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NOTES ON SIX SPECIES OF SNAKE COLLECTED IN CENTRAL KOREA, 1956-7

By

P. M. C. Davies

Dept. of Zoology, the University of Nottingham

While serving with H.M. Forces in Korea, I was able to make some observations on the local ophidian fauna. Military regulations being what they were, I was unable to bring home a complete set of specimens. However, I am very grateful to Mr. J. C. Battersby, of the British Museum, for identifying one specimen each of *Zamenis spinalis* and *Elaphe rufodorsata,* two of *Agkistrodon blomhoffi brevicaudus,* and for suggesting the identification of *Dinodon rufozonatum* from photographs.

The specimens described below were caught either in the immediate environs of the port of Inchon, or in the vicinity of the Imjin River, approximately sixty miles from Seoul. The three specimens of *Zamenis spinalis* were captured in what is now the historic "Gloster Valley".

Zamenis spinalis (Peters). Three specimens of this snake were captured and kept for a time in captivity. Others were seen but not taken. The species was fairly abundant, dwelling mostly in low sandy country.

In general appearance, this snake is very similar to *Coluber lateralis,* the Striped Racer (see Schmidt and Inger, 1957), slender, with a pointed snout and large eyes, but whereas in *Coluber* the pale yellow longitudinal body stripe is paired and lateral, in *Zamenis* it is single, and vertebral. The dorsal body colouration is dark brown or black, the belly is creamy yellow, and the supralabials are white. The iris of the eye is dark brown, the pupil circular. The dorsal scales overlap, and are unkeeled. The ventrals are broad, and the subcaudals are divided. The anal shield is bifid. The body is notably triangular in cross-section. Of the three specimens obtained, the longest was approximately twenty-eight inches in length.

These were extremely agile snakes, swift-moving, and nervously aggressive. All varieties of food were refused, and they remained unapproachable and totally intolerant of captivity. This species is frequently referred to as *Coluber spinalis* (see Pope, 1935).

Elaphe rufodorsata (Cantor). At least a dozen specimens of this snake were obtained altogether, for it was rather less agile and locally more abundant than *Zamenis.* Almost invariably it was found in or about shallow streams.

The body colouration of this snake is grey-brown, bearing irregular brown and black dorso-lateral markings. A pale stripe extends along the length of each flank, beginning immediately posterior to the head. The supra-labials are orange, speckled with black. Behind each eye is a short, uniform, horizontal streak of black. The iris of the eye is golden brown, and the pupil circular. But the most characteristic feature of these specimens was the belly pattern. The ventral scales are coloured alternately black and brown in a regular "chequer-board" design in such a way that any single scale is half black and half brown (left and right), where its immediate neighbours are half brown and half black (right and left). In one specimen the belly arrangement was less startling, being a very haphazard alternation of black and grey. The subcaudals and anal shield are divided. The dorsal scales overlap, and are unkeeled.

Freshly caught, these snakes showed no hesitation in biting. But in captivity they very soon became docile, and fed readily on frogs. The author possesses a snapshot of one exceedingly small specimen endeavouring to constrict an immense frog. The adventure proved fruitless, for the tiny reptile was little more than a thread around the waist of the amphibian.

These snakes are semi-constrictors, as is, for example, the European smooth snake, *Coronella austriaca,* for while they do not actually kill their prey prior to ingestion, they habitually use coils of their body to prevent excessive movement of the victim.

Elaphe dione (Pallas). Many specimens of this elegant ground-dwelling snake were captured over the course of many weeks, from a wide variety of locales—hill slopes, scrub, river banks and paddi-fields.

As the preservation of individual specimens was not possible in this case, identification was achieved by the comparison of field data with descriptions given by Stewart (1954) and Webb et al (1962).

The body colouration is bright khaki-brown, with a series of discrete copper-coloured, black bordered patches along the centre of the dorsal surface. A pale, dorso-lateral stripe extends along each flank, beginning in the region of the neck, and reaching to the very tip of the tail. Horizontally, behind each eye, is a short, copper-coloured streak. The most notable feature of those specimens examined was the consistent presence of a more or less definite 'T'-shaped copper-coloured marking on the dorsal surface of the head. The iris of the eye is pale brown, the pupil circular. The tongue is notable for its length and for its deep red colour. The ventral scales are broad, and coloured a mottled grey-white. The subcaudals and the anal shield are divided. The majority of the body scales are unkeeled, but those in the vertebral region may be very slightly keeled. All specimens measured between eighteen and twenty-four inches in length.

From the first moment of capture these snakes were extremely docile. Being timid, it was some time before they would accept food in captivity. Eventually they were persuaded to take frogs by placing them in a cage full of feeding grass-snakes (*Natrix sp.*—see below). Once again it was observed that body coils were employed in much the same way as was described for *E. rufodorsata.*

Elaphe schrencki anomala (Boulenger). Only one specimen of this snake was ever captured or observed. It was taken on the banks of a stream, at the foot of a steep, rocky slope, and was identified by comparing field data with descriptions given by Pope (1935), and more recently by Webb et al. (1962).

The general body colouration is black anteriorly, mingled on the flanks with vague patches of a paler, 'dirty-grey' colour, merging posteriorly with dark brown. The supralabials are yellow, and behind each eye is a horizontal streak of black. The iris is brown, the pupil circular. The chin

and throat are bright yellow, the belly cream. The subcaudals and anal shield are divided. The dorsal scales overlap, and are slightly keeled. This specimen measured approximately fifty inches in length.

Alert and unapproachable, this snake would bite with the least provocation. Although it fed readily on birds and mice, it always displayed the greatest objection to being handled in any way. When approached it had the habit of rapidly vibrating its tail. Upon closer approach the snake would invariably strike. Unlike the two members of the genus described above, this snake was a true constrictor, and killed its prey prior to ingestion.

Natrix tigrina lateralis (Berthold). This was probably the most common snake in those districts visited by the present writer, and was found in most locales, often high on rock-strewn slopes, seemingly quite far from water.

In general appearance this snake is not unlike its English relative, *Natrix natrix helvetica,* being olive green in body colouration with a series of black spots or bars extending down the entire length of the dorsal and lateral surfaces. Usually these coalesce on the flanks, particularly anteriorly, to form large, rectangular bars. The one striking difference in appearance between this species and the English one is the presence, between the bars on the anterior flanks, of patches of vivid orange or red. These areas become particularly noticeable when the animals adopt their characteristic defensive posture (see below). There is a black 'collar' around the neck, but no trace of yellow. The supralabials are white or pale yellow, with black vertical sutures, the iris is black, and the pupil circular. The chin and throat are white or pale yellow, and the belly usually a mottled grey black. Less commonly, it is uniform black. The subcaudals and the anal shield are divided, the body scales are heavily keeled. The average length of the specimens captured (about two dozen) was twenty-four inches, though one specimen measured forty-two inches.

