

SALAMANDERS

OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION



Edmund D. Keiser, Professor of Biology

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About the Author

Many of us attribute our initial interest in nature to the guiding insights of a great teacher-naturalist, someone whose keen insights, drawn from long experience and kindly shared, revealed to us not only the complex intricacies of the natural world but also the sublime beauty of it. Dr. Edmund D. Keiser is such a teacher and naturalist. For more than 40 years, he has inquired about nature and shared his findings with students, colleagues, and the public—first as a high school teacher, and then as a college professor, department chair, and wildlife commissioner. His knowledge of the amphibian and reptile fauna of the southeastern United States is unsurpassed. His commitment to increasing everyone's understanding of nature is demonstrated anew with the publication of this booklet, the seventh in The University of Mississippi Field Station Series. With this and Dr. Keiser's other works, we are assured that many more people will come to appreciate the natural world.

Gary L. Miller
Professor and Chair
Department of Biology
The University of Mississippi

SALAMANDERS

OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

Salamanders are moist-skinned, scaleless, tailed amphibians. With few exceptions, they have four legs. Their feet have no claws.

Courtship and breeding may occur in damp land habitats or in the water. Fertilization is external in a few species but internal by means of spermatophores in most. Spermatophores are stalked gelatinous masses containing sperm. During courtship, a male will deposit a spermatophore on an underwater or humid habitat substrate. The female being courted will take the sperm mass into her cloaca. Sperm are stored internally and ova are fertilized as the eggs leave the cloaca.

Most salamanders deposit their eggs in the water, but terrestrial breeders lay their eggs in burrows or crevices or within decaying logs and humus. The eggs have gelatinous envelopes but lack shells. Moist habitats are necessary for their development.

Eggs in the water hatch into larvae, which have legs, tails, and external gills. Larvae also have tail fins and lack eyelids. Most feed on small aquatic invertebrates. Some species also consume algae and the eggs and larvae of aquatic vertebrates. Most larvae metamorphose by losing their fins and gills and developing eyelids. The juveniles live on land and eventually become sexually mature adults. They spend their adult years within terrestrial habitats except for seasonal returns to water for courtship and egg deposition.

Some larvae become sexually mature and breed without leaving the water or losing all of their larval features. These are usually said to be "neotenic." The eggs of land-breeding salamanders may bypass the free-living larval stage and hatch as small versions of adults.

Only in recent years have biologists appreciated the tremendous influence that salamanders have on woodland and aquatic ecosystems and on populations of other species of vertebrates. Salamander populations are very sensitive to environmental changes. Their populations respond rapidly when their habitats are altered by clear-cutting of timber and by environmental pollutants.

About 400 species of salamanders exist in the world with 127 of these being found within the United States and Canada (Petranka, 1998). In Mississippi, we have 29 species of salamanders representing seven families. A list of these is included in the appendix on Page 21.

Twelve species have been taken within the acreage enclosed by the boundaries of The University of Mississippi Field Station (UMFS). These are summarized on Page 3. The University of Mississippi is located in Oxford, which is in Lafayette County in northwest Mississippi. The Field Station is 11 miles from the campus on County Road 202 and is nestled in a 3-mile, V-shaped valley surrounded by wooded hills.

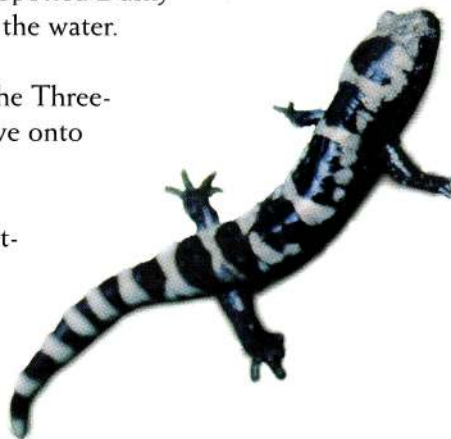


Of the 12 UMFS species, the Spotted Dusky Salamander (*Desmognathus fuscus conanti*), is known only from captures of introduced specimens. The Three-toed Amphiuma (*Amphiuma tridactylum*) has not been seen at the UMFS in more than 10 years. Its occurrence in lowland swamps elsewhere suggests that occasional individuals can be anticipated at the field station. The Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*) has not been seen at the field station in more than 20 years. The current existence of this species at the station is in doubt. The remaining nine species vary considerably in their population sizes and availability, but all can be observed by persons knowledgeable about species habits and habitats.

At the UMFS, only the Slimy Salamander, *Plethodon glutinosus*, is a true land breeder. This species does not lay eggs in the water or have aquatic larvae. The Spotted Dusky Salamander is known to deposit eggs in moist litter near or within the water.

Two species, the Western Lesser Siren (*Siren intermedia nettingi*) and the Three-toed Amphiuma are permanently aquatic although amphiumas move onto shorelines at night and overland during heavy rains.

The Central Newt (*Notophthalmus viridescens louisianensis*), has an aquatic larval stage, a terrestrial stage, and then an aquatic adult stage. Most larvae metamorphose and move onto land, where they spend several years as "efts." As sexual maturity approaches, individuals return to water and redevelop fins and other aquatic features. These aquatic adults remain in the water except for brief excursions onto land during rainy weather. Occasional larvae will skip the eft stage and become sexually mature, gilled adults that are said to be "neotenic."



The field station also has the Mole Salamander (*Ambystoma talpoideum*), a species in which individuals usually metamorphose into terrestrial adults, but some may occasionally retain larval features and reach sexual maturity in the water.

