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SNAKES

of the University of Mississippi Field Station

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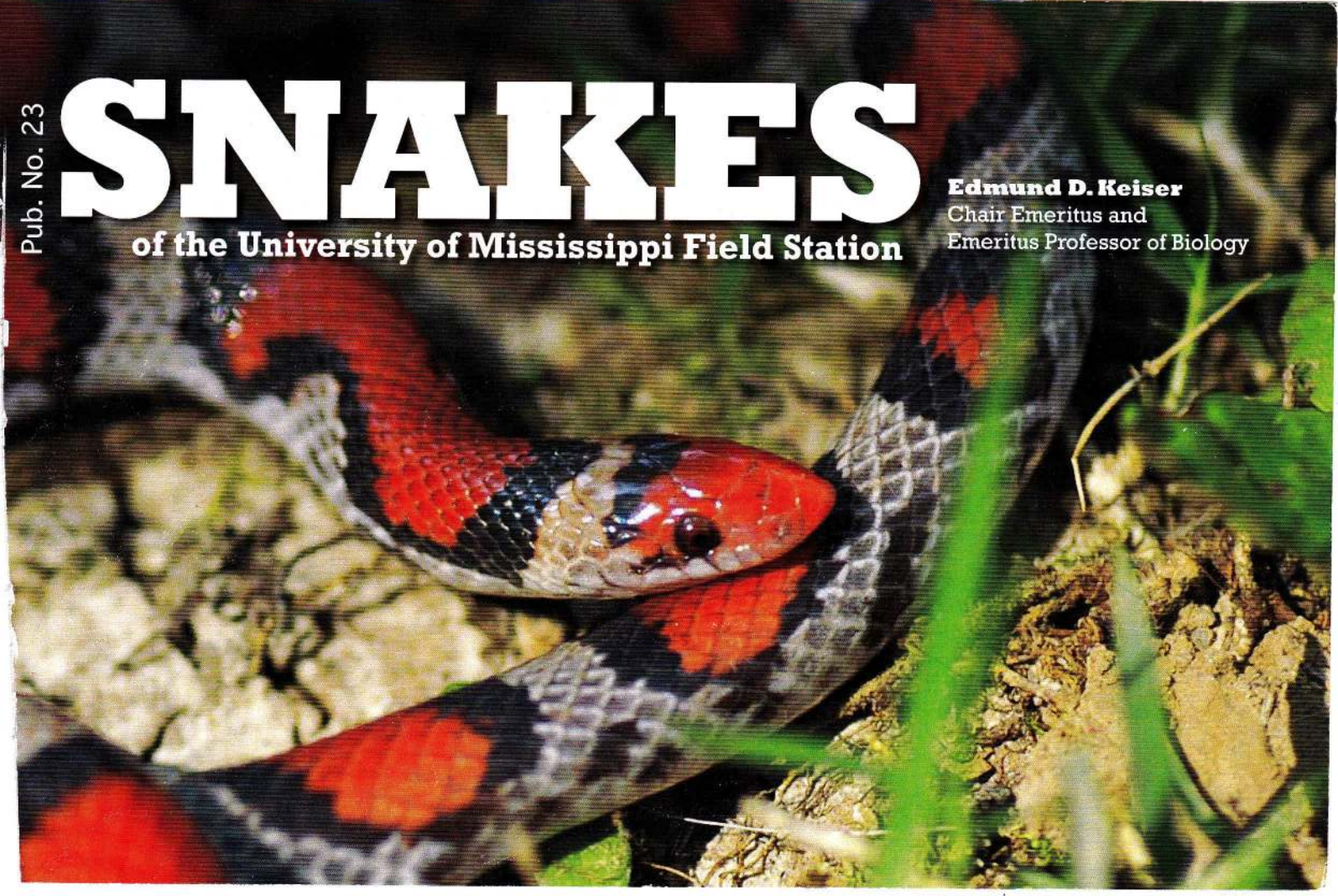

THE UNIVERSITY OF MISSISSIPPI FIELD STATION

The University of Mississippi Field Station (UMFS) is a major site for field research . It is located in an especially scenic area of northern Mississippi. The station is located in Lafayette County, about 11 miles northeast of the main University campus in Oxford. An unusual combination of terrain, water sources, vegetation, engineering, and habitat types makes a perfect outdoor laboratory for research in many fields.

The field station includes forested hills surrounding a V-shaped , almost 3 mile long valley. Springs and seeps emerge from these hills and provide water for approximately 200 ponds on the valley floor. Clear streams course along the periphery of the valley and a small swamp exists at the terminus of the southwest branch of the V. On top of the forested hills are extensive fields surrounded by hilltop woodlands. All this creates a place of great beauty and a remarkable diversity of habitats for various invertebrates and vertebrates. Add to this the species protection afforded by the station's refuge status and you have a site remarkably suited for maintenance of animal and plant populations and studies pertaining to those populations.

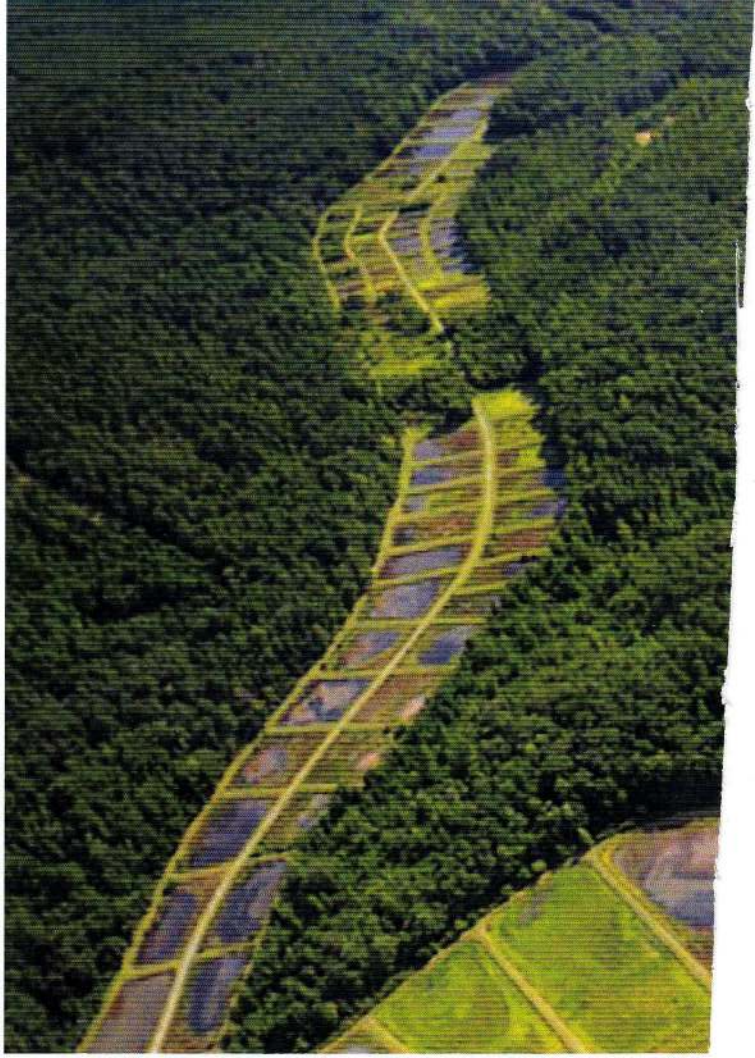


photo by Robert Jordan

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** All photos/illustrations by Dr. Ed Keiser unless otherwise noted.*

SNAKES ! !

Before joining Ole Miss, I lived in Alaska for over two decades – where there are no snakes. After arriving here, I soon learned that it was important to be able to recognize snakes because of my walks around the perimeter of the Field Station. The most commonly encountered snake here is the cottonmouth, which I quickly learned to recognize out of necessity. And, it's pretty easy when they show their namesake mouth to warn you away. Identifying the other snakes is the real challenge and I'm really glad to have this guide for my own use and as another contribution to providing useful information to the community about the plants and animals to be found at the UM Field Station and in the general region of northern Mississippi.

Dr. Ed Keiser

Fortunately, Dr. Ed Keiser volunteered to write the guide to Snakes of the University of Mississippi Field Station, our 23rd community service publication. Quite frankly, I don't know anyone better qualified to prepare our snake guide than Ed. After a 30-year career at UM, Dr. Keiser retired in 2005 from the Dept. of Biology, where he was a professor and department chair. Ed remains active in the Dept, teaching part-time. He also does contract work for the Mississippi Dept of Wildlife, Fisheries and Parks and for the U. S. Fish and Wildlife Service. Dr. Keiser is an expert on amphibians and reptiles and previously has written Field Station guides on salamanders, frogs and turtles. In addition, Ed is a superb and energetic field naturalist that is continually on the move and frequently visits the Field Station, as he has done since the station was established in the mid-1980s, to look for animals to study or photograph. Dr. Keiser is a real community resource and we deeply appreciate his volunteer efforts to help others by preparing this series of field guides.

Ray Highsmith
UM Field Station Director

SNAKES OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

Snakes are fascinating creatures and one of the few kinds of animals immediately recognized the world over. They are elongate, slender, scaled, vertebrate animals that lack paired legs, moveable eyelids, and external ear openings. They are classified as reptiles, and as such, are grouped with lizards, their nearest living relatives, and more distant animals such as crocodilians and birds. There are approximately 2,950 surviving species in the world.

Using conservative estimates, Mississippi has about 43 species of snakes representing six or more families. The most important published summaries of Mississippi amphibians and reptiles are those of Cook (1962), Cliburn (1976), and Loehoenefer and Altig (1983). Majure's (1975) unpublished Master of Science thesis, is the most detailed work to date on Mississippi snakes. Virtually all of these are outdated today. Numerous changes in generic and specific names and classifications have occurred since 1983, and taxonomic changes associated with advances in molecular analyses are occurring at a rapid pace.

Twenty-five species of snakes, representing four snake families, can be found at the University of Mississippi Field Station (UMFS). These species are emphasized in this booklet. The classification, common, and scientific names utilized herein are those recognized on the April 2, 2010 list of the Center for North American Herpetology (www.cnah.org/nameslist.asp?id=6).

Three, and possibly five, additional species have known ranges which suggest the possibility of being future additions to the field station fauna. Most of the known field station species are harmless to humans. Even some of the venomous species are currently considered to have bites of little consequence to human health. Three of the field station species, cottonmouth, copperhead, timber rattlesnake, however, can produce bites that have serious harmful consequences to those who are unlucky enough to be bitten.

Snakes are not, as some say, "slimy animals." They have somewhat dry, cornified, outer skin which consists mostly of scales formed from their epidermis. In a process referred to as "ecdysis," they shed part of this outer layer several times each year. Even the outer layer of transparent scale (= "brille") covering the eye peels away during ecdysis. The lower level of epidermis and the dermis are not shed. The button and rattle of rattlesnakes are essentially products of ecdysis.

The absence of ear drums and external ear cavities results in an inability of snakes to hear all but the very lowest frequencies of airborne sound waves. Snakes do have a middle ear bone, the stapes, which contacts a jaw bone instead of a resonating ear drum (tympanum). They are quite sensitive to ground or seismic vibrations since the lower jaw and body are usually in contact with the substrate.

Snakes are ectotherms which means their body temperature depends primarily on absorbing heat from the environment. Rather than producing most of their heat from internal metabolism, they achieve favorable body temperatures by locating to microhabitats having the desired temperatures.

Snakes have numerous, backward-curved, needle-like teeth which help them capture and hold their prey. These teeth are shed and replaced frequently in rhythmic waves that insure that teeth will be present at all times. Prey is swallowed whole, sometimes alive and sometimes not. Because of loose, ligamentous attachments of the jaws, snakes are able to swallow prey that is bigger in diameter than their bodies. They use a swallowing process referred to as "jaw-walking" in which the loosely articulated left and right jaws are alternately lifted and inserted in the prey. By alternately shifting the jaws forward and backward, the prey is almost literally walked into the esophagus.

Some snakes have teeth that are considered "fangs." Fangs are elongate teeth usually specialized for the delivery of venom. Four currently known field station species are in the Family Dipsadidae and are called "rear-fanged snakes." Such snakes have enlarged, open-grooved teeth on the rear of the jaws. Scientists know little about the venom produced by the rear-fanged species found at the field station but these snakes hardly ever bite when handled and their bites are generally considered of minor consequence to humans. It would be wise, however, to avoid being bitten as any foreign substance injected into the human blood stream can have serious consequences.

Three species found at the field station are pit vipers of the Family Crotalidae. These snakes have hollow fangs located in the front of the mouth. These fangs can be elevated when the mouth is open and folded inward when it is closed. Bites from any of the crotalid species can have serious consequences which require hospitalization. One of the five anticipated species, the Pigmy Rattlesnake, is also a pit viper. Fortunately, bites from venomous pit vipers are uncommon in Mississippi and, thanks to modern medical care, deaths from snake bite are rare. A detailed source on Mississippi venomous snakes is Keiser (1982).

