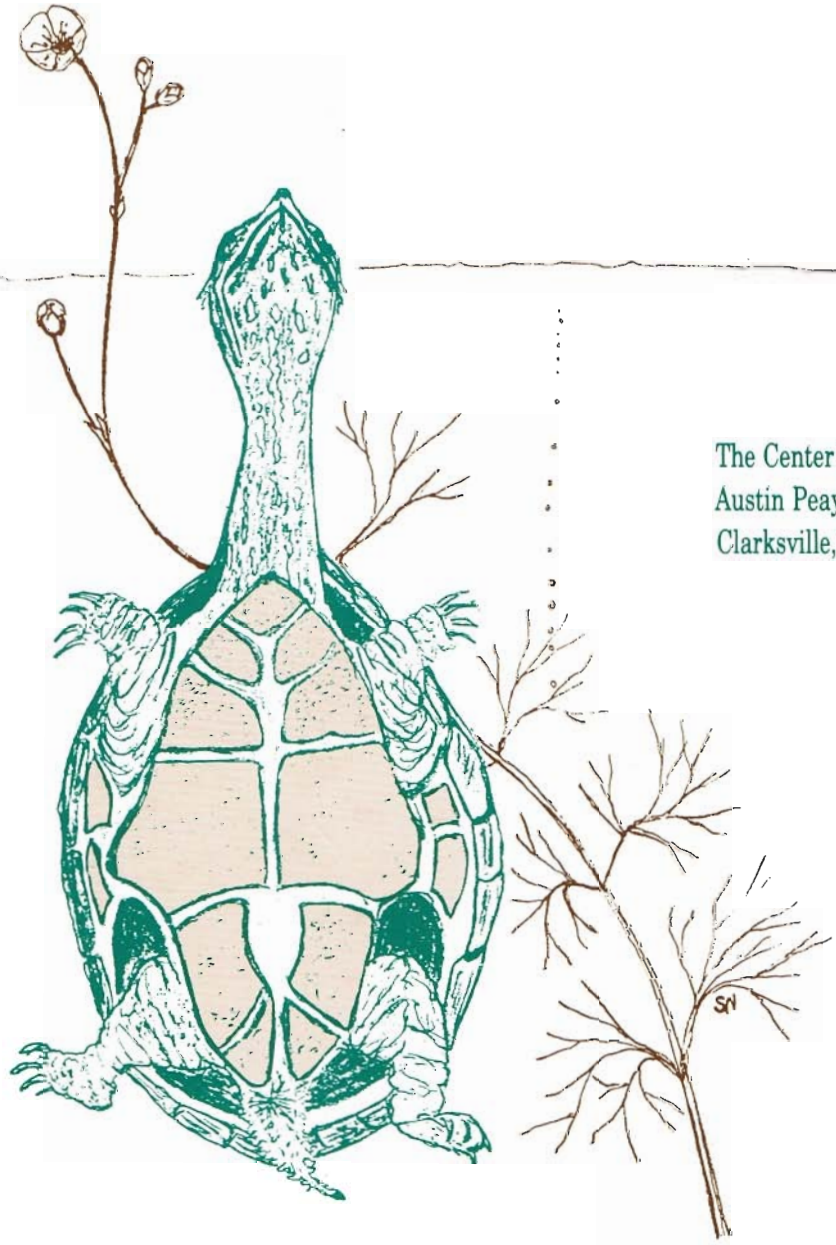
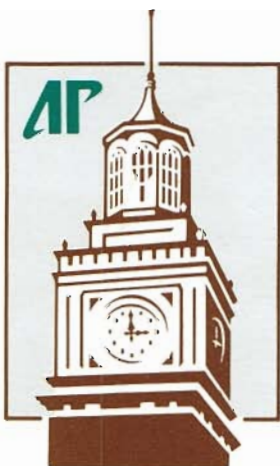


David Snyder

The Pond-Dwelling Vertebrates
of
Land Between The Lakes



The Center For Field Biology
Austin Peay State University
Clarksville, Tennessee 37044