All other UMFS salamanders deposit eggs in the water, have aquatic larvae, and metamorphose into terrestrial adults that only rarely move away from moist habitats. These adults return to water seasonally for courtship and egg deposition.

Identification of UMFS Salamanders

Identification of juvenile and adult UMFS salamanders is not difficult. A checklist of the 12 species of the field station, an identification key, and individual accounts of species follow this section. The identification key, species accounts, and photographs can be used as aids in determining the species of individual salamanders. With these guides and a little practice, one can quickly learn to identify these 12 species.

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 (Pages 4-6), the user will begin at couplet 1 and compare the salamander to be identified with the two choices in the couplet. The choices will either lead to the vernacular name of the species in hand or

to the number of the next couplet to be considered. For example, if the specimen to be identified in couplet 1 has no hind limbs, it is a Western Lesser Siren. If it has hind limbs, the user will then proceed to couplet 2 and again decide which of the two choices applies. If properly utilized, the key should help the user identify most juvenile and adult salamanders encountered at the field station. It will not, however, permit identification of most larvae or aberrantly colored adults.

All identifications made by using the key should be verified by reading the species account descriptions and studying the color plates (Pages 7-18).

Technical terminology in this booklet is minimal. The few terms that are used in the keys and species accounts are defined in the glossary (Page 19). Scientific names are consistent with the utilization in Petranka (1998).

SALAMANDERS

OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

FAMILY AMBYSTOMATIDAE

Spotted Salamander	<i>Ambystoma maculatum</i> (Shaw)
Marbled Salamander	<i>Ambystoma opacum</i> (Gravenhorst)
Mole Salamander	<i>Ambystoma talpoideum</i> (Holbrook)
Eastern Tiger Salamander	<i>Ambystoma tigrinum tigrinum</i> (Green)

FAMILY AMPHIUMIDAE

Three-toed Amphiuma	<i>Amphiuma tridactylum</i> Cuvier
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FAMILY PLETHODONTIDAE

Spotted Dusky Salamander	<i>Desmognathus fuscus conanti</i> Rossman
Southern Two-lined Salamander	<i>Eurycea bislineata cirrigera</i> (Green)
Three-lined Salamander	<i>Eurycea longicauda guttolineata</i> (Holbrook)
Slimy Salamander	<i>Plethodon glutinosus</i> (Green)
Southern Red Salamander	<i>Pseudotriton ruber vioscai</i> Bishop

FAMILY SALAMANDRIDAE

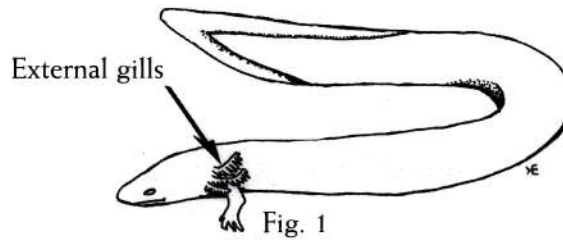
Central Newt	<i>Notophthalmus viridescens louisianensis</i> (Wolterstorff)
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FAMILY SIRENIDAE

Western Lesser Siren	<i>Siren intermedia nettingi</i> Goin
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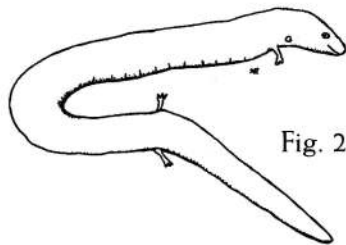
Key to the Adult Salamanders OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