Despite claims otherwise, coral snakes and diamondback rattlesnakes do not occur at the field station or in the northern areas of Mississippi. These occur far to the south and are not among the known or anticipated species at the field station.

Snakes have evolved a somewhat linear inner anatomy. Most of the normally paired, side-by-side vertebrate organs, lie one behind the other in snakes. In most field station species, only the right lung is large and elongated and a thin growth of vascular tissue called a "tracheal lung" is supplementary.

Tongue flicking in snakes is sometimes the subject of erroneous beliefs. Some southerners refer to the tongue as a "fang" and many consider the tongue to be an instrument to inject poison.

venom. An extended flicking tongue sweeps fine particles from the air and deposits these on or near olfactory tissues located on the roof of the mouth. The tongue and olfactory tissues assist the nostrils in detecting airborne particles, thus aiding the sense of smell.

Snakes typically undergo some sort of courtship routine prior to mating. In some species, competitive males may even engage in ritualistic activities. In most field station species, courtship and mating activities typically occur in the warm months of spring and early summer.

Male snakes have two copulatory organs termed "hemipenes." Hemipenes lie side by side inside the tail and just posterior to the cloaca. Only one hemipenis is inserted into the female during mating. The structure is everted into the female cloaca and sperm flow down a hemipenial groove into the female. Snakes can be sexed by the presence or absence of these organs. Even if the organs are not everted, tail bases of male snakes are obviously wider than those of female snakes. Males also tend to have longer tails.

Some snakes at the field station lay shelled eggs and are termed "oviparous." Others give birth to living young, and are "viviparous" or "live-bearing." Egg laying snakes at the field station most frequently deposit their eggs at a nest site during the late spring and early summer months. Hatching takes place in late summer or early fall. Most field station live-bearers give birth to litters in late summer or early fall. In nearly all species, however, there are exceptions to these generalizations. Litter sizes are variable. Average litter sizes are cited in the species accounts but snake litters within a given species often vary with the size of the female or the circumstances at the time of fertilization, oviposition, or parturition.

Parent females of very few species remain with the eggs or newly born young. None provide maternal care to offspring. Newly hatched or newly born juveniles must be immediately able to care for themselves. As with many vertebrates, the young are very susceptible to predators and other environmental hazards.

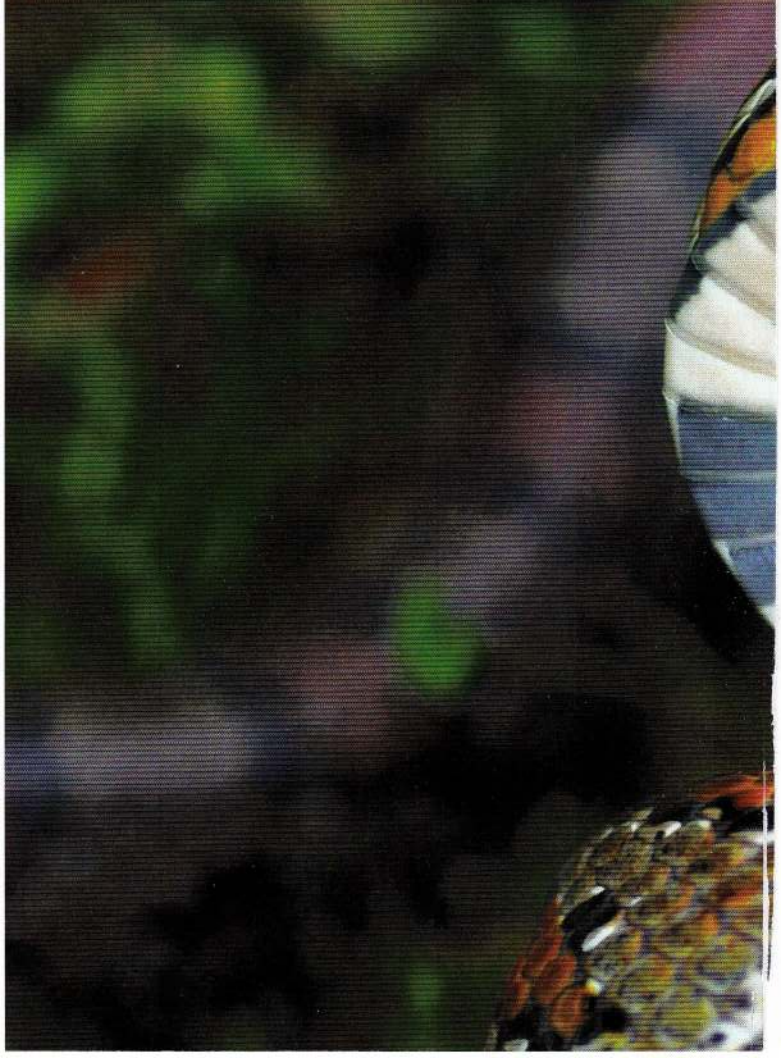
Snakes have many enemies including insects, crayfish, spiders, large frogs, flesh-eating turtles, other snakes, crows, blue jays, hawks, large wading birds, and carnivorous mammals to name a few.

Although not of great public concern and also not easy to prove, a life time of field work indicates that our Mississippi snake fauna, with some exceptions, has declined considerably over the past 30-40 years. This is true statewide, particularly with small species, and it is also obvious at the field station.

Snake declines in Mississippi and elsewhere appear to be primarily related to human activities. Loss of habitats, pesticides, herbicides, frequent intentional burning of forest ground litter, human-introduced predators (fire ants, rats, feral

and domestic pigs, dogs, cats, e.g.), have all taken heavy tolls on snake populations. Automobiles take an enormous toll each year. During warm weather, it is not unusual to count 2 or 3 snakes killed almost daily on a 10 mile stretch of Route 30 not far from the field station. Many people kill every snake they encounter either because it is a snake or because they feel the animal might be dangerous.

Whatever one's feelings about snakes, they are essential components of the ecosystem. They are among the many invaluable organismic links that, taken as a whole, insure the health of our planet's biosphere. The field station, because of its refuge status and many protected habitats, is a haven for survival of many species of vertebrates including snakes. We need the field station. We need the snakes. We need a healthy ecosystem. On such things depends the future of our species.



IDENTIFICATION OF UMFS SNAKES

A checklist of the 25 species known for the vicinity of the field station, an identification key, and individual accounts of species follow this section. Identification of adult UMFS snakes is not difficult although the exceptional variability shown by individuals of some species can be confusing to beginners and, occasionally, to those who are not novices in identifying snakes. The identification key, species accounts, and photographs can be used as aids in determining the species of individual snakes. With these guides and a little practice, one can quickly learn to identify most, if not all, field station individuals. With just a little experience, one should have no trouble identifying those which have less typical color patterns.

An identification key is an arrangement of species attributes presented as a numbered series of choices. The choices are arranged in pairs termed "couplets."

In the following key, the user begins at **couplet 1** and compares the animal to be identified with the two choices in name of a species or to the number of the next couplet to be considered.

For example, if the specimen to be identified in **couplet 1** has a legless body, ear openings and moveable eyelids, it is a legless lizard and not a snake. If it has no ear openings or moveable eyelids, proceed to **couplet 2.** There are two choices at **couplet 2.** If the eyes have elliptical pupils and a pit between the eyes and nostrils, go to **couplet 3.** If round pupils and no pit, advance to **couplet 6**. If you make the correct choices, you should quickly advance to the species common name of the animal in hand.

All key determined identifications should be verified by reading the species account descriptions and studying the color plates. No key can possibly account for all color and pattern variations so double check your key results.

Technical terminology in this booklet is minimal. The few terms that are used in the keys and species accounts are illustrated and/or defined in the glossary. Figures 1 and 2 and the drawings and photos in the key should be helpful in making decisions involving snake scutellation.

Figures Illustrating Names and Patterns of Snake Scales (Scutes)

Fig. 1

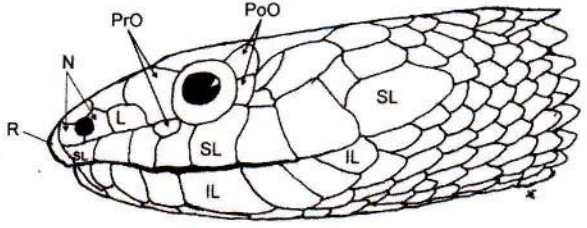


Fig. 1. Snake head, lateral view. IL = infralabial; L = loreal; PrO = preocular; PoO = postocular; N = nasal; SL = supralabial

Fig. 2

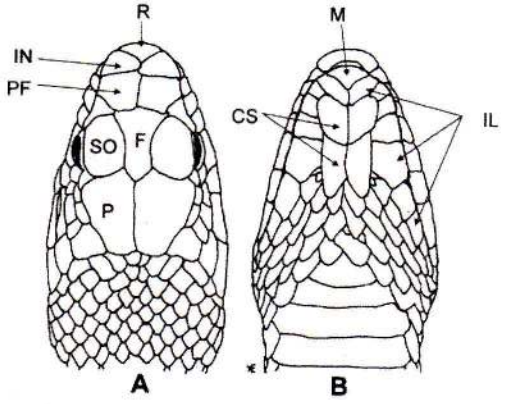


Fig. 2. Snake head.
A. Dorsal view. F = frontal; IN = internasal; P = parietal; PF = prefontal; R = rostral; SO = supraorbital.
B. Ventral view. CS = chin shields; IL = infralabial; M = mental.

Fig. 3

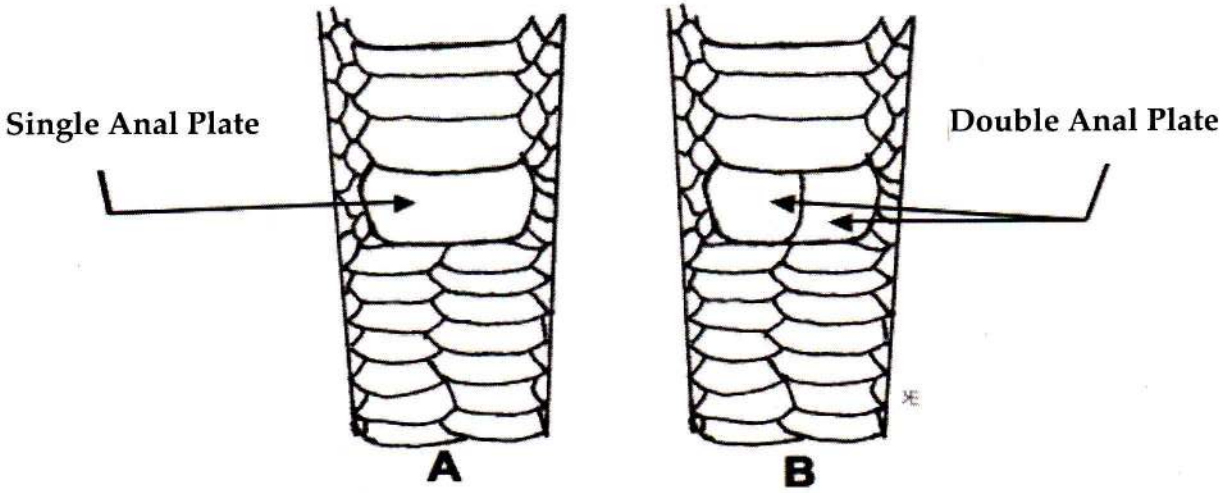
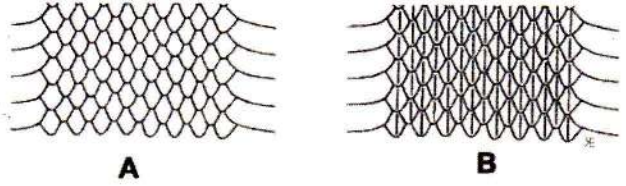


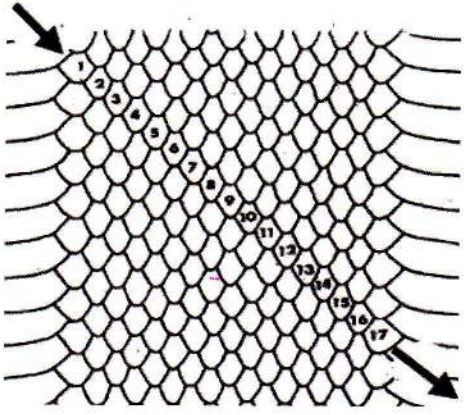
Fig. 4



A. Dorsal Scales Smooth

B. Dorsal Scales Keeled

Fig. 5



Dorsal Scale Counts

CHECKLIST OF SNAKES
OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

The nomenclature utilized is that recognized by the Center for North American Herpetology as of April 4, 2010.