Rick V. Harris
Sallie M. Noel
1992

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5. Snyder, D. H. and F. J. Alsop, III. 1991. Birds of Land Between the Lakes. Accounts of 230 species of birds, with residency status and abundance information, basic descriptions, anecdotal commentaries, and suggestions on how and where to watch birds in the region. Illustrated with 125 color photographs. 234 pp. \$7.00 + \$1.00 shipping.
6. Chester, E. W. 1992. An annotated catalogue of vascular plants known from Land Between The Lakes, Kentucky and Tennessee. \$4.00 + \$1.00 shipping.
7. Harris, R. V. and S. M. Noel. 1992. The pond-dwelling vertebrates of Land Between The Lakes. \$3.00 + \$1.00 shipping.
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THE POND-DWELLING VERTEBRATES
OF

LAND BETWEEN THE LAKES

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INTRODUCTION

Land Between The Lakes (LBL) is a 170-thousand-acre (69,000 ha) peninsula of mostly forested (89 percent) land located astride the Tennessee-Kentucky border between the impounded lower reaches of the Tennessee and Cumberland rivers (Kentucky and Barkley lakes, respectively). Averaging about 8 miles (12.9 km) wide, it stretches 38 miles (61.3 km) from its southern boundary near Dover in Stewart County, Tennessee to just south of Grand Rivers in Lyon County, Kentucky where a canal connecting the two reservoirs marks its northern boundary.

Designated in 1963 as a national demonstration area for outdoor recreation, environmental education, and resource management, LBL is under the stewardship of the Tennessee Valley Authority (TVA), which employs a broad-based professional staff to carry out the multiple-use land management practiced on the area.

Throughout the forests and woods-openings of LBL are over 500 ponds (a few natural but most man-made) of varying ages, sizes, and depths. Some are permanent bodies of water that may or may not support fish populations, whereas others are ephemeral and devoid of fish. Regardless of their specific character, these ponds serve as home to a fascinating array of vertebrate life including, in addition to fish, salamanders, frogs, toads, turtles, and snakes.

The purposes of this guide are to: 1) acquaint amateur naturalists, teachers, and students of middle and high school biology with the vertebrates inhabiting LBL's ponds and 2) instill in its users an appreciation for the importance of these habitats in the overall welfare of the ecosystems they serve.

THIS GUIDE AND ITS USE

While writing this guide, we tried to avoid as much scientific terminology as possible. However, many technical terms were needed to differentiate between species and to provide adequate descriptions of each. Therefore, a glossary of all **boldface** words has been included following the species account.

To use this guide effectively, simply turn to the section concerning the vertebrate group that includes the animal to be identified. Then, one or preferably both of the following methods of identification can be followed: First, match the animal with the picture that resembles most closely the specimen in question. By comparing the notes and description found under the picture to the actual specimen, its identification can often be achieved. Second, follow the series of choices found in the descriptive keys. This will require a little more effort, but will allow the investigator to learn more about the major group that includes the animal being identified.

Illustrations have been provided where possible to aid in identification. Many of the illustrations were prepared or chosen to help point out features that are used in the keys.

LOCATING, COLLECTING, AND IDENTIFYING SPECIMENS

Before any animals are confined for study, a collecting permit should be obtained from LBL officials and from the state(s) involved. Kentucky permits are issued by the Kentucky Department of Fish and Wildlife Resources in Frankfort, and Tennessee permits by the Tennessee Wildlife Resources Agency in Nashville.

Identifying adult individuals is usually not too difficult. Larval forms, however, often pose special problems. For example, they may be in too early a stage of development to be identified. Still, we have included a key to the larval amphibians found within the ponds of LBL. Larvae of some species possess special features that can be used to identify them. For example, Northern Cricket Frog (*Acris crepitans*) larvae have a black-tipped tail fin. Other larval forms are not quite as easy to identify, so we have tried to list as many larval features as possible for each species included in the key.

