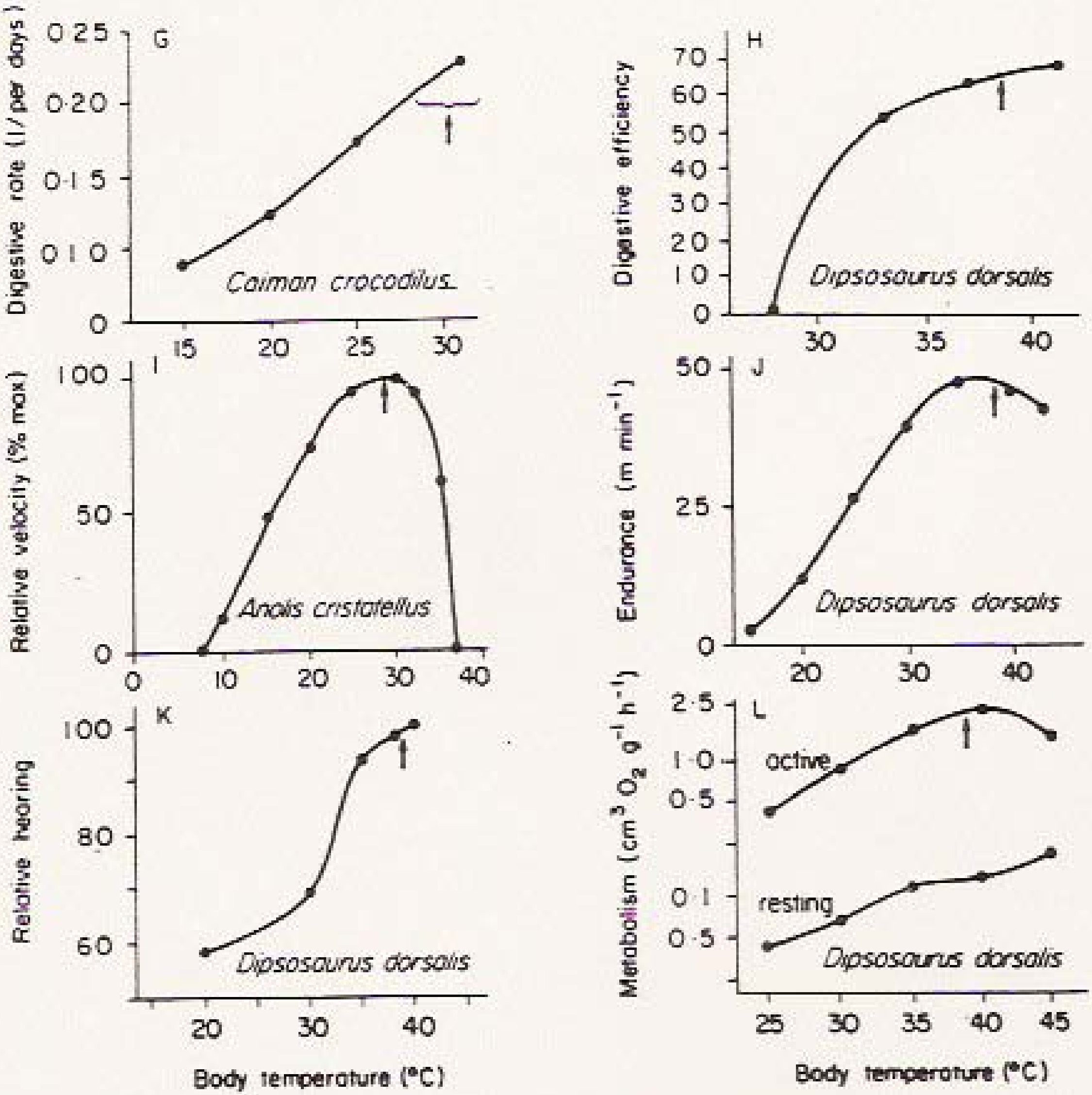


FIG. 3. Representative performance of whole-animal physiological systems of reptiles as functions of body temperature. Vertical arrow indicates selected body temperature. A (from data in Licht *et al.*, 1969); B (survival after three days, from data in Kluger, 1979), C (from data in Maderson and Licht, 1968), D (from data in Muth, 1980), E (redrawn from Bull, 1980), F (from data in Greenwald, 1974), G (from data in Diefenbach, 1975a, b), H (from data in Harlow *et al.*, 1976), I (Huey, 1982 and Huey and Webster, 1976), J (from data in Bennett, 1980), K (hearing at 1000 Hz, from data in Werner, 1972), L (redrawn from Bennett and Dawson, 1972).