FAMILY COLUBRIDAE (Harmless Egg-laying Snakes)

Scarlet Snake..... *Cemophora coccinea*

Eastern Racer..... *Coluber constrictor*

Prairie Kingsnake..... *Lampropeltis calligaster*

Common Kingsnake..... *Lampropeltis getula*

Rough Green Snake..... *Opheodrys aestivus*

Eastern Corn Snake..... *Pantherophis guttatus*

Midland Rat Snake..... *Scotophis spiloides*

Southeastern Crowned Snake..... *Tantilla coronata*

FAMILY CROTALIDAE (Pitvipers)

Copperhead..... *Agkistrodon contortrix*

Cottonmouth..... *Agkistrodon piscivorus*

Timber Rattlesnake..... *Crotalus horridus*

FAMILY DIPSADIDAE (Rear-fanged Snakes)

Eastern Worm Snake. ..... *Carphophis amoenus*

Ringneck Snake..... *Diadophis punctatus*

Mud Snake..... *Farancia abacura*

Eastern Hognose Snake ..... *Heterodon platirhinos*

Family Natricide (Harmless Live-Bearing Snakes)

Plainbelly Water Snake. ..... *Nerodia erythrogaster*

Diamondback Water Snake..... *Nerodia rhombifer*

Northern Water Snake..... *Nerodia sipedon*

Brown Snake..... *Storeria dekayi*

Redbelly Snake..... *Storeria occipitomaculata*

Western Ribbon Snake..... *Thamnophis proximus*

Eastern Ribbon Snake..... *Thamnophis sauritus*

Eastern Garter Snake..... *Thamnophis sirtalis*

Smooth Earth Snake..... *Virginia valeriae*

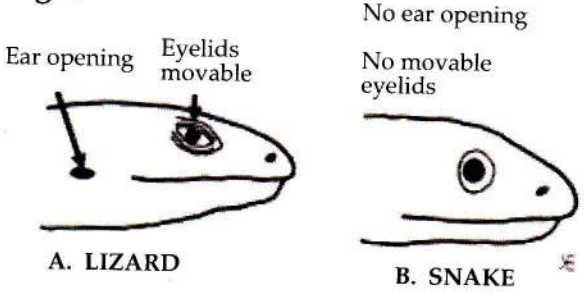
Rough Earth Snake..... *Virginia striatula*

KEY TO SNAKES OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

1. Snake-like, legless body: head with ear openings and movable eyelids (Fig. 6A)..... ..... **SLENDER GLASS LIZARD** (not a snake)

Snake-like, legless body; head lacking ear openings and no movable eyelids (non-movable eyecups over eyes (Fig. 6B) 2

Fig. 6

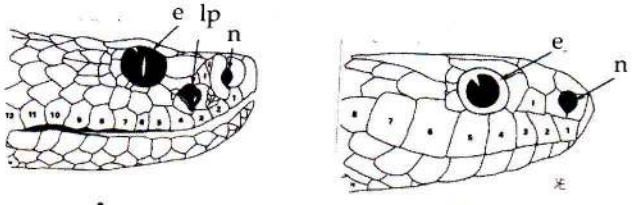


A. LIZARD B. SNAKE

2. Eyes with elliptical pupils; obvious pit between the eyes and nostrils (Fig. 7A)..... 3

Eyes with round pupils; no pit between eyes and nostrils (Fig. 7B). 6

Fig. 7

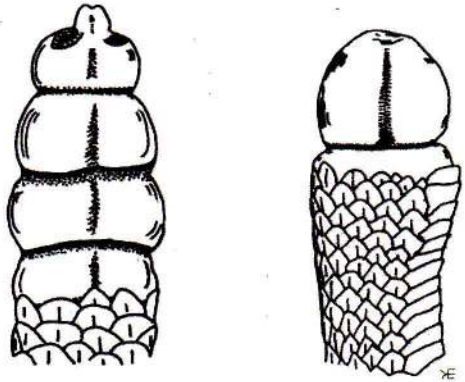


e = eye, lp = loreal pit. n = nostril, supralabial scales are numbered

3. End of tail with rattle or button (Fig. 8)..... 4

End of tail lacking rattle or button (Fig. 9 5

Fig. 8

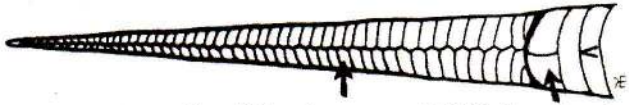


Rattle

Button

Fig. 9

Snake tail lacking rattle or button



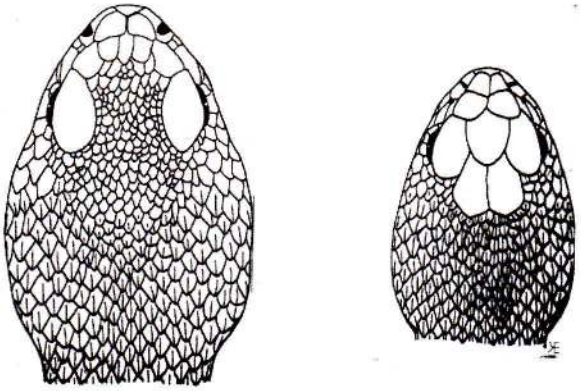
Caudial scales

Divided anal scale

4. Top of head having only small scales (Fig. 10A).....
.....**TIMBER RATTLESNAKE**

Top of head with 9 large scales (Fig. 10B). .....
..... **PIGMY RATTLESNAKE**

Fig. 10



Timber Rattlesnake

A

Pigmy Rattlesnake

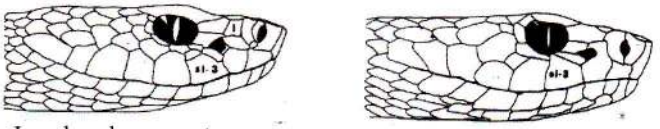
B

5. Supralabial scales separated eye from eye by subocular scales; loreal scale present between preocular scale and postnasal scale (Fig. 11A). .....
..... **COPPERHEAD**

At least one supralabial scale in contact with eye; no loreal scale between preocular scale and postnasal scale (Fig 11B).
..... **COTTONMOUTH**

Fig. 11

L = loral scale; sl-3 = supralabial 3



Loral scale present
Sl-3 does not touch eye

COPPERHEAD

A

No loral scale
Sl-3 touches eye

COTTONMOUTH

B

6. Body with three prominent yellow, longitudinal stripes (Fig.12) 7


Fig. 12

Body with fewer than three stripes or stripes absent.....9

7. Lateral yellow stripe anterior to mid-body on dorsal scale rows 2 and 3..... **EASTERN GARTER SNAKE**

Lateral yellow stripe anterior to mid-body on dorsal scale rows 3 and 4..... 8

8. Parietal spots conspicuous and often fused (Fig.13); supralabial scales usually 8 (See Fig. 7); dorsal dark pigment barely or not at all extending onto scales of belly.....**WESTERN RIBBON SNAKE**


Fig. 13

Parietal spots tiny or absent (Fig. 14); supralabial scales usually 7 (See Fig. 7); dorsal dark pigment extends well onto scales of belly (Fig. 14) . .....**EASTERN RIBBON SNAKE**

9. Coloration of dorsum uniform green or gray-green; body slender, elongate, and vine-like. (Fig. 15)..... ..... **ROUGH GREEN SNAKE**

Coloration of dorsum not uniform green or gray-green; body not slender, elongate, and vine-like.....10

10. Dorsum shiny black; belly with bright red or red-orange crossbars which alternate with black crossbars and encroach onto the lower dorsal scales (Fig. 16). ..... **MUD SNAKE**

Fig.16

Coloration not as described. 11

11. Dorsal surface of head and neck black with black pigments separated by a white or cream-colored crossbar (Fig. 17)..... ..... **SOUTHEASTERN CROWNED SNAKE**

Fig.17

PHOTO CREDIT: ROBERT A YOUNG

Dorsal head and neck colors not as described. 12

12. Ventral surface a uniform red, pink, or orange and without large blotches or cross bars. 13

Ventral surface not a uniform red, pink, or orange; large blotches and or crossbars may or may not be present. 15

13. Ventral coloration extending well onto lower dorsal scale rows (Fig. 18). ..... **EASTERN WORM SNAKE**


Fig.18

Ventral coloration not extending onto lower dorsal scale rows. 14

14. Dorsal scales smooth (Fig. 4a) and usually uniformly dark gray or black; light spot below and behind eye inconspicuous or absent; ventral surface orange and typically with numerous black dots the length of the body (Fig. 19). ..... **RINGNECK SNAKE**


Fig.19

Dorsal scales keeled (Fig 4b) and variable in color; light spot below and posterior to the eye conspicuous (Fig.20); belly uniform reddish or orange and lacking black dots except perhaps anteriorly (Fig. 21). .... **RED-BELLIED SNAKE**


Fig.20

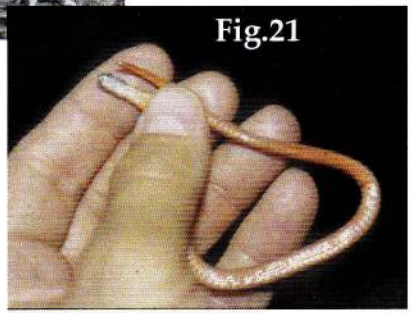


Fig.21

15. Dorsal pattern of black and red or reddish-orange saddles or rings extending from the head to the tail (Fig. 22). 16


Fig.22

Coloration not as described. 18

16. Posterior dorsal scales smooth; red and black saddles vivid and boldly outlined by white or cream (Fig. 23). .... **SCARLET SNAKE**

Fig.23

Posterior dorsal scales keeled; red and black saddles dull and outlined by tan or brown. 17

17. Dorsal scales weakly keeled and usually only on posterior two thirds of body; dorsal saddles orange or reddish orange; ventral surface with black squares on a white background that form a checkerboard pattern (Fig. 24); prominent spear point on head and crossbar on snout (Fig. 25). .....**CORN SNAKE**

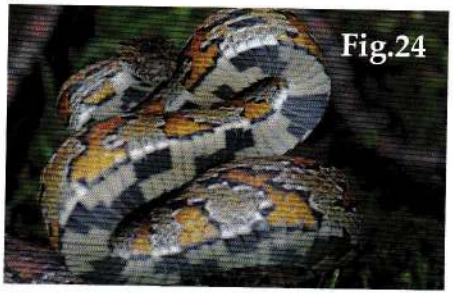


Fig.24

Fig.25

Dorsal scales strongly keeled over entire back; dorsal saddles reddish-brown or brown(Fig. 26); belly cream with dark half moon spots on each scale(Fig. 27); prominent spear point and crossbar absent. .... **NORTHERN WATER SNAKE** (part)


Fig.26

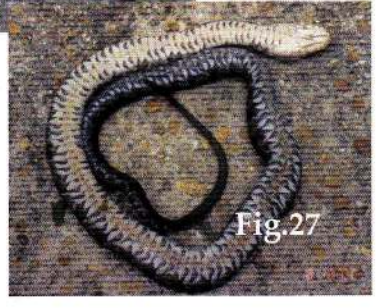


Fig.27

18. Rostral keeled and turned upward anteriorly (Fig. 28). .. ..**EASTERN HOGNOSE SNAKE**


Fig.28

Rostral scale not keeled and turned up anteriorly. 19

19. Mid-dorsal stripe on full length of body 20

Mid-dorsal stripe absent. 21

20. Dorsal stripe conspicuous and tan; stripe usually bordered or invaded by black blotches or spots (Fig. 29); belly usually tan and often with tiny dark spots along the scale edges; light spot below and behind eye absent or inconspicuous; dorsal scale rows 17 at mid-body (See Fig. 7). .....**BROWN SNAKE**


Fig.29

Dorsal stripe reddish or copper brown and conspicuous, inconspicuous, or absent; belly red or red orange (Fig 30); obvious light spot below and behind right eye (Fig. 31); dorsal scale rows 15 at midbody (See Fig. 7) ....**RED BELLIED SNAKE**

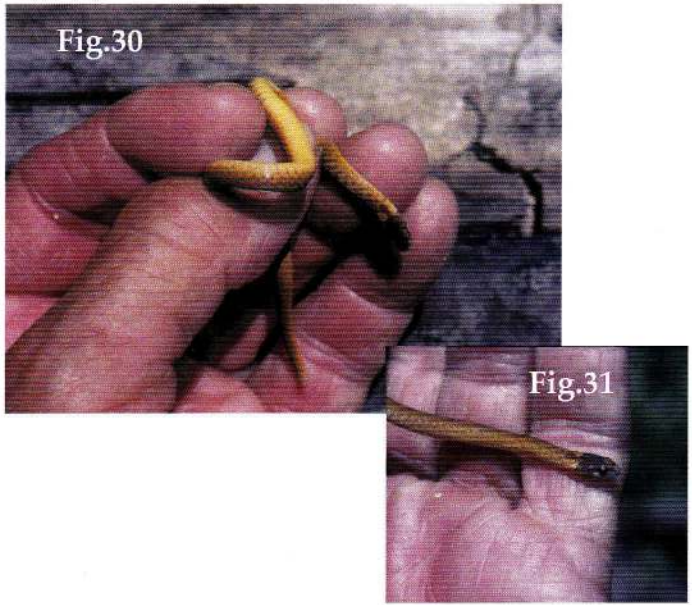


Fig.30

Fig.31

21. Dorsum more or less uniform in coloration and lacking conspicuous blotches, saddles, rings, or large spots. 22

Dorsum not uniformly colored and conspicuous markings present 25

22. Supralabials 6 or fewer (see Fig 7); small snakes (adult total length rarely exceeding 13 inches). 23

Supralabials 7 or more (see Fig. 7); large snakes (adult total length always exceeds 30 inches). 24