These snakes thrived in captivity, feeding readily on frogs. When cornered, or annoyed, their behaviour is so radically different from that of their English counterpart that it is worthy of particular note. There appears to be no tendency to feign death. Instead the Korean snake almost invariably rears up cobra-fashion, flattens the anterior portion of its body, arches its neck, and hisses violently. It is at this time that the red flanks are most noticeable, and the creature presents an impressive appearance. If any attempt is made to touch it in this posture, the snake turns away, sways, hisses and strikes, usually with mouth closed. If actually grasped, it will sometimes bite, but these aggressive tendencies do not persist for very long. Anal glands may also be used, but a good deal less readily than is the case with *N. natrix helvetica.*

These snakes gather in large numbers for hibernation in late October. The three aggregations examined by the author all appeared to be entirely monospecific, though no attempt was made to uncover the hole into which the snakes vanished when molested. Hibernation most likely does not begin until late October or early November, when the temperature rarely rises high enough to permit of any activity. Re-emergence was first observed in mid-March, 1957, after "the coldest winter for thirty-one years" (press report).

There was little opportunity for observing the reproductive habits of these reptiles, but copulation was observed on one occasion, amongst captive specimens, in late September, though this would appear to have been unusually late.

Recently, the genus *Natrix* has been divided into five distinct genera (Malnate, 1960). Accordingly, *N. tigrina lateralis* is now sometimes referred to as *Rhabdophis tigrina lateralis.*

Agkistrodon blomhoffi brevicaudus (Stejneger). This was the only species of venomous snake encountered in Central Korea, though widespread rumours persistently told of a common and deadly "bootlace snake". What actually this was, if indeed it was anything at all, the author never succeeded in discovering.

A. blomhoffi brevicaudus is typically crotaline in appearance—squat, lethargic, with a large triangular-shaped head. The general body colouration is dark brown, but an intricate network of sandy-yellow lines breaks this down into a series of hexagonal patches staggered along the dorsal body surface. A short, dark horizontal streak, surmounted dorsally by a white border, extends backwards from behind each eye. The iris is dark brown the pupil vertically elliptical. The loreal pit is characteristically present between the eye and nostril on each side of the head. There is only a single pair of sublinguals; the belly is a mottled grey-brown. The subcaudals are divided, but the anal shield is entire. The larger of the two specimens measured twenty-seven inches in length.

This snake (two specimens only were captured) did not appear to be unduly aggressive, but the army authorities were not entirely convinced that anything could be gained by close study of venomous creatures, and so the snakes had to be destroyed. Not wishing to damage their bodies in any way, an attempt was made to drown them in a perforated cigarette tin immersed in water. This method proved to be highly unsatisfactory, for they showed little inclination to succumb to asphyxiation. After four hours immersion the two snakes were still in a position to inflict a bite. After eight hours signs of life persisted, but by this time some formalin had been procured, and the snakes were killed without any further difficulty.

Only one other species of snake was encountered in the wild, and this has been identified tentatively, as *Dinodon rufozonatum.* Three specimens were captured, all in hilly country, and each slightly exceeded six feet in length. Notes on these specimens will be published at a later date.

In the native quarters of both Seoul and Inchon there are numerous shops which sell only snakes and patent medicines. Though a variety of species is sometimes found in these establishments, by far the most popular species, sold allegedly for medicinal purposes, is *Agkistrodon blomhoffi brevicaudus.* Occasionally rat snakes are offered for sale, and in one shop the author was presented with a large, six-foot colubrid which at first sight could easily have been mistaken for the American King snake, *Lampropeltis getulus.* It was presumably an Asiatic relative of this species.

Table 1 summarises the more detailed herpetological features of the six species described.

TABLE

Column I : No. of specimens examined in detail.
Column II : Maximum length (inches).
Column III : No. of dorsal scale rows. (mid-body).
Column IV : No. of ventrals
Column V : No. of subcaudals.
Column VI : Anal shield : d=divided; e=entire.
Column VII : No. of supralabials.

Name of species	I	II	III	IV	V	VI	VII
Zamenis spinalis	3	28	17–19	189–196	90–93	d	8
Elaphe rufodorsata	12	24	19–21	172–181	56–61	d	7
Elaphe dione	6	24	19–25	193–203	60–70	d	8
Elaphe schrencki anomala	1	50	23	216	74	d	8
Natrix tigrina lateralis	12	42	17–19	164–170	58–71	d	7
Agkistrodon blomhoffi brevicaudus	2	27	21	143–146	37–40	e	7

Table 1. Morphological data of six species of Korean snake.

Further information concerning these species can be obtained by consulting the literature cited below.

In conclusion I would like to express my gratitude to all the men of 8 Platoon, C Company, 1st Bn. Royal Sussex Regiment, who so willingly assisted me in the capture and upkeep of the snakes described in this paper.

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MISCELLANEOUS NOTES ON LIZARDS FROM ECUADOR*

By

JAMES A. PETERS

United States National Museum, Washington, D.C.

A checklist and key for the lizards of Ecuador is now practically complete, and includes several species not previously recorded from the boundaries of that country, and several other species whose presence there has been questioned. Since the pages of a checklist are not the proper place for publication of new information, I am presenting notes on certain species prior to its appearance. Abbreviations used for reference to specimens include : BM, British Museum (Natural History), JAP, the author's collection, and OV, the collection of Gustavo Orcés-V., Escuela Polytecnica Nacional, Quito, Ecuador.

Tupinambis nigropunctatus Spix

The two specimens I have assigned to this species (JAP 3769, from the headwaters of the Río Capahuari, and JAP 7934, upper drainage of the Río Pastaza, both in Napo-Pastaza Province) do not fit the descriptions presented by Boulenger (1885 : 335-337) for the species and in part for the genus. Both specimens are quite small males, however, and some of the characteristics involved may be typical of juveniles only, but others (e.g., number of ventral scales) would not vary with age although they might differ depending upon the method of tabulation. Until all comparative material can be examined, then, I refer these specimens to this species, and merely indicate that they are probably representative of a new taxon.

* These investigations have been supported by National Science Foundation Grant No. G-21010.

The specimens are distinctive in the following characters, and there are several additional points that cannot be compared at present but may prove to be significant later. Statements in parentheses refer to Boulenger's description of the species, which must in part be drawn from his description of *Tupinambis teguixin* Linnaeus, and in part from the generic description, because of the method he used in describing *nigropunctatus.*

(1) 5 supraoculars, the third V-shaped (4 supraoculars).
(2) Parietals longer than interparietal (all three subequal).
(3) Labials and chin-shields in contact throughout (only first, or first four, labials in contact with chin-shields, the rest separated by small shields).
(4) 4 preanal pores on each side, arranged in an arc, and widely separated from the femoral pores (no preanal pores).
(5) A group of 5-6 preanals distinctly larger than surrounding scales (preanals small, like gulars).
(6) 7-7 femoral pores (about ten femoral pores).
(7) Tail with alternating whorls, one complete around tail, the next divided into two rows laterally, with a single row below and a double row above (two series of scales on upper surface corresponding with one on the lower).
(8) Posterior part of tail strongly compressed (tail rounded or scarcely compressed).
(9) Dorsum of head unicolour black (head with large black spots above).

