

BOOK REVIEWS

AMPHIBIEN UND REPTILIEN. KATALOG DER SUBFAMILIEN UND HÖHEREN TAXA MIT NACHWEIS DES ERSTEN AUFTRETENS. By Prof. Dr. O. Kuhn, (1967). (Amphibians and Reptiles. Catalogue of the Sub-Families and the higher Taxa with references of their first appearance.) *G. Fischer publ. Stuttgart. D.M.44. £4.11.10.*

The sub-title of this little volume may give rise to misinterpretation. The "first appearance" refers to appearance in print, not to evolution.

It is not often that an author finds the time and the enormous patience required to edit a catalogue of this nature and the herpetological fraternity must sincerely congratulate Professor Kuhn for having undertaken this herculean labour and the firm of G. Fischer for publishing it. On 124 pages the book gives us early classifications from 1758-1831, a recent classification by Mertens and Wermuth (Griffiths 1963 is not mentioned) and alphabetical lists of the higher taxa of the fossil and of the recent amphibia and reptilia. As usual with works of this kind, the abundance of invalid names is depressing to behold. The book ends with a page of Rules of Nomenclature by H. Wermuth. The list of relevant literature on p.10 is deplorably short. It includes a book by Terentiev titled comprehensively "Herpetology" although it only deals with Russian species but fails to mention the 1954 reprint of Noble's *Biology of the Amphibia* which might rightly be called the Herpetologist's bible. Considering its small size the price of the book is prohibitively high and in spite of its undeniable value it will hardly find a place anywhere outside the shelves of the specialists of herpetological taxonomy whose task it will be to develop eventually a system of amphibian and reptilian taxonomy that pleases everybody.

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E. Elkan.

LIVING TURTLES OF THE WORLD. By P. C. H. Pritchard. T.F.H. Publications Inc., T.F.H. Building, 245 Cornelson Avenue, Jersey City, N.J., 07302. Distributed in the British Empire by T.F.H. Publications (London) Ltd., 13 Nutley Lane, Reigate, Surrey. 1967. 288 pp. price \$9.95.

A most useful account of chelonians, attractively illustrated with black and white, and colour photographs. Deals with classification, evolution, reproduction and vivarium keeping, as well as giving a systematic description of each family. Much of the information is based on the author's wide personal experience of chelonian habits.

A. d'A.B.

BRITISH JOURNAL OF HERPETOLOGY

Vol. 4 No. 3

December 1968

Published by

THE BRITISH HERPETOLOGICAL SOCIETY

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The British Journal of Herpetology is published twice a year and is issued free to members. Application to purchase copies, and/or for details of membership to the Society should be made to the Hon. Secretary, British Herpetological Society, c/o The Zoological Society of London, Regents Park, London, N.W.1.

Contributions should be addressed to the Editor, Dr. Harold Fox, Department of Zoology, University College, Gower Street, London, W.C.1. 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 and suitably lettered for publication.

A COLLECTION OF SNAKES FROM GREECE

By

R. J. CLARK

Palio Limani, Spetsai, Greece

(Received 6/8/67)

Eighteen species of Ophidia have been recorded within the territory of Greece, representing four families. Most of these species extend further east, into Asia Minor and beyond: others have a westward extension into Europe. Although the land mass of Greece is only 51,168 square miles, its broken up nature has resulted in a diverse distribution of its reptile species.

The herpetofauna differs markedly between the mainland and the various groups of islands, and even between one island and its immediate neighbours. Overall patterns of distribution are fairly well defined, often related to ancient and present day land masses but the details of each island or mainland region continue to be irregular. The making of records for individual islands is justified by the complete isolation of one from the next.

Some of the older records are open to doubt and lists of 'absences' have sometimes been hastily compiled with lack of sufficient search. The European checklist of Mertens and Wermuth (1960) included Greece and gives considerable information concerning the distribution of its herpetofauna, but inevitably cannot consider individually all the many islands. More details about this area are given by Werner (1930), Bird (1935) and Wettstein 1953 and 1957). A little has been added to the literature since 1960 (Mertens, 1961; Daan, 1967).

Over the past five years the present author has collected reptiles spasmodically in Greece. He has caught and examined nearly 400 snakes, so now feels justified in listing the localities in which he found them. His find of *Vipera xanthina* (Clark, 1968a) apparently represents a new record for Greece, and in many other cases he believes he is adding distinct new localities for species previously known in Greece. This is not surprising: in the past many islands have been but briefly visited, if at all, and even after a prolonged stay, some species will remain undiscovered.

There are several areas not yet visited by the author which warrant further search, notably Crete, the Ionian Islands, northern Sporades, the large north east Aegean islands and the northern part of the Greek mainland. Of the 18 species recorded in Greece only *Coluber ravergeri mummifer* (Rhodes) and *Coronella austriaca* (mainland, Samothrace) (Wettstein, 1953) have not been found by the present author.

A complete list of all snakes, with their localities, recorded by the author in Greece, from 1963 to 1967, is given in Table 1. Numbers in brackets indicate the total caught in the area. Where no number is given, the species was positively identified, but the specimen not captured or too damaged for preservation and subsequent complete examination. Numbers quoted must not be taken as an indication of abundance. A second brief list (Table 2) summarizes those localities in which the species is believed to be newly recorded. The appendix gives the chief islands in the major island groups, and approximate position of the mainland localities mentioned.

No attempt is made in this report to discuss the broader aspects of taxonomy and distribution or give any details of the snakes captured, though a few brief comments are made below. A more thorough analysis is in preparation.

It is never entirely convincing to record the 'absence' of likely species from any locality. If, however, the area has been thoroughly searched and local evidence agrees, negative findings can be fairly conclusive and are relevant to any discussion of distribution. For example, in spite of several visits, no vipers have been recorded from Seriphos and the local peasants know of no poisonous snakes there. They are apparently absent also from the more northerly members of the western Cyclades

chain — Kithnos and Kea — though *Vipera lebetina schweizeri* is established (and exclusively) on the Milos group and Siphnos, where it appears to have replaced *V. ammodytes*. On the Aegean islands, *V. ammodytes* is known from the northern and central Cyclades, but is absent from most other island groups. *V. xanthina* has now been recorded from the Dodecanese (Leros and Patmos) but is unlikely to be found further west. Similarly, *Coluber gemonensis* has replaced *C. jugularis* on the Peloponnese and Crete, though the situation is reversed on the north Greek mainland and Aegean islands, while on Corfu both species co-exist (Mertens, 1961).

Some species, viz. *Malpolon monspessulanus insignitus* and *C. najadum dahlia* are characteristic of the mainland and closer offshore islands (Argo-Saronic, Ionian, northern Sporades, eastern islands and Euboia) but absent from the Cyclades. *Eirenis modesta* is confined to the eastern islands. *Natrix tessellata* has a very erratic distribution. It is known only from the islands of Rhodes, Crete and Seriphos and there is an older record from Tinos (Bird, 1935) which has not been repeated. It is well established on the mainland. *Natrix n. persa* appears absent from the very dry southern Cyclades, and the Argo-Saronic group, though otherwise is more universally distributed.

The small remote south-east Cyclades are probably snake-free (Wettstein, 1953) and they are evidently dying out on the larger islands of the southern arc of the Cyclades — for example, *V. ammodytes*, abundant on the neighbouring Cyclades is absent from Folegandros, Santorini, Anaphi and Amorgos. *Elaphe quatuorlineata*, though now recorded widely in the Aegean region, has rarely been reported from the mainland (Werner, 1930, 1937).