1. Hind limbs absent (Fig 1) WESTERN LESSER SIREN



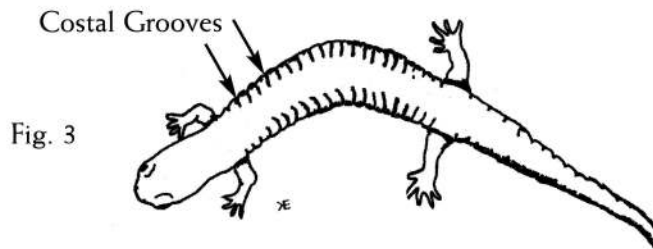
Hind limbs present 2

2. Body eel-like; paired limbs tiny (Fig. 2) THREE-TOED AMPHIUMA



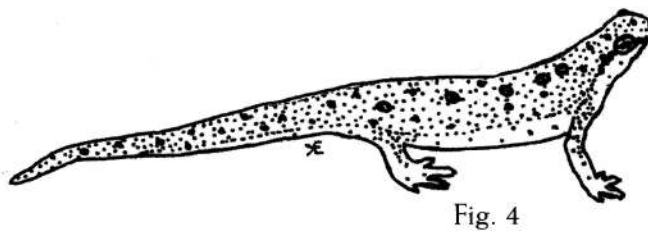
Body not eel-like; limbs not tiny 3

3. Costal grooves present (Fig. 3); skin not granular 6



Costal grooves absent; skin granular 4

4. Tail fins absent; terrestrial (Fig. 4) CENTRAL NEWT, eft stage



Tail fins present; aquatic (Fig. 5) 5

5. External gills absent (Fig. 5) CENTRAL NEWT, adult from eft

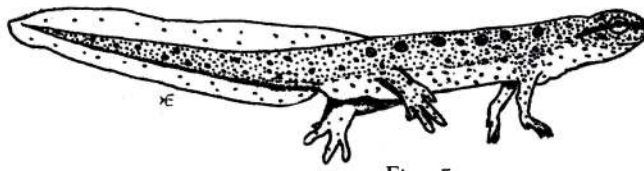


Fig. 5

External gills present (Fig. 6) CENTRAL NEWT, adult developed from larva

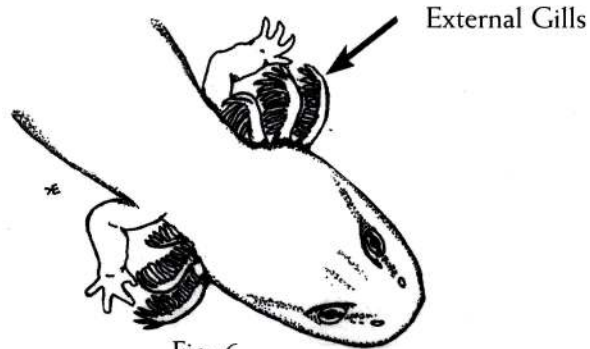


Fig. 6

6. Nasolabial grooves present (Fig. 7) 11

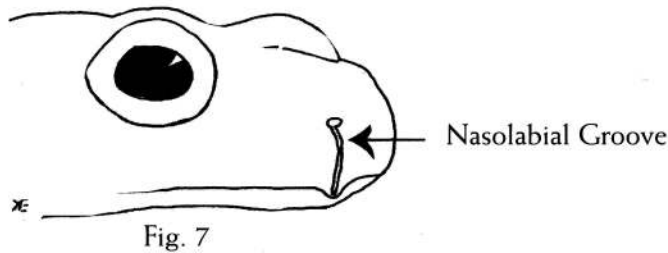


Fig. 7

Nasolabial grooves absent 7

7. Dorsum and tail lacking large spots or blotches of yellow, white, or silver-gray 8

Dorsum and tail with prominent, large spots or blotches of yellow, white, or silver gray 9

8. External gills absent MOLE SALAMANDER, terrestrial adult

External gills present (Fig. 8) MOLE SALAMANDER, neotenic adult

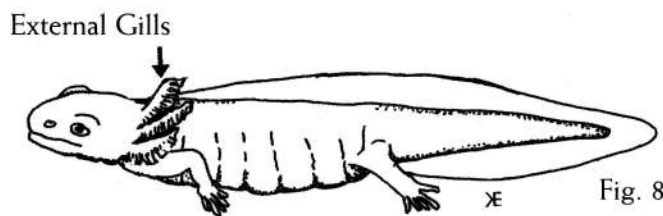
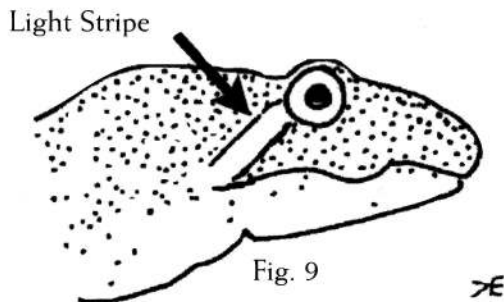


Fig. 8

9. Large, dull white or silver-gray, irregularly shaped cross-bands and/or blotches on the black dorsal surface of the back and tail **MARBLED SALAMANDER**
- Prominent spots or blotches of yellow on back and tail 10
10. Conspicuous large, yellow spots in two rows on the dorsal surface of the body and tail; spots on side of head behind eye are usually orange, occasionally yellow . . . **SPOTTED SALAMANDER**
- Large, variably shaped, yellow spots and/or blotches irregularly arranged on the dorsal and lateral surfaces of the body and tail. Spots are not in two rows. If present on side of head behind eye, spots are yellow and never orange **EASTERN TIGER SALAMANDER**
11. Body color brown, reddish-brown or dark red 12
- Body primarily yellow or black 13
12. No vague light line extending from rear of eye to angle of jaw. Body color reddish-brown to dark red with numerous small, scattered black spots. Spots larger and considerably more numerous in older adults **SOUTHERN RED SALAMANDER**
- A light line extends from behind the eye to the angle of the jaw (Fig. 9). Body color light to dark brown with two inconspicuous parallel rows of large, dull spots on the back and tail **SPOTTED DUSKY SALAMANDER**



13. Dorsum and venter uniformly black or black with tiny white spots. Spots are often heavily concentrated on the lower sides; tail round in cross-section. **SLIMY SALAMANDER**
- Dorsum predominantly yellow and with or without mid-dorsal black stripe. Venter pale yellow. Tail not round in cross-section 14
14. Body with three longitudinal black body stripes. A mid-dorsal black stripe is conspicuous **THREE-LINED SALAMANDER**
- Body with dorsolateral dark brown or black stripes but no well-defined mid-dorsal stripe. (a mid-dorsal stippling of small scattered black spots is evident in many specimens) **SOUTHERN TWO-LINED SALAMANDER**

THREE-TOED AMPHIUMA

Amphiuma tridactylum Cuvier

Identification

These are very large (Adult TL = 18"-36" or more), eel-shaped, aquatic salamanders that have four tiny limbs, each bearing only three toes. The dorsum is dark brown to slate in color and the venter is pale gray. The throat has a conspicuous dark patch. Adults have a single gill opening but lack external gill structures. The larvae have external gills for several weeks after hatching but otherwise resemble the adults in coloration and body shape.



Three-toed Amphiuma

Edmund D. Keiser

Comments

This presence of this species at The University of Mississippi Field Station is known from a single sight record during the last 10 years.

These salamanders are known to breed during winter and spring months. Their eggs are deposited in water, usually in underwater burrows. Eggs are covered by tough jelly-like envelopes and are laid in long strands that resemble rosary beads. Egg laying is usually during the spring months and hatching takes place several months later. The larvae have external gills during the first few weeks following hatching.