In addition to these two specimens, two more, OV 1930-31, are known from Ecuador, collected at the same time and place as JAP 3769. The species has not previously been identified from Ecuador.

Callopistes flavipunctatus Duméril and Bibron

This species was originally described from specimens with data indicating that they came from South America, and nothing further was known until Boulenger (1885 :376) synonymized *Tejovaranus branickii* Steindachner, from Peru, with this species. It has since been reported from Bellavista, Peru, by Burt and Burt (1931 :323). The first specimen collected in Ecuador is OV 4569, a male, from near Loja, in Loja Province, southern Ecuador. Descriptions of the species have been rather brief, and I append here a detailed description of the single Ecuadorian specimen to provide a basis for future comparisons with Peruvian material.

Dorsum of head with flat, polygonal, comparatively small shields. A row of scales separates rostral from anterior half of a divided nasal; scales between this row and the area between orbits not definable in terms of normal lacertilian head shields. A semi-circular row of scales begins at midorbit, runs posteriorly, and is vaguely distinct along posterior border of eye. An interparietal, about three times as large as surrounding scales; all other scales on temples and occiput quite small, diminishing in size with distance from interparietal. Five supraoculars, all except posteriormost much broader than long, and separated from supraorbital semicircles by two, from superciliaries by 3-4 rows of scales. Nostril between three nasal scales, the anterior and posterior approximately equal in size, with a smaller scale ventrally. Four or five horizontal rows of small scales in loreal area, one across orbit above (superciliary), and one bounding eyelid below. Superciliaries 13-13; nine or ten scales in the infraorbital series, which is separated from 16-16 upper labials by one or two rows of smaller scales. Mental followed by one unpaired postmental and four pairs of chinshields, first two pairs in contact, second two separated by much smaller scales. Lower labials bordered below by smaller scales; no infralabial row of enlarged scales. Scales from chinshields across gular folds to the chest small, smooth, imbricate, and uniform in size, although centres of each scale may be slightly swollen.

Dorsal scales very small with slightly raised, swollen centres, arranged in regular transverse rows, which are not separated from one another by minute granules. Lateral scales as dorsals; transverse rows tend to interdigitate with rows of much larger ventral scales, which are rectangular, smooth, and flat, lying in approximately 60 transverse rows with from 30-50 from one side of belly to other. Skin of sides of neck and shoulders folded and wrinkled.

Scales on limbs smallest laterally and posteriorly, increasing both dorsally and ventrally, where some are squarish and even in part imbricate, on hind leg. Digits clawed, with single, middorsal row of comparatively broad scales; a double row of plates below, the latter slightly puffy or swollen and with traces of brownish callosities; several rows of smaller scales laterally. No femoral pores. Tail covered by regular whorls of scales, slightly swollen anteriorly, with a raised posterior edge, but progressively more keeled posteriorly, until the posteriormost ones show strong keeling.

Ground colour of body blackish-brown, with irregular spots and short lines of yellowish-white. Tail very light brown dorsally, irregularly banded with black; limbs mottled with black and yellow-white. Ventrally, chin and throat, tail, and limbs almost totally yellow-white, with very few, quite small dark spots. Belly light pinkish-yellow with widely separated, small, black spots, darker than the other ventral surfaces because of a suffusion of grey.

The specimen is 87.3 mm. from snout to vent, and the tail length is 168.5 mm.

Basiliscus

This genus has recently been reviewed by Maturana (1962). I have decried elsewhere the practice of basing a revision on a purely political unit (Peters, 1960), but surely it is equally unfortunate that, after properly basing a review on a natural, biological unit, as Maturana has done, one should then omit from consideration both a large percentage of the available material, in North American museums and elsewhere, and also critical evaluation of all available earlier literature on the various species. Maturana indicated that the only species of the genus found in Ecuador is *Basiliscus galeritus* Duméril and Duméril, but he makes no reference to the record in Boulenger (1885 :109) of *Basiliscus vittatus* from Ecuador, on the basis of three specimens (BM 60.6.19.9-11) in the Fraser collection. J. A. Cochrane has re-examined these specimens, comparing them with the descriptions presented in Maturana's paper, and says (*in litt.*) that their characters "agree in every respect with those given for *B. vittatus.*" She thinks it most unlikely that the locality is in error, and it appears that *vittatus* should be retained on the list of Ecuadorian species. Nor does Maturana mention the record of *Basiliscus mitratus* from Guayaquil, published by Cope (1868 :97); since that species has been synonymized with *B. basiliscus,* the latter should be listed as Ecuadorian until Cope's specimen can be relocated and proven to be misidentified. *B. basiliscus* is found in the Colombian Chocó, according to Maturana and it is certainly to be expected in northwestern Ecuador, although Guayaquil is probably extralimital but perhaps peripheral. I shall therefore list all three species as Ecuadorian.

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THE OCCURRENCE OF TADPOLES OF THE GREEN TREEFROG, *Hyla cinerea cinerea* (SCHNEIDER), IN TRINITY BAY, TEXAS

By

RICHARD A. DIENER*

The observations reported herein were obtained incidentally to fishery investigations being conducted in Trinity Bay by the Bureau of Commercial Fisheries, U.S. Department of the Interior.

Trinity Bay, the north-eastern arm of the Galveston Bay estuarine system, covers about 96 square miles within the boundaries of Chambers County and is located about 40 miles east of Houston, Texas, U.S.A. Marshlands border the bay on the northern and eastern margins, but those on the eastern side are separated from the bay proper by spoil banks which are the result of the dredging of a navigation channel paralleling the shore. Bluffs 20 feet in height form the western boundaries of the bay. The bay receives fresh water from the Trinity River and from a number of small streams and bayous which are strongly influenced by tidal currents, Salinity has been observed to range from 0.0‰† at the head of the bay near Trinity River to over 20‰ along the southern limits connecting with Galveston Bay. The water temperature has been observed to range from 1.0°C. during the winter months to over 29°C. in late summer. Turbidity is generally greatest in the eastern half of the bay.

Perhaps the most beautiful of all our treefrogs is the green treefrog, *Hyla cinerea cinerea* (Schneider). Adults can be found throughout the spring and summer in the moist woods and swamps, fresh or slightly saline (salinity up to 1.6‰), of south-eastern Texas where they abound.

The occurrence of adults in brackish water habitats is well documented in the literature. Noble and Hassler (1936) found large choruses of this frog on sandy flats in the vicinity of Cove Point and Solomon's Island in Chesapeake Bay, Maryland, where the water was, in all probability, brackish. Dunn (1937) discusses a weakly differentiated population (*H. c. evittata*) which is largely confined to the area of the upper tidewater Potomac River in Virginia. Carr (1940) lists this species as being "occasional" in the Florida mangrove swamps. Burger, Smith, and Smith (1949) found this species about shallow pools of the coastal marshes near Sabine Pass, Texas. Peterson, Garrett, and Lantz (1952) found *H. cinerea* in brackish waters of the Florida Keys. Hardy (1953) found *H. cinerea* near Chesapeake Bay in Maryland, in breeding pools subject to saft spray and with salinity averaging 15‰. Neill (1958) records *H. cinerea* as inhabiting the salt marsh at Merritt Island, Florida, and breeding in large numbers on the causeway across Mobile Bay, Alabama, on a supertidal flat.