An anomaly is the find of *E. longissima rechingeri* (Werner, 1932; Wettstein, 1953) on Amorgos. The author again found this snake (alongside *E. quatuorlineata*) on Amorgos: the taxonomic status is doubtful and it is being studied. This form is not known elsewhere in Greece.

A reduction in size of certain Aegean island forms has previously been noted by the author for *E. quatuorlineata* (Clark, 1967a) and *V. ammodytes meridionalis* (Clark, 1968c). This generally smaller size is noted in some other species of snake on the central Aegean islands, namely *V. libetina schweizeri*, *C. jugularis*, *N. n. persa* and *Telescopus fallax*. It was not apparent in *E. situla* or *Eryx jaculus*, but very few of these were examined.

The black form of *C. jugularis*, well known in parts of Asia Minor, has previously been reported on Rhodes (Wettstein, 1953). The present author caught black individuals on Rhodes, and Leros, and saw one on Kalymnos. On the latter island, the typical greyish form was caught, so here the two forms evidently co-exist. Two much browner individuals were observed on Leros, but no typical specimens were noted. Elsewhere in Greece, the typical form was observed exclusively.

Eryx jaculus turcicus: Peloponnese — Nafplion (2); Spetsai (1); Ios (2), Amorgos (3).

Typhlops vermicularis: Peloponnese — Epidavros; Euboia (2); Patmos (1).

Natrix n. persa: N. Greece — Kozani (1), Louros valley (1), Kavalla (1), Thebes lake (2); Peloponnese — Galatas, Stymphalea lake, Nemea, Tripolis (1), Messini (3), Sparta (1), Gythion (2), Kalamata; Euboia (38); Myconos, Paros (1); Samos (6); Leros (9).

N. tessellata: N. Greece — Polykastron (1), Louros valley (1), Trigona (1), Katerini (1), Thebes (4); Peloponnese — Stymphalea lake (14); Seriphos (1).

Coluber gemonensis: Peloponnese — Mycenae (1), Akladokampos (2), Tripolis (1), Areopolis (1).

C. jugularis: N. Greece — Ioannina, Kavalla (1), Katerini (1), Spetsai; Andros, Iros (2), Syros, Kithnos, Seriphos (13), Siphnos, Santorini (1 skin); Ikaria (1); Samos, Leros (2), Kalymnos (1), Rhodes (1).

C. najadum dahlia: N. Greece — Evzoni, Louros valley; Peloponnese — Kranidi (1), Epidavros, Nafplion, Akladokampos (1), Areopolis; Aegina (3), Poros (1), Spetsai (9); Euboia (7); Patmos (8), Leros (2), Kalymnos (2), Kos (1).

- Elaphe quatuorlineata quatuorlineata*: Spetsai (4).
E. q. quatuorlineata <—> *E. quatuorlineata*: Euboia (13), (Clark 1967a).
E. quatuorlineata praematura: Myconos (1, and I skin), Paros (2), Ios (2), Amorgos (2), Santorini (1 skin).
E. situla: N. Greece — Konitsa (1); Peloponnese — Ermione (1), Epidavros (1), Argos (1); Spetsai (6); Syros (1), Seriphos (1).
E. longissima rechingeri: Amorgos (2).
Eirensis modesta: Samos (1); Kalymnos (1).
Malpolon monspessulanus insignitus: N. Greece — Evzoni (1), Domokos (1), Lamia (1), Kamena Voula (1), Konitsa (1), Parnes; Peloponnese — Ermione (1), Kranidi to Dhidyra (6), Epidavros (2), Nafplion (5), Stymphalea (1), Levidhi (1), Kalavrita (1), Vytina (1), Olympia (1), Megalopolis (1), Messini (1), Gythion (2); Paros (1), Hydra (2); Euboia (2); Kos (1).
Telescopus fallax: Peloponnese — Stymphalea (2), Tripolis to Sparta (2), Akladokampos; Spetsai (1); Euboia (1); Syros (1), Myconos (2), Kimolos (1), Milos (3).
Vipera ammodytes meridionalis: N. Greece — Messolonghi, Thebes lake (1), Vougliameni (1), Peloponnese — Dhidyra (1), Nafplion (3), Akladokampos (1), Tripolis to Sparta (1), Gythion (4); Euboia (13); Syros (4), Tinos (3), Delos (47), Myconos (13), Naxos (2), Paros (3), Ios (8).
V. lebetina schweizeri: Siphnos (1), Kimolos (12), Polyagos (3), Milos.
V. xanthina: Leros (1), Patmos (3).
 Table 1. List of snakes, with their localities, recorded in Greece by the author from 1963 to 1967.

Eryx jaculus turcicus: Spetsai (Clark 1967b).
Typhlops vermicularis: Peloponnese; Patmos.
Natrix n. persa: Samos, Leros.
N. tessellata: Seriphos (confirmation of Bird, 1935).
Coluber jugularis: Spetsia (Clark 1967b), Leros, Kalymnos.
C. najadum dahlui: Paros and Spetsia (Clark 1967b), Aegina; Patmos, Leros, Kalymnos.
Elaphe q. quatuorlineata: Spetsia (Clarke 1967b).
E. quatuorlineata sauromates: Euboia (Clark 1967a).
E. quatuorlineata praematura: Paros (Clark, 1967a), Amorgos, Santorini.
E. situla: Spetsai (Clark 1967b).
Eirensis modesta: Kalymnos.
Malpolon monspessulanus insignitus: Paros and Hydra (Clark 1967b); Kos.
Telescopus fallax: Spetsai.
Vipera ammodytes meridionalis: Paros (Clark, 1965 and 1968b).
V. xanthina: Leros and Patmos (Clark 1968a).

Table 2. List of localities from which the species has not been previously recorded, or only vaguely so. References are given where the author has already reported on these finds.

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APPENDIX

(Subdivisions of regions or island groups are arbitrary)

- North Greece: northern region — Kavalla, Evzoni, Polykastron.
 eastern region — Katerini, Kozani, Domokos, Lamia, Kamena Voula, Thebes, Vougliameni, Parnes.
 western region — Konitsa, Trigona, Ioannina, Louros valley, Messolonghi.
 Peloponnese: northeast region — Galatas, Ermione, Kranidi, Dhidyra, Epidavros, Nafplion, Argos, Mycenae.
 central region — Nemea, Stymphalea, Akladokampos, Tripolis, Levidhi, Vytina, Megalopolis, Olympia, Kalavrita.
 southern region — Sparta, Gythion, Arcopolis, Kalamata, Messini.
 Argo-Saronic: Aegina, Poros, Hydra, Spetsai.
 Euboia: lies parallel to the mainland, northwest of Andros.
 Cyclades: western chain — Kea, Kithnos, Seriphos, Siphnos, Kimolos, Polyagos, Milos.
 northern and central — Andros, Tinos, Myconos, Delos, Syros, Naxos, Paros, Ios.
 southern — Folegandros, Santorini, Anaphi, Amorgos.
 Dodecanese: Patmos, Leros, Kalymnos, Kos, Rhodes.
 Samos lies to the north of Patmos; Ikaria between Myconos and Samos.
 Ionian: Corfu.
 Readers should note that in his lists the author has arranged the islands and mainland localities according to the above grouping.

ADDENDUM

Since submitting this manuscript, the author has made subsequent collections in Greece, resulting in a number of further records, the most important of which are summarised here.

Additional records for Table 1.

- Eryx jaculus turcicus*: Peloponnese — Kosta (opposite to Spetsai) (1); North Greece Halkiades (1).
Natrix tessellata: N. Greece — Arta (1).
Coluber gemonensis: Peloponnese — Agios Petros (1).
C. jugularis: N. Greece — Leptokarya (1); Euboia (1).
C. najadum dahlui: N. Greece — Alexandropolis (1).
Malpolon monspessulanus insignitus: N. Greece — Serrai (1).
Telescopus fallax: N. Greece — Graikikon (1).
Vipera ammodytes meridionalis: N. Greece — Leptokarya (1); Peloponnese — Mt. Killene (1).

