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It is our intent to produce this series at the rate of six issues per year. We hope to add as many genuinely interested paleontologists as possible to our mailing list. If you are interested, please send your name and address to the PLASTER JACKET. These issues are distributed free of charge to all interested people.

This public document was promulgated at an annual cost of $2500 or $0.17 per copy to circulate authoritative material on Florida paleontology and to foster communication among enthusiasts of this subject.

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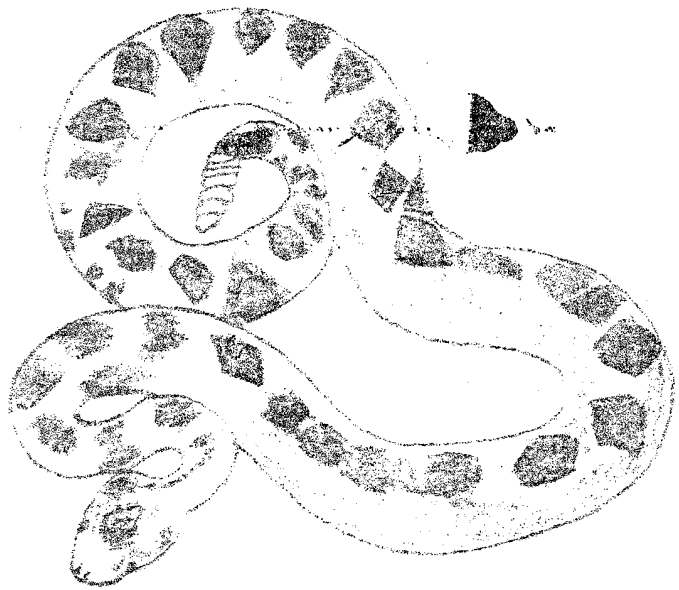

THE FLORIDA STATE MUSEUM

FLORIDA STATE MUSEUM
University of Florida
Gainesville, Florida

NUMBER 3 March 29, 1967

THE FOSSIL SNAKES OF FLORIDA

by

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The considerable work devoted to the collection of small fossils of vertebrates during the last few decades has greatly extended our knowledge of the evolutionary history of many groups of small animals. Snakes are an example of such a group.

Practically all the skeletal parts of snakes have been found as fossils. Some, like the skull and jaw, are very useful for determining relationships among the major groups of living snakes. However, to be useful in identification these parts must be completely articulated. The skull bones of snakes are so delicate and loosely connected to one another that it is surprising that snake skulls are found as fossils at all. The most commonly found parts of fossil snakes are vertebrae and ribs. Ribs are too similar from group to group to be useful in identification. Thus most fossil snakes are identified on the basis of vertebral shape.

Some of the characteristics used to identify snake vertebrae are constant throughout many species and distinguish families and genera; others are confined to particular species. Though no well-defined vertebral characters are known that will distinguish all the Florida genera, most can be identified.

Of all the vertebrae of the column, those in the middle (precaudals of some authors) are the most consistent in structure and most useful for identification. Most fossil snake vertebrae are found as isolated elements, and middle and posterior vertebrae are so similar that it is extremely difficult for the amateur to identify most of the fossils collected. Unfortunately, it is not possible to assist the amateur with this problem, except that the larger common fossil snake vertebrae are illustrated in Figures 1 thru 3. Fossil snake vertebrae are most easily identified by comparison with skeletons of modern species. Every serious amateur should have a few snake skeletons of several types (water snake, rattlesnake, etc.) available for rough identification.

Florida is one of the few places where it is possible to describe the changing snake fauna of a somewhat restricted area in reasonable detail from the Miocene to the present. The record from all but the Late Pleistocene is still too meager to permit evaluation of the relationships of the major groups of living snakes in the light of their fossil histories. This remains for the future.

Six families of snakes are known as fossils from Florida (Table 1): PALEOPHIDAE - an extinct group of large marine snakes related to the boas and known only from Eocene strata in several parts of the New and Old Worlds; BOIDAE - the boas, pythons, and their smaller burrowing relatives, a primitive group of snakes found in practically all tropical and subtropical parts of the world, but no longer present in Florida; ANILIDAE - a small group of peculiar snakes intermediate between the primitive boas and more advanced groups, at present restricted to South America, but formerly much more widely distributed; COLUBRIDAE - a large group including almost 75 percent of the living snake species of the world and most harmless types; ELAPIDAE - certain poisonous snakes with erect fangs, including the cobras, kraits, coral snakes, and their relatives,

distribution worldwide, though largely subtropical and tropical; CROTALIDAE - highly specialized poisonous snakes with large folding fangs; includes the Old World vipers, rattlesnakes, copperheads, moccasins, and their relatives; found in all continental areas except Australia.