When looking for a particular species, it is often useful to know something about its preferred habitat as well as its particular lifestyle. Some vertebrates mentioned within this guide move away from their pond habitat and can be found in a terrestrial setting. For example, in autumn, the female Marbled Salamander (*Ambystoma opacum*) may be found in woodlands under moist leaf litter tending her eggs; or Cope's Gray Treefrog (*Hyla chrysoscelis*) may be heard calling from the trunk of a tree, where its camouflage coloration makes it very difficult to see.

There are many good techniques for collecting specimens for study. A good seine or net is useful for capturing aquatic species such as fishes and larval forms of

amphibians. A minnow trap partially submerged in water near the shoreline often captures larval and adult amphibians and occasionally aquatic reptiles including the snakes mentioned in this guide. When secured by strong twine and thrown into the middle of the pond such a trap may increase the variety of specimens collected. Many amphibians are active primarily at night, moving about in search for food. The use of a good flashlight or headlamp will prove helpful while searching.

Once discovered, any frog, toad, or salamander found in the LBL area may be handled without fear of a harmful bite. Small ziplock bags in various sizes are useful for holding and transporting small specimens. It should be noted that the skin secretions of some toads are mildly toxic and can prove irritating to mucus membranes, so caution is advised.

Snakes should be treated as venomous until positive identification can be achieved. Non-venomous snakes can often be picked up safely by any part of their body, but large aggressive snakes, such as the ones mentioned in this guide, should be handled with care, as they can deliver a nasty bite. Snakes are best transported in a strong muslin bag or pillowcase, provided no holes are present. The Snapping Turtle, *Chelydra serpentina*, can be handled if moderate care is exercised. It is most safely held by its long tail with the head facing outward and well away from your body.

After obtaining an animal, you assume responsibility for its care. Fishes are relatively easy to maintain in an aquarium environment. Small insects provide a good source of food. Larval amphibians also live well in an aquarium. Most adult amphibians do best in a terrarium environment with high humidity. Small insects and worms should

provide an ample diet. Aquatic turtles such as pond sliders and snapping turtles fare well in an aquarium filled partially with water and provided with rocks for basking. Aquatic snakes can be maintained in the same set-up, if a top is placed securely on the aquarium. It should be noted that both turtles and snakes are easier to care for when they are small since adult forms require more space than is practical. Both turtles and snakes can be fed insects, worms, and tadpoles.

There is much to be learned from the vertebrates associated with the ponds in the LBL area. Often we fear most that which we understand least. It is hoped this guide will increase the reader's understanding of and appreciation for the fishes and herptofauna (amphibians and reptiles) found in the ponds of LBL.

CHECKLIST AND CLASSIFICATION

Class Osteichthyes (Bony Fishes)

Order Cypriniformes

Family Cyprinidae (Carps and Minnows)

Notemigonus crysoleucas/Golden Shiner

Pimephales promelas/Fathead Minnow

Order Cyprinodontiformes

Family Poeciliidae (Livebearers)

Gambusia affinis/Mosquitofish

Order Perciformes

Family Centrarchidae (Sunfish)

Lepomis cyanellus/Green Sunfish

Lepomis macrochirus/Bluegill

Micropterus salmoides/Largemouth Bass

Class Amphibia (Amphibians)

Order Anura (Frogs and Toads)

Family Bufonidae (True Toads)

Bufo americanus/American Toad

Bufo woodhousii/Woodhouse's Toad

Family Microhylidae (Narrowmouth Toads)

Gastrophryne carolinensis/Eastern Narrowmouth Toad

Family Hylidae (Treefrogs)

Acris crepitans/Northern Cricket Frog

Hyla chrysoscelis/Cope's Gray Treefrog

Pseudacris crucifer/Spring Peeper

Family Ranidae (True Frogs)

Rana catesbeiana/Bullfrog

Rana clamitans/Green Frog

Rana utricularia/Southern Leopard Frog

Order Caudata (Salamanders)

Family Ambystomatidae (Mole Salamanders)

Ambystoma maculatum/Spotted Salamander

Ambystoma opacum/Marbled Salamander

Ambystoma talpoideum/Mole Salamander

Ambystoma tigrinum/Tiger Salamander

Family Salamandridae (Newts)

Notophthalmus viridescens/Eastern Newt

Class Reptilia (Reptiles)