Additions to appendix.

- North Greece: northern region — Alexandropolis, Serrai.
 eastern region — Halkiades, Leptokarya.
 western region — Graikikon.
 Peloponnese: northeast region — Kosta.
 central region — Mt. Killene, Agios Petros.

THE SUBSPECIES OF *CALLIOPHIS MACULICEPS* (GÜNTHER)

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(Received 15/2/68)

In the course of preparing a field guide to the snakes of Vietnam for use by the Armed Forces, I have had an opportunity to review some specimens and literature from neighbouring areas as well. This note provides new data concerning the subspecies of *Calliophis maculiceps* (Günther).

The first mention of the species was by Cantor (1847 : 1027), under the name of *Elaps melanurus* Shaw. *Calliophis melanurus* (Shaw) is, however, restricted to India and Ceylon, and Cantor's description fits *maculiceps* in all characters given, including its distribution, which Cantor (1847 : 1078) gave as "Malayan Peninsula, Tenasserim, Nerva." Later, Günther (1858 : 232) described *Elaps maculiceps*, basing the species on two syntypes. In the original description, Günther described the smaller specimen as immaculate above and the larger specimen as having "... two series of spots, ... and the scales with minutely brown-variegated edges." The locality for both specimens was given as the East Indies. Sauvage (1877 : 111) described *Elaps atrofrenalis*, which he attributed to Jan, from Cochin China. Jan, however, never published this name and appears to have used it only on museum labels. Boulenger (1896 : 398) synonymized *atrofrenalis* with *maculiceps*, and it has not been used by any later authors. It is available for a taxon from Vietnam, if additional material justifies the division of the species.

M. A. Smith (1914 : 123) discussed, but did not name, a striped variety of *maculiceps*, which he stated was "... similar to var. *univirgatus* of the allied *Calliophis maclellandi* ..." Later Smith (1915 : 786) wrote, "This variety is similar to the var. *univirgatus* of *Calliophis maclellandi* and the same title would be suitable for it." This is the original description of *Calliophis maculiceps univirgatus*.

In 1927 (p. 190), Cochran described a new species of *Calliophis* from the island of Koh Tao, in the Gulf of Siam, as *Calliophis hughi*. This species was distinguished from *maculiceps* "... in having a much higher number of ventrals and in lacking the black dots on the back." The ventral count given in the original description of *hughi* was 285. Recently, at the suggestion of Dr. Cochran, I re-examined the holotype (still the only known specimen) of *hughi* and found that the original ventral count was in error. The holotype of *hughi* has a single preventral and 186 ventrals, which is well within the range of *maculiceps*. I consider the holotype of *Calliophis hughi* to belong to the species *maculiceps* and Dr. Cochran agreed.

Bourret (1934 : 24) described *Calliophis maculiceps punctulatus*, differing from *maculiceps* "... par un nombre moindre de ventrals et par la présence d'une temporal postérieure." Later, Bourret (1936 : 405) stated that in *punctulatus*: "Le nombre des temporals est variable, 1, 1+1, 1+2."

In 1961 (p. 28), Deuve described *Calliophis maculiceps michaelis* from Laos, which is distinguished from *univirgatus* Smith by a higher number ("212 dans certaines exemplaires ...") of ventrals and by the presence of black spots on the tail. Deuve recently stated (pers. comm.) that he no longer feels that the colouration of *michaelis* is sufficiently consistent to permit its recognition. The much higher ventral counts in *michaelis* as opposed to the lower counts for *univirgatus* (173 - 184) may prove to be of sufficient value to recognize *michaelis* as a valid taxon.

In 1963 (p. 285) Klemmer, in accordance with Article 59a of the International Code of Nomenclature, proposed the replacement name *Calliophis maculiceps smithi* for *Calliophis maculiceps univirgatus* Smith, which is preoccupied by *Calliophis maclellandi univirgatus* (Günther). Later, Taylor (1965 : 978) proposed another replacement name, *Calliophis maculiceps malcolmi*, which is a strict synonym of *C. m. smithi* Klemmer.

The following names have been used by previous authors for taxa in the species *Calliophis maculiceps*, and are available for use when sufficient material accumulates to make a revision possible:

Calliophis maculiceps maculiceps (Günther)*Elaps melanurus*: (not of Shaw, 1802) Cantor, 1847 : 1027.*Elaps maculiceps* Günther, 1858 : 232. Type locality — East Indies.*Calliophis maculiceps maculiceps*: Bourret, 1936 : 404.*Calliophis maculiceps hughi* Cochran*Calliophis hughi* Cochran, 1927 : 190. Type locality — Koh Tao, Gulf of Siam.*Calliophis maculiceps hughi*: Bourret, 1936 : 405.*Calliophis maculiceps punctulatus* Bourret*Calliophis maculiceps punctulatus* Bourret, 1934 : 24. Type locality — Cambodia.*Calliophis maculiceps smithi* Klemmer*Calliophis maculiceps univirgatus* Smith, 1915 : 786. Type locality — Nong Kai Ploi, Siam.*Calliophis maculiceps smithi* Klemmer, 1963 : 285.*Calliophis maculiceps malcolmi* Taylor, 1965 : 978.*Calliophis maculiceps michaelis* Deuve*Calliophis maculiceps michaelis* Deuve, 1961 : 28. Type locality — Savannakhet, Laos.

In addition the following name is available, although it has been included in this genus only through its appearance in synonymy (Boulenger, 1896 : 397):

Elaps atrofrenalis Sauvage*Elaps atrofrenalis* Sauvage, 1877 : 111. Type locality — Cochin China.*Calliophis maculiceps* (partim): Boulenger, 1896 : 397.

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ANATOMY AND HISTOLOGY OF THE HEMIPENIS AND ASSOCIATED STRUCTURES IN *NATRIX PISCATOR PISCATOR* (SCHNEIDER.)

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(Received 7/2/67)

INTRODUCTION

Very little work has been done on the anatomy and histology of the hemipenis in oriental reptiles. The external genital structures have a systematic importance in reptiles and they show variations in structural adaptation to suit particular modes of life. Wall (1923) was the first to draw attention to the possibility of a classification based upon the structure of the hemipenis. Ophidians are limbless crawling animals which undergo immense difficulties during successful coitus. It should therefore be of interest to know their anatomical and physiological requirements. The present investigation was undertaken with this end in view; to investigate the structural details of the reptilian hemipenis in general and those of an ophidian in particular.

HISTORICAL

Although thousands of species of snakes are known, little attention as yet has been paid to the details of the anatomy and histology of the external genitalia and associated structures. Smith (1943) studied the external genitalia of a number of species of oriental snakes, but his observations were based on poorly preserved material. MaCann (1946) in a general account of the genitalia of reptilia, mainly described the external morphology in an everted condition. Volsøe (1944) described the genital tract of *Vipera berus* in his detailed account of the seasonal variations of the male reproductive organs. This review emphasised the large gaps in our modern knowledge of the genital tract of Indian snakes. It is hoped, that a study of such structures of *N. piscator piscator* will add to our limited knowledge of them.

MATERIAL AND METHODS

Specimens of *N. piscator piscator* were collected from tanks and ponds around Nagpur and kept alive in an aquarium in the laboratory. Several snakes were dissected to study the gross structure of the hemipenis. The length and weight of the snakes were recorded. Microscopical serial sections were made from material fixed in alcoholic Bouin. They were cut at 10 micra and stained either with haematoxylin and eosin or PAS.