Fossil snakes are known from six geologic time periods in Florida:

EOCENE

Only one snake vertebra of Eocene age is known from Florida, though the same genus (and species ?) is reasonably common in similar age deposits in Alabama, Mississippi, and New Jersey. The Florida specimen, collected from the Ocala limestone near Newberry, is referred to the distinctive marine genus Pterosphenus (body to 15 feet long).

OLIGOCENE

Several Oligocene snakes are now known from Florida, but they have not yet been studied.

MIOCENE

The terrestrial Miocene deposits of Florida contain the earliest known members of the family Colubridae in the New World. Here it is represented by two genera, Paraoxybelis and Pseudocemophora - each with only a single species. Paraoxybelis (body 3 feet long) is apparently unrelated to any of the living North American genera, but may be close to the whipsnakes of the West Indies. Pseudocemophora (body 2 feet long) seems closely related to the living king and scarlet snakes (Lampropeltis and Cemophora) and may be ancestral to one or both of them.

The family Anilidae is represented in the Florida Miocene by one vertebra. Though the generic relationships

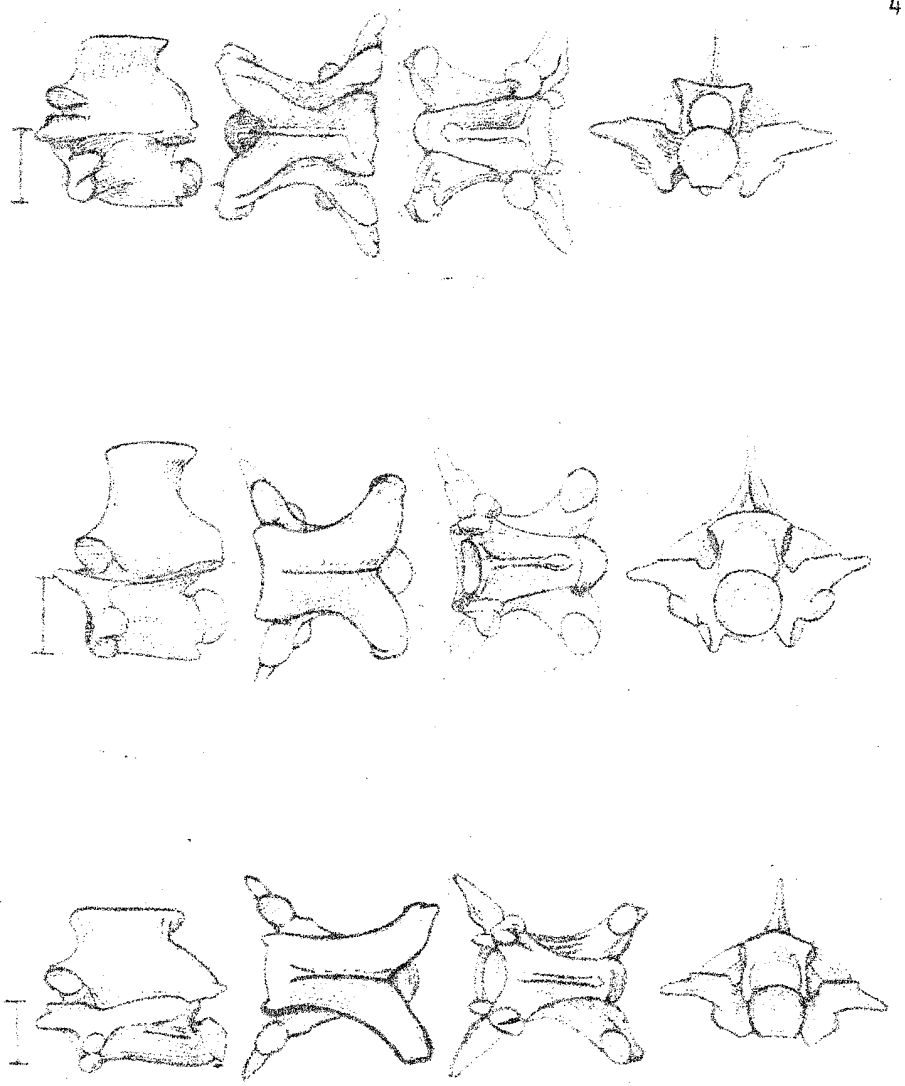
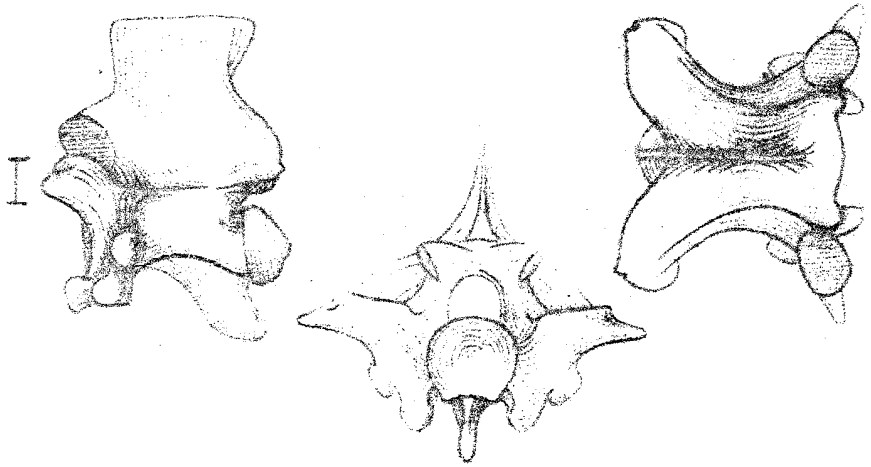