Amphiumas are primarily nocturnal. They spend their days within underwater burrows. They forage along the shorelines of ponds and swamps during the night. They feed on carrion and almost any invertebrate or vertebrate small enough to be consumed. They have been known to ingest swimming vertebrates such as mice. During heavy rains, individuals often wander considerable distances over land.

SPOTTED SALAMANDER

Ambystoma maculatum (Shaw)

Identification

These are large salamanders (TL = 6"-8" or more) with two prominent, uneven rows of large, rounded, yellow spots on each side of a black or slate-colored dorsum and tail. Similar orange (usually) or yellow (occasionally) spots are on the head and neck of most field station individuals. The belly is a lighter slate-gray and unspotted. There are 11-13 costal grooves.

The larvae are gilled and have tail fins. Their dorsal surfaces are brown or olive and have no conspicuous markings. The ventral surfaces are very light and lack dark pigmentation.



Spotted Salamander

Edmund D. Keiser

Comments

The terrestrial adults are most often encountered at the UMFS during periods of winter and early spring rains. On cold, rainy nights in January and February, adults move into woodland rain pools and shallow permanent ponds. The ponds and pools are typically fishless or have only small fish species. Courtship and egg laying occur in the water. Occasionally, egg masses can be found in field station ponds that harbor larger fish species including largemouth bass. Eggs are contained in a firm, jelly-like mass that is either clear or milky in color. By late February, many of the field station ponds will contain these egg masses.

Hatching occurs several weeks or more after egg deposition. The larvae remain in the ponds for several months. They feed on small aquatic invertebrates.

Small brown metamorphosing individuals still showing black gill stumps tend to leave the ponds in waves during late May, June, and early July. The waves correspond to periods of summer rainfall. Tiny pale spots begin to appear at metamorphosis, but these will not be prominent for some time.

The metamorphosed juveniles soon move into the forests where they will eventually become sexually mature adults. The terrestrial young and adults feed on a variety of invertebrates that exist in the soil and leaf litter. Much of the year is spent in burrows under rotting logs and leaf litter.

MARBLED SALAMANDER

Ambystoma opacum (Gravenhorst)

Identification

These are moderate-sized (Adult TL = 4"-4.75" or more), stout-bodied salamanders. The dorsal color is black with conspicuous silver-gray (females) or white (males), irregularly shaped blotches or cross-bands on the head, body, and tail. The belly is black. There are 11 or 12 costal grooves.

Larvae have bushy external gills and prominent tail fins extending dorsally almost to the level of the forelimbs. They are gray-black or brown and lightly flecked with tiny white spots. There is often a row of light spots on the low side, and the throat is usually darkened with pigment. Older larvae may become slightly mottled. Recently metamorphosed young do not have the silver-gray or white markings characteristic of adults.

Comments

The terrestrial adults are most often encountered during or immediately after periods of fall, winter, and spring rains. Courtship and breeding typically occur during the fall months. At the field station, nests are found in late fall and early winter under rotting leaf litter, logs, or boards in low forested areas that are subject to inundation by rising waters. Most, but not all, females remain with their eggs after deposition.

Eggs begin development immediately, but hatching will not occur until the site is flooded by rising waters. Some females remain with their eggs until they hatch.

Hatching occurs within two weeks after deposition. The gilled larvae feed on small aquatic invertebrates and on the larvae of other amphibians.

Metamorphs emerge from ponds on rainy nights during spring. The silver or white blotches characteristic of juveniles and adults develop gradually over the next two to six weeks. Juveniles and adults are primarily lowland deciduous forest or adjacent pine-mixed hardwood forest hillside inhabitants. They usually occupy underground burrows under some sort of cover, most frequently a rotting log. They feed mostly on small invertebrates.



Marbled Salamander

Edmund D. Keiser

MOLE SALAMANDER

Ambystoma talpoideum (Holbrook)

Identification

These are moderate-sized (Adult TL = 3"-4"), stumpy-bodied salamanders. The head appears large for the short body and short tail. The tail length is typically less than 37 percent of the snout-vent length. There are 10 or 11 costal grooves. Terrestrial and neotenic adults are known at the UMFS.

Terrestrial adults live on land but move into the water during the breeding season. Neotenic adults are aquatic adults that achieved sexual maturity while still retaining many of their larval features. Neotenic adults have gills, tail fins, and mid-ventral stripes. The dorsal color of terrestrial and aquatic adults may be dark brown, slate gray, or black. These colors may be uniform or mottled with various shades. Well-defined large spots and blotches are absent. Inconspicuous pale gray or cream flecks are usually present on the back and sides. The belly color of terrestrial adults is usually similar to that on the low sides or back. Neotenic adults typically have a mid-ventral dark stripe, often purple-brown, on a dark cream, brown, or slate background.



Mole Salamander

Edmund D. Keiser

The older larvae have gills, broad tail fins, and stocky bodies. They often resemble adults in dorsal coloration but have pale to dark cream bellies with one to three longitudinal dark stripes.

Comments

This is a common species at the UMFS. They are often found under logs and other cover objects during or immediately after periods of late fall, winter, and spring rains. A drift fence in the northwest end captured more than 2,600 individuals during a 15-month period in 1991-92. Larvae and occasional neotenic adults may be found throughout the year in shallow, heavily vegetated ponds or pools having small fish species or none at all. In years past, some shallow ponds have been so full of large larvae that single sweeps with a dipnet would capture 50 or more individuals!