23. Supralabials 6 (see Fig. 7); postoculars 2; internasals 2; dorsal scales smooth or very weakly keeled. .... **SMOOTH EARTH SNAKE**

Supralabials 5 (see Fig. 7); postoculars 1; 1 internasal; dorsal scales obviously keeled .... **ROUGH EARTH SNAKE**

24. Dorsal scales strongly keeled (Fig. 32); labial scales not white..... .... **PLAIN-BELLIED WATER SNAKE**

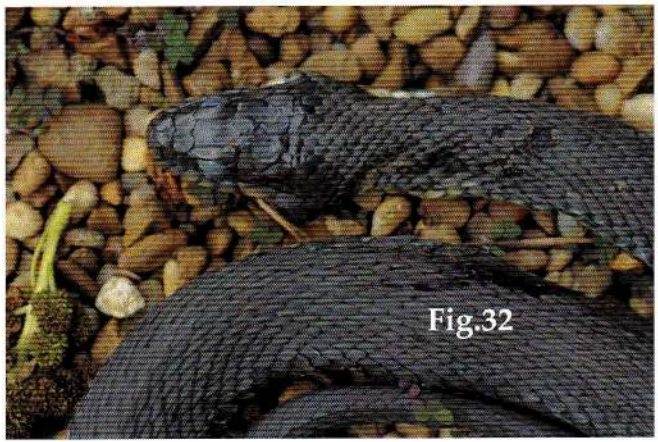


Fig.32

Dorsal scales smooth and not keeled; labial scales white (Fig.33). ..... **RACER**

25. Dorsal scales smooth. 26

Dorsal scales keeled at least posteriorly. 28

26. Dorsal scales in 17 rows (See Fig. 5). .... **RACER**

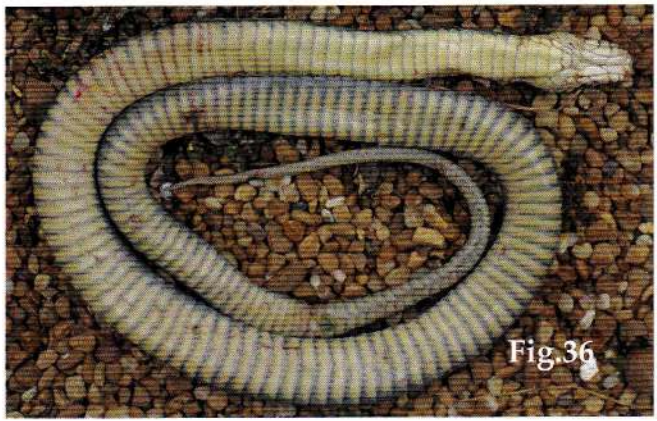
Dorsal scales in 21 or more rows (See Fig. 5). 27

27. Dorsum black with numerous small, yellow spots scattered evenly or in chainlike patterns over the entire body, and tail (Fig. 34); dorsal scales in 21-23 rows..... .... **COMMON KINGSNAKE**

28. Dorsal scale keels weak and usually absent anteriorly or restricted to a few mid-dorsal scale rows.... RAT SNAKE
Dorsal scales strongly keeled for entire length and width of body. 2

Dorsum tan or brown with numerous, large and irregularly arranged, black and/or white-bordered, dark brown blotches on the mid-back and/or the sides (Fig. 35); dorsal scales in 25 or more rows. .... **PRAIRIE KINGSNAKE**

29. Belly cream or yellow and lacking spots and blotches; lateral edges of ventral scales may be tinted with darker color (Fig. 36). ..... **PLAIN-BELLIED WATER SNAKE**



Coloration not as described. 30

30. Dorsum with dark, chain-like pattern alternating with smaller blotches on sides (Fig. 37); belly cream with black or brown dark, often crescent-shaped spots..... **DIAMONDBACK WATER SNAKE**

Dorsum with black-bordered dorsal saddles alternating or connecting with similarly colored side bars visible for length of body (Fig. 38); belly cream or yellow with dark half moon spots on many scales. ..... **NORTHERN WATER SNAKE** (part)

Fig.37

Fig.38

SCARLET SNAKE

Cemophora coccinea (Blumenbach, 1788)

Identification

This is a slender, strikingly colorful snake. It has bold, red, saddle-like blotches extending the length of the body and tail. Each blotch is bordered anteriorly and posteriorly by black crossbands. The saddles are outlined by the dirty white or cream background color. The blotches do not extend onto the belly scales. The top of the head is red, with black, then white crossbars behind the eyes. The snout is pointed. The rostral scale is enlarged and extends beyond the lower jaw. The belly is uniform white. The dorsal scales are smooth and the anal plate is undivided. Young individuals are colored as the adults.

Similar Species

The only snake likely to be confused with the vividly colored Scarlet Snake is the Scarlet Kingsnake which has yet to be found in Lafayette County. The belly of the Scarlet Kingsnake is strongly invaded or often circled by the red and black colors of the dorsum. The Scarlet Kingsnake also has a rounded rather than pointed snout.

Taxonomic Comments

The subspecies found in north Mississippi is *Cemophora coccinea copei*, the Northern Scarlet Snake.

General Comments

Scarlet Snakes are burrowing snakes and are only rarely found above ground during the day. Activity above ground is mostly nocturnal. They are uncommonly encountered at the field station, perhaps because of their secretive habits. They can, however, be found from the valley floor to the hilltops at the field station. Adults are usually slender and about 2 feet in total length. They tend to be gentle when captured and rarely bite. Mice, snakes, lizards, frogs, salamanders, insects and small reptile eggs are the usual foods. Mating takes place in the spring and one or more clutches of about five or six eggs are laid in underground burrows, bark piles, or ground litter. Hatching usually occurs in late summer or early fall.

EASTERN RACER

Coluber constrictor Linnaeus, 1758

Identification

This is a large, smooth-scaled, slender snake. Adults at the field station typically have uniform dark gray, blue-gray, or olive backs, but individuals may also be black, bluish black, brownish black or even have a darkened remnant of the juvenile pattern remaining. The chin and throat are white but the white grades into a shade of uniform gray or blue-gray, sometimes darker on the posterior two thirds of the belly. Individuals that have gray backs typically have a vague, dark postocular stripe. These snakes lack keels, have a divided anal plate, and possess 15 dorsal scale rows just anterior to the anal plate. The young do not resemble the adults. They are boldly patterned with a mid-dorsal row of dark, usually brown or reddish-brown blotches against a light gray background. The dorsal blotches alternate with smaller blotches on the sides.

Similar Species

Adult snakes are not likely to be confused with other area species. Juvenile racers, however, may be confused with other species having numerous body blotches. Racers will have light, unmarked, uniformly colored bellies, smooth scales, and divided anal plates and these features plus coloration should separate them from most other blotched species. Juvenile racers look similar to juvenile Coachwhip snakes which have yet to be found at the field station. They are best separated by scutellation features. Coachwhips, for example, usually have 13 dorsal scales just anterior to the anal plate.

Taxonomic Comments

The influence of two subspecies, the Blackmask Racer, *Coluber constrictor latrunculus* and the Southern Black Racer, *Coluber constrictor priapus*, is seen in racers found at the field station.

General Comments

Adult Eastern Racers often reach five feet or more in length. They are diurnal, exceptionally fast moving, alert snakes. They usually move at ground level with their heads elevated but may also climb into trees. They are excellent swimmers and will not hesitate to enter water. Racers eat almost any small amphibians, reptiles, or mammals. They do not constrict their prey. The young often feed on invertebrates. Mating occurs in the spring and summer and they usually lay 10 or more eggs between May and early July. Hatching typically occurs in late summer or early fall. Racers usually flee when they encounter humans but, if escape is not possible, they may become aggressive. They will bite viciously and exude a foul smelling musk if handled.

PRAIRIE KINGSNAKE

Lampropeltis calligaster (Harlan, 1827)

Identification

This is a moderate sized, smooth-scaled, short-tailed, fairly robust snake. They are usually tan with 40 to 50 or more white-bordered, dark brown or reddish-brown blotches along the dorsum. Alternating rows of smaller blotches are along the sides. Very old individuals may be almost solid brown in color and have only traces of the blotches. The belly is cream to yellow-tan with distinct, somewhat squared but variously shaped dark brown blotches. The head usually has a dark bar across the snout, a stripe extending from the eye to the posterior corner of the mouth, and dark bars extending backward from the head onto the neck. The anal plate is single. The young are similar to the adults although the dorsal blotches are more obvious.

Similar Species

Young Prairie Kingsnakes may be confused with other juvenile, smooth-scaled and blotched patterned snakes, e.g. Eastern Racers and Coachwhips. The racer and Coachwhip, however, do not have blotches on their bellies. The presence of keeled scales and divided anal plates in blotched water snakes, Eastern Corn Snakes, and Midland Rat Snakes will distinguish them from kingsnakes.

Taxonomic Comments

Lafayette County Prairie Kingsnakes show obvious influence of two subspecies, *Lampropeltis calligaster rhombomaculata*, the Mole Kingsnake, and *Lampropeltis calligaster calligaster*, the Prairie Kingsnake.

General Comments

Adult Prairie Kingsnakes are usually less than 4 feet in total length. They thrive in agricultural areas, overgrown fields, and pastures. They eat amphibians, reptiles including other snakes, small birds and mammals, and eggs. Breeding usually takes place in the spring and egg deposition from May well into the summer months. Nest sites include rodent burrows, sawdust piles, and mounds of loose soil or bark. Clutches usually contain seven or more eggs and hatching occurs in late summer or early fall.

COMMON KINGSNAKE

Lampropeltis getula (Linnaeus, 1766)

Identification

This is a large, smooth and shiny scaled, short-tailed, fairly robust snake. They are black with numerous and prominent yellow spots on most of the head, body, and tail scales. The belly is yellow or cream with numerous large, irregular black blotches. The anal plate is single. Juveniles resemble the adults in color but may have fewer yellow spots.

Similar Species

No other shiny black snakes with numerous yellow spots occur at the field station.

Taxonomic Comments

Common Kingsnakes at the field station are predominantly of the subspecies *Lampropeltis getula holbrooki*, the Speckled Kingsnake. An occasional individual will have a dorsal color pattern reflecting the influence of the more northeastern *Lampropeltis getula nigra*, the Black Kingsnake.

General Comments

Adult Common Kingsnakes may exceed four feet in total length. They thrive in areas with ponds, marshes, swamps, bottomland forests, and upland hardwood and pine forests. They are common at the field station. They capture and kill prey by constricting. They eat frogs, lizards, snakes, birds, and the eggs of reptiles and birds. They are diurnal in habits. Breeding usually takes place in the spring and egg deposition from April into early summer. Nest sites include mammal burrows, litter piles, mounds of loose soil or bark, and rotting stumps. Clutches may contain as few as three to more than 20 eggs and hatching usually occurs in late summer and early fall.

ROUGH GREEN SNAKE

Opheodrys aestivus (Linnaeus, 1766)

Identification

This is a slender, vine-like, solid green snake with a uniform pale yellow, cream, or white belly. The anal plate is divided and the scales have conspicuous keels. Juveniles resemble the adults in color but are usually pale green or greenish-gray dorsally.

Similar Species

No other slender, vine-like, solid green snake species occur at or near the field station.

Taxonomic Comments

No subspecies are presently recognized.

General Comments

Adult Rough Green Snakes may exceed 4 feet in total length. They are semi-arboreal and move easily through low tree canopies, shrubs, and vines. Dense vegetation bordering ponds and woodlands are favorite habitats. They are diurnal. Spiders, insects, snails, tiny frogs, and insect larvae are preferred prey. Breeding usually takes place in the spring or early fall and egg deposition, sometimes in two clutches, occurs from June to September. Nest sites include tree cavities, rotting stumps and logs, and under loose bark. Clutches average about six eggs and hatching typically occurs from August through September.


Note spear point between eyes

EASTERN CORN SNAKE

Pantherophis guttatus (Linnaeus, 1766)

Identification

This is a moderately heavy-bodied, flat-bellied snake with colorful reddish or orange, black-bordered blotches coursing down the mid-back and alternating with smaller but similar blotches on the sides. The blotches are on a pale, dull orange or tan background. The blotches on the head typically form a spear point that meets between the eyes. A lateral stripe behind the eye extends onto the neck. The belly is white with black, somewhat squarish, well-defined blotches. The dorsal body scales are weakly keeled, at least posteriorly, and the anal plate is divided. Juveniles are similar to the adults in color although the reddish and orange colors are often darker, and sometimes brown.