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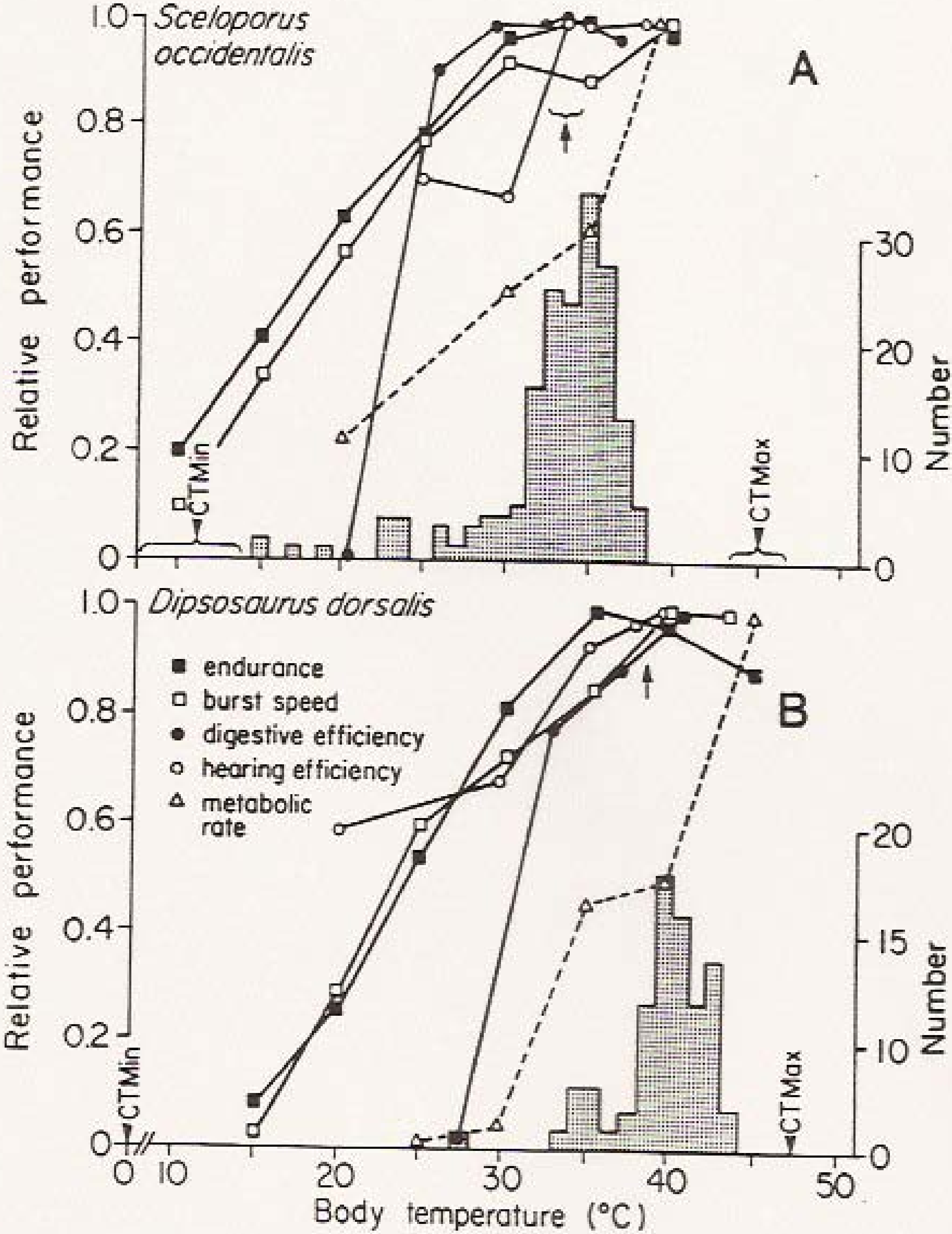

FIG. 6. Relative performance of several physiological systems and the relative metabolic rate for the lizards *Sceloporus occidentalis* (A) and *Dipsosaurus dorsalis* (B). Arrow indicates selected body temperature(s). References for A: Brattstrom, 1965; McGinnis, 1966; Werner, 1972; Harwood, 1979; A. F. Bennett, 1980, personal communication. References for B: Brattstrom, 1965; DeWitt, 1967; Bennett and Dawson, 1972; Werner, 1972; Harlow *et al.*, 1976; Bennett, 1980).

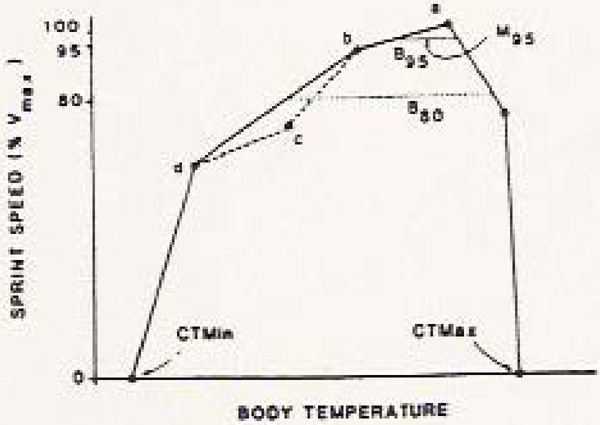

FIG. 2. Schematic diagram illustrating how sprint speed data were analyzed and the variables used to describe the thermal sensitivity of sprint speed. Solid circles are hypothetical data for an individual lizard. The critical thermal maximum (CTMax) and minimum (CTMin) are at 0 speed. Point a is the maximum speed (V_{max}). The angle formed by points b–c–d (dashed line) is convex down, all other angles (for example a–b–c) are convex up (see text for explanation). The solid line illustrates how adjacent points were connected by a minimum convex polygon. The dotted lines are the performance breadths (Huey and Stevenson, 1979), defined as the range of body temperatures over which a lizard can run 95% (B_{95}) or 80% (B_{80}) of its maximum speed or faster. The M_{95} (midpoint of the B_{95}) estimates the temperature at which the lizard sprints fastest.

