PAPERS AND PROCEEDINGS OF THE ROYAL SOCIETY OF TASMANIA, VOLUME 94

OBSERVATIONS ON THE SKINK LIZARD
Egernia whitii (*Lacépède*)

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(With 3 figures in the Text and 1 Plate).

ABSTRACT

Observations on the habitat, activity, food, reproduction, growth, moulting, longevity and abnormalities of the lizard *Egernia whitii* (*Lacépède*) are recorded. Information on the keeping of the lizard in captivity is given. *E. whitii* is most active at temperatures between 24°C. and 29°C. becoming dormant below 13°C. It feeds largely on ants, beetles, bugs and spiders. In the vicinity of Hobart mating of the lizard takes place in October. Pregnant females carry from one to five embryos and most births occur in February. *E. whitii* takes at least four years to attain a snout-vent length of 80 mm. and moults from three to five times a year. Its life span is estimated to be more than eight and a half years.

INTRODUCTION

In the course of studying the life-history of the cestode *Oochoristica vacuolata* Hickman, which occurs as a parasite in the lizard *Egernia whitii*, the opportunity was taken to record some observations on the biology of the lizard itself. These observations are set out in the present paper.

Although the lizard is common and widely distributed in Australia, the only information concerning its habits are the brief comments of McCoy (1890), Lucas and Frost (1894), Waite (1929) and Hewer (1948). Up till now there has been no record of the lizard climbing trees. In fact McCoy (1890) and Waite (1929) claim that *E. whitii* does not climb trees.

Lucas and Frost (1894) mention that its food consists chiefly of insects and that in captivity it will feed on smaller lizards. They also record an instance of the lizard swallowing its own detached tail. Hewer (1948) refers to its eating "small fruits such as strawberries, &c". These brief observations appear to be all that have been recorded concerning the food of the lizard.

The only reference to the longevity of *E. whitii* is that of Flower (1925), who records the lizard as living in the Zoological Garden, London, for three years, two months and sixteen days. Flower also makes reference to a record of a related species, *E. cunninghami*, as living in the Jardin des Plantes, Paris, for nineteen years, eleven months and four days.

Lord and Scott (1924) claim the lizard to be "a common species in many localities" in Tasmania and Hewer (1948) refers to its occurring "all over Tasmania from sea-level to mountain top". Apart from these general remarks on the distribution of the lizard in Tasmania, the only references to its occurring at specific localities in the State or on adjacent islands are those of Lucas and Frost (1894), who record it from King Island and the Kent Group, and Hewer (1951), who mentions that it occurs on Betsy Island.

The length of the lizard seems to vary considerably. In South Australia, according to Waite (1929), it reaches a total length of 355 mm., but is better known as a somewhat smaller lizard. Lucas and Frost (1894) give the total length as 295 mm. and the tail length as 185 mm. They state, however, that in Victoria it rarely exceeds a total length of 250 mm. Lord and Scott (1924) record the average total length as 300 mm. and the tail length as 187 mm. More recently Hewer (1948) states that "mature specimens usually about 10 inches, although larger specimens are sometimes found".

In the present study it will be shown that of 350 specimens measured, none attained such lengths. It is possible that the higher average day temperatures in South Australia and Victoria may account for the lizard growing to a larger size in those States.

KEEPING *EGERNIA WHITII* IN CAPTIVITY

It is possible to obtain new-born lizards by collecting from the field females in advanced stages of pregnancy and keeping them in a suitable vivarium until the young are born. The vivarium used in the present investigation consisted of a wooden enclosure about 274 cm. long, 91 cm. wide and 20 cm. deep, partly lined with galvanised iron, which was sunken into the ground to a depth of about 20 cm. in order to prevent the lizards from burrowing out. The enclosure was provided with a movable wire-mesh cover and a small door for the admission of insects serving as food. The whole structure was located out-of-doors in a garden. Some eight or more large flat stones and several grass tussocks were placed in the vivarium to provide adequate cover for the lizards.