On February 1st, 1961, three tadpoles of *H. cinerea* were captured in a 16-foot otter trawl by Anthony Inglis and Charles H. Koski. Two of the tadpoles, both 42 mm. long, were taken near Amerada Oil Well No. 1 in open waters 9 feet deep with a salinity of 0.1‰ and a temperature of 7.4°C. The Amerada Oil Well, situated within State of Texas Tract No. 66 in the couth central portion of the bay, is located about 4.4 miles south-east of dry land (Umbrella Point) and 6.5 miles west of the nearest appreciable source of fresh water, Double Bayou. The third tadpole, 43 mm. long, was taken near Tidewater Oil Well No. 1 in open waters 10 feet deep with a salinity of 8.3‰ and a temperature of 8.1°C. The Tidewater Oil Well, situated within State of Texas Tract No. 113, is located along the southern limits of the bay equidistant (5.2 miles) between Houston Point to the north-west and Smith Point to the south-east, and lies about 10.1 miles south-west of Double Bayou. During collections, the water was rough and turbidity high at both locations.

The colouration of the head and body of the tadpoles in preservative is dark brown, but becomes pale grey on the ventral surface. The lateral surfaces of the tail are pale brown in colour. Paired pelvic limb buds about 1 mm. long are visible on the three specimens.

* Contribution No. 187, Bureau of Commercial Fisheries Biological Laboratory, Galveston, Texas, U.S.A.

† Salinity in parts per thousand is represented by the symbol ‰.

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A CASE OF FATAL CLOACAL TUMOUR IN A SNAKE

By

HOBART M. SMITH and T. W. BETZ

Department of Zoology and Museum of Natural History,
University of Illinois, Urbana, Illinois, U.S.A.

An adult (1,334 mm.) Corn Snake, *Elaphe g. guttata* (Linnaeus), developed a cloacal tumour after three years in captivity, when otherwise in seemingly excellent condition. The snake had failed to eat for several weeks despite repeated offering of food and maintenance of near-optimum conditions, including temperature and humidity. It was nevertheless "in good flesh", being neither especially fat nor especially thin. It did progressively exhibit signs which, in our experience, are familiarly indicative of intestinal or urinary occlusion : (1) a very weak condition, commonly torpid and unresponsive although capable under duress of being aroused to mild activity; (2) a very poor "righting" reflex, especially at rear of body, and only a fair reflex when strongly aroused; (3) rear abdomen swollen, the skin taut, the scales spread; (4) a tendency to minimize axial flexion in the rear trunk, which was commonly held straight; (5) an occasional tendency when moving about to roll the rear part of the body belly up; and (6) palpable presence of several hard masses in the viscera near the cloaca.

The intensity of the signs observed on the last day of the snake's life suggested that the condition was not yet in its terminal stages; conceivably several days would elapse before the snake's demise, although invariably, in our experience, snakes suffering with the signs described die with little delay. Since repeated attempts to expel the abdominal obstructions by digital pressure were of no avail, and since without removal of them the snake was considered doomed, an attempt was made to remove the obstructions surgically.

We had anticipated, on the basis of previous experience, that merely a uric acid plug would be found in the colon, and that its removal would lead to recovery. The situation proved to be far more complex than anticipated, and presumably beyond the point of recovery by any means now known.

Having used Nembutal successfully before (Betz, 1962), we administered 0.2 ml—two-thirds of the calculated dose on the basis of 30 mg/k for a 517.5 g snake, using the unmodified commercial 50 mg/ml product—intraperitoneally, and 15 minutes later administered the remaining 0.1 ml since the snake was not surgically anaesthetized. Fifteen minutes later the snake still was insufficiently anaesthetized, and was given another 0.1 ml—one-third more than the calculated dose. In 20 minutes surgical anaesthesia was achieved.

Following aseptic procedures in view of the particular infection-potential of the colon, an incision was made through the skin between the first dorsal scalerow and the ventral scutes, opposite the palpable masses. The masses indeed proved to lie within the colon, but contrary to expectation they were largely black and of fecal composition. The larger mass, 50 mm. from the anus, measured approximately 38 x 12 x 8 mm., the smaller one (about 12 mm. anterior to the other mass) about 25 x 8 x 4 mm. The masses were very hard, foul-smelling, and so firmly bound to the wall of the colon that the colon after incision had to be everted to free the masses. The wall of the colon, formerly applied to the fecal mass, was fibrose to gross inspection.

Although prior to operation a small third mass had been palpated about a half-inch from the anus, visual inspection revealed no obstruction comparable to the fecal masses, so the operation was terminated. Very little blood had been lost. The colon (without a cannula) and the skin were sutured. Throughout the operation the snake's heartbeat remained normal for the anaesthetic state (about 50-60/min.), until the last suture was tied, when without warning the snake died.

It is possible that the snake was seriously injured in our preliminary attempts to expel the intestinal plugs by digital pressure. Although over-anaesthesia presumably was the immediate cause of death, other factors probably contributed importantly to the snake's sensitivity and any one of those factors would likely soon have caused death by itself. It was, however, exceptionally slow to respond to the anaesthetic. It would perhaps be well under similar circumstances to allow more time for attainment of surgical anaesthesia.

On the other hand, the apparent extent of the toxemia was not realized until later when the snake was autopsied and we discovered that the third mass near the anus actually was present, but being small and whitish in colour was not clearly visible. The mass was a hard tumour, about 12 x 6 x 6 mm. in size, located at the junction of the ureters with the colon, about 12 mm. anterior to the anus. Dr. Joseph Simon, pathologist of the Univer-

sity of Illinois School of Veterinary Medicine, kindly identified the mass as a carcinoma "composed of epithelial cells which appear to originate from the lining epithelium. In some cases atypical cells, an occasional mitotic figure, hyperchromatism, and attempts to form acinar structures are seen. In some cases the cells of the lining epithelium have undergone hyperplasia suggestive of a transitional type epithelium."

The tumour apparently completely occluded the intestine, causing retention of the fecal matter and its subsequent adhesion to the colonic wall. Toxemia from that alone probably would have been fatal. However, the ureters also appeared to be occluded, resulting in an engorgement of the ureters and kidneys with uric acid deposits. The kidneys were enlarged and contained scattered deposits of uric acid; the ureters were white throughout their length with uric acid. Uremia appeared to be in an advanced and irreversible stage from which the snake probably would not have recovered had it been left alone.

Our observations lead us to suspect that colonic occlusion occurs with moderate frequency among captive snakes. In view of the involvement of a tumour in the present case, it would be of great interest to analyse the causative factors in a large number of cases. The frequency with which uric acid plugs, or fecal plugs, or tumours are involved remains unknown.