Similar Species

All species that are potentially confused with the Eastern Corn Snake lack the spear point between the eyes. Juvenile Midland Rat Snakes are perhaps the most similar, but the ventral dark blotches are poorly outlined and the lateral stripe behind the eyes stops at the mouth line. Prairie Kingsnakes, Scarlet King Snakes, and Scarlet Snakes have single anal plates and scales without keels.

Taxonomic Comments

No subspecies are presently recognized. Some authorities continue to use the genus *Elaphe* for this species.

General Comments

Adult Corn Snakes may exceed 5 feet in total length. While often seen at ground level, they are semiarboreal and move easily through low tree canopies, shrubs, and vines. They are also excellent swimmers and do not hesitate to take to the water if pursued. Normally diurnal, they become active at night during hot summer months. Corn snakes feed on frogs, lizards, snakes, small mammals, birds, and the eggs of birds. Small animals are swallowed alive and larger ones are killed by constriction before being swallowed. Courtship and mating occur in the spring and clutches of a few to over 40 eggs are deposited in early summer. Eggs are deposited under loose bark, inside rotting logs and stumps, and in piles of rotting litter. Hatching usually occurs in 60-65 days although the time varies depending upon the nest site temperature.

MIDLAND RAT SNAKE

Scotophis spiloides (Dumeril, Bibron & Dumeril. 1854)

Identification

Adults are large, heavy-bodied, flat-bellied snakes, although young specimens may appear somewhat slender. Typical snakes in this area are gray with large dark blotches on the back and smaller blotches on the sides. Many individuals have dark crossbars on the snouts but they do not have an arrow-shaped blotch pointing between the eyes. Older individuals may be almost black and the blotch patterns may be difficult to distinguish. The chin and throat are white but the posterior belly darkens and varies considerably in color and blotching. The dorsal scales are weakly keeled and the anal plate, while usually divided, may be single. Juveniles have blotch patterns similar to adults but the gray areas are lighter and the blotches more obvious.

Similar Species

Juveniles and young adults most closely resemble Eastern Corn Snakes. The blotches of the latter are red or reddish orange and the background color much more tan than gray. Young of both species may have a dark crossbar across the snout, but only corn snakes have the arrow-shaped blotch pointing between the eyes. Prairie King Snakes and Scarlet Snakes have smooth scales. Northern Water Snakes have strongly keeled body scales low on the side as well as mid-dorsally and the dorsal blotches are on a tan, not grey background.

Taxonomic Comments

No subspecies are presently recognized. Some authorities continue to use *Elaphe obsoleta* for this species and *Elaphe obsoleta spiloides*, the Gray Rat Snake for the subspecies found at the field station. Time and more data will, hopefully, resolve this situation.

General Comments

Adult Midland Rat Snakes may exceed 7 feet in total length. While often seen at ground level, they are semiarboreal and move easily through shrubs, vines, and high and low tree canopies. They are excellent swimmers and are often seen in ponds and creeks at the field station. They are diurnal, but may be active at night in very hot weather. They feed on treefrogs and lizards, small mammals, birds, and bird eggs. Large prey may be killed by constriction. Courtship and mating occur in the spring and early summer. Nesting occurs within a month or two of mating and clutches of a few to over 40 eggs are deposited in rotting vegetation, rotten logs and stumps, piles of loose bark, or holes within living trees. Hatching occurs in 40-80 or more days.

SOUTHEASTERN CROWNED SNAKE

Tantilla coronata (Baird & Girard, 1853)

Identification

This is a small, almost pencil-thin, terrestrial, burrowing snake. The body and tail are light brown or gray-brown dorsally. The mostly black head is accentuated by a lighter crossband to the rear and a black collar which is usually 3 to 5 neck scales wide. The belly is white and without spots or blotches. The snout is pointed, the dorsal body scales are smooth, and the anal plate is divided. Juveniles are similar in color to adults.

Similar Species

This species might be confused with certain color phases of the Brown Snake, Redbelly Snake, and Smooth and Rough Earth Snakes but all of these small snakes lack the light rear head band and black neck collar. All these, with the exception of the Smooth Earth Snake, have keeled dorsal scales.

Photo Credit: Dr. Robert A. Young

Taxonomic Comments

No subspecies are presently recognized.

General Comments

Southeastern Crowned Snakes rarely exceed 12 inches in total length. They are burrowing snakes that do well in sandy soil, but also thrive in pine and mixed hardwood forests that have ample ground cover in the form of logs, rocks, and bark piles. The species, however, is uncommon or even rare in the vicinity of the field station. They feed on earthworms, insects, spiders, centipedes and use tiny grooved rear fangs to inject venom into their prey. Their venom is considered harmless to humans. Mating can occur during any warm month and one, two, or three eggs are deposited during early summer months. The shelled eggs have been found under loose bark piled around the base of rotting stumps. Hatching occurs in late summer or early fall.

COPPERHEAD

Agkistrodon contortrix (Linnaeus, 1766)

Identification

This is a medium sized, moderately heavy-bodied, venomous snake. The pupils of the eyes are vertically elliptical and there is a heat sensitive loreal pit between the eye and the nostril. The head is very flat from the eyes to the tip of the snout and the rear of the head is obviously wider than the neck. The dorsum is tan with hourglass-shaped crossbands. The crossbands are dark brown with lighter centers and are sometimes broken at mid-back level to form upright triangles on each side of the body. The top of the head is solid light brown and similar in color to the background color of the back. The sides of the snout and cheeks are even lighter in color. The belly ranges from cream to tan and has darker blotches. The dorsal scales are conspicuously keeled, the anal plate is single, and the snout has loreal scales (Fig. 11). Adults tend to darken with age. The young are similar in color to the adults but the tail tips are yellow or greenish-yellow.

Similar Species

Young copperheads may be confused with juvenile cottonmouths. Both may have yellowish tail tips. Cottonmouths have a dark band running through the eye, the dorsal crossbands are irregularly shaped and do not form hourglass or triangular blotches, and they do not have loreal scales.

Taxonomic Comments

Copperheads from the field station are usually considered to be of the subspecies *Agkistrodon contortrix contortrix*, the Southern Copperhead. Some individuals, however, show characteristics which may reflect influence from *Agkistrodon contortrix mokasen*, the Northern Copperhead.

General Comments

Most copperheads encountered locally are under 3 feet in length and individuals approaching 4 feet are rare. These snakes are terrestrial and primarily nocturnal but may be active by day. They are not uncommon around the field station ponds and creeks or on the adjacent forested hills. Their poison is hemolytic. Their bite is painful but there is only one confirmed death. A bite victim should always seek medical attention. They feed on large insects, frogs, lizards, snakes, birds, and small mammals. Small animals are swallowed alive. Larger prey is bitten, poisoned, and released, then tracked by its odor. Copperheads mate in the spring and fall. Litters of up to 20 or more young are born, not hatched, in late summer and early fall.


Juvenile Cottonmouth

COTTONMOUTH

Agkistrodon piscivorus (Lacepede, 1789)

Identification

This is a moderate to large, heavy-bodied, venomous snake. The pupils of the eyes are vertically elliptical and there is a heat sensitive loreal pit between the eye and the nostril. The head is very flat from the eyes to the tip of the snout and the rear of the head is obviously wider than the neck. Older adults may be dark brown or black and patternless, while younger adults and juveniles are conspicuously patterned. The pattern, if present, consists of irregular, wavy dark brown crossbands on a lighter background. The crossbands have both light tan and dark brown interiors. The top of the head varies from black to brown to tan and there is a dark brown or black band running through the eye to the back of the jaw. The belly is usually tan with a variety of dark and light brown blotches and the ventral surface of the tail is black. The young have bold, colorful patterns and yellow or greenish yellow tail tips. The dorsal scales are strongly keeled, the anal plate is single, and the snout does not possess loreal scales.

Similar Species

Young cottonmouths are often confused with juvenile copperheads. Both may have yellow tail tips. Copperheads do not have a dark band running through the eye to the jaw, the crossbands do not form obvious triangles or hourglasses, and they have loreal scales.

Taxonomic Comments

Field station Cottonmouths are considered to be of the subspecies *Agkistrodon piscivorus leucostoma,* the Western Cottonmouth.

General Comments

Mississippi residents usually call these snakes moccasins, water moccasins, or cottonmouth moccasins. Unfortunately, these names are also applied to harmless water snakes.

Warm weather night collecting at the field station by University of Mississippi field classes over a 30 year period almost never failed to observe at least one Cottonmouth. Keiser (1992) monitored field station amphibian and reptile populations during 1991-1992 and found Cottonmouths to be fourteen times more abundant in captures than the second most abundant snake species.

Most Cottonmouths encountered at the field station are under 3½ feet in length but much larger specimens (over 5 feet in length) are not rare in nearby areas. These snakes are commonly found around ponds, swamps, marshes, creeks, and springs but they are not uncommonly encountered on forested hill slopes and hilltops. They are mainly active at night in warm weather but may also be active during daylight hours. They are excellent swimmers and have no problems climbing into small trees to bask. They usually swim and move overland with their heads elevated.

Cottonmouth in threat posture

COTTONMOUTH Continued ..

Although some consider Cottonmouths to be aggressive, most individuals encountered at the field station either remain unmoving (perhaps to avoid attention), go into their "cottonmouth" bluffing postures, or rapidly retreat. They usually strike if a threat becomes obvious and escape routes are not available. The strikes themselves often appear intentionally inaccurate and are probably attempts to intimidate rather than attack a much larger human predator. Students, teachers, and researchers frequent the field station in large numbers and they carry on numerous activities that place them in the proximity of Cottonmouths. The absence of bites suggests that truly aggressive individuals are not abundant and the snakes tend to avoid encounters with humans. After all, a close encounter between a human and a snake often results in the death of the snake.

Despite any tendency of the snakes to be non-aggressive, some individuals will bite and the bite of a Cottonmouth is an extremely serious matter. Cottonmouth poison is hemolytic. It is a strong anticoagulant and it readily destroys red blood cells. Their bite is very painful and often results in loss of an appendage due to gangrene. Deaths are unusual but they do occur. **A bite victim should make it a high priority to seek medical attention as soon as possible!** Hospitalization is always necessary.

Cottonmouths are opportunistic feeders and feed on both carrion and live animals. Their prey includes crayfish, insects and other invertebrates, fish, aquatic salamanders, frogs and frog larvae, snakes, small alligators, small to medium size mammals, and birds. They typically hold large prey in their mouths until the venom can take effect. Small prey is swallowed alive.

Mating can occur during almost any warm month. Cottonmouths give birth to their young usually from August into October. Litters of 5 to 8 young are most common.

It should be noted that contrary to the opinion of many local residents, humans can come into contact with active cottonmouths during every month of the year in northern Mississippi. Basking cottonmouths can sometimes be seen even on sunny days following nights with below freezing temperatures. It is best to watch where one is stepping, sitting, or placing hands when in fields or woodlands regardless of the time of year.

TIMBER RATTLESNAKE

Crotalus horridus Linnaeus, 1758

Identification

This is a large, heavy-bodied, venomous snake. The pupils of the eyes are vertically elliptical and there is a heat sensitive loreal pit between the eye and the nostril. The head is flat from the eyes to the tip of the snout and the rear of the head is conspicuously wider than the neck. The head scales between the supraocular scales are small (Fig. 10A). Timber Rattlesnakes are light brown, tan, yellowish tan, or somewhat gray with black, chevron-shaped crossbands. There is usually a dull orange stripe running along the mid-dorsal region. The top of the head is tan or brown. A black stripe runs through the eye to the jaw line. The tail is black. The belly is grayish-white or cream in color with small black spots. The dorsal scales are strongly keeled, the anal plate is undivided, and the tail ends with a horny button or rattle. The young resemble the adults in coloration.

Similar Species

Timber Rattlesnakes are not likely to be confused with other species. Pigmy Rattlesnakes have not yet been recorded for Lafayette County but they do occur in neighboring counties and are a possible future addition to the field station fauna. Pigmy rattlers may have a mid-dorsal orange stripe and a rattle, but the general coloration is not similar and the scales between the supraocular scales are large rather than small (Fig. 10B). Despite local hearsay, Eastern Diamondback Rattlesnakes do not occur in northern Mississippi.

Taxonomic Comments

No subspecies are currently recognized.

General Comments

Timber Rattlesnakes are frequently called Canebrake Rattlesnakes. While these snakes do occur at the field station and in the surrounding forests, they are not frequently encountered by hunters and others traveling through Mississippi woodlands. These are very dangerous snakes and their venom is both hemolytic and neurotoxic. While they tend to be reluctant to bite humans, their bites are painful and deaths from their bites have occurred. If one is found in the field, leave it undisturbed and walk away from the area. **Bite victims should seek medical help as soon as possible.** Adult Timber Rattlesnakes may reach lengths of six feet or more. These snakes typically are most common in wild areas less frequented by humans but individuals have been taken on field station roads and the parking lot and also within the city limits of nearby Oxford.

They are nocturnal and mainly active at night. However, they may roam and hunt prey during daylight hours particularly during cool weather. They can climb into low trees and will not hesitate to enter water.