About eight pregnant females were kept in the enclosure, which was inspected regularly. As the young lizards were found, which was usually soon after birth, they were immediately removed. Each specimen was placed in a small wooden box (about 18 cm. long, 10 cm. wide and 10 cm. deep) fitted with a glass front and a wire-mesh top. The box was filled to a depth of about half an inch with earth. A small flat stone under which the lizard might hide was placed in the box. The

boxes were kept in a sun-room which received direct sunlight for most of the morning. The young lizards were offered termites, small ants and spiders as food. These they would readily take after the first day. Water for them to drink was periodically sprayed into the box. On hot days, after a period of exposure to the sunlight, the boxes were shaded to avoid overheating the lizards. Fifteen young lizards born in captivity were raised in this way.

By daily visits to the field during the months in which the females give birth to their young another thirty-four newly born lizards were obtained. These were kept in a manner similar to that employed in the case of those born in captivity.

Single adult specimens lived satisfactorily in separate wooden boxes, 52 cm. long, 22 cm. wide and 18 cm. deep. The top of each box was fitted with a movable glass lid leaving a gap of about 10 cm. by 22 cm. at one end. This gap was closed with a wire-mesh door for ventilation. The box was filled with earth to a depth of five to eight centimetres. A small jar, sunk in the soil at one end of the box was kept filled with water. A 25-watt globe placed at the end of the box opposite to the wire door provided artificial heating when required. A flat stone, about 15 cm. long, 18 cm. wide and 5 cm. deep, placed in the box near the door, served for the lizard to hide under and also for it to rub against when moulting. Ants (adults, larvae and pupae), termites, spiders, beetles and flies provided a varied diet on which the lizards thrived.

DISTRIBUTION AND HABITAT

Egernia whitii occurs not only in Tasmania, but also in Victoria, New South Wales, Queensland, South Australia, Western Australia and Central Australia. Its distribution within Tasmania has not been studied systematically, but I have collected it at the following places:—Table Cape, Burnie, Trevallyn, Mt. Rumney, Lindisfarne, Risdon, Ridgeway, Mt. Nelson and the Queen's Domain, and received specimens from Orford and Sandfly.

In the vicinity of Hobart the lizard occurs from sea level on the Queen's Domain to an altitude of approximately 1,200 feet at Ridgeway. It favours the more exposed areas on rock-strewn slopes, which face east, north or north-west and which have a friable top soil. In such localities *E. whitii* may often be seen sunning itself on top of a rock, on grass tussocks or on bare areas of soil between the tussocks. It frequently hides in burrows made in cracks in the soil, at the sides of roots of trees, or under stones. Such retreats usually have at least two openings, possibly serving for ventilation or for easy escape if necessary.

ACTIVITY

To investigate the feeding activity of the lizard, specimens collected on the Queen's Domain during each month of the three year period, 16th September, 1954, to 15th September, 1957, were chloroformed, dissected and the gut contents examined. The presence or absence of food in each of the three regions of the alimentary canal—stomach, small intestine, and large intestine—was noted. A lizard which had food in any two of these regions was considered to have been feeding more actively than one which had food in only one region or one which had no food present in any region of the gut. The feeding activity of 150 specimens of the lizard was examined on this basis. The results analysed for the three year period are shown in Table 1. Feeding is seen to be at a maximum from November to March. During June, July and August when the average maximum temperature is below 13°C., the lizards exhibit a minimum of activity and the majority of them hibernate in holes in the ground or under stones.

Table 1. Anaysis of the feeding activity of *Egernia whitii* for the period 16th September, 1954, to 15th September, 1957.

Month	Number of specimens of *E. whitii*					*Daily average sunshine (in hrs.)*	*Mean max. temp. in degrees Cent.*
	examined	*with no food in gut*	*with food in 1 region of gut*	*with food in 2 regions of gut*	*with food in 3 regions of gut*		
Jan. ..	8	0	0	1	7	8.1	21.3
Feb. ..	9	0	0	1	8	6.5	21.5
Mar. ..	33	0	1	1	31	6.1	20.1
April ..	15	0	1	3	11	4.8	17.4
May ..	11	0	1	2	8	4.1	13.7
June ..	6	2	3	1	0	3.6	12.1
July ..	6	2	3	0	1	4.8	11.3
Aug. ..	6	2	4	0	0	4.5	12.9
Sept. ..	11	0	4	3	4	5.8	14.8
Oct. ..	25	0	5	6	14	6.2	16.2
Nov. ..	13	0	0	2	11	6.6	17.3
Dec. ..	7	0	0	1	6	7.2	20.3

An analysis of the feeding activity in relation to the size of lizards collected during the months May to August inclusive is given in Table 2. The analysis indicates that during these months, when activity falls to a minimum, it is the young or small lizards that show the greater activity. Moreover, in the early morning of a day in December young lizards were observed to come out of their

Table 2. Analysis of feeding activity of *E. whitii* in relation to size of specimen collected in the months May-August (inclusive) during the period 16th September, 1954, to 15th September, 1957.