Terrestrial adults move into breeding habitats (ponds, rain pools, and roadside ditches) at night during winter periods of heavy rain and near-freezing temperatures. Courtship and breeding occur in the water. Eggs are usually attached in small, jelly-like masses to underwater objects. Occasionally, single eggs or small masses can be found in damp litter under cover objects near but not within the water.

The larval period lasts several months or more. Larvae feed on aquatic invertebrates but will ingest vertebrate eggs and larvae. Metamorphs leave field station ponds as early as mid-March, but most leave the ponds during the late spring and summer months. By the fall months, few remain. Some larvae overwinter in the ponds and move onto land in late winter or early spring. Others may become gilled, sexually mature neotenes and remain in the ponds indefinitely.

Terrestrial juveniles and adults spend much of the year in underground burrows in the nearby lowland and hill-side forests. Adults feed primarily on small invertebrates.

EASTERN TIGER SALAMANDER

Ambystoma tigrinum tigrinum (Green)

Identification

This is the **largest terrestrial salamander** in Mississippi (Adult TL = 7"-8" or more). Most adults are dark brown, olive, slate, or black dorsally with **highly irregular, dull yellow blotches and spots scattered over the head, body, and tail**. The belly is a lighter shade of olive-yellow and these colors usually extend onto the sides. Costal grooves usually number 12 or 13 on each side.

The larvae have broad heads, external gills, and tail fins that extend onto the back. Older larvae are olive to dark brown dorsally and a lighter cream color ventrally. Black dorsal spots are often present, but yellow spots and blotches are absent. **The toes are broad at the base and pointed toward the tips.** (They are cylindrical in larvae likely to be confused with this species.)

Comments

Tiger Salamanders are listed for the UMFS on the basis of several larvae that were among a large series of salamanders collected at the field station and on The University of Mississippi campus in nearby Oxford more than 25 years ago. These larvae were unfortunately combined into a container by someone unfamiliar with the importance of proper locality data. The collector was subsequently able to verify the two localities but was unable to determine whether the tiger salamanders came from one or both localities. The University of Mississippi campus pond was eliminated years ago and there have been no known collections of tiger salamanders on the campus or at the UMFS since that time.

Tiger salamanders are rare in north Mississippi, but they have been found within Oxford and in other parts of Lafayette County as recently as 1997. Their existence at the field station remains a possibility.

Eastern Tiger Salamanders breed during the winter and spring months in small permanent ponds, large rain pools, and roadside water-filled ditches. Egg masses are attached to underwater vegetation and debris. Larvae feed on a variety of invertebrates and on the eggs and larvae of aquatic vertebrates. They may metamorphose during the spring



Eastern Tiger Salamander

Edmund D. Keiser

or summer following hatching or overwinter in the water for one or more years. Neotenic adults are known elsewhere, but not at the UMFS. Juveniles and adults live in burrows under rotting logs, log piles, and other debris and may be found in fields and woodlands. Adults feed on invertebrates and small vertebrates.

SPOTTED DUSKY SALAMANDER

Desmognathus fuscus conanti Rossman

Identification

These are medium-sized (adult TL = 3"-5"), light to dark brown salamanders that have a dorsal pattern of two parallel rows of six to eight dull, golden, or tan spots on the back and tail. On many individuals, the spots may fuse into a line with zig-zagged or wavy outer edges. Very old adults are dark with little evidence of the spots. The ventral surface of the body and tail is cream-colored but may be mottled with dark markings. A light line extends from behind the eye downward to the angle of the jaw. There are 14 costal grooves.



Spotted Dusky Salamander

Edmund D. Keiser

Larvae have external gills and are usually a mottled brown with 6-8 pairs of light spots on the back and tail. There may be a dark lateral stripe along the upper sides of the body.

Taxonomic Comment

Some authors assign full species status (= *Desmognathus conanti* Rossman) to this subspecies.

Comments

Spotted Dusky Salamanders at the UMFS are known only from a single accidental release of several Tishomingo County specimens from a field container. The number of individuals that escaped is not known. Two of the released specimens have since been seen along the margins of ponds in the northwest end. There is no evidence of breeding or egg-deposition at the station. This species is not known to occur elsewhere in Lafayette County.

Adult dusky salamanders are terrestrial but typically found within or very near water. In northeastern Mississippi, they appear to thrive in very damp leaf litter and under various cover objects along the edges of ponds, sluggish streams and swamps, and in rocky areas below waterfalls. Courtship and egg laying are closely associated with water, but not necessarily within it. Small clusters of eggs may be attached under cover objects on mud flats or in very shallow water. The female remains with the eggs. Very little is known about seasonal timing of egg deposition and development of embryos and larvae in Mississippi. Larvae have gills and live in the water or in nearby wet leaf litter. Both larvae and adults forage for small invertebrates on land and in the water.

SOUTHERN TWO-LINED SALAMANDER

Eurycea bislineata cirrigera (Green)

Identification

These are medium-sized (adult TL = 2"-4" or more), slender salamanders that are usually common within or near UMFS springs and seeps and their associated shallow pools or ponds.

Their dorsal and lateral surfaces are dull yellow or greenish-yellow and sprinkled with fine black spots from the head to the tail. The spots do not form a mid dorsal stripe. A lateral black stripe extends from behind the eye, along the body and onto the side of the tail. This stripe may extend from high on the back to the belly in older specimens. The venter is usually dull yellow or greenish-yellow. There are 14 costal grooves. Juveniles and adults resemble young three-lined salamanders but can be easily separated by their shorter tails and the absence of a distinct mid-dorsal black stripe.

