

if it has not a convenient hole to fall into. There is, by contrast, a period of intense activity in early spring, when the snakes are mating. At this time the males move around constantly at quite a rapid rate for long periods at a stretch, looking for females, and when they find them indulge in frenzied outbursts of courtship.

When kept indoors, it is not essential that the Dice Snake should have a large water container. Like most of the American *Natrix* snakes, it does quite well if kept in a dry cage with a small water bowl for drinking, and usually learns to take fish from such a bowl. Freshly-caught specimens will not always take dead fish at first, but usually learn to do so after a while. If slow to learn this, forced feeding may be necessary for a while, and although this practice is in general not to be encouraged, it is often found that a Dice Snake will readily swallow a fish if the head is introduced into its mouth, and a snake which has consistently refused to feed and is once treated in this way will often resume feeding by itself as a result. However, in order to really study the interesting habits of this snake, there is no doubt that it is best to have a water container large enough so that the snake can move around in it and catch its prey in the normal manner. The water need not be more than 4 to 6 inches deep and it is best to have plenty of weed in it, as this definitely encourages the snake to enter the water to feed. If some small branches or twigs are arranged to overhang the water, the snake will use these as a resting place and when sufficiently tame will learn to glide down into the water when food is introduced. It is, of course, necessary to ensure that the water container does not leak or slop over into the rest of the cage, as like all snakes the Dice Snake will quickly develop skin sores if kept in permanently damp surroundings.

The eggs, which in a wild state are laid in July and August, may be any number between 5 and 25, according to the size of the female, and hatch in about twelve weeks. Any eggs laid in captivity should be treated as those of other snakes, by being kept at suitable temperature and humidity, packed in sphagnum moss, wood shavings or the like. The young take to the water almost as soon as hatched and feed largely on fish fry, or small amphibian larvæ. If this food can be obtained, they are not particularly difficult to rear.

Altogether, this is an interesting snake, well deserving more attention than it seems to have received in the past.

SOME ECOLOGICAL NOTES ON THE BRITISH REPTILES,  
WITH PARTICULAR REFERENCE TO THEIR  
FEEDING HABITS

by

D. G. BROADLEY,

Honorary Keeper of Herpetology,  
National Museum of Southern Rhodesia

These observations are based on a study of a collection of reptiles maintained at Southampton during the seasons 1953-54. Most of the specimens were collected in Hampshire and Dorset, but a few *Lacerta vivipara* came from Stamford, Lincolnshire.

*ANGUIS FRAGILIS* Linné

**HABITAT.** The Slow-worm is very common in Hampshire and Dorset, but rarely seen because of its secretive habits. I trapped scores of specimens on the slopes of an old quarry at Crabwood, Southampton, simply by laying pieces of wood or cardboard flat on the grass. The reptiles were attracted by the warmth and humidity under the cover and often several Slow-worms would be found in one trap. Several male Blue-spotted Slow-worms (var. *colchica*) were taken. The spots were usually pale blue-grey or Cambridge blue immediately after sloughing, but often turned brownish later.

**DIET.** Small slugs taken by captive specimens.

*LACERTA AGILIS AGILIS* Linné

**HABITAT.** Thirteen Sand-Lizards were captured in Dorset, but none in the New Forest, although thoroughly searched for. Specimens were taken along an overgrown ditch at Wareham and on Stoborough and Studland Heaths near Corfe Castle.

**DIET.** A breakdown of the food taken by captive specimens is given in comparison with the data for *Lacerta vivipara*, under which species the table appears.

**HABITS.** A less active reptile than the next species. The Sand-Lizard is usually found in colonies on small hillocks or banks which are often covered with thick heather. These lizards quickly became tame in captivity and fed from hand.

*LACERTA VIVIPARA* Jacquin

**HABITAT.** The Viviparous Lizard is very common in Hampshire and Dorset on dry heaths and along ditches. I have never found this species in the areas inhabited by the Sand-Lizard. At Stamford, Lincolnshire, a colony of *Lacerta vivipara* lives in a limestone wall within a few yards of the Great North Road (A1) and appear to thrive because the heavy traffic frightens away their enemies. One male from this colony measured 165 (60 + 105) mm. and found his long heavy tail quite a handicap. There were two melanica individuals out of a collection of 200 lizards. One was a pitch black female, fully grown and with an original tail, taken on Southampton Common. The other was a young male from Bournemouth in which the lighter markings were just discernible.

**DIET.** During the seasons 1953 and 1954 a collection of lizards was kept in an open air vivarium. They were taken out in the evening and placed in an empty box, into which a mixed selection of invertebrates was emptied. A card was made out for each lizard and everything eaten was recorded on it, each item being assessed at a value in points according to bulk (e.g., 1 for a small spider or house-fly; 4 for a centipede; 6 for a large spider, beetle, etc.). The following table shows the various groups of creatures preyed upon, expressed as a percentage of the total amount of food consumed.