Lizard with Snout-Vent length	Number of specimens of *E. whitii*				
	examined	*with no food in gut*	*with food in 1 region*	*with food in 2 regions*	*with food in 3 regions*
Less than 60 mm.	13	1	3	2	7
More than 60 mm.	16	5	8	1	2

burrows to sun themselves at least half an hour before the older lizards in the same area appeared. It would therefore seem that small lizards become active earlier and remain active longer than do large lizards.

From observations of the habits of lizards kept in captivity, activity and feeding are at a maximum at temperatures between 24°C. and 29°C. Above these temperatures the lizards seek shade under cover of stones or grass. On very hot days in summer, they sun themselves and feed in the mornings and afternoons, but retreat into their burrows or under stones in the heat of mid-day. When sunning themselves they part their hind legs and flatten the body, so as to bring the ventral surface to the trunk against the ground or stone on which they are resting.

In loose soil *E. whitii* is capable of digging actively. It quickly excavates a burrow under a stone, using its right or left manus to scratch out the soil. Freshly excavated earth at the side of a stone is often an indication of the presence of the lizard in its burrow.

In warm weather the lizard is able to run with considerable speed, the head being lifted up slightly above the ground, while the tail is dragged over the surface. Jumping is rarely exhibited by *E. whitii*. However, it will sometimes spring off the ground in order to snap at a fly which is hovering near by. Occasionally the lizard will climb a tree as was observed late one afternoon, when a specimen was noticed basking in the last rays of the sun, about sixty centimetres up the trunk of a Prickly Box (*Bursaria spinosa*).

In capturing an insect or other prey the lizard usually moves into a position, where it is able to snap at the head of its victim. It then straightens its fore-limbs, raises its head, arches its neck and strikes suddenly at its prey in an endeavour to swallow it head first. If the prey is large or too hard, the lizard will often attempt to crush it by seizing it with its jaws and rubbing it on the soil or against a stone. In the act of swallowing large insects the lizard sometimes stretches its neck by moving its head forwards and upwards and then from side to side.

Water is obtained by using the tongue to lick dew and rain off the surface of stones and grass. In captivity water is readily taken from the end of a glass pipette. After drinking the lizard sometimes makes a peculiar clicking noise with its jaws.

Depending on food-intake and temperature conditions, defecation occurs once or twice a day. On warm days faeces may be passed once in the morning and again in the afternoon. It usually takes three days for food to pass through the alimentary canal. The lizard often goes to a definite site to defecate, generally near the place where it suns itself. Here faecal pellets collect, unless carried away by coprophagous insects.

When irritated *E. whitii* will sometimes raise the head and front of the body, open the mouth and attempt to bite.

FOOD

Lizards kept in captivity appeared to tire of the one kind of food. They would frequently refuse to eat until an alternative food was provided. That *E. whitii* likes a change in its diet is further indicated by the great variety of food found in the stomachs of lizards collected in the field. A summary of the food present in the alimentary canal of 197 lizards from the Queen's Domain is given in Table 3. The food, in order of frequency of occurrence, consists of Insecta, Arachnida, Crustacea, Myriapoda, Gastropoda and Oligochaeta.

Insecta.—Hymenoptera occurred in the food of 99.4% of the lizards examined. The most frequent Hymenoptera, the Formicidae, were represented by several unidentified Dolichoderinae and species of the genera *Pheidole, Polyrachis, Promyrmecia, Orectognathus* and *Camponotus*. Ants formed part of the food in every month of the year and were particularly numerous in the food consumed during the summer. The stomachs of several young lizards (about one month old) contained 30-40 small ants belonging to the Dolichoderinae and Myrmicinae. The Ponerinae and Camponotinae appeared more frequently and in greater numbers in the food of the older lizards, the common Sugar Ant (*Camponotus consobrinus*) being especially evident.