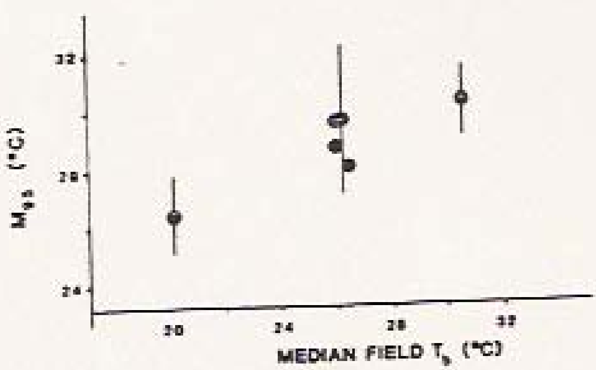

FIG. 3. The relationship between M_{95} and the median of the field body temperatures. Plotted here are the mean values ±95% CI of M_{95} for each species. For clarity, I have only included the 95% confidence interval for one (*Anolis intermedius*) of the four species whose median field T_b fall between 26.0 and 26.4°C (Table 4). The other three confidence intervals are smaller and fall within the limits of the value shown (see Table 5). Note that the correlation between M_{95} and the median was computed non-parametrically using all values.

TABLE 4. Summary of field body temperatures (°C) of species for which data were available. See text for explanation of missing data for *A. lionotus*. Field data on *A. tropidolepis*, *A. intermedius*, and *A. cupreus* from J. Tsuji (unpubl.).

Species	Median	Q_{3-1}	Min	Max	N
tropidolepis	20.2	3.95	16.9	24.4	23
intermedius	26.3	6.00	20.2	30.8	66
limifrons	26.2	1.80	23.7	29.6	73
humilis	26.4	2.90	22.3	30.5	90
lionotus	26.1	—	21.5	30.3	31
cupreus	30.6	3.70	23.2	32.8	57

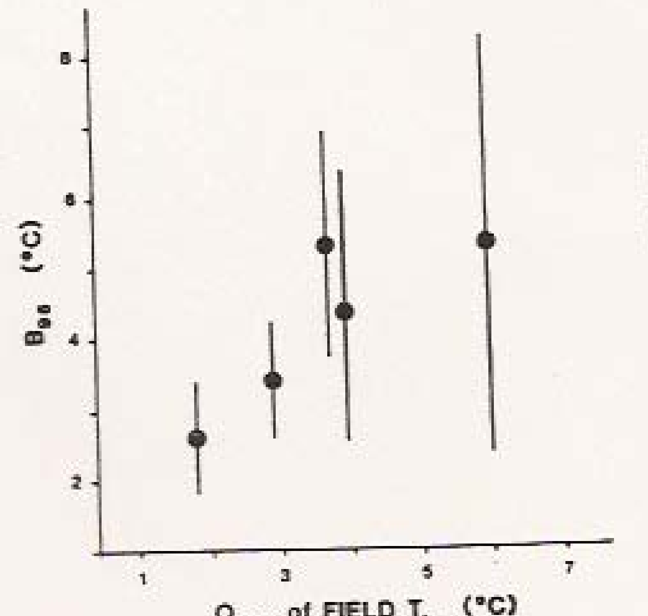

FIG. 4. The relationship between B_{95} and the interquartile distance of the field body-temperature distribution (Q_{3-1}). Plotted here are the mean values ±95% CI of B_{95} for each species. Note that the correlation between B_{95} and the Q_{3-1} of field T_b was computed nonparametrically using all values. The B_{80} shows a similar relationship to Q_{3-1}.

