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NOTES ON THE BIOLOGY OF *VARANUS GOULDI* *FLAVIRUFUS*

By ERIC R. PIANKA, Department of Zoology, University of Texas,
Austin, Texas 78712

The Sand Goanna, *Varanus gouldi*, is perhaps the most familiar of the Australian monitor lizards. Yet relatively little, most of it anecdotal, has been reported concerning its behaviour, natural history, and ecology. The species occurs from coast to coast across Australia, and lives along seashores, in most forests, and in all habitats of the central deserts, including the Nullarbor Plain. The present note deals only with the inland race *flavirufus*, described by Mertens (1958), and is based upon 64 specimens in my collection.*

White (1952) reported that *gouldi* eat nestling birds, and pastoral people know that it will eat dead sheep and other carrion. Thompson and Hosmer (1963) assert that *flavirufus* is not arboreal, but that when hunted it seeks refuge in burrows in the sand. (Although this is usually true, on several occasions I have "treed" these goannas). One specimen, after being chased down and dug out of a burrow, assumed a peculiar threatening

* Now deposited in the Los Angeles County Museum of Natural History.

defensive posture (Fig. 1), with its back arched and neck inflated. The animal would not run after taking on this stance, and actually lunged at me several times.

In the Great Victoria desert, *gouldi* displays a strongly seasonal pattern of activity, usually being seen only during the 6 months from September through February, and remaining underground from March through August (Table 1). This long winter inactivity is probably related to thermoregulatory requirements. The mean body temperature of 52 active individuals was 38.1° C. (standard deviation = 3.04), well above the mean of the ambient air temperature (\bar{x} = 30.3° C., s.d. = 4.34). In order to attain and maintain a body temperature so much higher than air temperature, these large poikilotherms must require fairly high substrate temperatures and/or substantial levels of solar irradiation.



Fig. 1.—An adult *Varanus gouldi flavirufus*, in peculiar threat display described in text. Near Ayer's Rock in the Northern Territory.

Varanus gouldi flavirufus forage over great distances; I followed for over a mile the fresh tracks (made that day) of one individual. These daily forays often take the lizards through several habitats. The tracks of one monitor went along a sandridge, across the sandplain and down into a mulga "donga." Sand goannas are powerful diggers, frequently stopping to dig up prey. Their diggings are common in the desert and are quite characteristic, approximately kidney-shaped in cross-section. The lizards appear to have good powers of olfaction, often using their forked tongues. Even though large, sand goannas are relatively difficult to track as they do not ordinarily drag their tails as do *Varanus eremius* and *V. tristis*. One must look fairly closely to see the delicate footprints. The animals seem to be extremely wary of humans on foot, since one very seldom encounters them while walking. By contrast, driving along tracks leads an observer to believe that they must be fairly common.

The diet (Table 2) consists of fairly large food items (mean volume of 260 prey = 1.64 cc.). One small specimen was observed trying to subdue a large (151 mm. snout-vent) *Varanus gillemi*. Another contained parts of two unidentified baby birds, estimated to have weighed about 6 grams each. I found 17 identifiable species of lizards in 48 stomachs with contents (Table 3). The most important prey items, by both volume and

TABLE 1.—DATA DEMONSTRATING PRONOUNCED SEASONALITY OF ACTIVITY

MONTH	NUMBER OF DAYS SPENT IN FIELD	NUMBER OF <i>gouldi</i> COLLECTED	NUMBER PER DAY
Jan.	26	10	.38
Feb.	20	5	.25
March	15	0	.00
April	2	0	.00
May	17	0	.00
June	14	0	.00
July	0	0	—
Aug.	17	0	.00
Sept.	16	13	.81
Oct.	26	16	.62
Nov.	30	12	.40
Dec.	24	7	.29
TOTALS	207	63	

frequency, are various lizards and reptile eggs, both of which are probably normally dug up. However, it is interesting that 4 arboreal lizard species are represented: *Amphibolurus barbatus minor*, *Varanus caudolineatus*, *Varanus gilleni*, and *Diplodactylus ciliaris*. Probably most of these were dug out of their burrows, but some could have been captured above ground.

Three females contained eggs 15 to 25 mm. long in their oviducts, while two others had very large yolky ovarian eggs (8-15 mm. diameter). The females with oviducal eggs were collected on 22 November, 9 December, and 11 December; those with enlarged ovarian eggs on 22 October and 7 December. Clutch sizes of these 5 females were 5, 8, 6, 7, and 6, respectively. Judging from the data in Table 1, mating must occur in September and early October. Hatchlings emerge in late January and February, immediately before the onset of the winter period of inactivity.

One final slightly macabre observation on the sand goanna seems worth note; we found two undamaged but dead individuals at the mouths of burrows deep in the Great Victoria Desert at Lake Yeo and 18 miles south of Neale Junction. Both coincided with recent visits by Government doggers. As the stomach of one contained masses of disintegrating meat, it is apparent that these lizards will eat poisoned baits.

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TABLE 2.—SUMMARY OF STOMACH CONTENT DATA (N=64). 16 stomachs were empty. Volumes in cubic centimetres.

FOOD ITEM	Number	Estimated Volume of Intact Prey	% of Total Number	% of Total Volume	Frequency
Centipedes	8	23.6	3.1	5.6	12.5
Spiders	15	25.2	5.8	5.9	14.0
Scorpions	5	15.0	1.9	3.5	7.8
Wasps	1	0.5	0.4	0.1	1.5
Grasshoppers	27	31.5	10.4	7.4	18.7
Roaches	8	12.8	3.1	3.0	10.9
Stick insects	1	0.9	0.4	0.2	1.5
Beetles	47	44.3	18.1	10.4	20.3
Moths	1	2.0	0.4	0.5	1.5
Caterpillars	11	14.4	4.2	3.4	7.8
Unidentified insects	5	2.0	1.9	0.5	3.1
Mammals	1	5.0	0.4	1.2	1.5
Birds	2	12.0	0.8	2.8	1.5
Lizards	27	118.4	10.4	27.9	29.6
Reptile eggs	96	110.6	36.9	26.0	21.8
Unidentified vertebrate remains	5	7.0	1.4	1.6	7.7
TOTALS	260	425.2	99.8	100.0	

TABLE 3.—LIZARD SPECIES EATEN BY *VARANUS GOULDI FLAVIRUFUS*.

AGAMIDAE

Amphibolurus barbatus minor

Amphibolurus inermis

SCINCIDAE

Ablepharus greyi

Ablepharus timidus

Ctenotus atlas

Ctenotus colletti nasutus

Ctenotus helena

Ctenotus leonhardii

Ctenotus quattuordecimlineatus

Ctenotus schomburgkii

VARANIDAE

Varanus brevicauda

Varanus caudolineatus

Varanus gilleni

GEKKONIDAE

Diplodactylus citiarius

Diplodactylus conspicillatus

Diplodactylus pulcher

Rhynchoedura ornata