Coleoptera occurred in 44.7% of the lizards. Rarely more than six beetles were found in any one specimen. As might be expected the large family Curculionidae predominated.

Hemiptera, the only other insect group forming a major part of the skink's diet, were present in 32.5% of the lizards and were represented mainly by Heteroptera.

Lepidoptera, Diptera and less frequently Orthoptera, Thysanoptera and Odonata also occurred in the food.

Arachnida.—The gut of 39.5% of the lizards contained Arachnida, mainly spiders. The latter formed part of the food every month of the year.

Crustacea.—Terrestrial Isopoda occurred in 14.2% of the lizards and were represented by *Porcellio scaber, Armadillidium vulgare* and *Eluma caelatum*.

Myriapoda (mainly Chilopoda), *Gastropoda* and *Oligochaeta* were occasionally present but formed only an insignificant part of the food.

Flowers and seeds, possibly swallowed by the lizard when capturing insects, were the only plant material found in the gut of the lizards.

REPRODUCTION

In the vicinity of Hobart mating of *E. whitii* occurs in October. On one occasion a male was observed to chase after a female and, using his jaws, to seize her at the sides of the thorax immediately behind the left forelimb. He then attempted to bring his body close to hers and to insert into her cloaca a hemipenis, which was protruding from his own cloaca. The female, however, freed herself and escaped.

TABLE 3

Summary of food of *Egernia whitii*

Months	Number of Lizards Examined	Number of Lizards containing: Hymenoptera	Formicidae	Ichneumonidae	Braconidae	Chalcididae	Unidentified	Coleoptera	Curculionidae	Carabidae	Scarabaeidae	Chrysomelidae	Elateridae	Tenebrionidae	Dermestidae	Staphylinidae	Pselaphidae	Byrrhidae	Larvae	Unidentified	Hemiptera	Heteroptera	Homoptera	Lepidoptera	Adult	Larvae	Diptera	Orthoptera	Thysanoptera	Odonata	Arachnida	Araneida	Acarina	Opiliones	Myriapoda	Chilopoda	Diplopoda	Crustacea (Isopoda)	Porcellionidae	Armadillidiidae	Gastropoda	Oligochaeta
January	8	8	8	...	...	...	...	6	3	4	...	...	...	...	...	...	...	...	1	4	4	...	...	...	...	...	5	8	1	1	1	8	...	1	8	1	2	1	1	...	...
February ..	43	42	42	...	...	...	6	23	10	4	2	2	2	3	3	...	...	...	3	7	7	7	...	1	1	...	6	4	1	...	13	13	...	...	1	1	...	3	2	...	...	...
March	41	39	39	...	1	...	3	13	5	2	...	3	2	...	...	...	1	1	...	6	15	12	3	7	6	1	6	7	...	...	18	17	2	1	1	1	...	5	...	2	...	...
April	15	15	15	...	...	1	5	7	5	...	...	1	...	...	...	...	...	...	1	3	7	7	...	2	2	...	2	...	...	...	7	7	...	...	...	...	...	...	...	...	...	...
May	11	11	11	...	...	...	4	4	2	...	...	...	...	...	...	1	...	...	...	2	...	...	...	3	3	...	...	1	1	...	3	3	...	...	2	2	...	1	...	1	1	...
June	6	4	4	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	1	...	...	1	1	...	...	...	...	...	...	...	...	...	...
July	6	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	...	...	...	1	...	1	...	...
August	6	4	4	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...
September ..	11	11	11	...	...	...	2	5	...	...	2	...	1	1	1	...	...	...	...	5	2	2	...	1	...	1	1	...	...	...	6	5	1	...	1	1	...	3	2	1	1	...
October	30	29	29	...	...	...	3	20	7	1	6	2	4	...	...	...	...	...	...	5	15	15	...	8	3	6	7	...	...	...	14	13	2	...	...	...	...	9	1	8	3	...
November ..	13	13	13	1	...	...	4	12	8	1	2	1	...	1	...	1	...	...	...	2	10	10	...	4	...	4	3	...	...	...	4	4	...	...	1	1	...	4	2	2	...	1
December ..	7	7	7	1	...	...	...	7	4	5	...	...	...	...	...	...	...	...	...	1	4	4	...	2	1	1	2	...	...	...	7	7	...	...	...	...	...	...	...	...	1	1

The lizard is viviparous. In a female carrying three embryos, two were in the right and one in the left uterus. The maximum number of embryos found in any one female was five. Though most births are in February, some take place in the last week of January and others do not occur until March or April. The mother bears her young in cavities under stones or in holes in the ground. The newly-born lizard is quite active and after moulting is ready to feed. The umbilical scar on the ventral surface of the body remains for some time and was still evident on a lizard having a length of 61 mm. from snout to vent.

