

the domestic fowl have a chapter to themselves. Fish (pp. 16), Amphibia (pp. 11) and Reptiles (pp. 5) have short chapters to themselves, written by Prof. H. G. Schlumberger of Columbus, Ohio, U.S.A., who is well known to us for his work, with B. Lucké, on the malignant tumours of *Rana pipiens*. For any research worker wanting to explore a particular chapter of the pathology of any of these groups, the nine tightly packed pages of bibliography on these three classes provide a most useful first stepping-stone. The text itself is, from our point of view, deplorably short. Such problems, for example, as those arising from the running of large pregnancy diagnosis laboratories where many hundreds of frogs and toads must be kept in good health all the year round, are not mentioned at all. Yet the name of the sixty eminent contributors—if not the exorbitant price—may reassure us that we will be getting our money's worth if we add this work to our library.

E. ELKAN.

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Contributions should be addressed to Dr. A. d'A. Bellairs, St. Mary's Hospital Medical School, London, W.2. Articles should be typed in double spacing on *one side* of the paper only. Figures should be drawn in *Indian ink* on plain white paper, or preferably Bristol Board.

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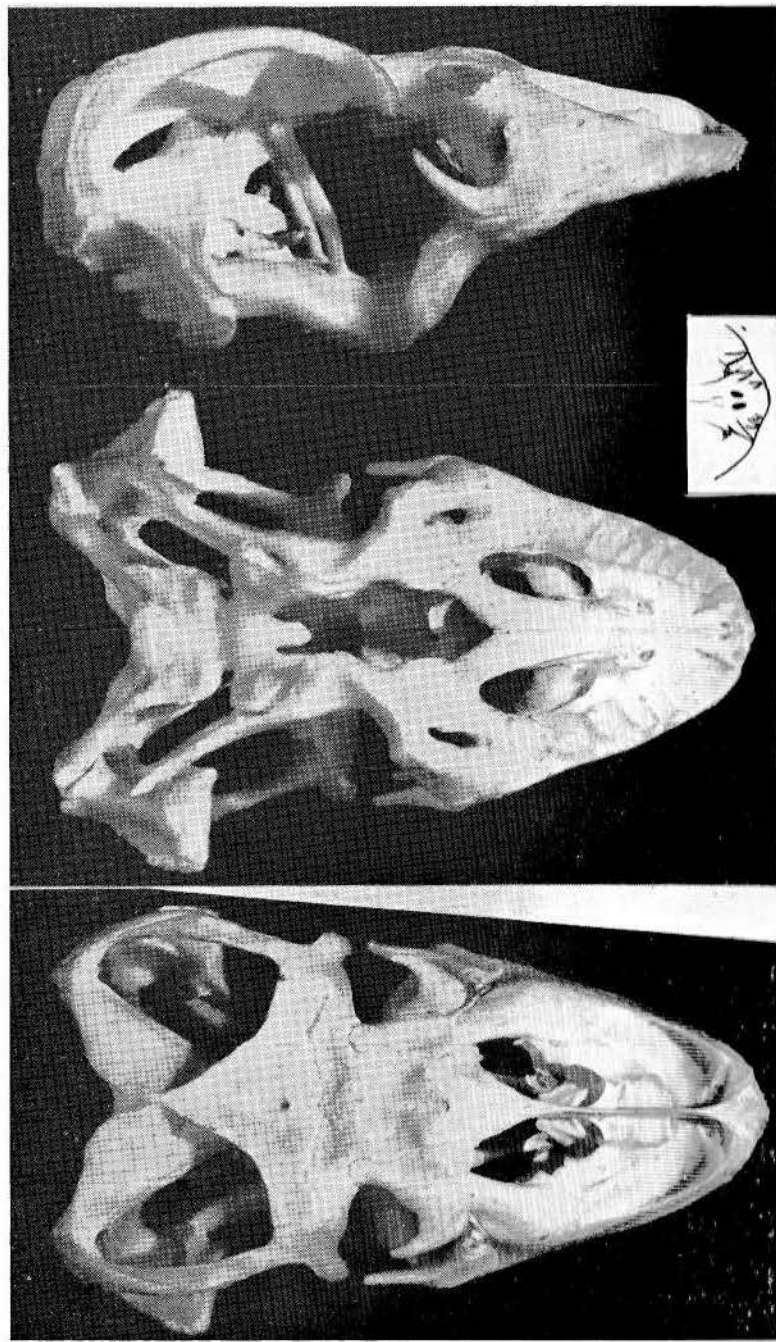


Plate 1

Side, lower and upper views of nearly toothless varanid skull.  
Inset drawing shows the few small teeth. (x0.65.)