FIGURE 1.-- Vertical bars represent actual height of each vertebra. A.) Drymarchon corais (indigo snake); B.) Pituophis melanoleucus (pine snake); C.) Masticophis flagellum (coachwhip).



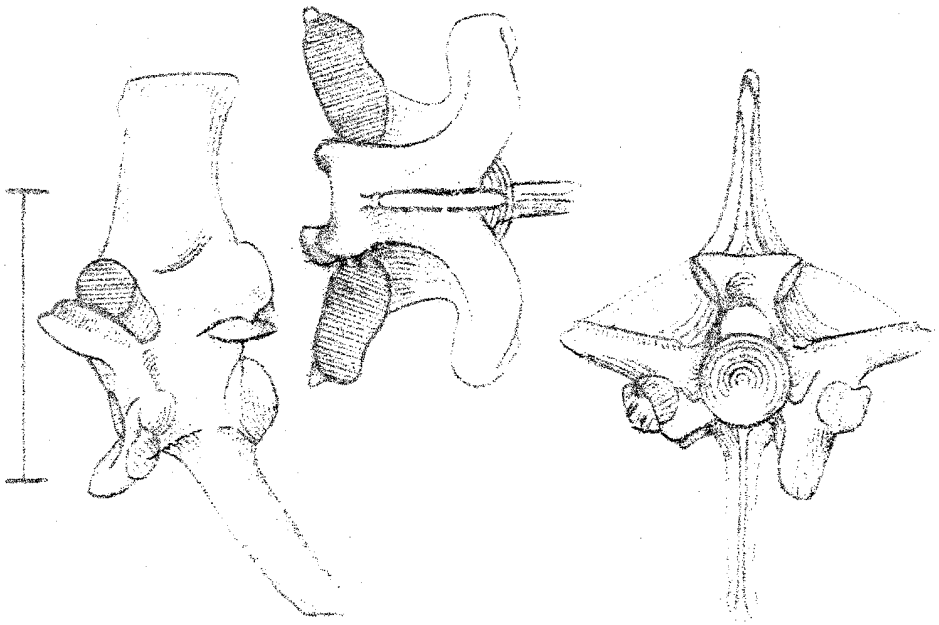
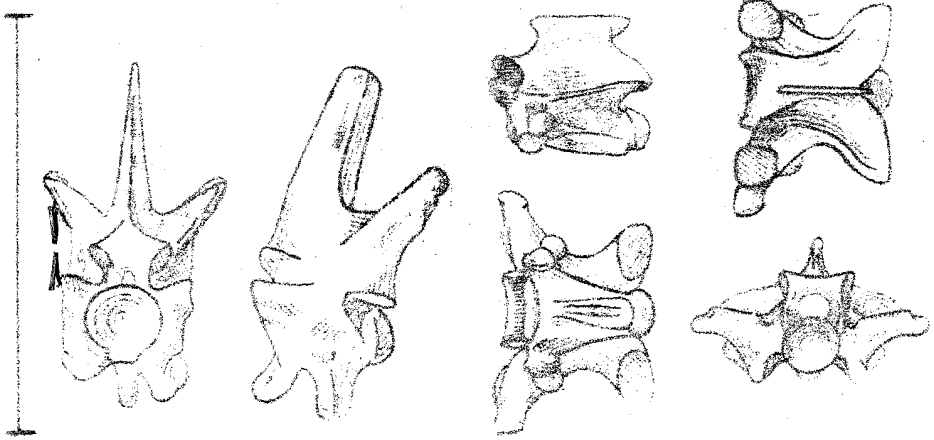