The fact that occasionally a one year old lizard may be found together with a fully grown adult under the same stone, suggests that the young may remain with the parent for at least a year.

The size and age at which sexual maturity is reached was not definitely discovered. The smallest pregnant female measured 182 mm. in total length and 78 mm. from snout to vent. However, from the well developed condition of the ovary in lizards measuring 140 mm. in total length and 58 mm. from snout to vent, sexual maturity of the female might be attained in specimens measuring less than 78 mm. from snout to vent.

GROWTH, MOULTING AND LONGEVITY

At birth the young lizards have the following measurements in millimetres:—Total length 70-92, tail length 35-53 and snout-vent length 35-39. Three hundred and fifty specimens including young and adult were measured and although the majority of the larger lizards measured 182-207 mm. in total length, 102-122 mm. in tail length and 80-85 mm. in snout-vent length, the largest had a total length of 219 mm., a tail length of 129 mm. and a snout-vent length of 90 mm.

The growth in tail length relative to that in snout-vent length is shown in Fig. 1. Because of the occurrence of broken and regenerated tails and the possibility that some such tails may not have been detected, only the maximum tail length for each snout-vent length is plotted.

From the frequency histograms (Figs. 2 and 3) of the snout-vent length of specimens collected during the periods January to March and Sep-

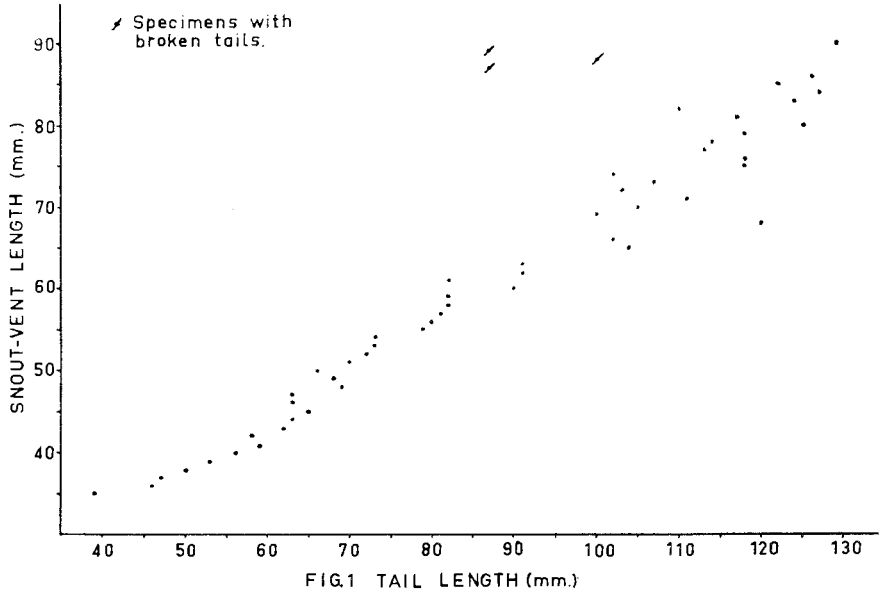

FIG. 1.—*Egernia whitii*. Snout-vent lengths relative to tail lengths in fifty-five specimens.

tember to November, it may be seen that in the first year the lizard grows to a snout-vent length of 51-60 mm. Compared with the corresponding measurement at birth, this is an increase in snout-vent length of 12-25 (mean 19) mm. A lizard raised in captivity showed a similar increase in the first year. Its snout-vent length grew by 18 mm. in the first year, by 9 mm. in the second year and by 8 mm. in the third year. After 42 months its snout-vent length measured 75 mm. At such a rate of growth *E. whitii* would require at least four years to attain a snout-vent length of more than 80 mm. However, growth may be extremely slow as is evidenced by the fact that a lizard raised in captivity measured only 50 mm. in snout-vent length after 34 months.