OBSERVATIONS

The genitalia of the male in its post-breeding season (body weight 162 gms; date of collection 19th. November 1964) are composed of the following components:—

A pair of testes situated asymmetrically in the lower part of the abdomen; the epididymis arising from the posterior region of the testis, passes downwards and posteriorly to become the vas deferens, which opens caudally into the cloaca. In adults the components of the reproductive tract undergo a marked enlargement during April. Male specimens collected in this month weighed from 273 to 279 gms

a) Testis

The testes are situated in the abdomen always anterior to the kidneys. Each elongated testis is cylindrical and measures about 2 mm. in diameter. However, during April the testis enlarges considerably. The breeding season is from April to June, and during this time the testis rapidly enlarges to about four times its original size, 22 mm. in length and 8 mm. in breadth. Convolutions of the epididymis are well marked. From its caudal end the vas deferens can easily be recognized in transverse section as a muscular duct.

The cloaca is essentially the same as that seen in Lacertilians, but *N. piscator* does not possess a urinary bladder. The copulatory organs lie beneath the skin in recesses at the posterior lateral corners of the shallow vestibulum.

b) Hemipenis

i) External morphology

Smith (1943) stated, that the hemipenis in *N. piscator* reaches the 12th. caudal plate and is forked for about one third of its length.

In its fully everted condition the hemipenis of *N. piscator piscator* is blunt and bifid, each bifurcation ending in a spherical head (Fig. 1). The pedicel is moderately long. The side opposite to the sulcus bears a median hump. The sulcus has a shallow groove, which bifurcates at the base of the head. The hemipenis is spiny throughout and measures 25 mm. in length and 5 mm. in breadth.

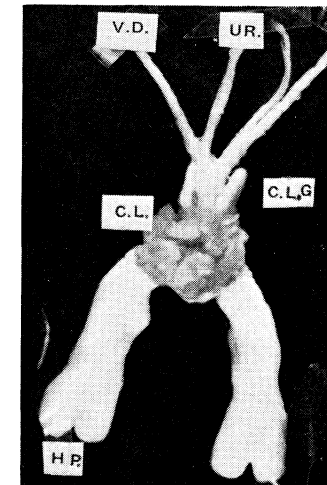


Fig. 1. The everted aspect of hemipenis with the cloaca and cloacal glands.

ii) Histology

The hemipenis is encircled by propulsor muscles, of circular and longitudinal fibres. At the base of the spines the basal epithelial layer is three layered. Intense PAS positive material is found within a well developed basement membrane. The ground substance of the connective tissues is also moderately reactive (Fig. 2).

c) Anal gland

The anal or cloacal glands are sausage shaped structures, which lie on either side of the cloaca and open into it at right angles by a constricted orifice, immediately behind the vent. Their secretion is milky white in colour. Noble (1937) has shown however, that in snakes the scent of this secretion has no hedonic value.

Histologically the anal gland appears to be alveolar in structure. Tubules are compact and enclosed in a connective tissue sac. The epithelial cells, that line the tubules are columnar with basal nuclei. Intense PAS positive material is recognized in the well developed basement membrane surrounding each tubule, in the broad intercellular channels at the lateral surfaces of the secretory cells and around each of the blood vessels. The ground substance of the connective tissue and cytoplasm of the secretory cells are also moderately reactive (Fig. 3).

PAS staining has been used to demonstrate the distribution of glycogen and nature of the secretions in the cells of the hemipenis and the cloacal gland, which are mucoid in nature. Extensive distribution of glycogen is observed in muscles of the hemipenis.

SUMMARY

- 1) In the male *Natrix piscator piscator* the testes are permanently abdominal in position.
- 2) The hemipenis is paired and pedunculate, spinous throughout and directed caudally.
- 3) The cloacal alveolar glands are oval shaped and situated on either side of the cloaca.
- 4) The entire genital system becomes markedly enlarged in April during the breeding season.

ACKNOWLEDGMENTS

I am grateful to Dr. A. Gopalakrishna, D.Sc., Head of the Department of Zoology, College of Science, Nagpur, for providing me with the necessary facilities for this work. I am also grateful to Dr. A. d'A. Bellairs, for reading through the manuscript and making valuable suggestions.

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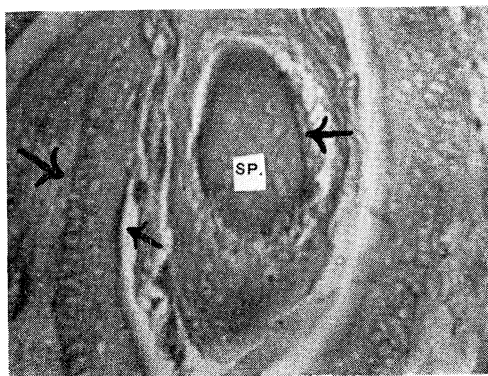


Fig. 2. Localization of PAS in the micrograph of the hemipenis of *N. piscator piscator*.



Fig. 3. Micrograph of a section of the cloacal gland stained with PAS. Intense positive secretion is seen in the centre of the lumen.

Abbreviations.

Cl.— Cloaca; Clg.— Cloacal gland; Hp.— Hemipenis;
Sp.— Spine; Ur.— Ureter; VD.— Vas deferens.

THE DETERMINATION OF SEX IN LIVING CROCODILIANS

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INTRODUCTION

In recent years an alarming decline has taken place in the numbers of individuals which represent many species of crocodylians (De Sola, 1930; Cott, 1961; Powell, 1965; Peters, 1966; Pooley, 1966; Brazaitis, 1967). Excessive hide hunting and the destruction of natural habitats seem to be major factors. Serious thought has recently been given to the establishing of programmes which involve the rearing or breeding of these reptiles under captive or semi-captive conditions (Powell, 1965; Pooley, 1966).

Only a few specific breeding programmes have been directed at the propagation of those species which may presently be facing extinction. The Nile crocodile, *Crocodylus niloticus*, which is a major source of most commercial leathers, is being 'farmed' in the Mkuzi Game Reserve in Natal (Pooley, 1966). The eggs, taken from the nests of wild crocodiles, are incubated artificially. Upon emergence, the young are raised under protective conditions until large enough to be released.

The Cuban crocodile *Crocodylus rhombifer* is also reported to be under protective management. The American Alligator *Alligator mississippiensis*, once considered to be one of the most well protected, is again seriously threatened within parts of its range, and ranks among the known endangered species (Peters, 1966; Spurr, 1966).

An artificial environment enclosure has been provided for a pair of Chinese Alligators *Alligator sinensis* at the New York Zoological Park. Unfortunately, only 6 species of crocodylians have been reported 'bred' in zoological institutions since 1959 (International Zoo Year Book 1959 - 1967). Institutions located within the natural range of the species involved seem to be major contributors. Few breeding instances, if any, may be regarded as the result of a specific programme.

DISCUSSION

An obstacle in the planning and application of any breeding programme involving crocodilians has been the lack of a simple and reliable means of determining the sex of the individual animal. Most previously described methods were found to be unreliable when applied to a number of different species represented by individuals of various lengths. These methods include the manual manipulation of the tail to produce the protrusion of the male organ through the anal vent, variation in the size and arrangement of the scales surrounding the anal vent, vocalization, general coloration and swelling of the neck or nasal regions at the approach of sexual maturity. (De Sola, 1930; Smith, 1931; Hsiao, 1934; Viosca, 1939).