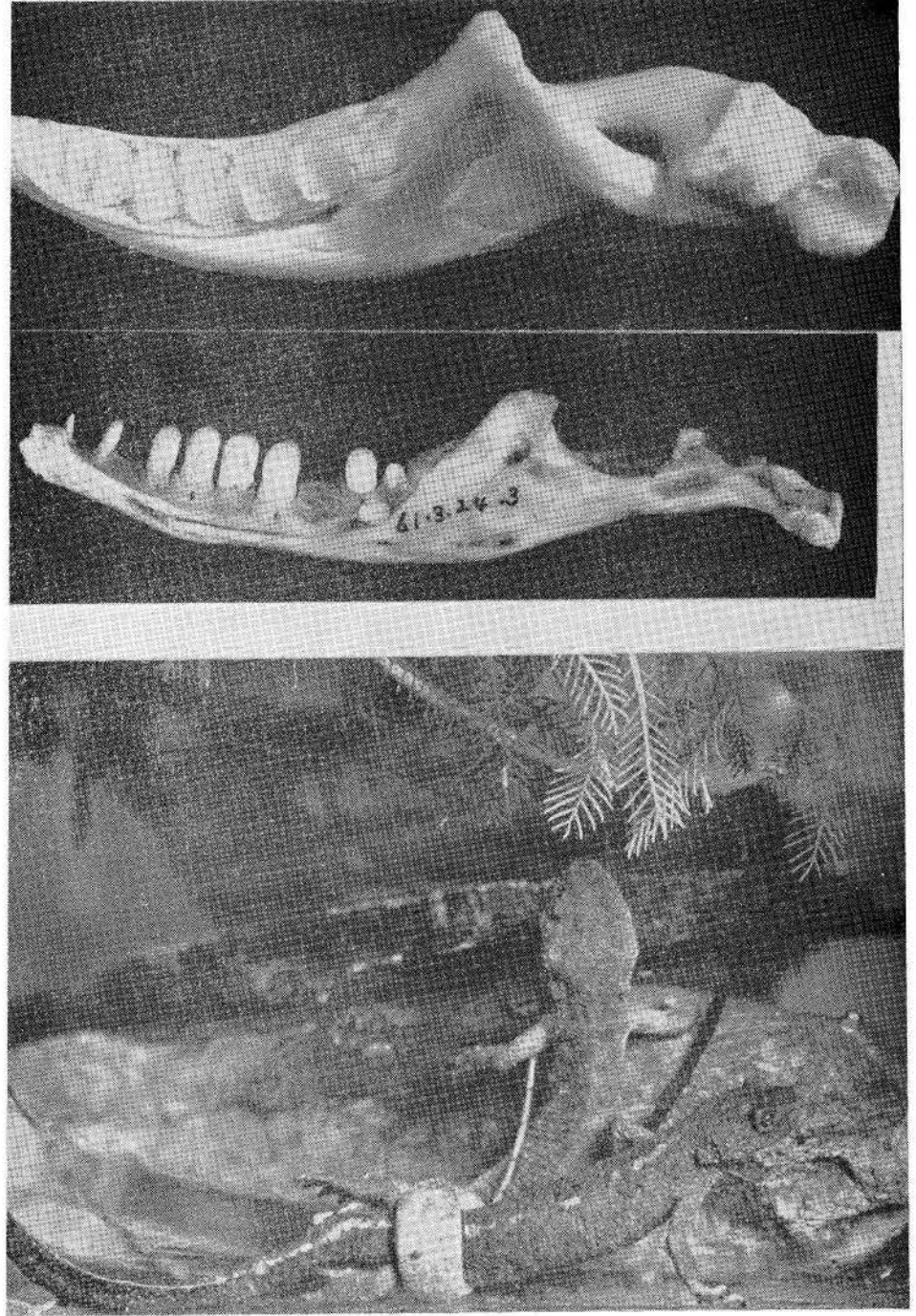


Plate 2

Bellairs & Miles; upper and middle photos. Inner view of nearly toothless varanid dentary (x0.9), and inner view of dentary of normal *Varanus niloticus* from Brit. Mus. collection (x0.9), showing stumpy teeth and tendency to stagger tooth replacement, but not a strictly alternating pattern. There is a large replacement tooth near the back of the tooth row.

Abrenfeldt; lower photo. Mating of the salamander *Euproctus asper* (x1).

It will be seen that although the total skull length from the tip of the premaxilla to the occipital condyle of Dr. Parrington's specimen is slightly less than in Mertens' longest skull (SMF 33252), the width, as measured across the hinder ends of the two squamosal bones, is nearly 17 mm. greater. The width of the skull is therefore about 53.5% of the length, as against 39.47% for Mertens' slightly longer but much narrower specimen. The proportions of the skull described here, are, however, more like those of a smaller specimen studied by Mertens (his NMW) where the width was nearly 48% of the length (see Table).

From these figures, and from others given by Mertens from his series of twelve skulls, it is clear that the cranial proportions in this species show much variation. In some kinds of lizard the skull of the mature male is broader and more massive than that of the female, but whether this is the case for *Varanus niloticus* is not known.

Table showing skull measurements in mm. of *Varanus niloticus*.

Based on system used by Mertens (1942, p. 122-3 and 181).

	Skull described here	Mertens NMW	Mertens SMF 33252	Brit. Mus. 61.3.24.3
1. Premaxilla to occipital condyle ... ..	129	104.5	132	119
2. Premaxilla to back of parietal in midline ...	130	95	—	105
3. Premaxilla to back of nasals in midline ...	65	45.5	51.1	53
4. Width between posterior ends of squamosals ...	69	49.9	52.1	50
5. Maximum width across postorbitals ... ..	68	42.8	50.2	45
6. Height from top of parietal to bottom of basisphenoid ... ..	41	31.3	39.5	29
7. Length of maxilla ...	63	51.8	65.1	60
8. Maximum height of maxilla ... ..	36	23.9	25.2	22
9. Maximum width across front of parietals ...	47	31.7	34	31
10. Total length of lower jaw ... ..	142	108.3	144.8	126
11. Length of dentary ...	87	64.6	83	77
12. Width of skull (measurement No. 4) as percentage of length (No. 1). ... ..	53.5	47.75	39.47	42

It is unfortunately impossible to estimate the total length of the animal from our own or Mertens' data. The largest Nile monitor skull in the British Museum (No. 61.3.24.3) with a premaxilla-condyle length of 119 mm. was the only big one in the series with an associated skeleton. This was partly disarticulated, but we estimated the total length to be about five feet. Cowles (1930) states that there are probably very few Nile monitors exceeding six feet in length, and adds that the larger specimens seen by him were usually females.

