

BIOMASS ESTIMATES AND THERMAL ENVIRONMENT OF A
POPULATION OF THE FRINGE-TOED LIZARD, *ACANTHODACTYLUS*
PARDALIS

By

STEPHEN D. BUSACK,
National Fish and Wildlife Laboratory,
National Museum of Natural History,
Washington, D.C. 20560.
(Received 26/11/73)

No field data are available for the lacertid lizard, *Acanthodactylus pardalis*. This study reports the results of a brief study of this species from 28.2km E and 6km S of Medenine, Gouvernorat de Medenine, Tunisia (elev. 50m). This is an area of North-saharan steppe in which over-grazing of *Rhanterium suaveolens* (Leguminosae) by sheep and camels has resulted in extensive dune formation.

Three small (.04-.06 HA) contiguous areas were chosen for population studies. Measurements of site dimensions were taken by pacing; the error in dimensions is about 10%. Specimens were collected from areas I and II from 11-13 May; area III was surveyed from 16-19 May, 1972. Each area was surveyed hourly during the period of activity (Fig. 1) and specimens were collected by stunning them with rubber bands. Specimens (usually dead) were stored at 20° C and weighed after return to the laboratory (a maximum of eight or nine hours after collection). All specimens observed were collected.

Several workers have presented arguments for the removal method of population estimation. Delury (1947) requires a thorough understanding of the biological factors which influence the behaviour of the subjects of the study. Hayne (1949) requires that the probability of capture be constant and that the number of animals present at the beginning of each period be the original population minus the number previously captured. Zippin (1956) requires that the probability of capture during a given trapping be the same for each animal and not vary from trapping to trapping. He (1958) further requires that trapping conditions (climate, effort, etc.) remain the same and hypothesizes that the multinomial method's precision is dependent upon the proportion of the population captured.

Each segment of the sample was analyzed independently using the formulae derived by Zippin (1956 and 1958). A chi-square test was used for the level of significance (Table 1). Since the chi-square for males from area III was too high to be reliable, these data were not considered further. The sample sizes were too low to be reliable at Zippin's 90% level for Standard Error, but I believe one can estimate confidence to be somewhere between 85 and 90% considering the percentage of captures on a theoretical level.

Based on the samples which appear to be reliable, the overall estimate of 148 males and 231 females per hectare would present a biomass of 2154 grams per hectare. The removal method of estimating biological populations is inferior to the mark and recapture technique (Zippin, 1958) but certainly may be useful when time is short and the subjects are as conspicuous and predictable as *Acanthodactylus*.

There were no apparent differences among the sites and data were pooled. Males weighed 5.0 to 11.0 ($x = 7.4 \pm 1.4$), females 3.5 to 6.5 ($x = 5.0 \pm 0.8$), grams, and there is a statistically significant difference in weight ($t = 7.72$, $p < 0.01$).

Cloacal temperatures of active lizards were obtained with a Bureau of Standards calibrated Terumo TN-III thermometer. Because the Terumo registered only between 35 and 42°C, only maximum voluntary tolerance (Cowles and Bogert, 1944: 277) could be measured and is reported as 38.0°C.