Scales found in the gut of one-day-old lizards and in the faces of four-day-old lizards raised in captivity indicate that *E. whitii* moults at birth. The discovery of scales in the gut of lizards collected in the field during January, February, March, May, October, November and December, together with observations on the moulting of specimens in captivity, indicates that moulting may occur in any month with the exception of June,

July and August. The record of moulting of two full grown lizards collected in the field and of four young specimens born in captivity is shown in Table 4. It is seen that *E. whitii* undergoes three to five moults a year, the average number being four.

Temperature has a marked influence on moulting.. This is clearly shown by the fact that lizards in vivaria at 26°C. ± 3° doubled their moulting rate. Moreover, if a specimen, which from the dark appearance of its skin is seen to be about to moult, be kept at a temperature below 15.5C., it will fail to mould and consequently die.

The scales on the head and dorsal surface of the trunk are the first to come off and are removed by the lizard rubbing against grass, stones and other objects. Frequently the skin covering the tail comes away in one piece. On several occasions *E. whitii* was observed pulling the skin off its limbs with its teeth, a habit which may well account for the presence of scales in the gut. In some specimens the almost complete glove-like integument of the manus was found in the alimentary canal.

One lizard, which from its size was at least four years old when collected, lived in captivity from 1st December, 1954, to 26th May, 1959, a period of four years five months and 25 days. It is therefore probable that *E. whitii* has a life span of at least eight and a half years.

ABNORMALITIES

Among the three hundred and fifty lizards examined was a specimen having a forked tail. The lizard was 167 mm. in total length. The tail measured 87 mm. and the bifurcation occurred 65 mm. from the vent. Another specimen appeared club-footed. The third and fourth digits of the right forelimb and the second third and fourth digits of the right hind limb were missing. All the remaining digits on the limbs of both sides were represented merely by their bases, only three dorsal scales in each case being present. The club-footed appearance was obviously the result of mutilation, perhaps due to the lizard endeavouring to remove the integument of the digits with its jaws when moulting.

The possibility of self mutilation occurring in lizards renders the clipping of digits as a means of identification not dependable.

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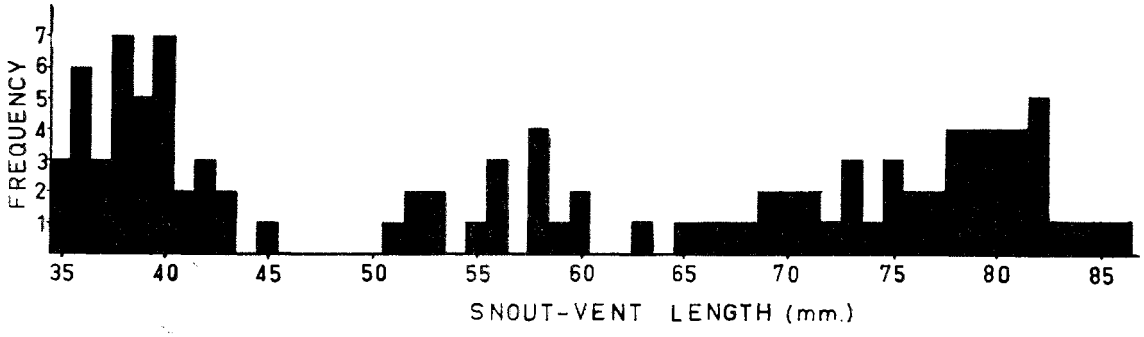