Smelvo & Losos 1991

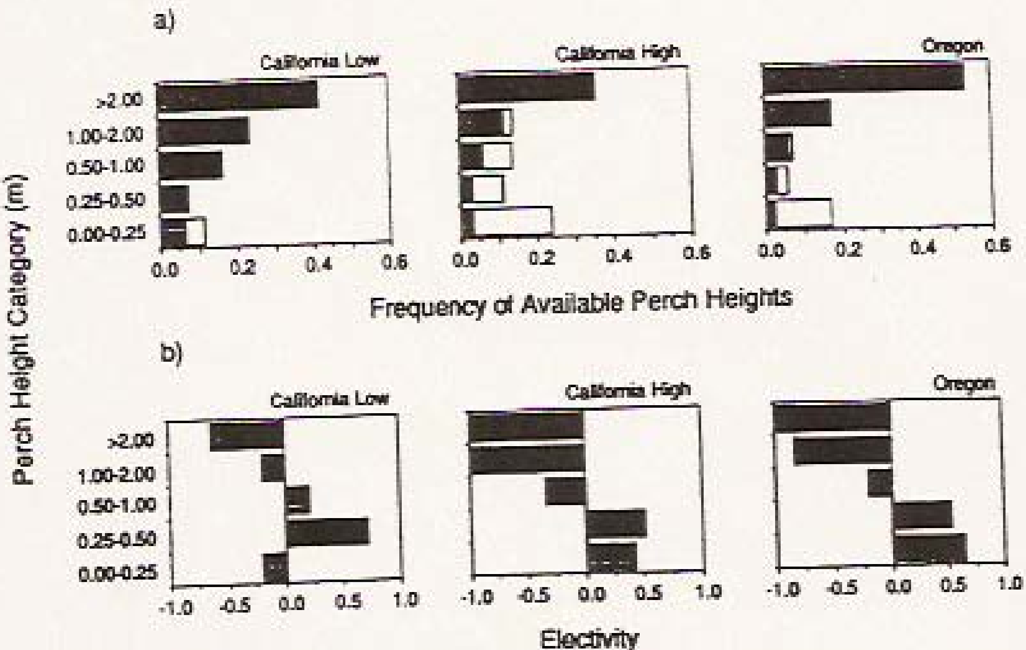

FIG. 1. (a) Frequency distributions for perch height availability (excluding the ground). Data for California lizard populations are from Adolph (1990*a*). Black bars represent the surface area on trees, open bars represent surface area on logs, stumps, rocks, and debris. Ratios of total perch-surface area to total quadrat area were 240 m^2:4495 m^2 for low elevation in California, 444 m^2:7725 m^2 for high elevation in California, and 1170 m^2:5351 m^2 for Oregon. The percentage of ground cover at each site was 8.3% at low elevation in California, 8.9% at high elevation in California, and 4.2% in the Oregon site. (b) Electives for perch heights (excluding the ground) are calculated from Ivlev's (1961) formula: $e_i = (u_i - a_i)/(u_i + a_i)$ where e_i = electivity for height class *i*, u_i = proportion of observations of lizards in height class *i* (derived from the sum observed on horizontal and vertical perches, Fig. 1a), and a_i = the relative abundance of perch height class *i* (Adolph, 1990*a*). A positive electivity indicates lizards are choosing a particular perch height class with a greater frequency than its availability in the habitat.

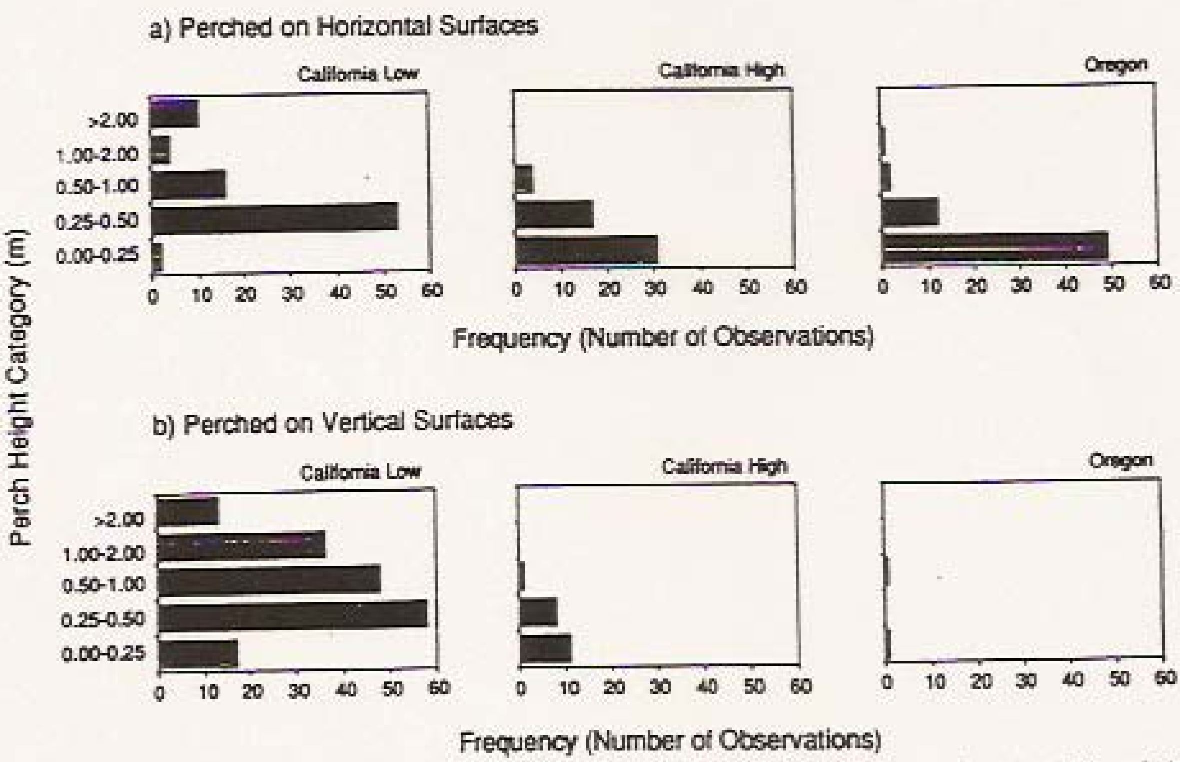

FIG. 2. Frequency distributions (number of observations) for perch height categories on (a) horizontal and (b) vertical surfaces. Multi-way contingency-table analysis indicates differences among populations are significant (see Table 2).