These snakes are mostly ambush-style predators although they will feed on carrion and occasionally stalk smaller prey. Mice are the preferred prey, but they will also prey upon shrews, moles, rats, rabbits, squirrels, raccoons, skunks and various bird species. Reptiles and even invertebrates may be

Timber Rattlesnake Cont....

taken occasionally. Small prey are swallowed alive. Large prey are bitten, released, and trailed by odor.
Mating can occur during the spring but usually occurs from July into October. Individuals usually do not mate every year. They typically give birth to litters of 5 to 20 young from late summer to October.

Rattlesnakes are born with a cornified button. A rattle segment is added every time they shed the outer layer of their epidermis. They will shed their skin two or more times yearly. Snakes with very long rattles tend to lose the terminal segments during locomotion. It is therefore not possible to age a rattler by counting the number of rattle segments.

EASTERN WORM SNAKE

Carphophis amoenus (Say, 1825)

Identification

This is a small, almost pencil size, rear-fanged snake. They are usually dark brown dorsally and pink or a uniform pinkish-orange on the belly. The belly colors extend over the lower caudal scales and thus can be seen when looking down on the snake. The scales are shiny and smooth, the anal plate is divided, and the tail ends in a spine. The head is small, not wider than the body, and the eyes are small. The young resemble the adults in color.

Similar Species

Ringneck snakes have dark dorsal scales and orange bellies but the scales are keeled and there are numerous black spots on the belly and a prominent light ring behind the head. Red-bellied Snakes may have uniform orange or red bellies and a dark dorsal coloration. However, their dorsal scales are keeled and their ventral colors do not extend over the lower back scales.

Taxonomic Comments

The subspecies found in Mississippi is *Carphophis amoenus helenae*, the Midwest Worm snake.

General Comments

Worm snakes only rarely exceed a foot in length. They are terrestrial burrowers and spend much time underground. Individuals are common within the forests of the field station and are often found under logs, bark, and trash piles in woodland and residential areas. They feed on slugs, snails, insect larvae, worms and even very small vertebrates such as juvenile salamanders. Breeding occurs in the spring and fall. Four or more eggs are deposited under bark piles or rotting logs in early to mid-summer and hatching takes place from August into October. These are gentle snakes that almost never bite humans when being handled. While little is known about their venom, these snakes are not currently considered dangerous to humans even if handled.

RINGNECK SNAKE

Diadophis punctatus (Linnaeus, 1766)

Identification

This is a small, slender-bodied, rear-fanged snake. They are usually dark gray to black dorsally with a prominent light colored neck band (collar) immediately behind the head. The collar may be interrupted at the mid-neck region. The belly is typically yellow-orange to yellow with numerous, conspicuous small black spots along the full length. The spots may be irregularly arranged or in pairs. The head is only slightly wider than the neck. The dorsal scales are smooth, the anal plate is divided, and they possess loreal scales. The young are similar to the adults in color.

Similar Species

Ringneck snakes may be confused with several field station species. They may be distinguished from Brown Snakes and Redbelly Snakes by the absence of belly spots and the presence of keeled scales. Southeastern Crowned Snakes are tan dorsally and lack belly spots and loreal scales. Rough Earth Snakes and Smooth Earth Snakes both lack spots on their bellies and have no neck band.

Taxonomic Comments

The subspecies found in Mississippi is *Diadophis punctatus stictogenys*, the Mississippi Ringneck Snake.

General Comments

Ringneck snakes only rarely reach 15 inches in length in north Mississippi. They are common at the field station and are most often found on forested hillsides under logs, boards, bark piles, or other ground litter. They feed on various invertebrates, particularly earthworms and insect larvae, and also on small salamanders, frogs, snakes, and lizards. Mating occurs during spring and fall months. Females usually deposit up to 10 or more eggs in piles of bark, rotting logs, or animal burrows and hatching usually occurs from July into September. These snakes are gentle and almost never bite when handled. Their bite is not currently considered harmful to humans.

MUD SNAKE

Farancia abacura (Holbrook, 1836)

Identification

This is a moderately large, robust, smooth and shiny scaled, rear-fanged snake. The dorsal colors are jet black with red bars extending from the belly onto the low sides. The belly is red with black, checkerboard-like blotches. The head is rounded and about as wide as the neck. The tail ends in a spine which has a sharp point in juveniles and a blunted point in adults. Young snakes resemble adults in coloration although the red bars typically extend higher on the sides. The anal plate is usually but not always divided.

Similar Species

No other field station snakes resemble Mud Snakes.

Taxonomic Comments

The subspecies found in north Mississippi is *Farancia abacura reinwardtii*, the Western Mud Snake.

General Comments

Mud Snakes may reach lengths of over 5 feet. Their main response when handled is to press their tail spine harmlessly into one's flesh. The spine has no venom and does not penetrate the skin. These snakes almost never bite when handled. They are infrequently encountered at the field station. They are usually found within or near ponds, marshes, and swamps. They burrow easily into shoreline mud and may inhabit animal burrows within or near their wetland habitats. They are active day and night and may occasionally wander a considerable distance from water.

They feed primarily on aquatic salamanders, tadpoles, and fish. Matings have been observed in late spring and early summer and nesting from mid-summer to early September. Females prepare a nest site, often in mats of shoreline vegetation including alligator nests. They usually lay 20 or more eggs and tend the eggs by coiling around them after oviposition. Hatchlings usually appear from August into October. Southerners often refer to these snakes as "hoop snakes" on the erroneous assumption that they bite their tails, form a circle, and roll around like a hoop. Others credit them (falsely, of course) with having killed the dead trees in a swamp by stinging the trees with their tail spines.

EASTERN HOGNOSE SNAKE

Heterodon platihinos Latreille, 1801

Identification

This is a medium size, very robust, rear-fanged snake. Color patterns are exceptionally variable in this species. Solid dark brown or black specimens are common in this area, but individuals also exhibit an array of blotch and background patterns with dorsal saddles or irregular blotches that may be black, brown, gray, reddish, and orange and background colors of tan, gray, or yellow-brown. The belly is also highly variable with gray or gray-brown mottling on a lighter gray or yellow-gray background. Some individuals have dark bellies without the mottling. The ventral surface of the tail is lighter than the belly. Perhaps the best morphological feature for identification is the upturned, keeled snout. The dorsal scales are keeled and the anal plate is divided. The young resemble the adults that have conspicuous patterns. The threat display of flattening the head and neck and hissing loudly is a diagnostic behavior as is its tendency to feign death when seriously disturbed.

Similar Species

The upturned snout, lack of a loreal pit, and round pupils will distinguish this snake from the heavy-bodied pit vipers known to occur at the field station. Some individuals can be easily confused with Pigmy Rattlesnakes which, although a likely addition, have yet to be found in or near the field station. Pigmy Rattlesnakes do not have the upturned snout and they possess a loreal pit, elliptical pupils, and a button or rattle.

Taxonomic Comments

No subspecies are currently recognized.

General Comments

Eastern Hognose Snakes rarely reach lengths of three feet. While not abundant, they may be found on mowed lawns, among the forbs and grasses of the pond levees and within the hillside forests of the field station. Bluffing and death feigning activities are characteristic and newly captured individuals almost never bite. Many Mississippians refer to these snakes as "puff adders." Hognose snakes feed mainly on toads and frogs but will also consume invertebrates and small reptiles, birds, and small mammals. Courtship and mating typically occur in the spring and 4 to up to 60 or more shelled eggs are deposited anytime from May into August. At least some females produce two clutches each season. Eggs are laid in depressions in loose soil, sawdust and bark piles, and sometimes in mammal burrows. Hatchlings usually appear from August into October.

PLAINBELLY WATER SNAKE

Nerodia erythrogaster (Forster, 1771)

Identification

This is a large, moderately robust, live-bearing snake. Most distinctive is the uniform cream or yellow color of the belly and ventral surface of the tail. Some individuals have dark edges on the belly scutes. The dorsum may be uniform black, gray-black or brown, have traces of pattern, or be boldly patterned. Juveniles are boldly patterned and the pattern becomes less obvious as they age. Large and older snakes are either uniformly dark colored or show only traces of pattern. The juvenile pattern consists of dark brown or black, somewhat square, saddles mid-dorsally alternating with more slender blotches on the sides. The side blotches are typically absent in the neck region. The dark blotches contrast with a lighter tan or reddish-brown background. The spaces between the dorsal blotches are similar in size and give the back a checkerboard appearance. The dorsal scales are keeled and the anal plate is divided.

Similar Species

Individuals with dorsal patterns are similar to the Northern Water Snake, *Nerodia sipedon*, which can be easily distinguished by their patterned belly scales and complete bands, rather than dorsal saddles, on the neck.

Taxonomic Comments

The subspecies at the field station is *Nerodia erythrogaster flavigaster*, the Yellowbelly Water Snake.

General Comments

Adult Plainbelly Water Snakes may occasionally reach lengths of nearly 5 feet. They are common around the ponds and ditches of the field station and are primarily nocturnal. Their main foods are fishes and frogs but aquatic salamanders and crawfish may also be consumed. Prey are swallowed alive. While these are not venomous snakes, they will attempt to bite viciously if handled. They also exude a foul smelling musk when disturbed. Courtship and mating occur from April into June. Pregnant females usually give birth to a few to more than 35 young between late July and early October.

DIAMONDBACK WATER SNAKE

Nerodia rhombifer (Hallowell, 1852)

Identification

This is a large, robust, live-bearing snake. The dorsal color is brown or gray-brown with black, or dark brown, more or less diamond-shaped, open-centered, chain-like blotches along the mid-back region. Most of the dorsal blotches are connected with black blotches on the sides. The belly is yellow or cream with numerous brown or black, often half moon-shaped blotches. The juveniles are similar to adults although the dark markings are more prominent. Many have tubercles under the chin. The scales are strongly keeled and the anal plate is divided.

Similar Species

This snake is not likely to be confused with other field station species. Black, open-centered, diamond-shaped, chain-like dorsal blotches and dark, half moon-shaped belly blotches are not patterns found in other field station water snakes or cottonmouths.

Taxonomic Comments

No subspecies are currently recognized.

General Comments

Adult Diamondback Water Snakes often reach lengths of 5 feet or more and large ones are especially heavy-bodied and big-headed. They tend to be nocturnal and are commonly found around the ponds and ditches of the field station, particularly at night. On cooler days, they forage during daylight hours. Their main foods are fishes and frogs, but crayfish, insects, snakes, and birds may be consumed occasionally. Prey are swallowed alive. Courtship and mating occur from April into May and from 8 to 60 or more young are born between July and the end of September. These snakes will bite viciously if handled and large individuals can cause wounds that bleed freely. They also exude a foul-smelling musk when handled.

NORTHERN WATER SNAKE

Nerodia sipedon (Linnaeus, 1758)

Identification

This is a medium size, moderately robust, live-bearing snake. The body blotches and background colors vary from individual to individual. The background dorsal color is most often light brown, gray-brown, or reddish-brown. Alternating dark, reddish-brown or brown, dark-edged bands on the anterior body gradually change to somewhat square dorsal blotches to the rear. The chin, throat, and belly are cream-colored with red-brown, half-moon blotches becoming more prevalent toward the rear. Juveniles are similar to the adults in color, but the patterns are more vivid in juveniles. Older adults tend to be much darker with less distinct patterns. The scales are strongly keeled and the anal plate is divided.

Similar Species

This snake is most likely to be confused with young Plainbelly Water Snakes. The bellies of these snakes, however, do not have blotches.

Taxonomic Comments

Nerodia sipedon pleuralis, the Midland Water Snake, is the subspecies at the field station.

General Comments

Adult Northern Water Snakes often reach lengths of 4 feet or more. They tend to be nocturnal in warm weather, but on cooler days, they forage during daylight hours. They are fairly common at the field station where they seem to prefer the marginal streams but can occasionally be found along the edges of field station ponds. Fish are the primary foods, both alive and as carrion. At the field station, they have been observed corralling fish with their body coils and eating them one at a time. On some occasions they consume crayfish, aquatic salamanders, and frogs. Courtship and mating occur from April to June. Pregnant females usually give birth from late August through September. Litters usually involve 20 to 40 or more young. These non-venomous snakes will vigorously attempt to bite if handled and bite wounds usually bleed profusely.

BROWN SNAKE

Storeria dekayi (Holbrook, 1836)

Identification

This is a small, slightly robust, live-bearing snake. The background dorsal color is brown or gray-brown. A light, usually tan, mid-dorsal stripe begins behind the head and fades out on the tail. Paired dark blotches border the sides of the stripe and may or may not connect across the stripe. Lateral dark blotches are interspersed below the dorsal dark blotches and may connect with them in some individuals. The belly is tan or cream and uniformly colored except for tiny black dots on the sides of the ventral scales. The light spot behind and below the eye is usually inconspicuous. The young are similar to the adults but considerably darker. Juveniles also possess a pale neck collar which may sometimes persist into the adult stages. The anal plate is divided, loreal scales are absent, and the dorsal scales are keeled and in 17 rows.

