بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

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To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق

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بالرسالة صفحات

لم ترد بالأصل

ANATOMICAL STUDIES ON THE CRANIAL NERVES OF THE SNAKE *NATRIX TESSELLATA*

A THESIS

SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

IN ZOOLOGY (COMPARATIVE ANATOMY)

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INTRODUCTION

INTRODUCTION & AIM OF WORK

The snakes are highly specialized organisms. However, despite the constraints imposed by their elongated, limbless body, they have undergone a striking adaptive radiation. They constitute, together with the lizards, about 95% of the living reptiles. They are the representative of the suborder Ophidia (Serpents) of the order Squamata. About 300 living genera and 2600 species of the ophidians are known. They show a remarkable closer relationship with the lizards than with any other group of reptiles.

The great majority of the living snakes (About 2/3 of the living species) belong to the family Colubridae. It includes many medium-sized, harmless or only slightly venomous snakes. Although the members of this family show wide ecological niches, yet there is a relatively little additional morphological specialization.

Phylogentically, Young (1981) states that the snakes are of relatively recent appearance in their present state. He adds that they are obviously descended from lizards, but their precise mode of origin is obscure. Some workers believe that their nearest living reptiles are the platynotid lizards (Monitors etc...). There is evidence that the snakes passed through a burrowing stage in their early history. Moreover, the earliest fossils known are from cretaceous deposits and seem to be related to boas. Colubrid snakes are first known from the late Oligocene, followed by the venomous snakes elapids and viperids during the Miocene.

Herpetologists suspect that the snakes have their closest affinities to the platynoton lizards (Monitor lizards, the *Gila monster*, and a Bornean lizard known as the earless monitor, *Lanthanotus*). This is because, *Lanthanotus* shares with snakes the loss of the upper temporal arch, absence of pineal foramen, the incipient enclosure of the brain by the downward projections of the frontal bone and a movable joint in the lower jaw. In addition, the earless monitor used lateral undulations, where it moved rapidly although the legs are well developed.

Inspite of the importance of the study of the cranial nerves of Ophidia, as a base of Phylogeny and behavioural aspects, yet it is scarce and sporadic.

The earliest works on the cranial nerves of Ophidia were those of Vögt (1840), Owen (1866) and Gaupp (1888). Although these works are primitive and incomplete, yet they are useful for the investigators. Since the work of Agarwal (1964 & 1966) on the cranial nerves of *Ptyas mucosus*, which depends mainly on dissection, the matter remained vague. The first valuable work was that of Hegazy (1976), who presented a detailed anatomical study on the cranial nerves of three ophidians belonging to three different families. He gave a full analysis for each cranial nerve. Auen and Langebartel (1977) studied the cranial nerves of two colubrid species. Although, this work is useful, yet it is shortly described, poorly illustrated and reasonably accurate. Recently, Mostafa (1990 a, b, c & d) published successive studies dealing with certain groups of the cranial nerves of the colubrid snake, *Spalerosophis diadema*. Abdel-Kader *et al.* (2000) provided a study on the innervation of the nasal region in the Egyptian cobra *Naja haje*.

In contrast to Ophidia, the cranial nerves of reptiles, in general, and the lizards, in particular, have been studied in more detail and by many investigators. The first of these works was that of Fischer (1852), who made a comparative study on the cranial nerves of eleven lizards. The next trial was that of Watkinson (1906) on her account of the cranial nerves of *Varanus bivittatus*. After that, Willard (1915) published his extensive work on the cranial nerves of *Anolis carolinensis*. Soliman and Hegazy (1969, 1972), Soliman and Mostafa (1984) and Soliman *et al.* (1984) presented detailed analysis of the cranial nerves of *Chalcides ocellatus*, *Tarentola mauritanica* and *Agama pallida,* respectively. Dakrory (1994), in his study on the cranial nerves of the limbless amphisbaenian, *Diplometopon zarudnyi,* presented a detailed descriptive and phylogenetic study. This author attempted to show the affinities between Amphisbaenia and Ophidia on one side, and the amphisbaenian and the lizards on the other. Among other reptilian groups. Soliman (1964) made a detailed and extensive work on the cranial nerves of the turtles *Chelydra serpentina* and *Chelone (Erethmochelys) imbricata.*

Although the neurological studies on Ophidia are scarce, yet there are numerous works on the ophidian muscles and skeleton. There are many studies on the cephalic muscles of snakes. Most of these studies were aiming to show differences in muscle organization within certain genus or among closely related genera. Most of these studies came to the conclusion that the variation in muscle structure may reflect differences in phylogenetic relationships (Haas, 1952; Varkey, 1979) or due to with the difference in feeding habits (Cowan & Hick, 1951; Dullemeijer, 1959; Weaver, 1965; Cundall, 1986). Again, Edgeworth (1935) and Rieppel (1988) made a detailed analysis for the development of the jaw adductor muscles in *Natrix natrix.*

Many extensive works were published dealing with the cranial morphology and anatomy, to analyse the phylogenetic relations of the snakes (Underwood, 1967; Rieppel, 1980; Rieppel & Zaher, 2001). The aquatic snakes (genus *Natrix*) attracted the attention of many anatomists. Rathke (1839) and Backström (1931) studied the chondrocranium of *Natrix natrix* (*Tropidonotus natrix*). Zaher (1990) studied the osteocranium of *Natrix tessellata.*

It is clear from the above mentioned historical review that there is an extreme shortage about the ophidian cranial nerves. Consequently, a detailed anatomical study on the cranial nerves of an aquatic snake belonging to the family Colubridae is useful, aiming to throw light on the anatomy of the cranial nerves of this species and to make full analysis for the component fibres of each nerve. Also, the study shows the origin and the final distribution of the fibres and elucidates the relations between these nerves and the other cranial structures. Again, the results will be compared with the other studied snakes, lizards and other reptiles, as well as other vertebrates to show both the phylogenetic and taxonomic relations of the snakes.

MATERIALS & METHODS

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The species chosen for this study is *Natrix tessellata*. It is widely distributed throughout the world. It ranges from central and southeastern Europe (local name : checkered water snakes) to central Asia and across southwestern Asia to Pakistan, the Near East, including Iraq, Syria, Jordan, Palestine to the Nile Delta of Egypt. In Egypt, it inhabits the Nile Delta, lower valley and Fayoum.

This species was never found far from water, often resting or crawling on the bottom of streams and irrigation canals. It feeds on fish and amphibians. The Arabic name is Hanash El Maiya or Shakhakh.

It is not a venomous species; and wherever it is found, it has the habit of defending itself by means of a foul-smell anal secretion. They attempt to escape from enemies by diving or swimming away. Its bite is just mildly painful.

The body is cylindrical and elongated (25-30 cm) and the head is flattened and distinct from the neck. Eyes are moderately large. Tail is elongated. The body is covered by strongly keeled scales. The back is olive-grey, with small dark spots arranged in an irregular manner with a dark, more or less defined ∧ mark behind the parietal scales. abdominal surface is black with yellow spots. This species is oviparous, as the European & the Asiatic species and lies about 40-50 eggs.

Three youngs of *Natrix tessellata* were collected from Balteem. The heads of these specimens were cut and fixed in aqueous Bouin solution for 24 hours, followed by washing several days with 70% ethyl alcohol.

The specimens were decalcified using EDTA solution for five to six weeks, changing the solution every four days. This was followed by washing in 70% ethyl alcohol for about four hours.