Sinervo & Los 199

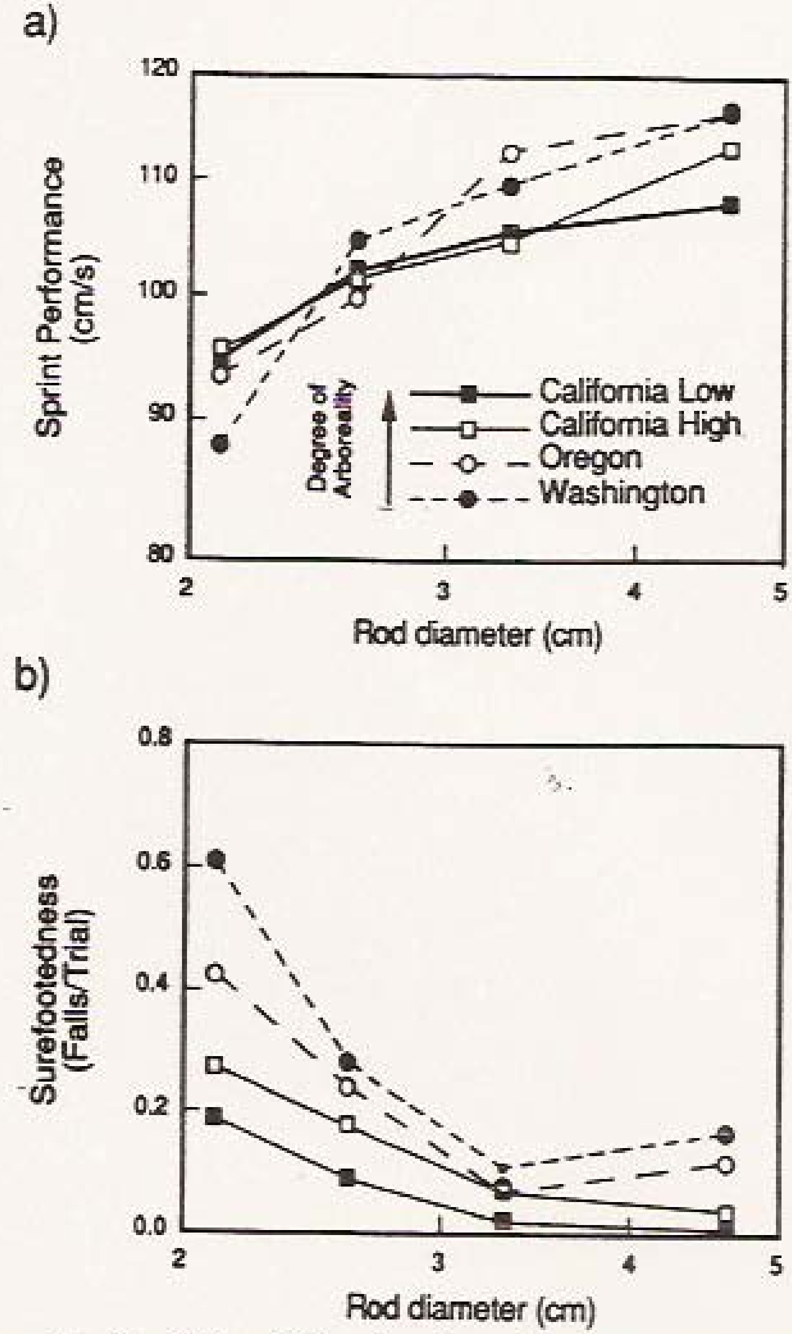

FIG. 3. (a) Sensitivity of sprint performance to surface dimensions for the four populations of fence lizards (population means are adjusted for the effects of the covariate body size, see Table 3). Populations that are more arboreal in nature are less sensitive to the effects of surface dimensions, in that sprint performance does not decline as rapidly with decreasing rod diameter. All variates were ln-transformed prior to data analysis. (b) Among-population differences in surefootedness on each rod size. Lizards that were more surefooted lost their balance or fell off the rod less often. Populations that are more aboreal (e.g., low-elevation California) were more surefooted (Kruskal-Wallis one-way analysis of variance tests: 2.1 cm rod: $\chi^2 = 16.5$, df = 3, $P < .001$; 2.6 cm rod: $\chi^2 = 7.7$, df = 3, $P < .05$; 3.3 cm rod: $\chi^2 = 4.8$, df = 3, $P < .19$; 4.6 cm rod: $\chi^2 = 17.5$, df = 3, $P < .001$), particularly on the smallest rods.