FIGURE 2.-- Vertical bars represent actual height of each vertebra. A.) Natrix sipedon (common water snake); B.) Crotalus giganteus (extinct giant rattlesnake).



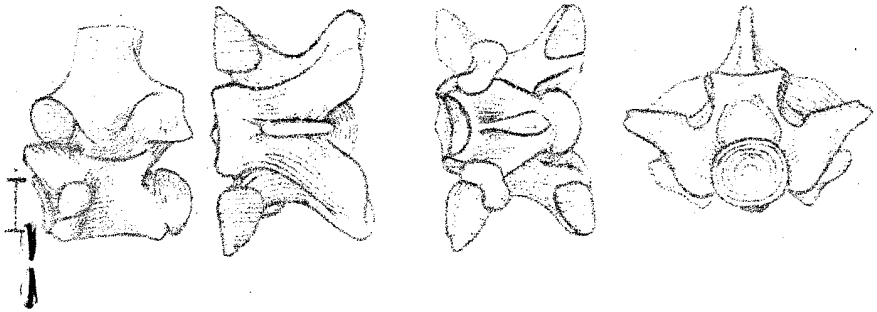


FIGURE 3.-- Vertical bars represent actual height of each vertebra. A.) Pterosphenus (extinct marine boa); B.) Farancia (mud snake); C.) Pseudoepicrates stanolseni (extinct large boa).

TABLE 1.-- THE FOSSIL SNAKES OF FLORIDA AND THEIR GEOLOGIC DISTRIBUTION.

	CRET.	PALEC.	EOC.	OLIGO.	MIO.	PLIO.	PLEIS.	RECENT
PALEOPHIIDAE (extinct marine boas)			FX					
ANILIDAE (primitive boa-like snakes)	X		X	F	F			X
Anilioides minutus (extinct anilid)					F			
BOIDAE (boas and pythons)	?	X	X	FX	F		X	X
ERYCINAE		X	X	X	F			X
Calamagras floridanus (extinct burrowing boa)					F			
Osmophis pauperrimus (extinct burrowing boa)					F			
BOINAE			X	FX	F		X	X
Pseudoepicrates stanolseni (extinct large boa)					F			
COLUBRIDAE (most harmless snakes)				F?	FX	FX	FX	FX
COLUBRINAE					FX	FX	FX	FX
Carphophis amoenus (worm snake)							FX	FX
Farancia abacura OR *Abastor erythrogrammus* (mud snakes)							F	FX
Paleofarancia bravispinosus (extinct mud snake)						F		
Diadophis elimorae (extinct ringneck snake)						F		
Diadophis punctatus (eastern ringneck snake)							FX	FX
Heterodon platyrhinos (common hognose snake)							FX	FX
Heterodon simus (southern hognose snake)							FX	FX
Heterodon brevis (extinct hognose snake)						F		
Opheodrys aestivus (rough green snake)							F	FX
Coluber constrictor (black snake)						X	FX	FX
Masticophis flagellum							FX	FX