Key to columns: 1. The variation in the 20 best feeders in 1953. 2. All *L. vivipara* for the period 4/4/53 to 17/10/53. 3. All *L. vivipara* for the period 20/3/54 to 21/8/54. 4. *L.a. agilis* (9 specimens) for the period 10/7/54 to 21/8/54.

	Variation	<i>L. vivipara</i>		<i>L.a. agilis</i>
		1953	1954	1954
Orthoptera (Grasshoppers)	0 to 17	5.4	5.3	32.4
Dermoptera (Earwigs)	0 to 14	2.7	0.6	0.5
Odonata (Damsel-flies)	0 to 54	11.5	2.1	5.0
Lepidoptera (Moths, Butterflies)	0 to 12	1.7	0.8	8.5
Diptera (Two-winged flies)	0 to 34	16.3	5.2	1.4
Colcoptera (Beetles)	0 to 6	0.3	0.5	0.6
Hymenoptera (Ants)	0 to 6	1.5	3.4	0.2
Insect larvæ and pupæ	0 to 11	2.0	2.7	6.4
Crustacea (Woodlice)	0 to 5	1.5	—	0.5
Arachnida (Spiders)	8 to 47	26.1	30.0	24.6
Chilopoda (Centipedes)	5 to 79	31.0	48.0	19.7
Oligochaeta (Earthworms)	Nil	—	1.2	0.2
		<hr/> 100.0%	<hr/> 100.0%	<hr/> 100.0%

The first column clearly shows the great variation in individual tastes. Of the 20 lizards for which data was collated three came from Stamford, and these specimens accounted for the most spiders (47%, 45% and 40% respectively). So there may be variation in food preferences between specimens from different districts.

The other columns show the food preferences for the average lizard. In the wild state lizards certainly consume less Damsel-flies and Centipedes, but the percentage of spiders would probably be higher. Very few specimens would show any interest in beetles, woodlice or worms. The figures for *L.a. agilis* differ little from those for *L. vivipara*; being a larger reptile it can more readily tackle the larger insects and this is indicated by the higher figures for Grasshoppers, Butterflies and Moths and larvæ.

One of the most interesting points is the great liking shown by both species for centipedes. Most lizards showed some intelligence by always seizing the Chilopod by the head and crushing it before they could be bitten. A few individuals were less sensible and regularly got bitten after taking a centipede in the middle of its body.

I was rather surprised to find that lizards would take moth pupæ, crushing them and then lapping out the contents with their tongues, which always reminded me of a child with an ice-cream cornet!

All the lizards were very fond of sweetened tea, lapping it up from a saucer. Often when the ring of lizards had drunk their fill some of them would climb into the saucer and flatten their bodies in the warm tea.

**HABITS.** The Stamford specimens were taken as they basked on the wall on which they lived. In Hampshire most specimens were taken on heaths, where they often basked in gorse bushes a few feet from the ground. Each lizard had a series of basking places according to the position of the sun and the lizard always returned to its basking place, even if it had narrowly avoided capture several times in succession. In captivity they demonstrated the curious habit of flattening their bodies to receive the maximum amount of warmth and then twisting their limbs so that the soles of the feet pointed upwards. I have observed the same behaviour in African lacertids (*Ichnotrophis squamulosa*; *Ichnotrophis capensis*; *Nucras intertexta holubi* and *Eremias lugubris*) in Southern Rhodesia. During spells of dull weather they basked quite happily in the heat of an electric fire, in the usual position with feet in the air and eyes closed. While writing in the evening I often had a few tame lizards climbing around my body or absorbing the heat it offered. On one occasion a lizard snuggled down in my breast-pocket and climbed out 24 hours later, much to my surprise.

*NATRIX NATRIX HELVETICA* (Lacépède)

**HABITAT.** The Ringed Snake is very common in the New Forest, being particularly abundant near Brockenhurst, where many specimens were taken along the Ober Water. From my field notes: 3/5/53—4 snakes captured out of 6 seen; 24/5/53—4 captured out of 10; 19/7/53—2 captured out of 5; 27/4/54—5 captured out of 8.

*LACERTA VIVIPARA* Jacquin

**HABITAT.** The Viviparous Lizard is very common in Hampshire and Dorset on dry heaths and along ditches. I have never found this species in the areas inhabited by the Sand-Lizard. At Stamford, Lincolnshire, a colony of *Lacerta vivipara* lives in a limestone wall within a few yards of the Great North Road (A1) and appear to thrive because the heavy traffic frightens away their enemies. One male from this colony measured 165 (60 + 105) mm. and found his long heavy tail quite a handicap. There were two melanica individuals out of a collection of 200 lizards. One was a pitch black female, fully grown and with an original tail, taken on Southampton Common. The other was a young male from Bournemouth in which the lighter markings were just discernible.