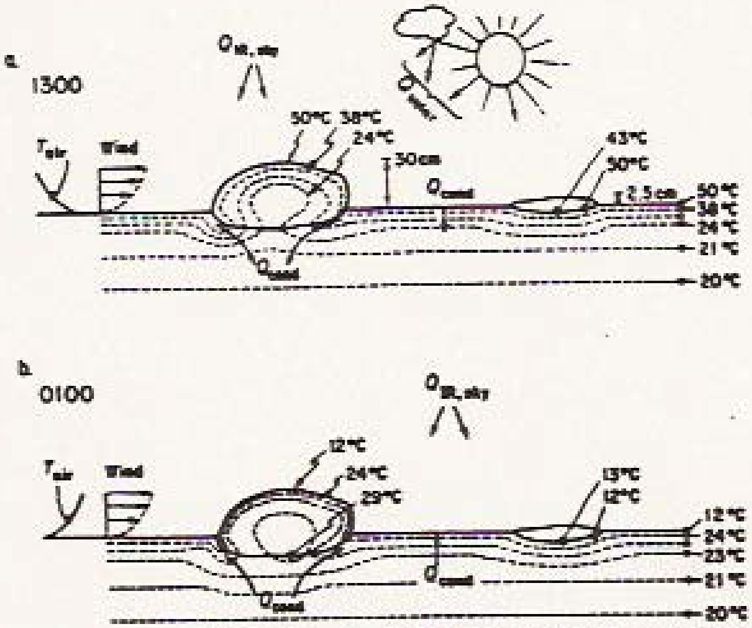

FIG. 4. (a) Temperature gradients within thick (30 cm) and thin (2.5 cm) rocks and within soil at 1300 on a clear summer day. We have assumed that the rocks and soil are in direct contact and have similar thermal properties (reflectance, thermal conductivity, and specific heat capacity). Isotherms are extrapolated from actual temperature measurements (indicated by ●). Note that (i) the center temperatures underneath the rocks are lower than the edge temperatures; and (ii) the temperatures under the thin rock are much higher than under the thick rock. Symbols: Q_{solar} = heat flux due to solar radiation; $Q_{lw,sky}$ = heat flux due to longwave radiation; Q_{cond} = heat flux due to conduction. Air temperature (T_{air}) and wind profiles are shown at the left. (b) Temperature gradients within thick (30 cm) and thin (2.5 cm) rocks and within soil at 0100 on a clear summer night. The isotherms are extrapolated as in Fig. 4a. Note that (i) the center temperatures underneath rocks are now warmer than the edge temperatures, (ii) that the temperatures under the thick rock are much warmer than either those under the thin rock or those in a burrow.

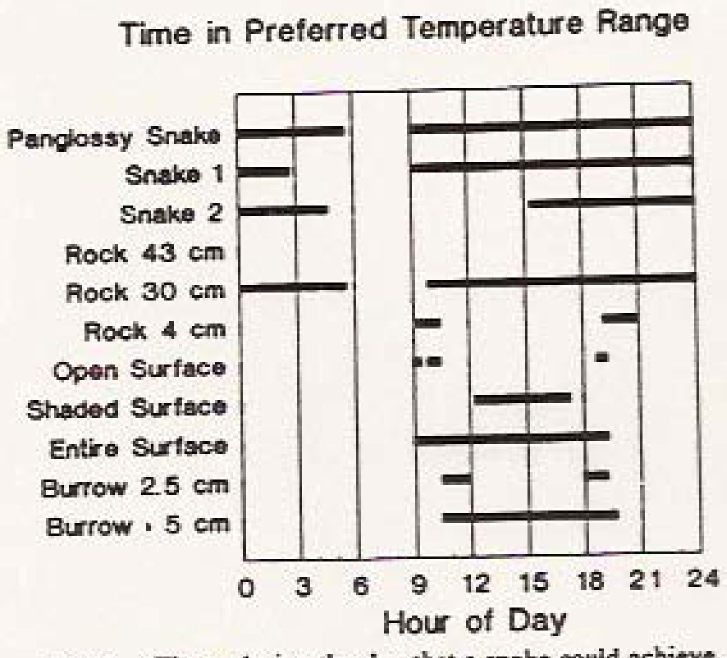

FIG. 7. Times during the day that a snake could achieve T_b within its preferred range (28°–32°C) if it stayed within a given microhabitat (e.g., under a 43-cm thick rock), or if it always selected the best available microhabitat (Panglossy snake). Note that the best single site is a rock ≈30 cm thick, similar to the Point D rock. Note that a slightly thicker rock (43 cm) never warms to the Tp range.

TABLE 1. Rock selection by garter snakes for nocturnal retreats at Eagle Lake, California. Rocks are divided into three (physiologically relevant) size categories.*

		Rock thickness (cm)		
	N†	<20	20–40	>40
			Proportion of rocks	
Selected by snakes	13	7.7	61.5	30.8
Available to snakes	182	32.4	34.6	33.0

* Snakes selected rocks of intermediate thickness and avoided thin rocks ($P < .05$, chi-square test with the two extreme sizes combined because of small expected values).

† Twelve different rocks were selected by the snakes. However, we use $N = 13$ in our calculations because one of the rocks was selected by two different snakes.