Similar Species

This snake is most likely to be confused with Redbelly Snakes but these have dorsal scales in 15 rows, usually a reddish, orange, or pink belly without tiny black spots, and the white spot behind and below the eye is more prominent. They may or may not have a mid-dorsal light stripe but if so, the stripe is not bordered by conspicuous, large dark blotches. Southeastern Crowned Snakes, Ringneck Snakes, and Eastern Worm Snakes do not have keeled dorsal scales. Smooth and Rough Earth Snakes have a loreal scale and lack large dorsal blotches and a mid-dorsal stripe.

Taxonomic Comments

Storeria dekayi wrightorum, the Midland Brown Snake, is the subspecies found at the field station.

General Comments

Adult Brown Snakes are small, terrestrial snakes which rarely exceed 15 inches in length. They are common in a variety of habitats at the field station and are most often found under boards and rotting logs and in mulch and bark piles. They often forage through leaf litter and, while primarily nocturnal, are often active in the daytime. Slugs, snails, earthworms, and insect larvae are the major prey animals, but adult insects, small fishes and frogs, and amphibian eggs are occasionally consumed. When handled by humans, these snake almost never bite. Courtship and mating are known to occur as early as February but usually take place in April and May. The young are born from June to September. Litter size probably averages around 12 or 13 young but much smaller and much larger litters have been reported.

REDBELLY SNAKE

Storeria occipitomaculata (Storer, 1839)

Identification

This is a small, slender to slightly robust, live-bearing snake. The dorsal color is highly variable. Tan, brown, and gray-brown are usual phases but dark brown, and rarely, black dorsa can occur. Typical individuals have a gray or tan mid-dorsal stripe and occasional specimens from this area will have red mid-dorsal stripes. Small black spots may border the stripe in some individuals. The head is dark with a conspicuous light spot below and behind the eye. A light neck spot or collar is often present. The belly is typically orange, reddish-orange, or light red and without dark spots or blotches. The anal plate is divided, the loreal scale is absent, and the dorsal scales are keeled and in 15 rows at mid-body. Juveniles resemble the adults in color.

Similar Species

Redbelly snakes are most likely to be confused with Brown Snakes but Brown Snakes have larger dark blotches bordering the mid-dorsal stripe and the blotches usually connect across the stripe. Also, the belly is tan or cream and uniformly colored except for tiny black dots on the sides of the ventral scales. Southeastern Crowned Snakes, Ringneck Snakes, Eastern Worm Snakes, do not have keeled dorsal scales. Smooth and Rough Earth Snakes have a loreal scale and lack a mid-dorsal stripe.

Taxonomic Comments

Two subspecies, *Storeria occipitomaculata occipitomaculata,* the Northern Redbelly Snake, and *Storeria occipitomaculata obscura,* the Florida Redbelly Snake, are reflected in characters shown by field station Redbelly Snakes.

General Comments

Adult Redbelly Snakes are small, terrestrial snakes which rarely exceed 14 inches in length. They occur in a variety of habitats at the field station and appear to be less common than Brown Snakes. They are often found under boards and rotting logs and in mulch and bark piles both within and near the forested hillsides. In warm weather, they forage in ground litter near dusk and at night. Slugs, snails, earthworms, and insect larvae are the major prey animals, but small frogs and salamanders are occasionally consumed. They are docile creatures and almost never bite when handled. Courtship and mating are known to occur during all warm months of the year. Litters, typically 8-10 young, are born from May through September. Larger and smaller litters are known.

WESTERN RIBBON SNAKE

Thamnophis proximus (Say, 1823)

Identification

This is a slender, long-tailed, live-bearing snake. These snakes have three conspicuous yellow or yellow-orange stripes, one mid-dorsal and two lateral. The stripes are on a black, brown, or olive-gray background. The lateral stripes are on scale rows 3 and 4, counting from the belly. The dark pigment on the low sides does not or only barely invades the ventral scutes. The belly is yellow and lacks spots and blotches. There are two prominent parietal spots on the head which are either in contact or fused into one. Eight supralabial scales are characteristic and these scales do not have black markings. The anal plate is single, the dorsal scales keeled, and the tail is long (about 1/3 of the total length) and narrow. Juveniles are similar to adults in appearance.

Similar Species

This snake is most likely to be confused with Eastern Ribbon Snakes which are also slender and have lateral yellow stripes on scale rows 3 and 4. However, the parietal spots are either absent or inconspicuous and the dark brown pigment on the low sides covers at least 40% of the ventral scales. There are also only 7 supralabials. Eastern Garter Snakes have heavier bodies, the lateral stripes are on scale rows 2 and 3, and the lip scales have vertical dark markings.

Taxonomic Comments

The subspecies found at the field station is *Thamnophis proximus proximus*, the Western Ribbon Snake.

General Comments

Adult Western Ribbon Snake adults probably average slightly less than three feet in length. They are primarily diurnal but can be found feeding around field station ponds at night. They prefer the vicinity of ponds, swamps, and marshes but will occasionally wander into nearby woodlands and grassy areas. Western Ribbon Snakes are seen only infrequently at the field station and are apparently far less abundant than Eastern Ribbon Snakes. They feed primarily on fish, amphibians, and their larvae, but will consume other small live vertebrates and, on occasions, carrion. Mating and courtship occur in late March, April, and May and females usually give birth to 10 to 30 or more young from June into October.

EASTERN RIBBON SNAKE

Thamnophis sauritus (Linnaeus, 1766)

Identification

This is a slender, long-tailed, live-bearing snake. These snakes have three conspicuous yellow, yellow-orange, or bluish-white stripes, one mid-dorsal and two lateral. The stripes are on a brown, or olive-gray background. Black spots may be between the dorsal and lateral rows. The lateral stripes are on scale rows 3 and 4, counting from the belly. The dark pigment on the low sides invades the ventral scutes and typically covers 40% or more of each scute. The belly is cream or light green and lacks spots and blotches. Parietal spots on the head are either absent or small, inconspicuous, and not in contact with each other. There are usually 7 supralabial scales and they do not have black markings. The anal plate is single, the dorsal scales keeled, and the tail is long (about 1/3 of the total length) and narrow. Juveniles are similar to adults in appearance.

Similar Species

This snake is most likely to be confused with Western Ribbon Snakes which are slender and have lateral yellow stripes on scale rows 3 and 4. However, on the western species, the parietal spots are conspicuous and fused, the dark brown pigment on the sides invades the scutes slightly or not at all, and there are usually 8 supralabials. Eastern Garter Snakes have heavier bodies, the lateral stripes are on scale rows 2 and 3, and the lip scales have vertical dark markings.

Taxonomic Comments

The subspecies found at the field station is *Thamnophis sauritus sauritus*, the Eastern Ribbon Snake.

General Comments

Adult Eastern Ribbon Snakes average less than three feet in length. They are primarily diurnal but may hunt prey at night. They are excellent swimmers and prefer the vicinity of ponds, swamps, and marshes but occasionally wander into nearby woodlands and grassy fields. Eastern Ribbon Snakes are seen frequently at the field station and are apparently more abundant than Western Ribbon Snakes. They feed primarily on larval and adult amphibians but will consume small invertebrates, particularly their larvae. Mating and courtship probably occur in the spring. Females typically give birth to ten or more young from July to early October.

COMMON GARTER SNAKE

Thamnophis sirtalis (Linnaeus, 1758)

Identification

This is a moderately robust, live-bearing snake. These snakes have three conspicuous yellow, brownish-yellow, or somewhat greenish-yellow stripes, one mid-dorsal and two lateral. The stripes are on a black, brown, or olive-gray background. Most individuals have two rows of black spots between the mid-dorsal and lateral stripes. These spots are obscure in many and absent in others. The lateral stripes are on scale rows 2 and 3, counting from the belly. The top and sides of the head are black, brown, or olive. Light colored paired spots may be absent or on the parietal scales. The supralabial scales are cream or greenish tan and edged by black pigment. The belly is cream or greenish-yellow with or without two rows of black spots. The dorsal scales are keeled and in 19-21 rows at mid-body. The anal plate is divided. Juvenile colors are similar to those of adults.

Similar Species

This snake is most likely to be confused with Western and Eastern Ribbon Snakes, but these are both exceptionally slender and long-tailed. Also, the lateral yellow stripes are on scale rows 3 and 4 and the supralabial scales do not have black edges in ribbon snakes.

Taxonomic Comments

The subspecies found at the field station is *Thamnophis sirtalis sirtalis*, the Eastern Garter Snake.

General Comments

Common Garter Snake adults are usually shorter than 2½ feet in length although larger individuals have been recorded. These snakes are seen frequently at the field station. They are primarily diurnal but will forage at night. Their preferred habitats usually include open, grassy areas bordering ponds, creeks, swamps, and marshes but they can be found in forested areas and fields some distance from water. They are excellent swimmers and do not hesitate to enter the water. Common Garter Snakes are one of the two field station snake species likely to be active on sunny warm afternoons following very cold winter mornings. Their diet include worms, slugs, snails, insects, fish, salamanders, frogs, many reptiles and birds and their eggs, small mammals, and, from time to time, carrion. There is some evidence that the saliva may have venomous constituents that may be lethal to small mammals and also somewhat toxic to humans. Mating and courtship occur sometime from March to June. Most females give birth to between 25 and 35 young from June into the fall months, but litter sizes over 100 are known.

SMOOTH EARTH SNAKE

Virginia valeriae Baird and Girard, 1853

Identification

This is a small, slightly robust, live-bearing snake with a small, cone-shaped head. They are usually gray-brown or brown with uniformly cream-colored bellies. Some individuals have tiny black spots along the back. The top of the head is colored like the body and the lips are lighter. The dorsal scales are typically smooth but if keels are present, they are weakly developed, inconspicuous, and almost never over the entire back and sides. There are usually 6 supralabials, two preoculars, two internasal scales, and 15 mid-body scale rows at mid-body. The anal plate is usually divided. Young snakes are similar to the adults in color.

Similar Species

This snake is most likely to be confused with the Rough Earth Snake, but this species has one preocular, one internasal, usually 5 supralabials, and the dorsal scales are prominently keeled for the full body length.

Taxonomic Comments

The subspecies at the field station is *Virginia valeriae elegans*, the Western Earth Snake.

General Comments

Smooth Earth Snake adults are usually a foot or less in total length. These snakes are less common at the field station than Rough Earth Snakes. They have a preference for hardwood and pine forests and nearby grassy fields. They burrow through loose soil and are usually found under boards, under and within rotting logs, and in piles of rotting bark. They are encountered above ground primarily at night and after heavy rains. Their diet focuses on earthworms but slugs and insect larvae and eggs will occasionally be ingested. Courtship and mating are known from March to April and the young are born from late June into September. Litter sizes of 6 or 7 young are common. These are gentle snakes and, if handled by humans, almost never bite.

ROUGH EARTH SNAKE

Virginia striatula (Linnaeus, 1766)

Identification

This is a small, slightly robust, live-bearing snake with a small, cone-shaped head. They are usually gray-brown or brown or with uniformly cream-colored bellies. The top of the head is colored like the body and the lips are lighter. Some individuals may have a vague light mark on the back of the head. The dorsal scales are conspicuously keeled and the anal plate is usually divided. There are 5 supralabials, one preocular, one internasal scale, and 17 dorsal scale rows at mid-body. Young snakes are similar to the adults in color.

Similar Species

This snake is most likely to be confused with the Smooth Earth Snake, but the latter has two preoculars, two internasals, and, usually, 6 supralabials. The dorsal scales are smooth or very weakly keeled.

Taxonomic Comments

No subspecies are presently recognized.

General Comments

Rough Earth Snake adults are 1 foot or less in total length. These snakes are common at the field station under boards and under and within loose soil, bark piles, and rotting logs. They are encountered above ground primarily at night and after heavy rains. They have a preference for open, pine-mixed hardwood and hardwood forests and the perimeters of adjacent fields. They eat earthworms, slugs, and insect larvae and eggs. Courtship and mating are known from March to June and the young are born from July into October. Litter sizes of 9 or 10 young are usual. These are gentle snakes and, if handled by humans, they almost never bite.

SNAKE SPECIES MOST LIKELY TO BE ADDED T0 THE UMFS FAUNA

Three species not included on the current list of UMFS species have ranges which suggest a likelihood of eventually being found within the field station boundaries.

The most likely of these is the Pigmy Rattlesnake, *Sistrurus miliarius*, a pit viper of the Family Crotalidae. Majure (1975) mapped northern Mississippi records only in the extreme northeast tier of counties. The range map of the Catalogue of American Amphibians and Reptiles (CAAR) species account (Palmer, 1978) and maps of various published field guides (e.g. Gibbons and Dorcas, 2005) show the field station to be within the predicted range. Despite years of collecting by herpetologists and students, there are no known specimens from Lafayette County and most published and museum records are well to the south or east. However, at least one Pigmy Rattlesnake is known from Union County not far to the northeast of the field station and another was collected by a University of Memphis biologist near the Mississippi River levee in DeSoto County. Also, habitats similar to those in which Pigmy Rattlesnakes have been taken occur at the field station. Thus the species is an anticipated possibility for the field station. The Pigmy Rattlesnake is illustrated in Fig. 71.