Older larvae have tail fins, external gills, and streamlined bodies. The yellow colors are evident but paler than in adults. The lateral stripes vary in intensity but are usually evident. Mid-dorsal black flecks may be present but do not form a stripe. The dorsal border of the low tail fin terminates at the level of the rear edge of the hind limbs.

Taxonomic Comment

Some authorities refer to this salamander as *Eurycea cirrigera* (Green).

Comments

Two-lined Salamanders are among the more frequently encountered salamanders at the UMFS.

Juveniles and adults are most common under leaf litter and cover objects within and adjacent to the springs. They seldom occur along the boundaries of ponds and small swamps that are not associated with a spring or seep. Only occasionally are individuals located under logs and litter on the forested hillsides.



Southern Two-lined Salamander

Edmund D. Keiser

At the field station, mating is known to occur during the fall, winter, and spring. Eggs can be found from March into the early summer months. Eggs are attached in clusters under cover objects in or over flowing water or in masses of wet leaf litter within flowing springs. Females remain near their egg clusters until after hatching. Hatching occurs several weeks or more following egg deposition. Nests with hatchlings emerging can be found from late spring through July. Larvae feed on tiny invertebrates living on the aquatic substrate. Metamorphosis usually occurs 1-1½ years following hatching. The metamorphosed juveniles resemble adults in coloration although the yellow colors are usually paler and the lateral stripes are considerably narrower and less well-defined. Juveniles and adults feed on small substrate and leaf litter invertebrates. Adults are active during all months of the year. They are primarily nocturnal.

THREE-LINED SALAMANDER

Eurycea guttolineata (Holbrook)

Identification

These are medium-sized (adult TL = 4"-6" or more), slender, noticeably long-tailed salamanders. Juveniles and adults can be easily recognized by their **three black body stripes on a yellow background color**. The prominent mid-dorsal stripe may be continuous or broken into small segments. It begins on the neck and extends to the tail base. The belly is pale yellow and usually mottled with flecks or spots of gray or black. They have 13 or 14 costal grooves. The longer tail and mid-dorsal black stripe will distinguish this species from the similarly colored Southern two-lined salamander.

Older larvae have tail fins, external gills, and streamlined bodies. The dorsal portion of the low tail fin terminates at the level of the hind limbs. The mid-dorsal stripe is usually indicated as a series of closely positioned irregular spots.



Three-lined Salamander Edmund D. Keiser

Taxonomic Comment

Some recent published sources refer to this salamander as *Eurycea longicauda guttolineata* (Holbrook).

Comments

Three-lined Salamanders are among the more frequently encountered salamanders at the UMFS.

Juveniles and adults are most common under leaf litter and cover objects within and adjacent to the springs. They also occur along the boundaries of many ponds, ditches, seeps, and small swamps and may sometimes be located under logs and litter on the forested hillsides. Breeding usually takes place in the fall months in the shallow waters of field station springs and spring ponds, but seeps and swamp pond margins may also suffice. Eggs are attached under cover objects within these waters. Clutches are commonly found during the winter months.

The larval period lasts 3½-6 months or longer. Gilled larvae may be taken in the spring ponds during most months of the year. Metamorphs are most common during late spring.

Larvae feed on small aquatic invertebrates. Juveniles and adults forage in moist substrate and leaf litter for suitable invertebrates. Adults are primarily nocturnal. They are active during all months of the year.

SLIMY SALAMANDER

Plethodon glutinosus (Green)

Identification

These are large (adult TL = 4.5"-6" or more), black salamanders that have numerous irregular small white spots and flecks scattered over the head, body, and tail. On some UMFS individuals, the spots on the low sides are exceptionally numerous and dense. The ventral surfaces are black but slightly paler than the dorsum. Costal grooves number 15 or 16. The tail is rounded in cross-section and tapers to a point distally. The young resemble the adults. There is no aquatic larval stage.



Slimy Salamander

Edmund D. Keiser

Taxonomic Comment

Some authorities consider Mississippi populations to represent a distinct species, *Plethodon mississippi* Highton. The common name for these salamanders is then modified to "Mississippi Slimy Salamander."

Comments

The Slimy Salamander is named because of the glue-like skin secretions released by the tail when they are handled. These salamanders are widespread and exceptionally abundant at the UMFS.

They are woodland inhabitants, and individuals can be found from the hilltops to the lowlands. They also can be found in habitats peripheral to woodlands. Individuals are easily located by turning logs or cover objects. Slimy Salamanders are primarily nocturnal but are often active during the day, particularly in rainy weather. Mating takes place on land in the spring and fall. Eggs are laid in moist land habitats during late summer and early fall. Hatching takes place about two months after egg deposition. The young are small versions of the adults when they hatch. Juveniles and adults feed on small terrestrial invertebrates.

SOUTHERN RED SALAMANDER

Pseudotriton ruber vioscai Bishop

Identification

These are large (adult TL = 4"-5" or over), moderately stout-bodied, short-tailed salamanders. Coloration is age-dependent. Adults are shades of red, reddish-purple, or reddish-brown with numerous scattered black spots on the head, back, and sides. The venter is similar to the back but lighter in color. Black spots invade the ventral surfaces. Old individuals have many more black spots and are very dark in appearance. Juveniles and subadults may be brown, yellow, or bright red with scattered black spots. The iris of the eye is dull yellow in most specimens. There are 16 or 17 costal grooves.

The streamlined brown or reddish-brown larvae have external gills and low tail fins.