One method which proved reliable over extensive application was to manually probe the cloaca to determine, by direct contact, the presence or absence of the male organ within the cloacal chamber (Fig. 1). Recently reported to have been used in the management of *A. mississippiensis* (Chabreck, 1967) in the wild, studies undertaken in 1961 at the New York Zoological Park led to the development of the same technique.

Male crocodilians possess a single organ, rooted to the interior ventral wall of the cloaca immediately anterior to the anal vent. Normal rigidity of the organ permits contact when probed at a depth of 8 centimetres or less in an animal 3 to 4 metres in length. The absence of a rigid organ within the cloaca of the female reveals only a vacant chamber when probed. The small flaccid clitoris of the female cannot easily be confounded with the penis of the male if a minimum specimen size limitation of 75 cm. is observed, particularly when dealing with individuals of the genus *Tomistoma* and *Gavialis* (Fig. 2).

More than 200 specimens representing all of the 8 genera of crocodilians were examined during the course of these studies. Erroneous determination was made in a single specimen of *Crocodylus acutus* (NYZP 590715). Determined to be a female, careful examination revealed it to be a male which had suffered a reduction in the size of the male organ, possibly through fighting. However, a female *A. mississippiensis* was thought to have been erroneously determined because of an accelerated rate of growth comparable to that of a male (Dowling and Brazaitis, 1966 : 267). Autopsy eventually proved the animal to have been a female, developing eggs at the time of its death.

Table I contains a representative number of individuals of each species available. Although variation in the structure of the male organ was encountered among the species it was not sufficient to prohibit the use of this method. Individual identity was maintained through the use of metal tags affixed to the webbing between the toes of a hind limb. Probing was conducted on large and dangerous individuals after they had been secured with ropes. Masking or surgical tape was used to maintain closed the animals' jaws and eyes. Once immobilized, weighing, measuring and sexing operations could be accomplished with a minimum of restraint. Juvenile individuals were merely hand-held during the process. Most specimens were sexed at various lengths over a period of years. Lengths indicated in the table were taken at the time of sexing and are 'total' lengths.

Species not available during these studies were:

Alligatoridae — *Caiman latirostris*

Crocodylidae — *Crocodylus novae-guineae*, *Crocodylus johnsoni*, *Crocodylus intermedius*

CONCLUSION

The incorporation of a sexing technique in the management of the crocodilian collection at the New York Zoological Park has resulted in a general broadening in the numbers of species represented, achieving at the same time a maximum breeding potential. Specimens are no longer purchased at random nor disposed of indiscriminately. Surplus males are eliminated to reduce the possibility of injury to valuable animals through territorial and courtship disputes. Purchased specimens are selected with an eye towards possible breeding pairs. Exchanges between institutions are made on the same basis. Most important, individual animals may be brought together in specific combinations within the collection to further the possibility of reproduction.

SUMMARY

The recent decline in the numbers of crocodilians representing many species has led to a serious consideration of the possibilities of breeding these animals under captive or semi-captive conditions. One obstacle in the planning of most breeding programmes has been the lack of a simple and reliable means of sexing the animals involved in order to determine the necessary breeding combinations. Several possible methods were combined during the course of these studies (De Sola, 1930; Smith, 1931; Hsiao, 1934; Viosca, 1939). 200 specimens representing the 8 genera were sexed over a 5 year period, by means of a manual probing method, to determine the presence or absence of the male organ within the cloaca. Specimens 75 cm. long and larger were consistently determined without injury. The manual probing method of determining the sex of crocodilians has been applied in the management of the crocodilian collection at the New York Zoological Park and has proved to be a valuable aid in the selection and disposal of specimens as a means of achieving a degree of breeding potential.

ACKNOWLEDGEMENTS

I wish to thank the New York Zoological Society, members of the staff, particularly the Keeper personnel for their help and co-operation during the course of these studies. Mr. R. Brandner and Mr. I. Gilboa deserve a special note of thanks for their help in handling large and dangerous specimens. Drawings are by Mr. Lloyd Sandford. I also wish to express my thanks to Dr. Herndon G. Dowling of the American Museum of Natural History, who showed me every consideration during the investigations.

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TABLE 1: SPECIMENS EXAMINED

FAMILY: *Alligatoridae*

Species	N.Y.Z.P. No.	Sex	Length/cm.
<i>A. mississippiensis</i>	500000	M	315
" "	510500	F	247
" "	610521	F	239
" "	66586#	M	202
" "	630526	F	94
<i>A. sinensis</i>	560502	M	166
" "	610527	F	156
" "	620504	F	145
<i>Caiman crocodilus</i>	640045	F	163
" "	640053	M	145
" "	640054	F	97
" "	640463	M	90
" "	640462	F	77
" "	640464	M	73
" "	66008	M	60
<i>Melanosuchus niger</i>	580505	M	278
" "	630522	F	114
" "	640039	F	100
<i>Paleosuchus trigonatus</i>	570919	F	107
" "	66117	F	81
" "	620000	F	79
<i>Paleosuchus palpebrosus</i>	650615	M	85
<i>Crocodylus acutus</i>	590715	M (injury)	213
" "	620025	F	184
" "	620001	F	153
" "	600621	F	122
" "	640035	F	110
" "	620126	F	96
<i>Crocodylus cataphractus</i>	610503	M	179
" "	610504	M	169
" "	650719	F	91
<i>Crocodylus moreletii</i>	570801	M	200
" "	590223	F	137
" "	66173	F	61
<i>Crocodylus niloticus</i>	411130	F	280
" "	610008	F	161
" "	610009	M	153
<i>Crocodylus palustris</i>	551223	F	262
<i>Crocodylus porosus</i>	580115	F	239
<i>Crocodylus rhombifer</i>	580001	M	257
<i>Crocodylus siamensis</i>	650092	F	98
" "	650093	F	92
<i>Osteolaemus tetraspis</i>	600500	M	153
" "	66513	F	107
" "	650163	M	89
<i>Tomistoma schlegelii</i>	640014	M	182
<i>Gavialis gangeticus</i>	560500	F	257
" "	650668	F	121

NOTE: The first two digits of the N.Y.Z.P. number indicates the specimen's year of arrival into the reptile collection. Sexing data was collected from 1963 to 1967.

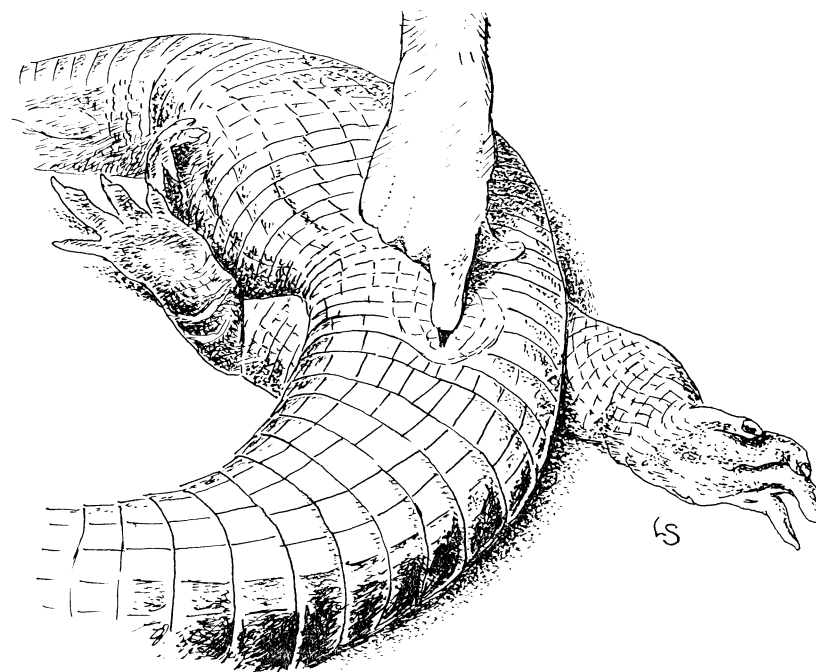


Fig. 1. Manual Probing of the cloaca is done via the anal vent.