**DIET.** During the seasons 1953 and 1954 a collection of lizards was kept in an open air vivarium. They were taken out in the evening and placed in an empty box, into which a mixed selection of invertebrates was emptied. A card was made out for each lizard and everything eaten was recorded on it, each item being assessed at a value in points according to bulk (e.g., 1 for a small spider or house-fly; 4 for a centipede; 6 for a large spider, beetle, etc.). The following table shows the various groups of creatures preyed upon, expressed as a percentage of the total amount of food consumed.

Key to columns: 1. The variation in the 20 best feeders in 1953. 2. All *L. vivipara* for the period 4/4/53 to 17/10/53. 3. All *L. vivipara* for the period 20/3/54 to 21/8/54. 4. *L.a. agilis* (9 specimens) for the period 10/7/54 to 21/8/54.

	Variation	<i>L. vivipara</i>		<i>L.a. agilis</i>
		1953	1954	1954
Orthoptera (Grasshoppers)	0 to 17	5.4	5.3	32.4
Dermaptera (Earwigs)	0 to 14	2.7	0.6	0.5
Odonata (Damsel-flies)	0 to 54	11.5	2.1	5.0
Lepidoptera (Moths, Butterflies)	0 to 12	1.7	0.8	8.5
Diptera (Two-winged flies)	0 to 34	16.3	5.2	1.4
Coleoptera (Beetles)	0 to 6	0.3	0.5	0.6
Hymenoptera (Ants)	0 to 6	1.5	3.4	0.2
Insect larvæ and pupæ	0 to 11	2.0	2.7	6.4
Crustacea (Woodlice)	0 to 5	1.5	—	0.5
Arachnida (Spiders)	8 to 47	26.1	30.0	24.6
Chilopoda (Centipedes)	5 to 79	31.0	48.0	19.7
Oligochaeta (Earthworms)	Nil	—	1.2	0.2
		100.0%	100.0%	100.0%

The first column clearly shows the great variation in individual tastes. Of the 20 lizards for which data was collated three came from Stamford, and these specimens accounted for the most spiders (47%, 45% and 40% respectively). So there may be variation in food preferences between specimens from different districts.

The other columns show the food preferences for the average lizard. In the wild state lizards certainly consume less Damsel-flies and Centipedes, but the percentage of spiders would probably be higher. Very few specimens would show any interest in beetles, woodlice or worms. The figures for *L.a. agilis* differ little from those for *L. vivipara*; being a larger reptile it can more readily tackle the larger insects and this is indicated by the higher figures for Grasshoppers, Butterflies and Moths and larvæ.

One of the most interesting points is the great liking shown by both species for centipedes. Most lizards showed some intelligence by always seizing the Chilopod by the head and crushing it before they could be bitten. A few individuals were less sensible and regularly got bitten after taking a centipede in the middle of its body.

I was rather surprised to find that lizards would take moth pupæ, crushing them and then lapping out the contents with their tongues, which always reminded me of a child with an ice-cream cornet!

All the lizards were very fond of sweetened tea, lapping it up from a saucer. Often when the ring of lizards had drunk their fill some of them would climb into the saucer and flatten their bodies in the warm tea.

**HABITS.** The Stamford specimens were taken as they basked on the wall on which they lived. In Hampshire most specimens were taken on heaths, where they often basked in gorse bushes a few feet from the ground. Each lizard had a series of basking places according to the position of the sun and the lizard always returned to its basking place, even if it had narrowly avoided capture several times in succession. In captivity they demonstrated the curious habit of flattening their bodies to receive the maximum amount of warmth and then twisting their limbs so that the soles of the feet pointed upwards. I have observed the same behaviour in African lacertids (*Ichnotrophis squamulosa*; *Ichnotrophis capensis*; *Nucras intertexta holubi* and *Eremias lugubris*) in Southern Rhodesia. During spells of dull weather they basked quite happily in the heat of an electric fire, in the usual position with feet in the air and eyes closed. While writing in the evening I often had a few tame lizards climbing around my body or absorbing the heat it offered. On one occasion a lizard snuggled down in my breast-pocket and climbed out 24 hours later, much to my surprise.

*NATRIX NATRIX HELVETICA* (Lacepède)

**HABITAT.** The Ringed Snake is very common in the New Forest, being particularly abundant near Brockenhurst, where many specimens were taken along the Ober Water. From my field notes: 3/5/53—4 snakes captured out of 6 seen; 24/5/53—4 captured out of 10; 19/7/53—2 captured out of 5; 27/4/54—5 captured out of 8.