Comments

Southern Red Salamanders are seen occasionally at the UMFS within and near the springs, spring ponds, and seepage areas of the valley lowlands. Rarely are more than two or three seen during a single day of field work. Very little is known about the reproductive patterns for this

species. Eggs are deposited in springs or seepage during the fall or winter months. Females usually remain with the nests until hatching, which occurs two or three months after egg deposition. The larval period lasts from one to several years. Larvae may be collected in the UMFS spring ponds during any month of the year. Juveniles and adults usually live in burrows under forest or streamside cover and feed on a variety of invertebrates and, occasionally, small amphibians.



Southern Red Salamander

Edmund D. Keiser

CENTRAL NEWT

Notophthalmus viridescens louisianensis (Wolterstorff)

Identification

These are moderate size (adult TL = 2"-4") salamanders which have an aquatic larval stage, terrestrial eft phase, and an aquatic adult stage.

Adults are usually reddish-brown or olive brown dorsally with numerous small, scattered black flecks. Many have small red spots bordered by black. There is often a black lateral stripe extending along the side of the head and snout. The venter is yellow or pale orange and evenly stippled with scattered black flecks. The skin is granular but less so than in the eft stage. There

are conspicuous tail fins, and costal grooves are not evident. Adults that have returned to water after a land existence lack external gills. Some larvae will skip the land stage and achieve sexual maturity in the water. Such adults, uncommon at UMFS, will have external gills.



Central Newt Aquatic Adult

Edmund D. Keiser

The terrestrial eft is small (1 1/4"-3"), granular skinned, and has no fins or external gills. There are no costal grooves. The head has raised parallel ridges between the eyes. The dorsum is dull reddish-brown, dark brown, or olive-brown with scattered black spots and flecks. Black-bordered red spots may also be present. Ventral surfaces are pale yellow or orange with small, evenly spaced black spots.

The larvae have external gills and high tail fins extending onto the rear of the back. They are various shades of brown dorsally and much paler on the belly. There are numerous black spots scattered over the fins, body, and venter. Older larvae possess a conspicuous dark stripe that extends from behind the eye to the snout.



Central Newt Eft Stage

Edmund D. Keiser

Comments

Following hatching, Central Newts have an aquatic gilled larval stage. Most larvae will metamorphose and leave the water within two to six months of hatching. Metamorphs usually move onto land during July and August at the UMFS. These soon become terrestrial efts. Efts live in adjacent woodlands and peripheral habitats under logs, bark, or leaf litter. The eft stage may last two or more years. When approaching maturity, these salamanders move toward breeding ponds and eventually

enter the water. Sexual maturity is attained around the time of arrival at the pond. The aquatic adults develop tail fins and remain in their aquatic habitats except for brief forays on land during rainy weather. On rare occasions, dipnetting in field station ponds will uncover a gilled adult. These developed sexual maturity directly from the larval stage. Adults are usually found in ponds that have considerable aquatic vegetation. Ponds with larger fish species may be occupied if submerged aquatic plants are abundant. Skin toxins enable these animals a degree of protection from fish predators. Newts feed on small invertebrates and on the eggs and larvae of other amphibian species.

WESTERN LESSER SIREN

Siren intermedia nettingi Goin

Identification

These are large (adult TL = 7"-18" or more), eel-shaped, aquatic salamanders with tail fins, external gills, well-developed forelimbs, and no hindlimbs. The dorsal colors are slate gray to bluish-black. The venter is similar but lighter. There are numerous black or brown spots and flecks scattered over the head, body, and tail. The lateral margins of the jaws and cheeks are light cream and the jaws are covered by horny sheaths. There are 31 to 38 costal grooves.

Larvae are similar in shape but have more extensive dorsal fins, white lateral stripes, and yellow or red bands on the head.

Comments

Western Lesser Sirens are occasionally seen in the ponds and adjacent wetland swampy areas of the UMFS. They are known to burrow into the mud when ponds are drained or when dried by summer heat. They are most common in field station ponds having considerable submerged vegetation.



Western Lesser Siren

Edmund D. Keiser

Very little is known about the reproductive habits of sirens. Eggs are sometimes deposited singly or in masses within small depressions on the bottoms of ponds. They also have been found in pond bottom debris. Clutches may consist of more than 200 eggs. Juvenile and adult sirens are primarily nocturnal, typically remaining in their underwater burrows during the day. Sirens can best be seen at the field station by moving slowly around the margins of vegetation-choked, clear water ponds at night and searching carefully with a bright light. They are rarely seen when ponds are drained because of their tendencies to burrow into pond bottoms. Sirens feed on algae and various aquatic invertebrates.

Glossary of Terms and Abbreviations

Adult	A salamander that is sexually mature.
Anterior	Toward the head end of the body.
Costal groove	A deep, vertical groove that indicates a rib position. Conspicuous grooves between the hind limb and forelimb are counted.
Dorsal	Refers to the back region.
Dorsum	The back of a salamander.
External gills	Filamentous respiratory structures extending outward from behind the head. These are reabsorbed at metamorphosis.
Hatchling	The stage where the young larva emerges from the jelly envelopes that surround the egg.
Juvenile	A young, post-larval individual that has not reached sexual maturity.
Larva	The post-hatching stage of a salamander. Larvae have gills and tail fins and move and feed within the aquatic habitat.
Lateral	Toward the side.
Metamorph	A salamander that is losing its larval features and moving onto land. This is between the larval and juvenile stages.
Mid-dorsal	The middle of the back region.
Mid-ventral	The middle of the belly region.
Nasolabial groove	A depression extending from the nostril opening to the upper lip.
Neoteny	Attainment of sexual maturity while still retaining larval features.
Neotene	An individual that has become sexually mature while remaining aquatic and retaining larval features.
Posterior	Toward the rear of the body or tail.
TL	TL = "total length." Measured from the end of the snout to the tip of the tail.
UMFS	Abbreviation for The University of Mississippi Field Station.
Ventral	Refers to the belly region.
Venter	The belly of a salamander.