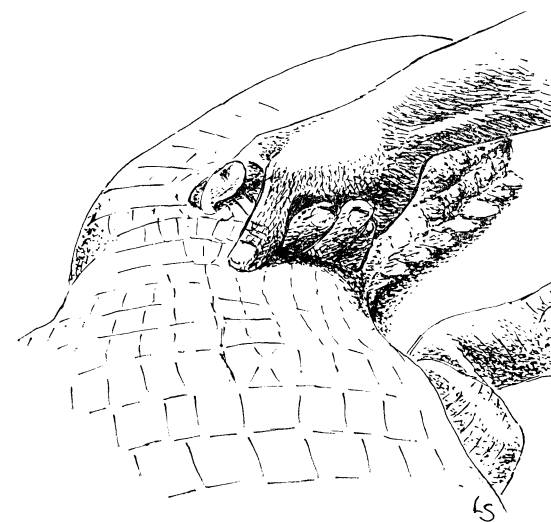


Fig. 1. The rigidity of the male organ permits contact when probed at shallow depths. Actual extrusion of the male organ is usually possible.

ARRIVAL OF FROGS (*Rana t. temporaria*)
AND TOADS (*Bufo b. bufo*) AT A BREEDING SITE

A unique opportunity for studying the arrival of frogs and toads at a breeding site was afforded during 1965 following the dredging of about half-a-mile length of the River Colne near St. Albans in Hertfordshire. The river along this stretch is normally a shallow stream between 3 and 5 feet wide, but subject to heavy flooding following periods of rain. Before being dredged, it was heavily congested with vegetation, both aquatic and marsh plants, with however a few deep pools comparatively free of vegetation. Following dredging, virtually all vegetation was eliminated and the bottom (clean flint gravel with a small proportion of sand) so graded that at normal flows the depth of water varied little around one to two feet, between more or less vertical banks about 5 to 6 feet high.

A long period of rain in February 1966 filled the river to a depth of about 5 feet and created a very strong current, so that it is difficult to believe any hibernating frogs could have maintained their position in it. The water level did not drop to normal until the end of February, by which time a few frogs started to appear at other breeding sites along the river.

A length of about $\frac{1}{4}$ mile of the dredged stretch of river was chosen for observation, and eleven 'traps' in the form of flat pieces of metal and asbestos were laid along the bottom at different spaced intervals. A few additional 'traps' occurred naturally, when from time to time during the period large clods held together by grass-roots fell from the top of the bank, where they had been undermined by the flood. Apart from these traps, the bottom of the river had no cover whatever and was clearly visible throughout. It was therefore possible, by examining the bottom and turning over the traps, to collect every frog and toad in the stretch under observation. In fact, throughout the period of observation, only one frog and three toads were found free on the bottom; all others were hidden under the traps.

The first check was made on the 1st. of March 1966 and further checks were made at irregular intervals up to the 24th. of March. At each check, all frogs and toads were removed and released in the river at another point about $1\frac{1}{2}$ miles downstream, where the eggs and tadpoles would have much better conditions for survival. Among the frogs found during the first check were three juveniles too young for breeding; apart from this, all frogs and toads found at all checks were adults (Table 1).

Date	Frogs		Toads		Approx. temperature (degrees F.) and weather	Remarks
	Males	Females	Males	Females		
1	4	0	1	0	45 Wet	Also 3 juvenile frogs.
5	5	1	3	0	45 Wet	
7	4	2	13	2	50 Showery	All females in amplexus with males of their own species.
9	3	6	29	0	55 Showery	3 female frogs in amplexus, 2 with male frogs and 1 with a male toad.
14	4	3	11	0	50 Dry	2 pairs of frogs in amplexus.
18	3	2	8	0	50 Showery	1 pair of frogs in amplexus.
24	6	5	10	4	40 Dry	2 pairs of frogs in amplexus. One female toad dead. Frog and toad spawn.

Table 1, check dates, numbers and sexes of adult frogs and toads at each checking.

CONCLUSIONS

It is known that in previous winters frogs have hibernated in this stretch. As a result of the dredging and heavy flooding in February, it seems almost certain that any frogs hibernating there during the 1965/66 winter would have been washed downstream by about the middle of February. In any case, it must be assumed that all frogs found after the first check had hibernated on land, and they represented only a small proportion of those which would have been present for breeding under normal circumstances. This is borne out by observation of numbers present during previous breeding seasons.

As toads hibernate on land, the toad counts presumably show a more normal picture of arrival. The early arrival of the males is clearly indicated, and the theoretical possibility that some females had arrived, mated, spawned and left the water between checks is discounted by the fact that no spawn was found throughout the period other than two clumps of frog spawn and one string of toad spawn on the 24th. of March. At the release site, much frog spawn was seen from the 7th. of March onwards and toad spawn on the 24th. of March, although thick vegetation made it impossible to observe thoroughly.

The discrepancy in numbers between male and female toads is interesting. Although at toad breeding sites males nearly always exceed females in numbers at any given time, this could result from the male spending longer in the water, by arriving at the site and waiting for females which stay only long enough to mate and spawn. It is clear that the number of males visiting this site was considerably larger than that of females.

The complete lack of vegetation, and of cover other than the traps, could have inhibited spawning, but unless it caused any frogs and toads to leave the water within a few days of entering it, should not have affected the numbers found or the proportion of sexes.

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Received 28/10/67

POST MORTEM ON A TROPICAL FROG

By

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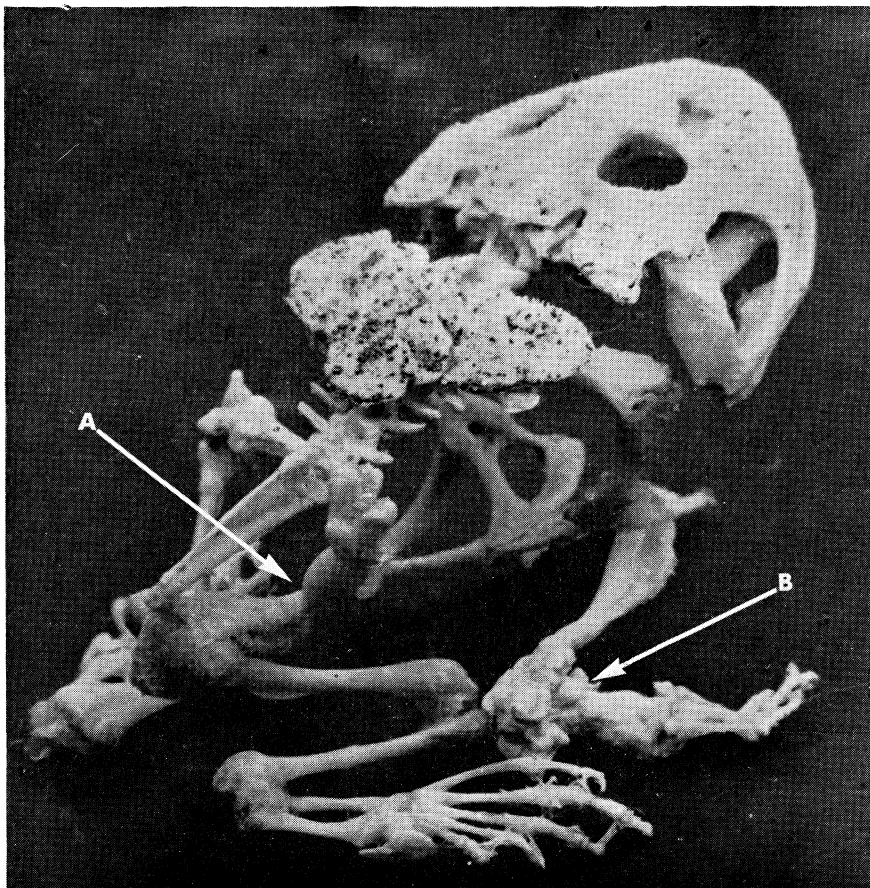
(Received 13/10/67)

Ceratophrys dorsata is a large Brazilian frog of the Family Leptodactylidae. It grows up to a length of 16 cm. (mouth to anus), is conspicuously coloured, voracious and of uncertain temper. Gadow (*Cambr. Nat. History*) describes it as 'a monster toad.' The natives are said to call it the 'sapo boi' because its voice resembles the bellow of an ox (Cochran 1954).