The normal dentition of *Varanus niloticus* shows certain peculiarities which occur in a few other members of the genus, such as *V. exanthematicus* and *V. albigularis*, also African forms. In young animals all the teeth are sharp and slightly recurved, as they are in most varanids throughout life. In mature Nile monitors, however, all the teeth except those on the premaxilla and the first few on the maxilla and dentary become massive and stumpy (Pl. 2), forming very suitable instruments for crushing the snails and crabs which form a considerable proportion of the creature's diet (Cowles, 1930). As Peyer (1929) has shown, this age change in the character of the dentition is not primarily the result of wear, but is due to an actual change in the shape of successive generations of replacement teeth.

The most remarkable feature of the specimen under consideration is the absence of all but the most anterior teeth (Pl. 1, 2). Of these, there is one at the tip of each dentary, one at the front of the right maxilla immediately against the suture, two on the right side of the fused premaxilla, and three on the left. The most posterior of the left premaxillary teeth is out of alignment with the others and looks as if it might possibly be a replacement for the one in front of it; like the others, however, it seems to be ankylosed to the bone. All these teeth are small and pointed and resemble the teeth present at the front of the mouth in normal specimens, except that there are fewer of them.

No stumpy teeth are present at all, the rest of the upper and lower jaws being completely edentulous. Along the bone are a series of shallow depressions separated by ridges, which resemble the spaces in normal specimens where functional teeth have been temporarily lost. The bone surface of these depressions is very smooth, and there is nothing to suggest that any functional teeth (which are normally very firmly ankylosed) had been broken off in the course of preparation of the skull.

Another apparently similar case of an almost edentulous monitor skull was seen by one of us during a recent visit to the Smithsonian Museum, Washington, through the kindness of Dr. Doris M. Cochran. This was a specimen of the Australian *Varanus gouldii*, a form in which the teeth normally remain sharp and recurved throughout life. Here the only teeth in the skull were one at the front of the left maxilla, and another near the front of the right dentary.

The skull of this Gould's monitor measured 118 mm. from premaxilla to condyle, and the total length of the skeleton was about five feet. Other skulls of this species examined by us, and also by Mertens, were much smaller, and accounts in various books suggest that 5 feet is near the upper limit for this species. It would seem that this specimen, like Dr. Parrington's Nile monitor, was well above the average in size, and was therefore probably aged.

## DISCUSSION.

Three possible and alternative explanations can be advanced to account for the absence of teeth in the specimens described. The first possibility is that all the functional teeth had been shed at the same time, but were in the process of replacement. The replacing teeth of varanids develop in the soft tissue on the inner aspect of the functional dentition, and can, as is evident in some of the British Museum specimens, be stripped away without leaving any traces.\* Later, however, they move outward into the spaces occupied by their functional predecessors, and become ankylosed to the jaw by their bases and outer surfaces in the typical pleurodont fashion.

In many reptiles there is a tendency for tooth succession to occur in an alternating manner,† so that in a prepared skull the ankylosed functional teeth are often separated from their neighbours on each side by vacant spaces ready to receive replacements. Bogert (1943) found this alternating or staggered pattern of tooth replacement in several species of *Varanus* and figures a part of the maxilla of *V. komodoensis* in which ankylosed teeth and vacant spaces alternate regularly. Study of our own and British Museum material suggests that tooth succession in varanids does not always occur in such a regularly alternating manner, and we often found a condition where several functional teeth or several vacant spaces were next to each other instead of alternating (Pl. 2). Indeed, in one skull of *V. albigularis* both sides of the premaxilla and the front of both maxillae and of one dentary were devoid of functional teeth, though there was evidence of some replacement in progress.

In no case, however, apart from the two specimens first described, did we find the greater part of both upper and lower jaws entirely denuded of functional teeth. While one cannot exclude the possibility that a few replacement teeth were originally present in these specimens and had been lost in preparation, it seems most unlikely that either of these animals, had they survived, would have received a normal complement of replacements.

A second alternative is that these two lizards did possess teeth, but that these for some reason failed to become ankylosed to the jaws and were stripped away without leaving traces. This seems unlikely in view of the firm ankylosis of the few small teeth which were present, and there is no evidence that failure of ankylosis does ever occur in lizards. So little is known, however, about the effects of age and disease on reptilian teeth that the possibility cannot be ruled out entirely.

The third and most probable explanation is that these two lizards had lost nearly all their functional teeth and also the ability to produce

\* In Tomes' *Dental Anatomy* (1923, Fig. 175, p. 283) a lower jaw, stated to be of *Varanus gouldii*, is illustrated, and the replacing teeth are said to develop in small cavities in the jaw along the inner aspect of the functional dentition. These cavities are shown in the figure and it is likely that in such a specimen the original presence of replacement teeth would always be apparent. Study of the appropriate material shows, however, that the specimen was incorrectly identified, and belonged, not to a varanid, but probably to a species of *Tupinambis*, the American tegu lizard.

† A substantial paper by Edmund (1960/61) will appear shortly, dealing with tooth replacement in reptiles, particularly with the "wave" concept of alternating succession.

new generations of replacement teeth. In view of the size of the animals it is likely that old age was the predisposing cause. Apart from their lack of teeth the skulls show no obvious pathological condition to suggest that disease might be implicated.