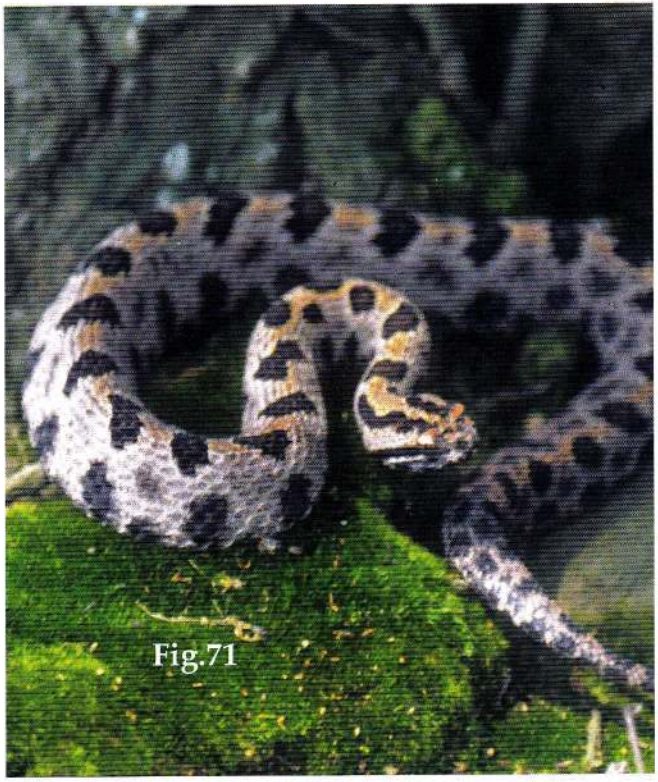


Fig.71

Another possibility is the Coachwhip, *Masticophis flagellum* (Family Colubridae). The range map of the CAAR species account (Wilson, 1973) shows locality records north and east of Lafayette County. Majure (1975) mapped north Mississippi records only in the northeastern tier of counties. The field station is well within the range in several recent field guides and both Cliburn (1965) and Lohoefener and Altig (1983) considered the distribution to be statewide. The field station is located near the mapped range edge for this species in Gibbons and Dorcas (2005). While there are no specimens from Lafayette County, I have collected an adult in adjacent Yalobusha County, 4 mi. north of Coffeeville. (This specimen was cataloged in the University of Mississippi herpetological collection as UMISS-2123.) There are also species-compatible habitats at the field station. The Coachwhip is illustrated in Fig. 72.

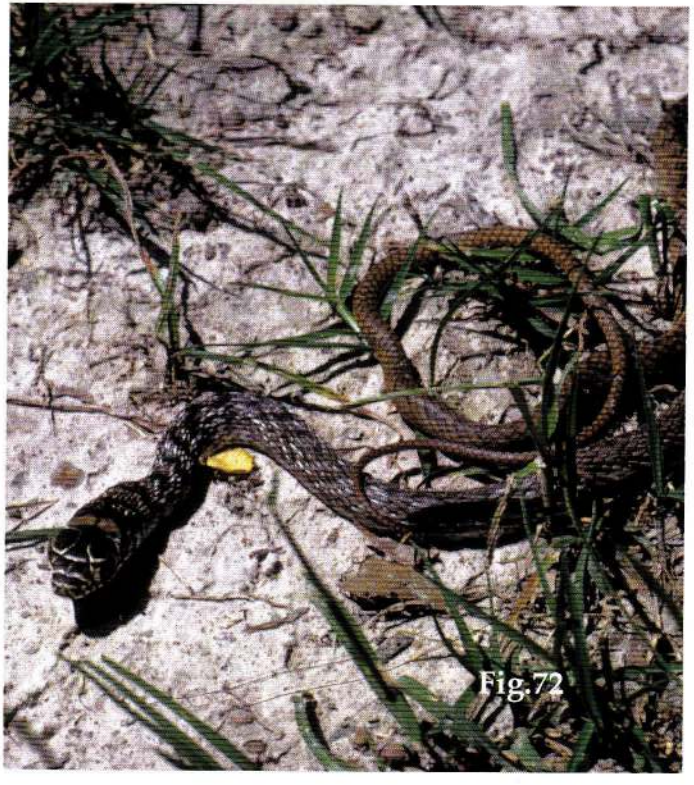
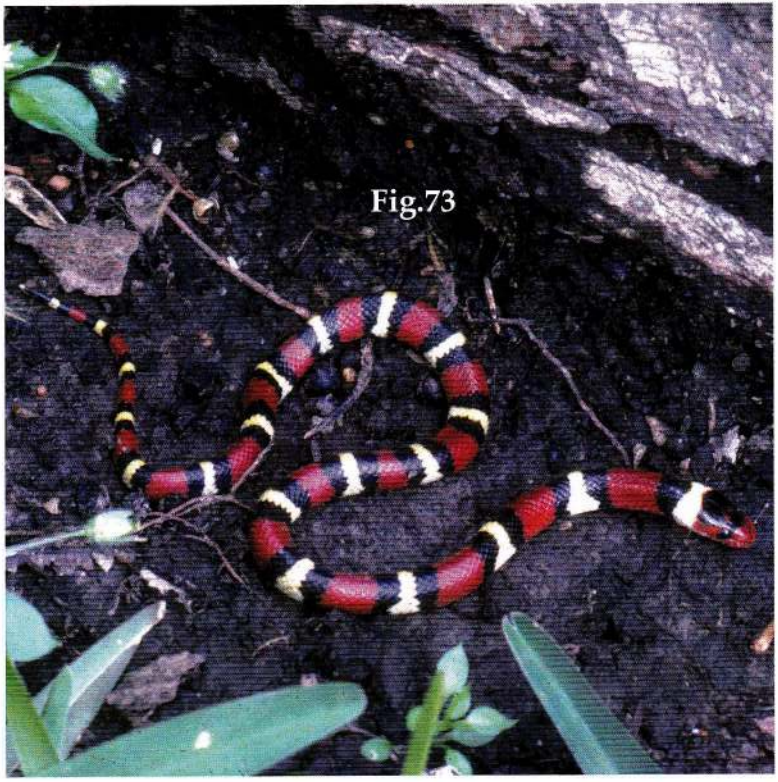


Fig.72



The eventual addition of the Scarlet Kingsnake, *Lampropeltis elapsoides* (Family Colubridae) to the station's faunal list is also in the realm of likelihood. Majure (1975) indicated no records of Scarlet Kingsnakes for Lafayette or any adjacent county. However, most field guides include this area in the range of the species and both Cliburn (1965) and Lohoefener and Altig, 1983 considered the range to be statewide. Williams (1988) listed no specimens near Lafayette County in his monograph on the American Milk Snake but drew a range edge that included the county. To the best of my knowledge, the closest museum records are from the vicinity of Starkville. The Scarlet Kingsnake is illustrated in Fig. 73.

In addition to the previous three species, two additional species cannot be discounted as future additions to the field station fauna. Gibbons and Dorcas (2004) mapped known locality records for Chickasaw and Carroll counties for Graham's Crayfish Snake, *Regina grahamii*, and Montgomery and Leflore county records for *Nerodia cyclopion*, the Mississippi Green Water Snake. Neither of these floodplain species are known from Lafayette County lands of the Little Tallahatchee floodplain but these wetlands have not been intensively collected. The station is only about 6 air miles south of the Little Tallahatchee floodplain and its drainage creeks eventually provide waters to the Little Tallahatchee River. Should one or both of these species occur in the floodplain, they might also be found at the field station. These snakes are pictured in Figures 74 and 75, respectively.


Fig.74


Fig.75

GLOSSARY OF TERMS AND ABBREVIATIONS

Adult A snake that is sexually mature.

Anterior Toward the head end of the body.

Cloaca The common chamber into which the digestive, excretory, and reproductive ducts discharge their contents

Dorsal Refers to the back region.

Dorsum The back. (Dorsa = plural)

Hemolytic Refers to destruction of red blood cells.

Hemorrhagic Refers to bleeding from ruptured blood vessels.

Internasal A scale on the dorsal head surface that is between the nasal scales and posterior to the rostral scale.

Juvenile A young snake that is not sexually mature.

Lateral Toward the side.

Loreal scale A scale between the nasal and preocular scales (See Fig. 1).

Mid-dorsal The mid-back region.

Mid-ventral The mid-belly region.

Neurotoxix	Refers to harming the nervous system tissues.
Ophiophagous	Refers to snake-eating predators.
Oviparous	A method of reproduction in which the young are encased in shells and deposited in a nest site.
Posterior	Toward the rear of the body.
Preocular	A scale on the anterior margin of the eye. Also refers to a color or position anterior to the eye
Postocular	A scale on the posterior margin of the eye. Also refers to a color or position posterior to the eye.
Rostrum	The snout
Scute	A large, flat scale.
Scutellation	A term referring to the scales of snakes.
Supralabials	Scales bordering the upper lip.
UMFS	Abbreviation for the University of Mississippi Field Station.
Taxonomy	The naming and classification of organisms according to scientifically accepted rules and guidelines.
Ventral	Refers to the belly region.
Venter	The belly.
Viviparous	A method of reproduction in which the embryos remain within the oviduct until their development allows them to be born. Calcareous or leather shells are not involved.

RECOMMENDED SOURCES ON SNAKES

Bartlett, R. D. and Patricia P. Bartlett. 2005. Guide and Reference to the Snakes of Eastern and Central North America (North of Mexico). University Press of Florida, Gainesville. 343 pp.

[*This is one of several good source books on snakes.*]

Campbell, Jonathan A. and Edmund D. Brodie, Eds. 1992. Biology of the Pitvipers. Selva, Tyler, Texas. 466 pp.

[*A multiple-authored, technical source on pit viper biology.*]

Conant, Roger and Joseph T. Collins. 1998. A Field Guide to Reptiles & Amphibians. Eastern and Central North America. Peterson Field Guides, Houghton Mifflin Co., Boston and New York. 616 pp.

[*This is an excellent, albeit somewhat outdated, field guide to the identification of U.S. frogs, other amphibians, and reptiles. It is available in most bookstores.*]

Ernst, Carl H. 1992. Venomous Reptiles of North America. Smithsonian Institution Press, Washington and London. 236 pp.

[*An excellent source of information on U.S. venomous snakes.*]

Ernst, Carl H. and Roger W. Barbour. 1989. Snakes of Eastern North America. George Mason University Press, Fairfax, Virginia. 282 pp.

[*This is a detailed, but older source on snakes found east of the Mississippi River.*]

Ernst, Carl H. And Evelyn M. Ernst. 2003. Snakes of the United States and Canada. Smithsonian Books, Washington and London. 668 pp.

[*For the snake enthusiast, this book is an indispensable source of detailed information on snakes of North America north of Mexico.*]

Gibbons, Whit and Mike Dorcas. 2005. Snakes of the Southeast. The University of Georgia Press, Athens and London. 253 pp.

[*For those becoming initially familiar with snakes, this is by far the best source available. The book applies only to southern U.S. snakes and it is superbly illustrated and easy to comprehend.*]

Gibbons, J. Whitfield and Michael E. Dorcas. 2004. North American Watersnakes. A Natural History. University of Oklahoma Press, Norman. 438 pp.

[*Another superb book, but more detailed than the previously listed Gibbons and Dorcas book and limited to water snakes.*]

Mattison, Chris. 2007. The New Encyclopedia of Snakes. Princeton University Press, Princeton and Oxford. 272 pps.

[A very good general reference on snakes.]

Powell, Robert, Joseph T. Collins, and Errol D. Hooper, Jr. 1998. A Key to Amphibians and Reptiles of the Continental United States and Canada. University of Kansas Press, Lawrence, Kansas. 131 pp.

[*This is one of the best identification keys available for the amphibians and reptiles of the U.S. and Canada. It is well-illustrated and easy to use.*]

Rossi, John V. and Roxanne Rossi. 2003. Snakes of the United States and Canada. Natural History and Care in Captivity. Krieger Publishing Company, Malabar, Florida. 520 pp.

[*This is an excellent source for those interested in keeping snakes in captivity.*]

Schuett, Gordon W., Mats Hoggren, Michael E. Douglas, and Harry W. Greene, Eds. 2002. Biology of the Vipers. Eagle Mountain Publishing Company, Eagle Mountain, Utah. 578 pp. + 16 pls.

[*A very detailed, technical source for information on pit viper biology.*]

Tennant, Alan. 2003. Snakes of North America. Eastern and Central Regions. Lone Star Books. Lanham, MD. 605 pp.

[*A fairly good sourcebook.*]

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Cook, Fannye A. 1962. Snakes of Mississippi, Revised Edition. Survey Bulletin. Mississippi Game and Fish Commission. Wildlife Museum. 45 pp.

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