Despite the loss of this individual due to a perhaps exceptional and irreversible condition, the success otherwise of the operation leads us to believe that, if caught sufficiently early, otherwise intractable cases of simple colonic occlusion (involving only the colon and consisting solely of a fecal or uric acid plug) could be successfully treated surgically.

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STOMACH STONE IN THE AMERICAN ALLIGATOR, *ALLIGATOR MISSISSIPPIENSIS* DAUDIN

By

J. P. Kennedy and H. L. Brockman

Department of Anatomy, The University of Texas Dental Branch, Houston, Texas 77025, U.S.A.

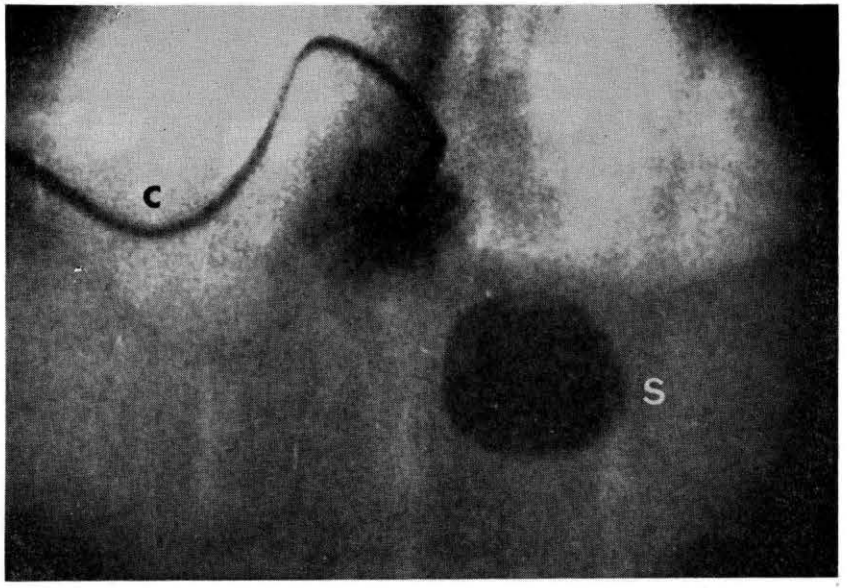
Stones in the stomachs of crocodilians are certainly not unknown but until recently there was little convincing evidence for their function or the exact manner of their acquisition. Such evidence is now available in the study of the Nile crocodile, *Crocodilus niloticus,* by Cott (1961) and it is Cott's report that prompts us to record an additional observation of a stomach stone in the American alligator, *Alligator mississippiensis,* and to comment upon the occurrence of non-food items in the stomachs of reptiles.

Investigators of reptilian food habits frequently record miscellaneous non-food items obtained in the examination of stomach contents. In examining the food of 367 colubrid snakes Hamilton and Pollack (1956) record sand in the digestive tract of *Cemophora coccinea, Halden valeriae,*

Carphophis amoenus, Farancia abacura. These authors also observed that a juvenile *Coluber constrictor* had ingested a small sliver of wood and a blade of dried grass; a 926 mm. male *Elaphe guttata* contained a long conglomerated mass of rope fibres, dead grass stalks and leaves with much impacted sand. Dry grass and sand in the hind intestine of *Sistrurus miliarius* was recorded in a similar study of the food of crotalid snakes (Hamilton and Pollack, 1955). Miscellaneous material, such as pieces of barnacle shell and sand grains, was present in only 2 per cent. of all digestive tracts of *Ameiva quadrilineata* and *Basiliscus vittatus* examined by Hirth (1963). The stomachs of *Sceloporus olivaceus* examined by Kennedy (1956) occasionally contained extraneous matter such as blades of grass, stems and small pebbles. Of *Sceloporus undulatus* in Maryland McCauley (1945) wrote: "Feeding is probably a rather careless process as foreign matter frequently is taken in with the food. Bits of leaves, grass, small twigs, sand, and small stones have all appeared along with the intended articles of diet. In one stomach a stone was found which measured 8 mm. in its largest diameter." In a study of *Egernia whitii* Hickman (1960) wrote: "Flowers and seeds, possibly swallowed by the lizard when capturing insects, were the only plant material found in the gut of the lizards." Numerous other studies could be cited.

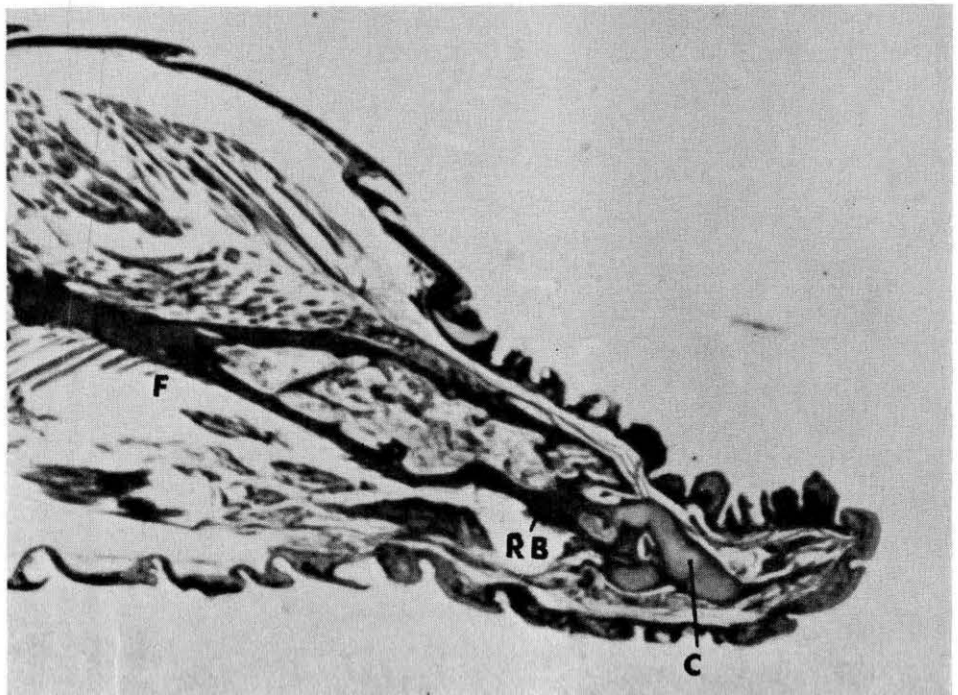
The function, if any, of non-food items in reptilian stomachs is problematical. Usually the evidence obtained by reviewing the diet and feeding behaviour of the reptile whose food is being investigated indicates that the records of non-food items are of isolated occurrence and suggests that these non-food items can, in the absence of supporting eidence, be dismissed as having no digestive function. Most non-food items have either been accidentally ingested in subduing the prey or secondarily ingested when the predator consumes a food animal that has in turn ingested non-food items or material that is foreign to the diet of the predator. The deliberate selection of non-food items by reptiles in nature is seldom well documented. However, occasionally the evidence clearly indicates that the ingestion of non-food items under natural conditions is voluntary. Some rat snakes, such as *Elaphe obsoleta lindheimeri,* are known to ingest artificial eggs that have been placed in the nests of chickens or even small cosmetic jars whose appearance and size resembles the white glass eggs. Thus these jars are sometimes placed in the chicken's nest by farmers in eastern Texas as a decoy for rat snakes. The artificial eggs are in time most likely regurgitated by these snakes but this is not always possible. Smith (1953) describes a case of an *Elaphe o. lindheimeri* that could not regurgitate a wooden egg that had been ingested under natural conditions. This snake was kept in captivity for several months to observe the influence of the irregurgitable artificial egg upon feeding. Regurgitation of the egg could not be forced manually without injury to the snake and the egg was removed surgically. The acquisition of such non-food items by *E. o. lindheimeri* is almost certainly based on their impulse to feed. Recognition of an artificial egg or similar object as food may be attributed to the appearance of these objects and the odour that they might acquire from the chicken nest. The basis of acquisition of such artificial eggs could have no other than a potential "food" function and indeed could be harmful as observed by Smith (1953).