Huey et al 1990

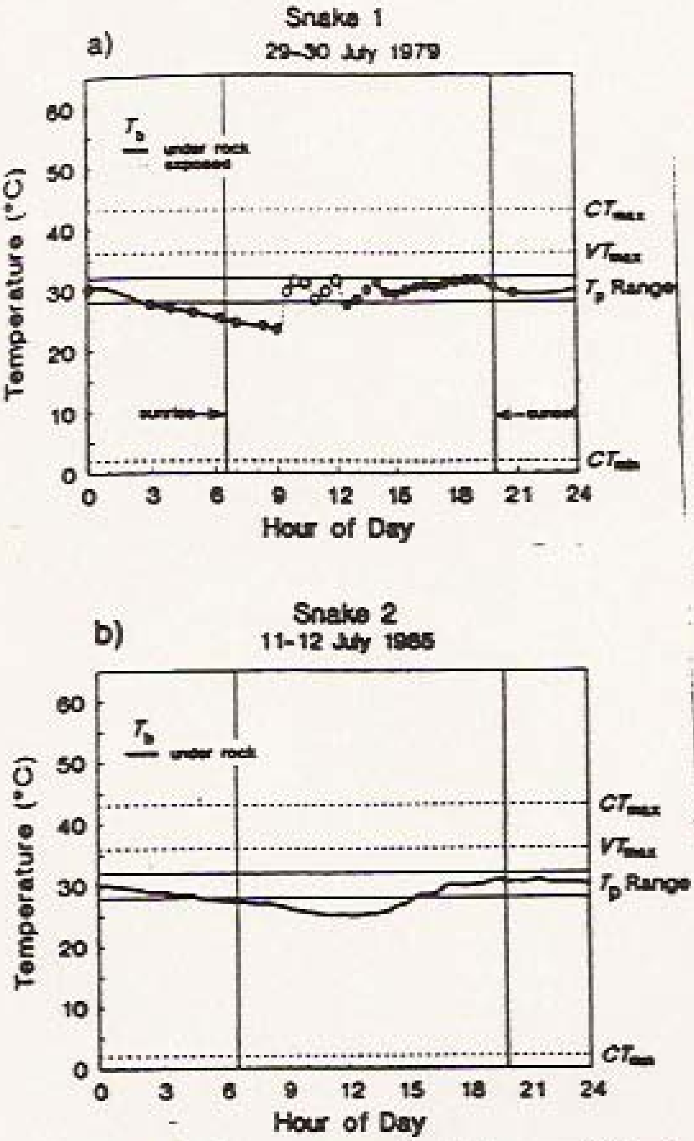

FIG. 1. (a) Body temperatures of snake 1, a gravid female *T. elegans* that was monitored by telemetry at Eagle Lake, California. ○ T_b when snake was exposed on the ground surface, ● T_b when snake was under a rock. Solid and dotted lines connecting ● and ○, respectively, were generated by a splining function of a graphics program (Mirage). Horizontal lines (—— or – – –) indicate temperature levels of CT_{max} (critical thermal maximum), VT_{max} (voluntary maximum T_b), T_p (preferred temperature) range, and CT_{min} (see Materials and Methods: Physiological Data and Simulations). Approximate times of local sunrise and sunset are indicated by vertical lines. (b) T_b of snake 2, which remained under a rock for the entire 24-h period. Note that both snakes were able to maintain temperatures within or near the T_p range for much of the day, even when sequestered in retreats.