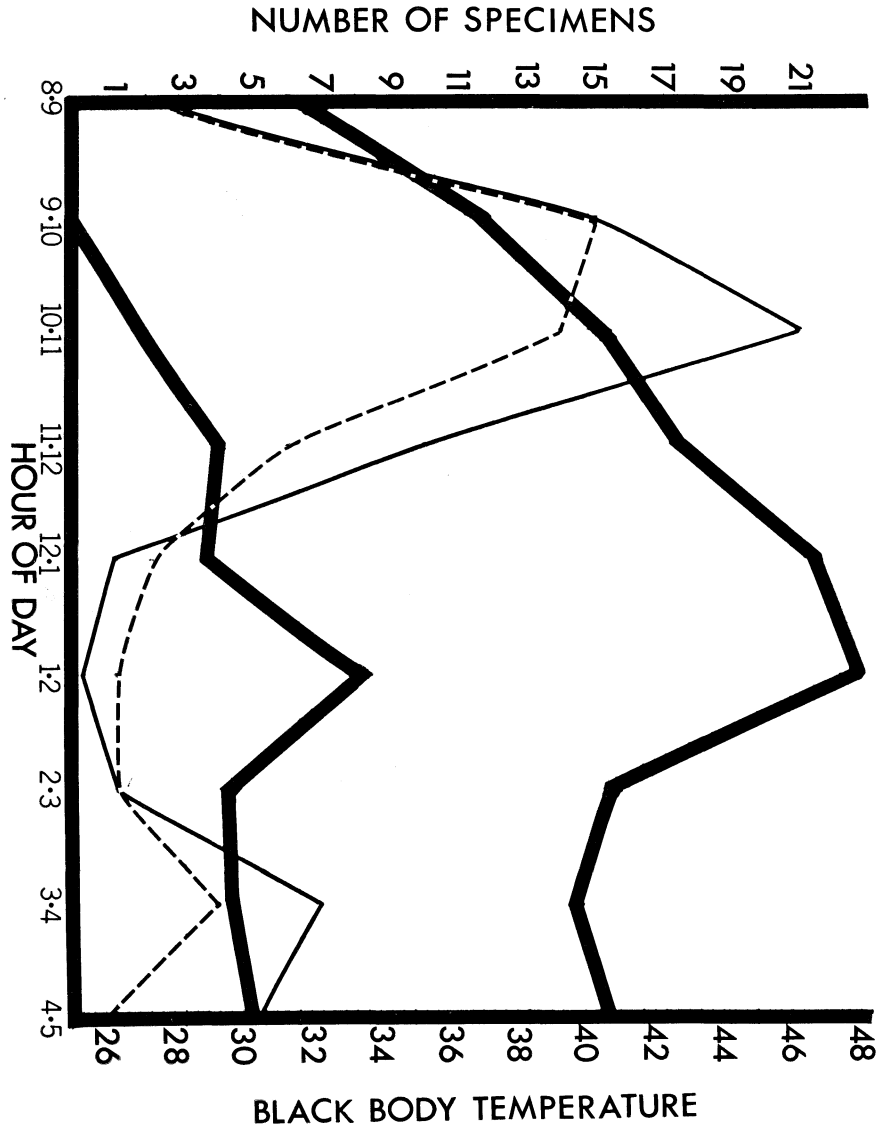


FIGURE 1. Activity patterns in relation to time and black body temperature. Heavy lines indicate air temperatures (lower, shade; upper, sun); solid thin line denotes numbers of males and the broken line, females.

The relation of activity to mean black-body temperatures is illustrated in Figure 1. Males and females show no apparent differences in activity. Since

the start of collecting was alternated between morning and afternoon on different sites on different dates, these composite data were compared with a nearby site from which no specimens were removed. Biomodality is not the result of collecting, but a natural effect; 36 months of data on *A. e. erythrurus* (pers. obs.) in southern Spain also exhibit this pattern.

Specimens collected are deposited in the Carnegie Museum (CM 56692(14), 56693(12), 56698-56705, 56715-56729, and 56731-56746).

Table 1. Actual and estimated *Acanthodactylus pardalis* population sizes.

AREA	♂♂		♀♀		PERCENT CAPTURED		STANDARD ERROR		x ² (2df) 99	
	N	N̂	N	N̂	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
I (.06 HA)	4	4	11	12.3	100	89	±1.0	±.48	0	.14
II (.04 HA)	8	11.4	10	10	70	100	±1.1	±1.0	1.01	0
III (.05 HA)	11	28.5	17	18.3	38	92	±4.0	±.38	10.74	.09

N̂ = Estimated population. N = Actual population.
x²₉₉ (2df) = 9.210 or less for significance.

SUMMARY

Preliminary estimates of biomass for *A. pardalis* based on a removal census are given at 2154 grams per hectare. Maximum population density is estimated at 148 males and 231 females per hectare. Males are significantly heavier than females and maximum voluntary temperature was recorded at 38.0°C. Thermal environment and activity patterns are given in Figure 1.

ACKNOWLEDGEMENTS

Transportation funds were provided through Carnegie Museum; work in the field was sponsored by F. H. Wagner and J. Ghiselin of United States International Biological Program. F. H. Pough of Cornell University provided U.S. Bureau of Standards calibration and reviewed an earlier version of the manuscript. The staff of the Division of Amphibians and Reptiles of the U.S. National Museum provided helpful comments, and, to each, I extend my sincere gratitude.

REFERENCES

COWLES, R. B. and Bogert, C. M. (1944). A preliminary study of the thermal requirements of desert reptiles. *Bull. Amer. Mus. Nat. Hist.* 33(5), 261-96.
 DELURY, D. B. (1947). On the estimation of biological populations. *Biometrics* 3(4), 145-67.
 HAYNE, D. W. (1949). Two methods for estimating population from trapping records. *J. Mammalogy* 30(4), 399-411.
 ZIPPIN, C. (1956). An evaluation of the removal method of estimating animal populations. *Biometrics* 12(2), 163-89.
 ZIPPIN, C. (1958). The removal method of population estimation. *J. Wildlife Management* 22(1), 82-90.