## FAILURE OF TOOTH REPLACEMENT IN OTHER REPTILES.

It is, of course, well known that there are some reptiles, such as the tuatara (*Sphenodon*) and chameleons, where there is virtually no tooth succession in the normal sense, though in the latter new teeth are added to the back of the series (see Tomes' *Dental Anatomy*, 1923). Rather similar conditions have been reported by Harris (1957) in the lizard *Agama agama* where new teeth are also added at the back of the row, but only the big caniniform ones near the front of the jaw are replaced in the usual way, and these only once or twice, while the animal is still quite young. It is interesting that the teeth of the tuatara and the chameleons, and the "post-canine" teeth of agamids, show the acrodont type of tooth attachment instead of the pleurodont one characteristic of varanids and most other lizards. Possibly the acrodont condition is correlated with loss of the ability to replace the teeth, although Gans (1957) has also found evidence of limited tooth succession in a pleurodont species of *Amphisbaena*.

Very little information is available about failure of tooth replacement in those species of reptiles (the great majority) which are normally polyphyodont, and no instances of this strictly comparable with the case of the two monitor lizards described have come to our notice. Kálin (1937), however, in an interesting paper on skeletal deformities in crocodiles, describes a condition which he calls *Gebissretention* in which a few of the teeth fail to erupt properly. Poole (in the press) suggests that in the Nile crocodile tooth replacement may slow down with advancing age, but it seems doubtful if it ever ceases entirely in the wild; a number of very large crocodile skulls which we have examined in the British Museum and elsewhere have a full complement of teeth, or at least of tooth sockets. The statement made by Bellairs (1957) that very aged crocodilians may become nearly edentulous therefore requires qualification.

In captivity, on the other hand, crocodiles do sometimes fail to replace their teeth. This condition has been observed in the London Zoo; the very big old Mississippi alligator known as "George" who lived there between 1912 and 1953 and finally reached a length of eleven feet is described in the post-mortem report as having only a few short teeth. Unfortunately it has been impossible to trace his skull. Partial loss of teeth may also occur in captive crocodiles of moderate size and is probably due to disease or dietary deficiency rather than old age.

## SUMMARY

1. Certain features shown by the skull of a large monitor lizard, almost certainly *Varanus niloticus*, are described. The skull is unusually broad and massive, and is devoid of teeth except for a few at the front of the jaws. Another almost toothless skull of a large specimen of *V. gouldii* was seen in the Smithsonian Museum, Washington.

2. Some possible explanations for the lack of teeth are suggested and it is thought most probable that the animals had lost the power of tooth replacement as the result of old age. Some relevant, though not strictly comparable instances of failure of tooth replacement in other kinds of reptiles are discussed.

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MATING BEHAVIOUR OF *EUPROCTUS ASPER* IN CAPTIVITY.

By

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The European mountain newts (Genus *Euproctus*), while also belonging to the Family Salamandridae, are not to be confused with the more or less montane species of the true newts (e.g., *Triturus alpestris*, *T. montandoni*, *T. vittatus*). There are three distinct species: *Euproctus asper* in the Pyrenees, *E. montanus* in Corsica, and *E. platycephalus* in Sardinia.

The distribution of the Pyrenean mountain newt, *E. asper*, is very localized and appears to be largely, if not entirely, restricted to the central and eastern parts of the range, between altitudes of approximately 700 m. and 2,800 m. (2,300—9,200 ft.). In France, it has been recorded only from two central départements: the Hautes-Pyrénées, and southern Haute-Garonne (Angel, 1946). On the southern slopes, its distribution appears to extend much farther eastwards, through Andorra, and the northern part of the Spanish provinces of Huesca, Lérida and Gerona (Mertens, 1925). Its natural habitat is mountain lakes and torrents with a water temperature of 10°—13°C. (and occasionally, 15°—20°C.), and it is usually found in the crevices between rocks and stones at the water's edge. It is particularly abundant in certain localities at very high altitudes, where there is ice and snow for 8 months in the year (Angel, 1946).

In most of the Salamandridae, mating is accompanied by some type of amplexus, although this does not occur in the true newts, *Triturus*. The very specialised amplexus found in *Euproctus* is of considerable interest. In *E. asper*, the male places himself beneath the female, encircling and gripping firmly with his strong, prehensile tail, her pelvic region and hind-limbs, and also clasping her with one foreleg; while, with a hind-leg, he strokes at intervals the belly and cloacal region of the female, sometimes so vigorously as to cause bleeding and to scrape off some of the skin. The cloacae are approximated, and the pressure of the male's hind-legs on the lips of the female cloaca facilitates the picking up by the latter of the spermatophore as it is deposited. In the other two species, the tail is similarly the principal prehensile organ; but in addition, in *E. montanus*, the hind-limbs of the male develop, in the mating season, tibial spur-like processes which assist in clasping the female; and in *E. platycephalus*, the male bites firmly on to the female, in the region of the hind-limbs, lumbar area, or base of the tail.\*

Noble (1931) states that, in this genus, "The males lie in wait among the rocks and snare passing females with their prehensile tails. So forceful and prolonged is the grip that it frequently kills the captured animal." It is difficult to see how constriction, however firm, by the male *Euproctus* of the pelvic region of a female of the same species could normally, or indeed "frequently", cause the death of the latter. It would, in all probability, be only as a result of accidental constriction of some other part of the body that this might occasionally ensue. The clasping reflex in these newts is, without any doubt, extremely strong, and in the absence of females, is applied—as, e.g., in many species of Salientia (cf Boulenger, 1898)—"indiscriminately" to males of the same species, newts of a different genus, and other animate and inanimate objects; and it has been recorded that a male *Euproctus* killed two "blind" salamanders (*Proteus anguinus*) by thus constricting their necks with its tail (Klingelhöffer, 1956).

In the natural state, the mating of *E. asper* occurs in the water, from June to August, and sometimes as late as October (depending on altitude, temperature, etc.); i.e., sexual activity lasts throughout the relatively warmer part of the year. This would account for the fact that mating behaviour in this species in captivity (with an average water temperature of 15°C.) has been observed by the writer in March-May and September-December. The photograph here reproduced was taken on 16th December, 1958.