DIET. I witnessed an adult snake swallowing a large toad (*Bufo b. bufo*) at Crabwood, Southampton. Captive specimens fed readily on newts (*Triturus v. vulgaris* and *T. helveticus*), frogs (*Rana t. temporaria*), very small toads (*Bufo b. bufo*) and tadpoles. One large female swallowed a dozen small lampreys. On one occasion an adult snake took 12 newts in succession and was still looking for more.

HABITS. A three-foot female from the New Forest hissed fiercely and struck with closed mouth when captured; later she shammed death, lying on her back with limp body and open mouth. Most specimens discharged a foul-smelling fluid from the vent when captured. The only African snake in which I have noted this habit is *Mehelya c. capensis*, and to a lesser degree in *Thelotornis k. capensis*. My attention was drawn to one snake by a bird fluttering around it as it climbed up a bank via some tree roots.

#### CORONELLA AUSTRIACA Laurenti

HABITAT. An adult female was found coiled by the roadside on Set Thorns Heath in the New Forest on 5.7.53. She was about to slough and her vision was poor. The local vegetation was thick heather and gorse. A pair of specimens were taken near Corfe Castle in Dorset on 11.7.54. The male from Studland Heath measured 562 (437 + 125) mm. and the female from Stoborough Heath was 651 (540 + 111) mm.

DIET. In four months the New Forest snake consumed 14 *Lacerta vivipara* and 5 *Anguis fragilis*. Live lizards were held against the snake's coils but never constricted. The Dorset specimens took the same species and also *Lacerta a. agilis* when offered.

BREEDING. The New Forest female, 500 mm. in length, produced five young on 31/9/53, each encased in a semi-transparent membrane. This brood appeared too late in the year and the hatchlings did not survive the winter.

HABITS. All three Smooth Snakes were very docile, liked to be handled and fed very well on live or dead prey. The pair from Dorset were presented to the Zoological Society of London when I sailed for Rhodesia in September, 1954.

#### VIPERA BERUS BERUS (Linné)

HABITAT. Many Adders were collected in the New Forest, particularly along the Ober Water. On the 27th April, 1954, a warm spring day, I encountered 17 snakes along a stretch of a mile and a half, of these nine were adders. I took many snakes along the edge of New Park Enclosure, where they assembled to bask in the late afternoon sun. Several specimens were taken on the heaths round Corfe Castle.

DIET. One Adder had swallowed a lizard (*Lacerta vivipara*). No specimens could be induced to feed in captivity.

HABITS. Captive specimens could be handled freely, but they were apathetic, not tame.

### BREEDING BEHAVIOUR OF THE CHAMAELEON (*CHAMAELEO GRACILIS*) IN SIERRA LEONE

by

J. I. MENZIES,

Biology Section, Bo School, Sierra Leone

#### INTRODUCTION

Previous records of chamaeleons breeding (Milner, 1947, and Rose, 1950) refer to south and south-east African species which appear to differ in some respects, notably in length of incubation, from the West African *Chamaeleo gracilis*. These notes are based on observations on two females, one wild and one in captivity, in September, 1956, but anatomical studies of other specimens seem to confirm that breeding takes place only about that time of year. The possible implications of this are discussed later.

#### OVIPOSITION

Rose (1950) and Milner (1947) report that *Ch. dilepis* digs a tunnel in which to lay its eggs. *Ch. gracilis* also does this and detailed observations are given below. ♀ No. 1 had been in captivity for several days.

17th September, 14.30 hours. This chamaeleon appeared to be trying to dig through the floor of the cage. A heap of soil was introduced and she at once commenced to dig into this.

18th September, 14.30 hours. Still digging.

19th September, 10.00 hours. Still digging, but rather haphazardly, soil was obviously not deep enough.

12.30. Egg laying nearly finished.

18.30. Eggs buried and soil being stamped down.

The stamping down continued until 14.30 next day.

♀ No. 2 (wild). Some days later.

18.40 hours. Observed digging a hole beside a path. Hole was then 85 mm. deep.

21.00 hours. Squatting across the hole, egg-laying almost finished.

08.30 hours. Hole filled, stamping down.

11.30. Site now covered with stones.

Animal 1 took 44 hours to dig the nest hole. The time taken by No. 2 is not known as the hole was practically completed when first observed. Milner reports that *Ch. dilepis* takes 24 to 30 hours to dig a hole 10" to 24" in depth and Rose over two hours for the same species to dig a hole as deep as the length of the female's body. In all cases the digging procedure appears to be the same. Soil is removed with the forefeet and passed