Therefore it is of considerable interest that some reptiles not intent on feeding seemingly engage in deliberate acquisition of non-food items such as suggested by Cott (1961) for *Crocodilus niloticus.* In brief, *C. niloticus*



Top. Kennedy and Brockman.
Photograph made from 16 mm. movie angiocardiography of *Alligator mississippiensis* showing stone (S) in stomach and catheter (C) in right auricle. Photograph by Miss Fern Fetters.

Bottom. Poyntz and Bellairs.
Longitudinal section through regenerated hind limb of *Lacerta vivipara* A. The narrow part on the right is regarded as regenerated tissue. C, cartilage. RB, regenerated bone. F, femur.



ingests stones that act as a ballast enabling the crocodile to lie submerged in streams of strong current. The stones also contribute extra effective weight that assists the crocodile in holding large prey under water until the prey is drowned. The acquisition of the stomach stones is apparently deliberate for Cott (1961) found stones in crocodiles living in virtually stone-free waters. These crocodiles presumably had made extensive journeys to collect stones. Several crocodiles shot near swamp villages had ingested pieces of broken glass and pottery. The mean weight of contained stones increases progressively with age, from zero in the smallest length group to 3,356 grams in the largest group measured and a standard one per cent. load of stones will account for about one-eighth of the crocodile's weight when submerged and will raise the specific gravity from 1.08 to about 1.09 (Cott. 1961). The stomach stone recorded here (Plate) weighed 22 grams and was first observed during angiocardiography of an alligator weighing 7.8 kg and estimated to be about 130 cm in total length. Weight of the stone as a percentage of body weight is 0.28. This alligator had been kept in captivity for about 6 months and the fact that its environment precluded the acquisition of stones may account for the small load. The understanding of the role of stomach stones in the American alligator can only be realized after much additional data are at hand but comparable functions of stomach stones as discussed by Cott (1961) for *C. niloticus* are not unreasonable for *Alligator mississippiensis*.

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NATURAL LIMB REGENERATION IN *LACERTA VIVIPARA*

By

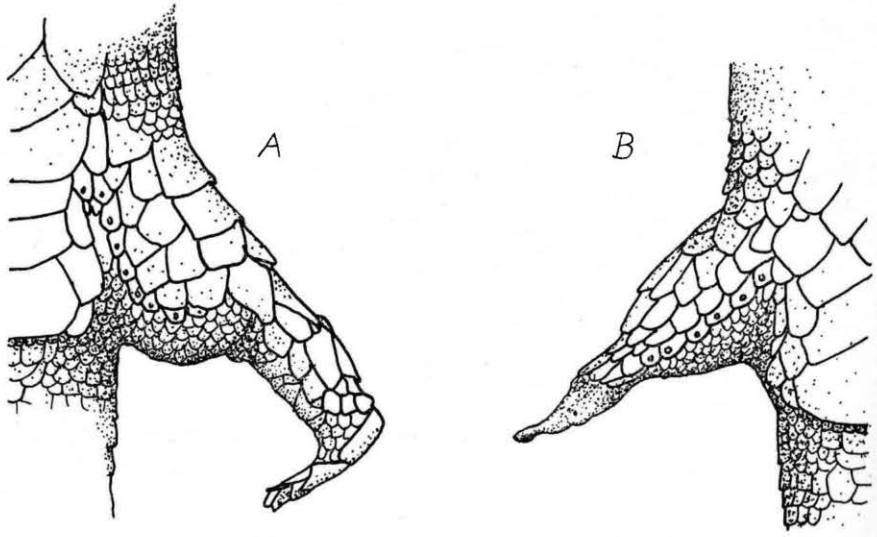
Susan V. Poyntz and A. d'A. Bellairs

St. Mary's Hospital Medical School, London, W.2.

Although the limbs of lizards do not regenerate so consistently or so completely as the tail in many species, they are not entirely devoid of regenerative capacity. The hind limbs regenerate more readily than the fore-limbs, but regeneration is by no means an invariable consequence of amputation and the factors which cause a limb stump to regenerate rather than to heal are not yet fully understood. Limb regenerates always seem to be atypical in structure and sometimes assume the appearance of tail-like appendages. They may, however, be of some value to the lizard since they increase the length of the stump and provide a lever or at least a prop which may assist in locomotion.

Partial regeneration of amputated limbs has been induced in the laboratory by variety of experimental procedures (see Guyénot & Matthey, 1928; Marcucci, 1930; Vorontsova & Liosner, 1960; Singer, 1961; Simpson, 1961). Instances of regeneration in the wild have also been reported (Avel & Verrier, 1930; Hellmich, 1951) but seem to be comparatively rare so that accounts of further examples are of interest.

Two adult male common lizards (*Lacerta vivipara*) obtained by us show evidence of partial regeneration of the hind limbs. In both cases the original injury had probably occurred in the region of the lower thigh just above the knee, since the appendages taper sharply from this point and the pattern of the scales beyond it is irregular (see Fig.). In specimen A the regenerated left hind limb ends in a recurved scaly tip; in B the regenerate arising from the right hind limb is straight and somewhat tail-like in appearance. As is usual with limb regenerates in lizards, no structures resembling digits or claws can be identified.



Regenerated hind limbs of *Lacerta vivipara* seen from below.

Specimen B has been retained intact, but A has been sectioned in a longitudinal plane. The sections (see Plate) show no indication of a knee joint. The end of the ossified femur appears to extend into the region of the regenerate and its outer end is attached to a mass of cartilage. This is almost completely covered by perichondral bone, continuous with the cortical bone of the femur. It is possible that most or all of this cartilage would eventually have become ossified in continuity with the femoral shaft. The mass of cartilage is Y-shaped and the general appearance is fairly suggestive of an abortive attempt to reproduce a tibia and fibula, though of course, in the absence of a knee joint such an interpretation is very uncertain. A skeletal regenerate of rather similar pattern has been described by Guyénot & Matthey (1928). Our regenerate contains little if any muscle and its recurved tip is formed only by scales and connective tissue without skeletal support.