FIG. 2

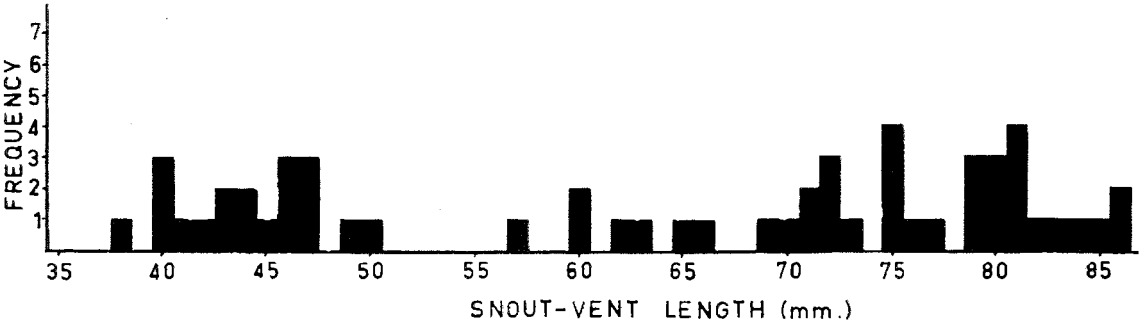


FIG. 3

FIG. 2.—*Egernia whitii*. Frequency histogram of snout-vent lengths of lizards collected in the months of January to March inclusive during the period 16th September, 1954, to 15th September, 1957.

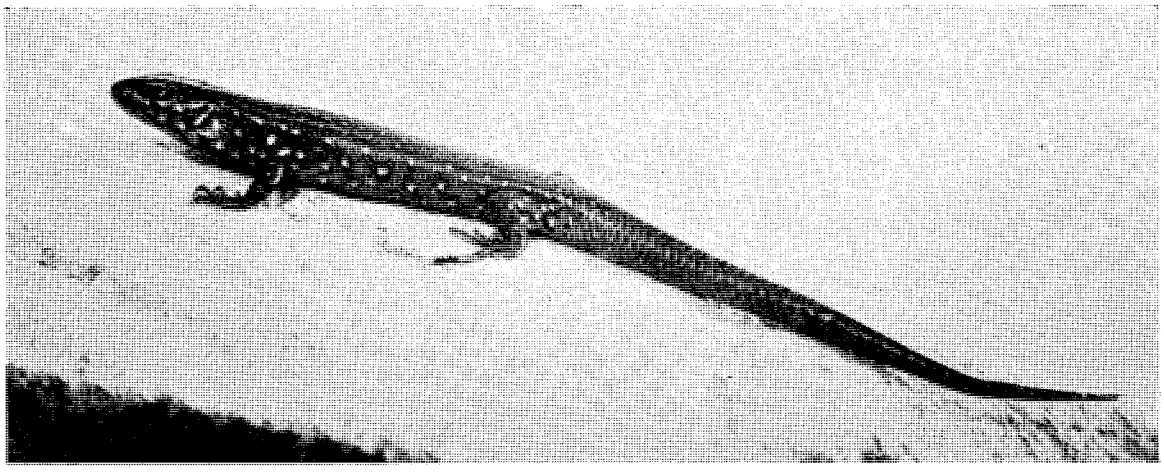
FIG. 3.—*Egernia whitii*. Frequency histogram of snout-vent lengths of lizards collected in the months of September to November inclusive during the period 16th September, 1954, to 15th September, 1957.

TABLE 4

Moulting of *Egernia whitii* in captivity

Specimen No.*											
1		2		3		4		5		6	
Date of moult	Period between moults	Date of moult	Period between moults	Date of moult	Period between moults	Date of moult	Period between moults	Date of moult	Period between moults	Date of moult	Period between moults
22.2.56		23.2.56		24.2.56		26.2.56		9.2.56		28.1.56	
14.11.56	266	29.9.56	219	11.11.56	261	5.10.56	222	13.10.56	247	5.5.56	98
22.12.56	38	26.11.56	58	17.12.56	36	7.12.56	63	14.12.56	63	19.9.56	137
22.2.56	62	4.1.57	39	30.3.57	103	14.1.57	38	18.1.57	35	5.12.56	77
2.11.57	253	4.2.57	31	14.11.57	229	23.2.57	40	11.3.57	52	30.1.57	56
11.12.57	39	20.3.57	44	30.12.57	46	19.10.57	238	19.10.57	222	30.3.57	59
15.2.58	66	4.11.57	239	25.2.58	57	18.11.57	30	11.12.57	53	28.9.57	182
		28.12.57	44			16.12.57	28	23.1.58	43	16.12.57	79
		10.3.58	72			2.2.58	48	24.3.58	60	12.2.58	58
Average number of moults/year .. 3		4		3		4		4		4	

* Specimens 1–4; raised in captivity.
5 and 6; collected from the field.



EXPLANATION OF PLATE

Egernia whitii. Specimen born and raised in captivity. Three years and eight months old. Total length 168 mm.