Personal observations have shown that amplexus in *E. asper* may last considerably longer than the period of 1—5 hours mentioned by previous authors. It was obviously not possible to keep the creatures under constant observation, day and night; nevertheless, on six occasions thus noted, the minimal duration was of 1 hr. (twice), 5 hrs., 8 hrs., 21 hrs., and 28 hrs., respectively. During amplexus, the male and female show, for much of the time, a fairly considerable individual mobility of the anterior two-thirds of the body, twisting and diverging so far as they are physically able (as shown in the photograph).

\* For further details and references on the ethology and ecology of *Euproctus*, cf. Bedriaga, 1895; Schreiber, 1912; Werner, 1912; Angel, 1946; and Klingelhöffer, 1956.

It is interesting to note that, in spite of the relatively frequent occurrence of amplexus in this pair of *Euproctus* in captivity (and it may reasonably be assumed that a number of such occasions passed unnoticed), no ova, so far as could be ascertained, were at any time deposited. Thus the endocrine or other stimuli which induced this reflex behaviour were not related to actual fertilization. In *Triturus*, the female does not accept the male until she has a mature ovum, and is therefore prepared to receive a spermatophore (Smith, 1954). Notwithstanding the "caveman-like" grasp of the male *Euproctus*, it must be presumed that no spermatophore is deposited, or picked up by the female, until the latter is physiologically ready to be fertilized.

It has been stated by various authors that *Euproctus* is rather delicate, and somewhat difficult to keep, in captivity; and that it requires cool, fresh water, not above 8°C., and of a depth of some 15 cm., which must moreover be frequently changed and remain as clear as its indigenous mountain streams, if the animal is not to develop ulcerous and other lesions such as are most liable to prove fatal (Schreiber, 1912; Klingelhöffer, 1956). The following personal observations may, therefore, be of some assistance and encouragement to herpetologists wishing to keep these uncommon and interesting amphibians. The present pair of *E. asper* was obtained 3 years ago (November, 1957) and, since then, has lived in a glass tank measuring 16 × 11 × 11 inches; the water depth is 5—6 inches (13—15 cm.), and the average water temperature throughout the year, about 15°C. (59°F.). The tank has been kept indoors, and has in the centre some large, flat stones forming a platform at water level, and providing crevices in which these somewhat photophobic creatures may conceal themselves. It is a regrettable, but undeniable, fact that neither has the water been changed as frequently, nor have the animals been fed as regularly, as would no doubt be desirable: this, it is hardly necessary to add, is due to the exigencies of contemporary (human) life, and necessary absences abroad. These two specimens are, nevertheless, still perfectly healthy and vigorous; they do not normally exert themselves unduly, as it is not in their nature to do so, and they remain, for the most part, relatively motionless on the stone platform, or in the crevices, or else at the bottom of the tank. They eat well all the year round, and are easy to feed: their sole diet consists of small earthworms, and they most readily come to the surface to "snap" these from the forceps, whenever they are fed. (Aquatic insects and larvae are not satisfactory, as they swim far too rapidly for these rather slow-moving, not to say clumsy, amphibians).

The writer is greatly indebted to Dr. E. Elkan for kindly providing him with these interesting creatures; and to Peter Robinson for the very excellent photograph, here reproduced, which was taken under the most difficult conditions. (Pl.2)

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## LIZARDS AND CROCODILES AS FOOD FOR MAN.

By

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In a previous paper (Irvine, 1954) the use of snakes as human food was discussed. The present article deals with lizards and crocodiles which, as Lydekker (1896) and other writers have mentioned, are eaten by man in various parts of the world.

## LACERTILIA

## AFRICA.

Various travellers in Africa such as Anderson (1896) among the Azande of S. Sudan, Landers and Clapperton (1830) among the Yoruba of S. Nigeria, Schultze (1907) and Dundas (Wellcome Report) amongst the Suk, and Nachtigal (1879) in Bornu, N. Nigeria, mention lizards as being used for food. It is almost certain that these were monitor lizards (*Varanus*).

The Nile monitor (*Varanus niloticus*) is roasted and eaten by Africans in the Victoria Nyanza region, where fishermen from the lake sometimes flay it alive, as its skin comes off more easily that way. Cansdale (1955) describes how the thick white steaks, resembling fish, are eaten in W. Africa. In Ghana the flesh is sometimes dried and kept, and is then eaten in palm soup. Other observers such as Dornan (1925), Pope (1955) and B. M. Nicol (private communication) have reported the eating of the Nile monitor or Bosc's monitor (*V. exanthematicus*) by South African Bushmen, and by other Africans in Ghana (e.g. by Nzima and other tribes) and in Nigeria.

## AUSTRALIA.

According to various authorities—Basedow (1929), Dunbar (1948), Matthew (1910), Ridley (1899), Sweeney (1947), Australian aborigines eat almost all kinds of lizards, as did the Tasmanians (Bonwick 1870; Spencer and Gillen, 1912). Examples of such edible lizards are the Frilled Lizard (*Chlamydosaurus kingii*), the Water Dragon (*Physignathus*), and the Bearded Lizard (*Amphibolurus barbatus*).