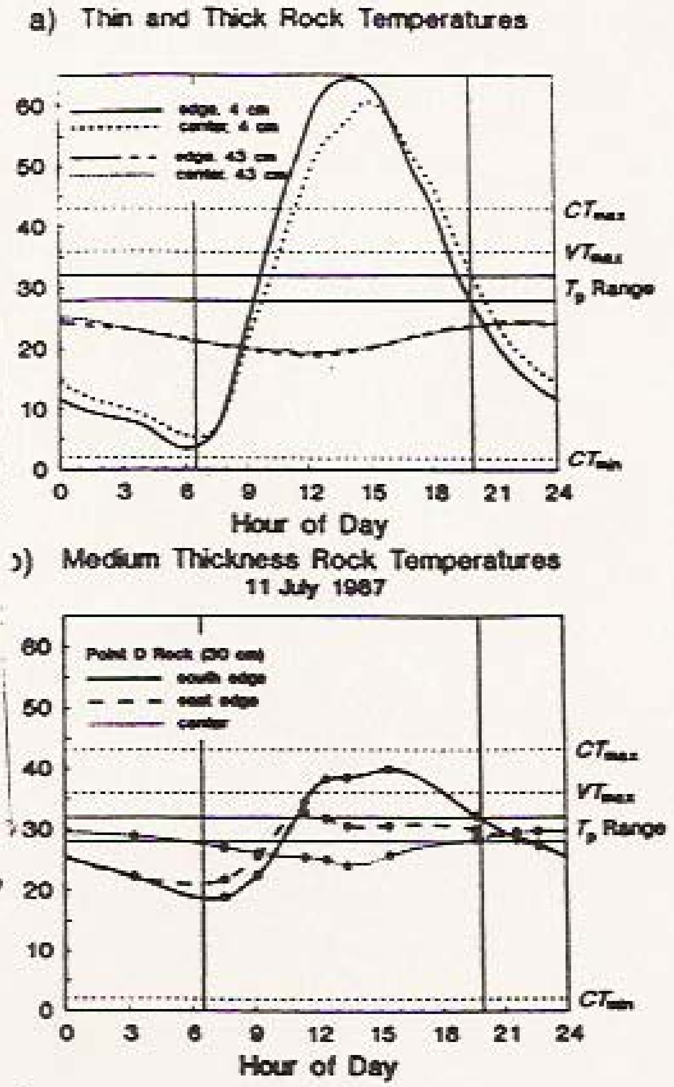

FIG. 2. (a) Daily cycle of temperatures under a thick (43 cm) and a thin (4 cm) rock, the rocks with the least and the most variable (respectively) temperatures. Various symbols as per Fig. 1. Both edge and center temperatures are indicated, and these delimit the thermal gradient available to snakes under each rock. Rock temperatures were taken at 30-min intervals, and spline functions are plotted. (b) Daily cycle of temperature underneath the Point D rock (intermediate thickness). Note differences between temperatures available on the south and east edges. Note also the long time that temperatures within the T_p range were available to a snake under this rock. (c) Temperature cycles at four representative depths in the soil at Snakehenge. Measurements were taken at 30-min intervals. (d) Operative temperatures from model snakes (shaded, exposed) on the ground surface at Snakehenge. Measurements were taken at 30-min intervals.

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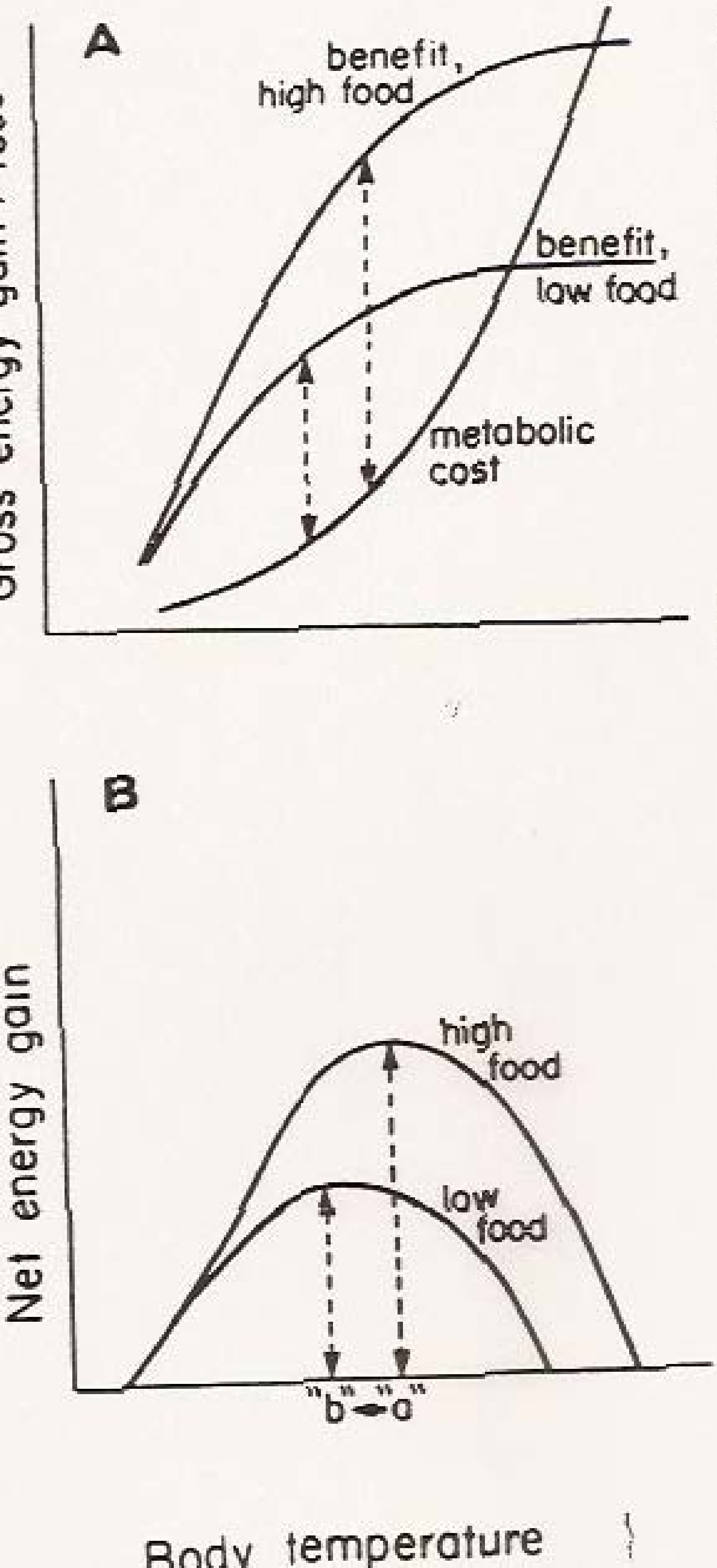

A
benefit, high food
benefit, low food
metabolic cost
B
Net energy gain
high food
low food
"b" ← "a"
Body temperature