The specimen investigated must have had a stormy life history. When the skeleton was prepared it appeared that two major bones, both on the right side of the animal, were grossly abnormal (Fig. 1). The right os ileum (anterior part of the pelvis) and the right radio-ulna present the picture one would see where a bone, including a joint, had been comminuted and subsequently healed on its own terms as best it could. The bones, consequently, are of a most irregular shape, the elbow joint stiff, unusable, indeed almost unrecognizable.

If this deformity were the sequel to a disease, for example to an attack of osteomyelitis, it is unlikely that two bones on the same side of the animal would have been affected. Indeed, we do not know whether osteomyelitis, as we know it in higher vertebrates, occurs in Amphibians. It seems much more likely that the frog was attacked and partly crushed by a snake or a small mammal, was then found unpalatable and left to shift for itself in this maimed state. The remarkable aspect of the case is that the victim survived.

My thanks are due to Dr. D. Cochran of the USA Nat. Museum, Washington who supplied the specimen.



Ceratophrys dorsatum, a large Brazilian Leptodactylid. Skeleton, showing late results of comminuted fractures of rt. os ilium and rt. forearm. Note the presence of the large bony dorsal shield in this species. Natural size of the specimen (mouth to anus) 12cm. A, right os. ilium; B, rt. radio-ulna and elbow joint.

CATALOGUE OF AMERICAN AMPHIBIANS AND REPTILES

The ASIH Herpetological Catalogue Committee has now published 55 individual accounts of North American amphibians and reptiles. Forty-eight of these are on salamanders, four on frogs, two on amphisbaenians, and one on snakes. Other accounts are in various stages of preparation and we expect to publish an additional 40 to 50 accounts in 1968.

The following accounts have been issued:

31 December 1963

1. *Hemidactylum*, by Wilfred T. Neill.
2. *Hemidactylum scutatum*, by Wilfred T. Neill.
3. *Leurognathus*, *L. marmoratus*, by Bernard S. Martof.
4. *Ambystoma macrodactylum*, by Denzel E. Ferguson.
5. *Plethodon cinereus*, by Philip W. Smith.
6. *Ambystoma gracile*, by Richard C. Snyder.

15 September 1964

7. *Desmognathus ocoee*, by Barry D. Valentine.
8. *Ambystoma talpoideum*, by C. Robert Shoop.
9. *Taricha rivularis*, by Victor C. Twitty.
10. *Hydromantes*, by Joe Gorman.
11. *Hydromantes brunus*, *H. platycephalus*, *H. shastae*, by Joe Gorman.
12. *Plethodon welleri*, by Gordon R. Thurow.
13. *Plethodon larselli*, by Douglas M. Burns.
14. *Plethodon caddoensis*, by Clifford H. Pope.

15 October 1965

15. *Plethodon yonahlossee*, by Clifford H. Pope.
16. *Aneides ferreus*, by David B. Wake.
17. *Aneides hardii*, by David B. Wake.
18. *Plethodon longicrus*, by Kraig Adler.
19. *Ambystoma annulatum*, by James D. Anderson.
20. *Typhlotriton*, *T. nereus*, *T. spelaeus*, by Ronald A. Brandon.
21. *Eurycea multiplicata*, by Harold A. Dundee.
22. *Eurycea tynerensis*, by Harold A. Dundee.

23 December 1966

23. *Eurycea troglodytes*, by James Kenneth Baker.
24. *Eurycea lucifuga*, by Victor H. Hutchison.
25. *Stereochilus*, *S. marginatus*, by George B. Rabb.
26. *Phaeognathus*, *P. hubrichti*, by Ronald A. Brandon.
27. *Pseudacris streckeri*, by Philip W. Smith.
28. *Hyla avivoca*, by Philip W. Smith.
29. *Plethodon dorsalis*, by Gordon R. Thurow.

17 March 1967

30. *Aneides aeneus*, by Robert E. Gordon.
31. *Gyrinophilus*, by Ronald A. Brandon.
32. *Gyrinophilus pallidus*, by Ronald A. Brandon.
33. *Gyrinophilus porphyriticus*, by Ronald A. Brandon.
34. *Eurycea latitans*, by Bryce C. Brown.
35. *Eurycea nana*, by Bryce C. Brown.
36. *Eurycea neotenes*, by Bryce C. Brown.

11 August 1967

41. *Ambystoma texanum*, by James D. Anderson.
 43. *Notophthalmus perstriatus*, by John S. Mecham.
 39. *Handecrotton, H. wallacei*, by Ronald A. Brandon.
 40. *Plethodon cuachitae*, by Albert P. Blair.
 41. *Eleutherodactylus augusti*, by Richard G. Zweifel.
 42. *Rhineura*, by Carl Gans.
 43. *Rhineura floridana*, by Carl Gans.
 44. *Manculus, M. quadridigitatus*, by M. B. Mittleman.
 45. *Eurycea bislineata*, by M. B. Mittleman.
 46. *Ambystoma opacum*, by James D. Anderson.

20 November 1967

47. *Ambystoma jeffersonianum*, by Thomas Uzzell.
 48. *Ambystoma laterale*, by Thomas Uzzell.
 49. *Ambystoma platineum*, by Thomas Uzzell.
 50. *Ambystoma tremblayi*, by Thomas Uzzell.
 51. *Ambystoma maculatum*, by James D. Anderson.
 52. *Ambystoma tigrinum*, by Frederick D. Gehlbach.
 53. *Notophthalmus viridescens*, by John S. Mecham.
 54. *Hyla andersonii*, by K. L. Gosner and I. H. Black.
 55. *Lampropeltis mexicana*, by Frederick R. Gehlbach.

As may be seen from the list, the coverage of salamanders is well along but that of other orders has hardly begun. The Committee invites prospective authors of accounts on other amphibians or reptiles found in the United States (our major emphasis at this point) to volunteer for this important work.

With more than 550 subscribers, the Catalogue is almost self-supporting — as it must be by June 1968, when National Science Foundation support will terminate. We encourage all persons with an interest in the American herpetological fauna to subscribe now with \$10 for the first 100 accounts. We also ask that all members make sure that their institutional libraries subscribe as well (a special imprinted post-binder is available for an additional \$5).

Individual accounts are available for 10 cents each, and may be ordered directly from W. J. Riemer, 8313 Loring Drive, Bethesda, Md. 20034 (minimum order, \$1). Regular subscriptions and requests for information should be sent to the address below.

H. G. DOWLING, *Chairman*
 ASIH Herpetological Catalogue Committee
 American Museum of Natural History
 New York, N.Y. 10024, U.S.A.