Two interesting points of difference between this limb regenerate and tail regenerates may be noted. In the limb the bone appears to possess considerable regenerative capacity whereas the formation of new muscle is hardly apparent. In the case of the tail the regenerated skeleton as a rule consists only of cartilage, whereas the muscle regenerates readily.

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NOTE ON A LARGE VIPER FROM THE CYCLADES

By

Richard J. Clark

The viper found widely, and often abundantly, on the Aegean Islands, is a subspecies of the Horned Viper, *Vipera ammodytes meridionalis* (Boulenger). This snake is clearly recognised by the locals who call it "Ohshà".

Hellmich (1956) gives no measurements but describes it as being smaller than the typical form *V. ammodytes ammodytes* (Linné) which may attain a length of 940 mm. Heldreich (1878) describes this snake as being "very abundant in Attica and throughout all the mainland; likewise the Peloponnese and the islands . . . it reaches 12-15 inches in length; individuals exceeding this are very scarce." Boulenger (1913), whilst mentioning the subspecies found in Greece and listing the distinguishing features between it and the typical form, fails to quote any measurements.

Specimens were collected from Mykonos, Delos, Tinos, Paros and Ios during late March, April and early May 1963. Most of these measured between 300 and 440 mm. in length. Contrary to the situation in *V. berus* (Linné), the males in *V. ammodytes* attain a greater size than the females. Of some interest, then, was the capture on Ios of a female measuring 567 mm., but showing no abnormality of marking and pattern; though perhaps the colours were rather less distinct than is usual even in females. The snake was sunning itself during the early evening at about 5.30 p.m. on the edge of a sandy beach, and was lying within the partial shade afforded by a group of low shrubs. The habitat was worthy of note as this viper normally shuns sandy places, prefering a rocky, well-drained hillside.

DESCRIPTION :

The ground colour was brown with a darker brown undulating band, rather narrow for the size of the specimen, in the vertebral position. This was edged indistinctly with black. A lateral row of faint, dark brown spots, corresponding to the sinuses of the median band, extended down each flank. The head (where the slough had been forcibly removed) was lighter than the ground with a dark marking which took the following form : a pair of V's with their apices laterally opposed. A dark streak ran from the posterior oculars to the angle of the jaw. The supra and sublabials were light fawn in hue and the belly pink with black powderings. The tail was tipped ventrally with green.

MAIN DIAGNOSTIC CHARACTERS :

Total length : 567 mm.
Vent to tail : 63 mm.
Snout to vent : 504 mm.
Length of head : 25 mm.
Breadth of head (orbital) : 10 mm.
Breadth of head (temporal) : 16 mm.
Girth : 61 mm.—at thickest part.

Ventrals : 145—anal divided.
Subcaudals : 33 x 2.
Dorsals : 21—mid-body count.
Supralabials : 10 (right) + 10 (left).
Sublabials : 11 (right) + 11 (left).
Supraoculars : 1 (right) + 1 (left).
Pre- sub-postoculars : 12 (right) + 11 (left).
Nasal : 6 (right) + 3 (left).

Upon returning to England this specimen was installed in a vivarium, but showed difficulty in sloughing. The old skin round the head was removed with the aid of forceps, but was found to adhere too strongly to the new epidermis below to be drawn off. Allowing the snake to bathe in a generous vessel of water did not help.

During this period, early May to mid-July, the reptile took no food although other specimens of the same species housed with it fed readily.

The snake was eventually killed and is now preserved in the writer's collection.

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Hill Mount, Charing Hill, Charing, Kent.

ECTOPIC EMBRYOS IN REPTILES

By
L. HARRISON MATTHEWS
Zoological Society of London

After reading the paper by Jean-Pierre Dufaure (1964) in the BRITISH JOURNAL OF HERPETOLOGY, I referred to my notes and find the following records of ectopic embryos in British reptiles examined in the years 1939 and 1940.

Among 57 female *Lacerta vivipara* five specimens were found containing ectopic pregnancies. All the ectopic foetuses were pigmented, being uniformly black, and appeared to have gone to full term. They were shrivelled and dessicated but not resorbed, and were enclosed in a membranous sac lying free in the body cavity with the exception of one which communicated by a stalk with the oviduct. In one female, there were two such ectopic foetuses. Among 40 female specimens of *Anguis fragilis* examined during the same period, two similar ectopic foetuses were found, one enclosed in a sac lying freely in the body cavity, the other in a diverticulum of the oviduct. This represents a proportion of 5 per cent. compared with 8.8 per cent, in *Lacerta vivipara*, but the total numbers are small and must be treated with caution. The specimen from *Lacerta* in which the sac was still attached to the oviduct by a stalk, and that from *Anguis* in which the foetus lay in a diverticulum of the oviduct, show the probable mode of formation of these anomalies. Presumably an embryo becomes pinched-off from the main part of the oviduct in a diverticulum, and the resorption of the connecting stalk results in the embryo contained in a detached piece of the oviduct coming to lie freely in the abdominal cavity.

As Dufaure points out, these "fossilized" embryos must persist from pregnancies of a previous year because all the animals examined contained a full complement of contemporary eggs or developing embryos in addition to the ectopic foetuses.

The animals came from various localities in Surrey, Sussex, Somerset and Gloucestershire.

SUMMARY

In a series of 57 female *Lacerta vivipara,* five ectopic pregnancies, probably remaining from the previous year, were found; and in a series of 40 *Anguis fragilis,* two similar cases were discovered. The incidence of ectopic embryos was nearly 9 per cent. in *Lacerta* and 5 per cent. in *Anguis.*

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COPULATION IN A PAIR OF *ALLIGATOR MISSISSIPIENSIS*

By
BRYAN R. BURRAGE
San Diego State College, San Diego, California

Despite the sizable amount of literature regarding the American Alligator, I can find no detailed description of the mating and copulation of this species. McIlhenny's thorough work (1935, *The Alligator's Life*

History. Boston, Christopher Publish. House), only states that copulation takes place in the water. On July 14th, 1962, I witnessed this in a pair of large alligators at the San Diego Zoo. Copulation of this pair was also observed on July 10th by Mr. Carl Pyle, the Senior Keeper of Reptiles. Exact measurements are unavailable, but the overall length of the male is estimated at ten feet; that of the female at eight feet, with slightly more than half of this comprising the snout-vent length.

The female approached the male, who was floating in deep water, circling him slowly and then swimming to the shallow end of the pool. The male followed the female and commenced to caress her head gently with his. For four minutes the male's caresses were long sweeps broadcast over the female's head, which progressed to two minutes of short, vigorous rubs concentrated on the posterior part of the female's skull.