Daisy Bates (1944) states that the "Barking Lizard" is eaten by the aborigines of Australia and confirms that they consume other lizards also. It is likely that the lizard she had in mind was the "Water Dragon", "Gippsland Alligator" or "Salamander"—*Physignathus lesueuri* (Gray). Lizard's eggs are also eaten by aborigines (Basedow, 1929). Monitor lizards

or Goannas (*Varanus*) are eaten by the aborigines (Thomson, 1948-9). Their flesh is white and tasty (Finlayson, 1936). The tail and legs of the Monitor lizard or Sand Goanna (*Varanus gouldii*) are used as food by Australian aborigines (Roth, 1901), and are roasted, stewed, grilled or baked in clay. In stewing they are boiled over a low fire with bread or flour as a thickening. In grilling they are cooked by direct contact with the naked flames. In clay baking, the body is wrapped in clay or wet newspaper and buried in hot ashes for 6-8 hours (Butler, 1950). According to Barrett (1947), these Goanna lizards from Fitzroy River district were used in the days when aboriginal labour was used on sugar plantations, to be sold to the Chinese who paid the Kanakas 5/- each for Goannas, whose fat and oil they sent back to China. *Varanus giganteus*, the largest Australian lizard, second only to the Komodo Dragon in size, is also eaten by the aborigines, the flesh being white and tasty, and the abdomen containing (as does that of *V. gouldii*) two long fillets of fat—very useful in a country where so many animals are lean. (Finlayson, 1935).

## AMERICA.

Certain S. American Indian tribes, e.g. the Botocudo of E. Brazil, the ancient Cainang of E. Brazil and the Guato of Paraguay River basin ate lizards (Steward, 1946-50, 1.382,451).

Both the flesh and eggs of the Galapagos Land Iguana (*Conolophus subcristatus*) are eaten by the inhabitants of the Galapagos Islands off the S. American coast (Lydekker, 1896). The seaweed-eating Marine Iguana of the Galapagos Islands (*Amblyrhynchus cristatus*) is also eaten (Beebe, 1924), the flesh being regarded by British sailors who ate it, as preferable even to that of the turtle.

The American Iguanas are stated to be a well-known article of food, by Maufrais (1953), and Steward (1946-50, 4.332). Their flesh was reserved for chiefs (Steward 1946-50, 4.524). The Common Iguana (*Iguana iguana*) is often seen in local food markets; this and another species (*I. delicatissima*) are specially hunted and caught in nooses. The flesh is white and delicate, resembling that of the breast of chicken in flavour. Their eggs are also highly esteemed as food. The Black Iguana (*Ctenosaura acanthura*) from Mexico also has a highly esteemed flesh (Lydekker, 1896). G. Mall-Teare (1949) recounts having had a meal in a S. American village in which the main dish seemed to be a peculiar but delightful sort of cheese which he later saw had been made from the eggs cut out of a large Iguana.

Maufrais (1953) describes the use of Iguanas as food in French Guiana, and the Mochicas of Peru hunting Iguanas as additional food. Various other large species of tropical American lizards appear in food markets (Pope, 1955).

The Tegus (*Tupinambis*) belonging to the family Teiidae of tropical America, are also eaten and are specially hunted, with the aid of dogs for their tender and well-flavoured flesh. (Lydekker, 1896). These lizards are carnivorous, and swift runners. The largest species is the common Tegu (*T. teguixin*) which grows up to 4 feet long. The Surinam Ameiva (*Ameiva surinamensis*), another member of the Teiidae, is also probably eaten.

In the Western United States, certain larger desert lizards were formerly eaten by the Gosiute Indians, and were said to be well flavoured (Chamberlin, 1911). The flesh of the Chuckawalla (*Sauromalus obesus*) was liked by N. American Indians of the S.W. States (Pope, 1955). This large iguanid lizard (16 in. long) hides itself in rock crevices, inflating its lungs so as to increase its bulk by 60% and so making its extraction difficult. The Indians therefore effected its capture by hunting it with sharp sticks (Pope, 1955).

## ASIA.

The meat of Monitors (*Varanus*) is widely eaten in the Old World (especially Asia), their eggs being also relished. (Deraniyagala, 1939; Pope, 1955). The Indian Monitor *Varanus monitor* [= *bengalensis*] is eaten by the lowest caste Hindus. Their soft-shelled white eggs are sometimes deposited in the nests of termites, one female laying up to 30 eggs, each nearly 2 inches in length. These eggs are much relished by the Burmese and command a higher price in the local market than hens' eggs (Lydekker, 1896; Smith, 1935). The Burmese also eat *Varanus salvator* (Dunbar, 1948). Its fat is used medicinally.

J. Waters (private communication) describes how taxidermists in Malaya also sell the (edible) flesh left on the skins of monitor lizards, skinned for use as leather. J. D. Romer (private communication) describes having eaten the flesh of a monitor lizard in India in 1944, where it was served with either onion or bread sauce, and had a flavour resembling both chicken and fish.

The Arabian Thorny or Spiny-tailed Lizard *Uromastix aegyptius*, an agamid of Arabia, Egypt and Crete, which reaches a length of 18 inches, is frequently tamed by the Arabs, who feed it in captivity for its flesh, which resembles that of a young chicken in flavour and is much relished (Lydekker, 1896). This lizard (known as *dabb* in Arabic), is often eaten by the Bedouin, and this is considered to be lawful. (Al Damiris, 1906). The species *Uromastix hardwicki*, which occurs widely in Pakistan, and has a limited distribution in India (United Provinces) is also eaten (Pope, 1955).

The Sail-tailed lizard (*Lophura amboinensis* of the family Agamidae) from the Philippines, Java, Celebes and Moluccas, is hunted for its white and well-flavoured flesh which is much appreciated. (Lydekker, 1896, fig. 124).

The lizard *Lirolepis belliana*, another agamid, according to the late Dr. Malcolm Smith, is eaten by the Siamese and the Cambodians. An article in "Reveille" (Nov. 28th, 1952) by an unknown author mentions a lizard curry from Siam (Thailand) with a musty flavour.