UNUSUAL DEFENCE ATTITUDE IN *RANA TEMPORARIA*

During Monday evening on the 7th. of August, 1967, the writer witnessed an unusual display by *Rana temporaria*. The frog which was hiding beneath a log, possibly realising that it was no longer concealed, lay forward on its stomach and crossed its legs at the knees, so that its feet were heel to heel, practically forming a barrier at the rear of the body.

It then commenced kicking, still heel to heel, into the air, the frog's entire body moving forward slightly with the force of the movement. After doing this for about 10 seconds the frog uncrossed its legs and jumped away.

This defence attitude (?) probably is not used against snakes as none are to be found in the area.

M. DAVIES.
 10 Tevery Close,
 Stapleford, Nottingham.
 Received 24/8/67

LETTERS TO THE EDITOR

STUDY OF THE LIFE AND HABITS OF *RANA TEMPORARIA*

I am continuing a long-term study concerning the common Frog (*Rana temporaria*) and wonder whether any of your readers may have information relating to the following:

1. Are tadpoles still as plentiful in your district as, say, three years ago?
2. Did you see any spawn which failed to hatch?
3. Did you see any spawn which did hatch produce noticeably fewer tadpoles than one would have expected?
4. Have any tadpoles been seen with a distinct kink at the base of the tail?
5. Have any tadpoles been seen which gyrated during swimming?
6. Records of tadpoles over-wintering as tadpoles?

I should be most grateful for any information along these lines; such should include the exact locality and altitude if known, the approx. date and observer.

ELLEN HAZELWOOD,
 44, Rigby Lane, Bradshaw, Bolton, Lancashire.

SALMONELLOSIS AND TURTLES

Publication of a paper on the cause of death in young terrapins, kept in captivity produced a letter from an American Histopathologist, an excerpt of which might interest your readers:

"In recent years there have been several cases of humans developing Salmonellosis following the handling of pet turtles. Accordingly, the United States Public Health Service undertook an investigation into the epidemiology of Salmonellosis in turtles. Some of the interesting facts that were uncovered during this investigation were:

1. Louisiana is the largest producer of pet turtles with 10 million being sold each year for a net income of 3 million dollars.
2. Turtles are usually raised on commercial turtle farms in small, dug out shallow ponds with a clay bank and a surrounding area of grass, closed off by a fence made of sheet metal roofing. Turtles are allowed to swim freely in the pond, and following mating the turtle will crawl out onto the bank and lay her eggs. These are dug up and placed into an incubator until they hatch. The young turtles are kept until fit for shipment and delivery to the turtle industry.
3. While at the turtle farm the turtles are fed with poultry offal or offal from livestock food processing factories.
4. The Public Health Service's study revealed that many of these turtle ponds were infested with *Salmonella*.

Because of the pressure of the U.S. Food and Drug Administration and the U.S. Public Health Service the turtle producers in the Southern part of the U.S.A. have formed an Association and are making a strong effort to clean up the *Salmonella* problem.

signed LOUIS N. LOCKE, D.V.M.,
 Patuxent Wildlife Research Center, Laurel, Maryland."

Attention might at the same time be drawn to letters which appeared in the British Medical Journal of Nov. 25th. 1967, Dec. 2nd. and Dec. 16th. 1967, drawing attention to the danger of Salmonellosis in turtles and quoting cases which have affected human patients.

E. ELKAN,
62 Woodhall Gate,
Pinner, Middx.

Received 12/10/68

REFERENCE:

- ELKAN, E. and ZWART, P. (1967). The Ocular Disease of young terrapins caused by Vitamin A deficiency. *Pathologia Veterinaria* 4; 201 - 222.

BURROWING OF THE SAND LIZARD *LACERTO AGILIS*

I found Mr. H. O. Munro's note entitled 'Observations on egg deposition by a Sand Lizard (*Brit J. Herpetol.* 4, No. 1, December, 1967, pp. 20 - 21) of great interest. It is a good account of the process of digging a burrow by a gravid female of this species despite the close proximity of three observers. It does not, however, in itself imply that eggs were laid; this species often digs such retreats in which it spends much time in unfavourable conditions, including the hottest parts of summer days (Sims, 1964). It may well be that the eggs are sometimes laid in such burrows, but those I have found in Lancashire have been laid in very shallow pits dug vertically in sandy soil and covered thinly by the sand lizard with a layer of soil and plant debris. Smith (1964) states that he also found them under stones. Unless Mr. Munro examined the site for the clutch, or saw the female lizard later and was able to confirm that she had deposited her eggs the account as printed cannot be taken as a description of egg-laying.

C. SIMMS,
Curator of Natural History,
The Yorkshire Museum,
York.

Received 8/2/68

REFERENCES

- SIMMS, C. (1964). Notes on the Burrowing Habits of the Sand Lizard. *Liverpool Naturalists' Field Club Proceedings*, 1961 - 1963, pp. 22 - 25.
SMITH, M. *The British Amphibians and Reptiles*. London, Collins, 1951 (3rd Edn. 1964).

I am at present engaged on research into the ecology and conservation of the Sand Lizard in England. Accordingly I would be most obliged to any individual who could furnish me with any details of sightings of *Lacerta agilis*, since 1958.

K. F. CORBETT,
'Grange',
Old Lane Gardens,
Cobham, Surrey.
26/10/68.

BOOK REVIEWS

THE CAECILIANS OF THE WORLD. A Taxonomic review. By Edward Harrison Taylor, University of Kansas Press, Lawrence, Kansas, 1968, pp. 848. Price \$25.00. Available at the American University Publishers Group Ltd., 27 - 29 Whitfield Street, London, W.1.

If one consults the Bibliography of this book, then on pages 836 and 837 the author will be seen to have published, from 1920 onwards, either alone or in association with others, numerous scientific contributions on Caecilians — the so-called legless amphibians. Harrison Taylor is thus quite obviously an expert on his subject, which is rather a change these days when innumerable books on biological topics are written by people who are quite obviously not.

This extremely large and detailed volume is not meant to be read right through, heaven forbid, but it is to be referred to, picked up and put down whenever any information of taxonomic import on Gymnophionan Amphibia is required. The contents deal in the main, apart from a brief history of the order, with the external morphology and distribution of the various members of the group. Most detailed keys for identification are furnished for the 3 living orders of Amphibia and thence, in the Gymnophiona for the Families Ichthyophiidae, Typhlonectidae and Caeciliidae and the various genera such as *Ichthyophis*, *Typhlonectes*, *Hypogeophis* and *Dermophis*, to mention just a few of the commonly well-known ones.

The Bibliography extends through 47 pages, comprising over 600 references: 425 black and white illustrations are included, many of them not of high quality, possibly because some of them were prepared from inferior pencil sketches and photographs. The full page of 'errata' suggested slipshod proof reading, though doubtless there is some excuse here in the 1st. Edition of such a detailed volume. No zoological library will henceforth be complete without this book and no research worker, who deals with the Gymnophiona in terms of taxonomy or external morphology, will be wholly safe without it on his bookshelf.

H. FOX

THE BIOLOGY OF THE REPTILIA

A substantial work in several volumes with this title, containing contributions by different authorities on many aspects of reptilian structure and function is in preparation. It will be published by Academic Press and edited by Carl Gans, T. S. Parsons and A. d'A. Bellairs. The first volume is expected in November or December 1968, probably at a price of 80/-, and further volumes will appear over the next few years. The contents of volume 1 includes articles on the origin of reptiles, on the structure of reptilian bone, and on the dentition, and is mainly devoted to anatomical topics.

A. d'A. BELLAIRS