Recommended Sources on Salamanders

Bishop, Sherman C. 1943. *Handbook of salamanders*. Comstock Publishing Company, Cornell University Press, Ithaca, N.Y. 555 pp.

[This book is an older but superb source of detailed information on salamanders of the United States. It was reprinted in 1994 as a Comstock Classic Handbook.]

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, lavishly illustrated field guide to the identification of U.S. salamanders, other amphibians, and reptiles. It is available in most bookstores.]

Duellman, William E. and Linda Trueb. 1986. *Biology of amphibians*. McGraw-Hill, New York. 670 pp.

[A superb source on the general biology of salamanders and other amphibians.]

Petranka, James W. 1998. *Salamanders of the United States and Canada*. Smithsonian Institution Press, Washington and London. 587 pp.

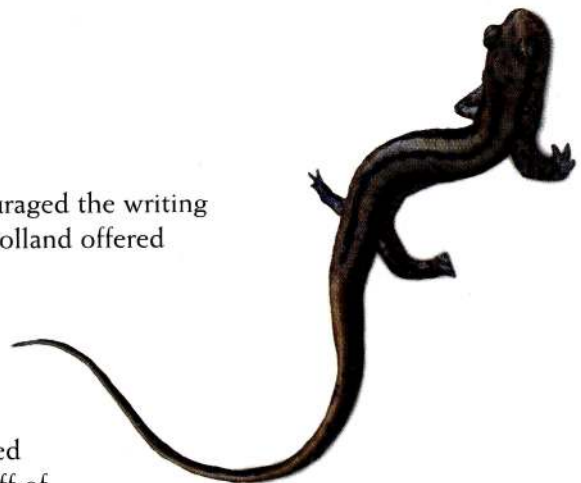
[This recent book is the most detailed work yet on the salamanders of the United States. It is indispensable to anyone interested in salamanders.]

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.]

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Appendix

THE SALAMANDERS OF MISSISSIPPI

FAMILY AMBYSTOMATIDAE

Spotted Salamander	<i>Ambystoma maculatum</i> (Shaw)
Marbled Salamander	<i>Ambystoma opacum</i> (Gravenhorst)
Mole Salamander	<i>Ambystoma talpoideum</i> (Holbrook)
Smallmouth Salamander	<i>Ambystoma texanum</i> (Matthes)
Eastern Tiger Salamander	<i>Ambystoma tigrinum tigrinum</i> (Green)

FAMILY AMPHIUMIDAE

Two-toed Amphiuma	<i>Amphiuma means</i> Garden
One-toed Amphiuma	<i>Amphiuma pholeter</i> Neill
Three-toed Amphiuma	<i>Amphiuma tridactylum</i> Cuvier

FAMILY CRYPTOBRANCHIDAE

Eastern Hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i> (Daudin)
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FAMILY PLETHODONTIDAE

Green Salamander	<i>Aneides aeneus</i> (Cope & Packard)
Southern Dusky Salamander	<i>Desmognathus auriculatus</i> (Holbrook)
Spotted Dusky Salamander	<i>Desmognathus fuscus conanti</i> Rossman ¹
Southern Two-lined Salamander	<i>Eurycea bislineata cirrigera</i> (Green) ²
Long-tailed Salamander	<i>Eurycea longicauda longicauda</i> (Green)
Three-lined Salamander	<i>Eurycea guttolineata</i> (Holbrook) ³
Cave Salamander	<i>Eurycea lucifuga</i> Rafinesque
Dwarf Salamander	<i>Eurycea quadridigitata</i> (Holbrook)
Northern Spring Salamander	<i>Gyrinophilus porphyriticus porphyriticus</i> (Green)
Four-toed Salamander	<i>Hemidactylium scutatum</i> (Schlegel)
Eastern Zigzag Salamander	<i>Plethodon dorsalis</i> Cope
Slimy Salamander	<i>Plethodon glutinosus</i> (Green) ⁴
Webster's Salamander	<i>Plethodon websteri</i> Highton
Gulf Coast Mud Salamander	<i>Pseudotriton montanus flavissimus</i> Hallowell
Southern Red Salamander	<i>Pseudotriton ruber vioscai</i> Bishop

FAMILY PROTEIDAE

Alabama Waterdog	<i>Necturus alabamensis</i> Viosca
Gulf Coast Waterdog	<i>Necturus beyeri</i> Viosca
Common Mudpuppy	<i>Necturus maculosus</i> (Rafinesque)

FAMILY SALAMANDRIDAE

Central Newt	<i>Notophthalmus viridescens louisianensis</i> (Wolterstorff)
Red-spotted Newt	<i>Notophthalmus viridescens viridescens</i> (Rafinesque)

FAMILY SIRENIDAE

Western Lesser Siren	<i>Siren intermedia nettingi</i> Goin
Eastern Lesser Siren	<i>Siren intermedia intermedia</i> Barnes

¹ Considered to be *Desmognathus conanti* Rossman by some authors.

² Considered to be *Eurycea cirrigera* (Green) by some authors.

³ Considered to be *Eurycea longicauda guttolineata* (Holbrook) by some authors.

⁴ Considered to be *Plethodon mississippi* Highton by some authors.

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Field Station
15 Road 2078
Abbeville, MS 38601
(662) 915-5479

www.olemiss.edu/depts/umbfs

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