The male and female then swam closely together to the deepest part of the pool, where they lay alongside each other, the male becoming increasingly affectionate and again nuzzling the posterior part of the female's head for an additional three minutes. The male then slowly mounted the female from the last two-thirds of the latter's body, by backing up slightly and going laterad. The female, who remained passive throughout, assisted by submerging her body. Slowly, the male depressed his tail until it was level with that of hers. Erecting and protruding his organ externally he brought it into contact with and entered the cloaca of the female. Coition lasted for fifteen minutes, after which the pair parted.

A MALE *COLEONYX VARIEGATUS VARIEGATUS* (BAIRD), WITH TWO PAIRS OF POSTANAL SPURS

By

H. Robert Bustard

Department of Zoology, Australian National University, Canberra

Introduction

The ground geckos of the genus *Coleonyx* inhabit North and Central America, ranging from the arid desert regions of the southwestern United States to the jungles of Panama. Male specimens possess a pair of externally projecting postanal bones, the spurs, which are situated laterally near the base of the tail. Their function has been shown by Greenberg (1943) to be to pull back the lower cloacal lip of the female prior to copulation. The broad internal base of the spur then exerts pressure on the hemipenis, which expands. Further data on the form of the spurs in *Coleonyx variegatus* is given by Smith (1933).

A colony of a dozen specimens was obtained for a behavioural study. They were collected in the Borego Desert, San Diego County, California. On examination one male was found to possess two pairs of postanal spurs. This male *C. v. variegatus* has been observed mating on several occasions. The abnormality does not interfere in mating as the second pair of spurs are functionless.

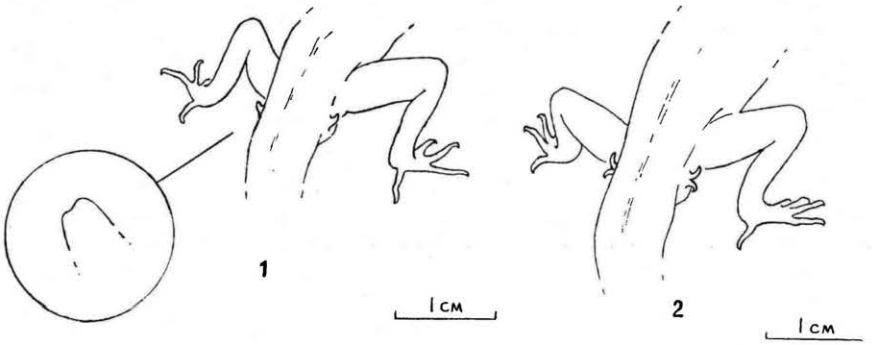
Description of Typical Spurs

In adult males the spur development is fairly uniform. They are visible externally for slightly in excess of one mm. and point upwards and outwards. Broad at the base and for most of their length, the tip exhibits a more pointed appearance and the front portion of the spur protrudes further than the rear portion. A very slight depression or notch is sometimes present in the centre. The appearance of the spurs is illustrated in fig. 1.

Decription of Double Spurs

No record of similar development is known to the author. Smith (personal communication) has never observed this condition nor has he seen mention of it in the literature.

The spurs are present two or three mm. behind the hind limbs on the sides of the tail in the typical postanal position above the region of secondary sexual swelling. The first pair of spurs are abnormal. They are directed upwards and outwards but are more elongated, approaching two mm. in total length. They are also slimmer than those of other male specimens examined and come to a definite, single point. The base of the second pair of spurs is directly behind the base of the first pair. They are much smaller (one mm.) and, like the first pair are curved. They point backwards. Their arrangement is shown in fig. 2.



Coleonyx variegatus. 1, Normal condition. 2, Specimen with double spurs.

Acknowledgments

Mr. Robin Lawson kindly obtained the *Coleonyx* for me in California. I am indebted to Mr. James Wilson for drawing the figures from life—a difficult task due to the extremely small size of the spurs.

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FURTHER RECORDS OF LARGE LITTERS FOR COMMON LIZARD AND SLOW-WORM

By

C. Simms

The Yorkshire Museum, York

The following records of large litters for the Common Lizard (*Lacerta vivipara* Jacquin) and Slow-worm (*Anguis fragilis* L.) may be of interest.

The numbers of young exceed the range given by Smith (1954) for this country although they are less than the maxima found by Holder and Bellairs (1963) and the Slow-worm record by Johnson (1963).

A Common Lizard, taken July 11th, 1960, at Wicken Fen, Cambridgeshire, gave birth to eleven young the same day. Three were still in membranes and were removed when they showed no attempt to struggle free. Of these one died the same day. Three of the ten survivors were given to Mr. L. J. Wolff of Newton Park College, Bath, for teaching purposes. The remainder did not survive the summer in vivaria.

On August 29th of the same year a large Slow-worm was taken near Swanage, Dorset, which over the period September 12-17 gave birth to nineteen living young and one which failed to emerge from the membrane and was discovered dead. Total lengths of the nineteen young, measured alive by dividers, ranged from 80-90 mm. approximately. Weighed on an automatic analytical balance of 1 mgm. sensitivity, at the Furzebrook Research Station of the Nature Conservancy, live weights at birth ranged between 0.4 and 0.6 gm.; the average 0.49 gm. Some of this litter are preserved in the spirit collections at Liverpool City Museum.

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DELAYED HATCHING AND GROWTH OF COMMON LIZARD (*LACERTA VIVIPARA*)

By

H. Ashley Best

A captive common lizard laid seven eggs on July 28th, 1963. These were placed in a glass jar and incubated at 75-80°F. One hatched after 24 hours; four others hatched after periods of up to seven days; the remaining two eggs failed to hatch. It is, of course, not unusual for young of the common lizard to be born still enclosed within their membranous eggs; M. Smith (*The British Amphibians and Reptiles,* Collins, 1954) states that they may not emerge for some days. A delay of seven days before hatching is perhaps unusual, however.

The baby lizards began to feed the day after hatching, taking black and green aphids and small spiders. At hatching they measured some 32-35 mm. with tail; one grew to about 45 mm. after 75 days. These figures are lower than those given by Smith for young of this species.

Limericks, Stonecourt Lane,
Pembury, Kent.

REVIEW

THE CONTINENTS WE LIVE ON Europe A Natural History, by Kai Curry-Lindahl. Hamish Hamilton, London. 1964. 300 pp. 4½ gns.

A superbly illustrated Chanticleer Press edition dealing with Europe's varied scenery, fauna and flora, from the tundra of the far north to the sub-tropical lagoons of the Camargue in the south of France. The text is admirably informative and clear, and the herptiles get their due share of attention.

MEN AND SNAKES: by Ramona and Desmond Morris. Hutchinson, London. 1965. 224 pp. 50s.

A fascinating and scholarly account of serpent lore with an excellent chapter on general biology. Highly recommended for both instruction and entertainment.

A. d'A. Bellairs.

ANNOUNCEMENTS

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Lt.-Col. R. H. R. Taylor (The Studio, Belchamp St. Paul, Sudbury, Suffolk), would be grateful for further distribution records of the British amphibians and reptiles.