## CROCODILIA

## AFRICA.

Torday (1930) quotes several travellers in Africa who had noted the use of crocodiles as food. These included Emley (1927) writing of the Turkana of Lake Rudolf; Petherick (1861) describes how the Dinka of the Sudan barter crocodile flesh for grain; Denham and Clapperton observed that crocodiles were eaten in Bornu, N. Nigeria; Mounteney-Jephson

(1890, p. 130) states that young crocodiles were eaten by professional crocodile hunters. They are also eaten in E. Africa today.

The use of crocodiles as food in W. Africa is well-known. The late Mr. J. Lester, formerly Curator of Reptiles at the London Zoo, reported (private communication) that white meat from crocodiles' tails was eaten in the officers' mess in French Ivory Coast during the war. It had a good flavour. He also reports that the eggs of the crocodile, before laying, were removed and eaten in the Accra district. A colony of Northern Territory people living near the River Densu, close to Accra, are specially engaged in hunting crocodiles for food. John Palmer (1951) states that according to experts, an East African (Kenya) crocodile could be reduced to meat worth £30 a ton, suitable for feeding pigs and poultry. Bone meal from the same source would be worth £15 a ton. Cansdale (1955) gives several instances of the use of crocodiles as food in W. Africa.

The Nile Crocodile (*Crocodylus niloticus* Linn.) is considered to be palatable in many parts of W. Africa, though it is taboo to some tribes in Ghana; it is eaten, however, in parts of Northern Ghana. In Sierra Leone its meat is in great demand though the poisonous gall-bladder needs to be removed first. The Short-nosed, or Broad-fronted Crocodile (*Osteolaemus tetraspis* Cope) is considered to have palatable flesh. Its tail is often very heavy and thick white steaks cut from it looked appetizing. The eggs of crocodiles are in demand as food in Sierra Leone, e.g. in the Bonthe District (T. S. Jones) and elsewhere, and are even considered a delicacy (Pope, 1955).

#### ASIA.

The flesh of the man-eating Estuarine Crocodile (*Crocodylus porosus*) is eaten in parts of Asia where its flesh is said to have a flavour midway between that of a shark and a chicken. It is relished in Bentota, Ceylon (Deraniyagala, 1939), and in the Irrawaddy Delta where it is caught with hooks (Pope, 1955). The Siamese Crocodile (*C. siamensis*) is sometimes eaten by the Siamese country people, but not *C. porosus*. (Malcolm Smith, private communication).

#### AUSTRALIA.

Basedow (1929) reports that crocodiles' eggs are eaten by Australian aborigines. The Estuarine Crocodile (*Crocodylus porosus*) which grows up to 20 feet, and the smaller (7-8 feet) fish-eating and harmless Johnston's Crocodile, or Australian Long-nosed Crocodile — *Crocodylus johnstoni* (Roth, 1897, described as *Philas johnstoni*)—are both eaten by the aborigines, the muscular base of the tail resembling the flesh of fish. It is roasted in ovens, buried in the ground using hot stones or pieces of termite mound. The eggs of both species are eaten by the aborigines (Thomson, 1948-9).

#### AMERICA.

The flesh of the American Alligator (*Alligator mississippiensis*) has been eaten in N. America. (Reese, 1915; and Schmidt, private communication).

Though the eggs of the American Crocodile (*Crocodylus acutus*) which have been eaten by the late Dr. Karl P. Schmidt, are said

locally to be inedible, they proved to be much like ordinary hens' eggs. Schmidt, who has eaten the tail-flesh of this and other species, states that it has "a bland taste, like second-rate fish". Certain S. American Indian tribes eat the flesh and also the eggs of Crocodiles (*Crocodylus*) (Steward, 1946-50, 4.448,456).

The tails of Caimans, found only in Central and South America, are eaten in French Guiana, having been eaten, for example, by Maufrais (1953, p.49) who also ate them in Matto Grosso (p.117). The common species are the Great Caiman (*Melanosuchus niger*) which reaches 20 feet, and the widely distributed *Caiman crocodilus* (formerly called *Caiman sclerops*) which grows to 8 feet long. The Guato of Paraguay River basin used Caimans as one of their favourite game animals and relished their tails, which were roasted in hot ashes. Caimans were hunted and eaten by various S. American Indians, e.g. by the Tupinamba and by the Cenu. (Handbook of S. American Indians, 1946-50). The eggs of the Great Caiman which are as large as turkey's eggs are eaten by the inhabitants of Dutch Guiana. (Lydekker, 1896). The Bosch Indians of that area, however, do not eat Caiman, saying that whoever does so will be eaten in his turn. (Maufrais, 1953). Schmidt, who has eaten the flesh of the Broad-snouted Caiman *Caiman latirostris*, describes its flesh also as being of a bland taste, like second-rate fish (personal communication).

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## NOTES ON CAPTIVE SNAKES

By

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*CHLOROPHIS* POISONED AFTER EATING NEWT

The West African water snake *Chlorophis irregularis* normally feeds on frogs and toads: *Triturus* does not occur in West Africa. A captive specimen was fed on *Rana temporaria*, but when the stock of these frogs was exhausted it was offered and accepted a specimen of the smooth newt (*Triturus vulgaris*). No symptoms of poisoning were observed for twenty-four hours; then the snake was found in a position that suggested death, being quite limp and lying belly uppermost. After handling, however, a slight movement of the snake's head was noticed. The belly of the snake was then palpated, and the partly digested newt was disgorged. The snake's stomach was then flushed with tepid water via the mouth with a syringe.

After this treatment the animal recovered, being quite normal some twenty-four hours later. Sixty-four hours later it ate another frog.