TABLE 1 Continued

	CRET.	PALEC.	EOC.	OLIGO.	MIO.	PLIO.	PLEIS.	RECENT
Drymarchon corais (indigo snake)							FX	FX
Elaphe obsoleta (chicken snake)							FX	FX
Elaphe guttata (corn snake)							F	FX
Pituophis melanoleucus (pine snake)							FX	FX
Lamprópeltis getulus (chain kingsnake)							F	FX
Lampropeltis doliata (scarlet kingsnake)							FX	FX
Stilosoma vetustum (extinct short-tailed snake)						F		
Stilosoma extenuatum (short-tailed snake)							F?	F
Pseudoeemophora antiqua (extinct ground snake)					F			
Tantilla coronata (crowned snake)							F	FX
Rhadinaea flavilata (yellow-lipped snake)							F	FX
Parnoxybelis floridanus (extinct racer)					F			
NATRICINAE (water snakes and allies)					X	X	FX	FX
Storeria dekayi (brown snake)							F	FX
Liodytes alleni (striped swamp snake)							F	F
Natrix cyclopion (green water snake)							F	FX
Natrix taxispilota (brown water snake)							F	FX
Natrix erythrogaster (red-bellied water snake)							F	FX
Natrix sipedon (common water snake)							F	FX
Thamnophis sirtalis (common garter snake)							FX	FX
ELAPHIDAE (cobras, kraits, and coral snakes)					X	F	FX	FX
Micrurus fulvius (eastern coral snake)							F	FX
Micrurus sp. (coral snake)						F		
VIPERIDAE (vipers)	X		X		X	FX	FX	FX
Sistrurus miliarius (ground rattlesnake)							F	FX
Agkistrodon piscivorus (cottonmouth)							F	FX
Crotalus adamanteus (diamondback rattlesnake)							F	FX
Crotalus giganteus (extinct giant rattlesnake)							F	
Crotalus sp. (rattlesnake)						F		

of this snake, Anilioides minuatus (body length 19 inches), are obscure, it may be close to an Eocene genus from Wyoming.

The remaining Miocene snakes of Florida belong to the family Boidae. The largest of these, up to 8 feet long, is Pseudoepicrates barbouri, a genus very similar, and perhaps identical, to the West Indian Epicrates. It is believed that Pseudoepicrates and Paraoxybelis represent part of a small West Indian reptile immigration during the Miocene. Like the living West Indian boas, Pseudoepicrates barbouri probably frequented caves and fissures in search of bats.

The two remaining genera of Miocene Florida boas, Calamagras and Ogmophis, both about 2 feet long, seem closely related to the rubber and burrowing boas now living in California and Mexico.

The end of the Miocene apparently marks the last appearance of the larger boas, such as Pseudoepicrates, in temperate areas of both North America and Europe -- ending a nearly unbroken fossil record from the Eocene to the Miocene on both continents. The Florida fossil boas merely represent the culmination of several North American evolutionary lines. The Miocene also marks the last appearance of the family Anilidae in North America. The fact that the family Colubridae was already diverse in the Florida Miocene suggests that it may eventually be found in deposits as old as the Eocene.

PLIOCENE

Following the extinction of certain forms characteristic of the Miocene, the Pliocene marks the first occurrence of genera still living in North America. Furthermore the distribution patterns of these Pliocene snake genera were somewhat similar to those of their living representatives.

The Florida Pliocene snakes belong to three families. The Colubridae are represented by the genera Heterodon (hognosed snakes), Diadophis (ringnecked snakes), Paleofarancia (mud snakes), and Stilosoma (short-tailed snakes). One species of elapid (Micrurus) and one crotalid (Crotalus) are also known from the Pliocene deposits in Florida. All are represented by species distinct from the species of the same genera living today. The Pliocene species are apparently ancestral to at least some of the living forms.

It is highly likely that between the Lower Miocene and Middle Pliocene certain characteristically western organisms extended their ranges eastward into Florida. This eastern extension of the western fauna included several snakes such as Heterodon and Crotalus.

PLEISTOCENE

The Pleistocene deposits of Florida present a complex series of beds containing a rather uniform fauna. Many of the fossil species of this age are identical to animals existing in the peninsula at the present time. This is particularly true of the snakes, which do not show the degree of extinction witnessed among mammals and birds. All of the Florida Pleistocene snakes belong to genera and species found in or near the peninsula today, except one. This is Crotalus giganteus, an extinct giant (10 feet) rattlesnake. The worm snake, Carphophis amoenus, occurs in Florida in the Pleistocene but presently reaches its southern limit just north of the state. In addition, the red-bellied water snake, Natrix erythrogaster, also occurs in certain Pleistocene deposits located slightly south of its present range limit in the Suwannee River drainage system. Other species with ranges similar to these two, such as the canebrake rattlesnake, Crotalus horridus, the queen water snake, Natrix septemvittata, and the copperhead, Ancistrodon contortrix, will probably be found in Florida Pleistocene deposits some day.