Two weeks after this incident the snake was again fed on a newt of the same species, and similar symptoms appeared. Despite the same treatment, the snake died. It is suggested that while this snake is able to withstand the poisons of Anura it may be susceptible to those of urodeles. It should be added, however, that the smooth newt is not generally regarded as a poisonous species and is eaten by many animals such as the grass snake (*Natrix natrix*) which seldom attacks the crested newt (*T. cristatus*), the skin of which is known to have poisonous properties (see Malcolm Smith: *The British Amphibians and Reptiles*, Collins, 1954, p. 54).

BREEDING OF *COLUBER VIRIDIFLAVUS*.

On June 24th, 1959, a captive specimen laid twelve eggs in the water container; this is not an uncommon site for egg-laying in captive snakes kept in dry cages. The eggs were then placed in a glass container with a lid between layers of moss lightly sprinkled with water. Soon after laying the eggs averaged 29 mm. x 15 mm. in size, and 4.8135 gm. in weight. They were incubated without special heating in an animal house kept at temperatures of between 75° and 85°F.

On August 12th the snouts of two young snakes were seen protruding through slits in the eggs; these were at once withdrawn if any movement was made in the vicinity. Both young had completely emerged on the next day, though one retreated into the empty shell on being disturbed. The snakes sloughed for the first time on August 16th, and shortly afterwards fed on nestling mice. Their length after hatching was about 255 mm. Unlike the adult, they had distinct yellow collars rather like those of *Natrix natrix*. The overall coloration on the back and flanks was silver grey, and there were distinctive black markings on the head.

TAIL VIBRATION IN *ELAPHE SITULA*.

A specimen of this snake has been kept in captivity for some years, though seldom handled. While its cage was being cleared the reptile was observed to raise the tip of its tail from the cage floor and vibrate it rapidly, occasionally striking and biting the writer's hand. The display continued until the snake was handled; the tail then ceased to vibrate although the snake continued biting. It is well known that certain other species (e.g. some pit-vipers without rattles) have the habit of vibrating the tail; possibly it serves to distract predators and to distract (or even attract) prey in the wild.

DISTRIBUTION OF BRITISH REPTILES AND AMPHIBIANS :  
A REVISED SURVEY

A paper by R. H. R. Taylor on the distribution of Reptiles and Amphibians in the British Isles was published in the British Journal of Herpetology No. 1 of June, 1948. In this paper, a complete record of the occurrence of the different species in the British Isles (divided into vice-counties) and Channel Isles was presented and illustrated with the aid of maps.

It is now proposed to re-write this paper and at the same time include records up to the end of 1960. This would then be published in a future number of the British Journal of Herpetology.

If we are to obtain a complete and accurate picture of present distribution, it is essential we get up-to-date records from all areas. For 40 or 50 years there have been no published records of even the commonest species from a number of vice-counties.

I would be very grateful, therefore, if you could help me to obtain reliable records in your area (or any other), from the beginning of 1948 to the present time and during 1960, of the occurrence of the following species :—

*Anguis fragilis* (Slow worm); *Lacerta vivipara* (Viviparous lizard); *Lacerta agilis* (Sand lizard); *Coronella austriaca* (Smooth snake); *Vipera berus* (Viper or Adder); *Natrix natrix* (Grass or Ringed snake); *Triturus helveticus* (Palmate newt); *Triturus cristatus* (Great Crested or Warty newt); *Triturus Vulgaris* (Smooth newt); *Bufo calamita* (Natterjack); *Bufo bufo* (Common toad); *Rana temporaria* (Common frog); *Rana ridibunda* (Marsh frog); *Rana esculenta* (Edible frog).

The records should show the year the species was observed and the locality. The locality can best be described by naming the nearest village or natural feature that is marked on a quarter inch to the mile map.

Would you please send any data you can to me,

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Suffolk.

*POISONOUS AMPHIBIANS AND REPTILES, RECOGNITION AND*

*BITE TREATMENT*: by F. BOYS and H. M. SMITH. Charles C.

THOMAS, Publisher, Springfield, Illinois, 1959. pp. v-vii, 1-149. Price \$4.75.

Written by a physician and herpetologist, this book combines two professional views with the result being a very practical and authoritative piece of work. Its main concern is poisonous snakes, their recognition, bite, first aid and medical treatment. It also includes similar, but brief sections on poisonous amphibians, turtles and lizards.

The "old" method of snakebite treatment (tourniquet application, multiple incisions and suction) is thoroughly discussed and given complete support by the authors as the best overall method. Antivenin is viewed as a worthy procedure under varying circumstances, but it is also noted that there are several disadvantages connected with its use. Various other methods of treatment are discussed and evaluated (e.g., cryotherapy and use of various drugs).

In essence this book is the result of a thorough literature survey of poisonous amphibians and reptiles; the precautions that should be taken to avoid a bite; first aid and medical treatment if bitten, with an evaluation of the latter two by the authors. One should note that it is written primarily with the United States in mind, but the nature of its contents, especially the first aid and medical sections, enhance its usefulness to any herpetologist or medical doctor.

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NEW LITERATURE

We note with great pleasure the appearance of a new periodical, The Biological Journal, published by the Biological Society of the University of St. Andrews. The address of the editor is The Biological Journal, 67 Arden St., Edinburgh, 9. Mr. Robert Bustard is one of the assistant editors and has contributed an article on Agamid Lizards in the first number, published in the spring, 1960.

The new number of the Zoological Record dealing with Reptilia (Vol. 94, Sect. 16B, 1957) and compiled by J. C. Battersby and W. E. Swinton is now available from the Zoological Society of London (price 7/6d.).