Order Testudines (Turtles)

Family Kinosternidae (Mud and Musk Turtles)

Kinosternon subrubrum/Eastern Mud Turtle

Sternotherus odoratus/Common Musk Turtle

Family Chelydridae (Snapping Turtles)

Chelydra serpentina/Snapping Turtle

Family Testudinidae (Tortoises and Terrapins)

Chrysemys picta/Painted Turtle

Trachemys scripta/Slider

Order Squamata (Lizards and Snakes)

Family Colubridae (Non-venomous Snakes)

Nerodia sipedon/Northern Water Snake

Nerodia erythrogaster/Plainbelly Water Snake

THE FISHES

Fishes show a remarkable adaptability to their environment. Despite the variety found among fishes worldwide, the body plan remains basically the same. To be at home in the water, fishes have developed several features which enable them to live and carry out their daily activities with success. Fishes possess a streamlined body which allows them to move with ease and precision through the water. By not having a body divided into regions such as head, trunk, and tail, they are able to move through their watery environment with a minimum of resistance.

The body plan of some species gives a clue to their lifestyle. Catfish for example have flattened bodies which aid in movement across the bottom of a river or lake. Sunfish possess a body that is deeply flattened vertically providing maneuverability rather than speed. Muscles, known as **myomeres**, found on the sides of fishes permit swift movement of the tail fin. There are five principal fins found on a fish. The **dorsal**, **pectoral**, and **pelvic** fins permit the fish to maneuver and maintain its balance as it moves through the water. The **anal** fin acts like the rudder of a boat steering and guiding the fish. The main fin is the **caudal** (tail) which propels the fish forward with each powerful stroke. Most fishes have the ability to float at a particular depth. This is accomplished with the aid of a **swim bladder**. This device allows gases to cause the fish to reach a state of neutral buoyancy.

Scales provide a protective covering over the skin of many fish species. Two types of scales are known among the fishes in LBL ponds. The minnows (Family Cyprinidae) have **cycloid scales** which are rather smooth. Sunfish (Family

Centrarchidae), on the other hand, have **ctenoid scales** that contain surface prickles which are rough to the touch. The skin located beneath the scales, secretes a **slime layer** that coats the fish. This layer is responsible for reducing friction in the water and also serves to prevent bacterial infections.

All animal life requires oxygen as a means of producing energy. Fishes accomplish this through gills. As water is taken in through the mouth, it is forced over the bony gill arches which contain the **filaments** that remove oxygen from the water. The filaments are very efficient. They remove up to 80% of the oxygen in the water that passes over them. This is necessary, since the concentration of oxygen in the water is usually less than 1%.

Fishes come in a variety of colors and patterns; however, two basic colors predominate. The dorsal side of most fishes tends to be olive-green. This blends with the dark background associated with the bottom. The **ventral surfaces** of most fishes contain a light color such as white. This serves as a perfect camouflage against the light background of the surface. Many fishes are patterned with blotches that blend in with the rocks and pebbles on the bottom of a stream. Some markings may also vary with the size or sex of fishes or the season of the year.

The sense organs of fishes are well-developed. Their eyes are always open as they contain no eyelids. Because of the special optical quality of water, fishes tend to be near-sighted. Since most water is **turbid** rather than clear, this is not much of a handicap. The sense of smell is highly developed in fishes, particularly in those species that live in very turbid waters or feed at night. The **lateral line** is a special sensory

structure running lengthwise down the sides of a fish. It serves as a source of "sonar" enabling the fish to pick up vibrations in the water caused by various objects or by other fishes.

Fishes may be divided into three categories based on how they feed. **Herbivores** feed on plants; **carnivores** feed on animals; and **omnivores** feed on both plants and animals. The basic food of most fishes consists of plankton, composed of tiny free-floating plants and animals.

Often the physical features of a fish will give a clue to its feeding habit. Fishes that feed on plants generally have a small mouth with teeth that allow them to scrape or grind. A predatory fish has a larger mouth and teeth specialized for seizing and holding prey. Minnows, on the other hand, have no jaw teeth but have hooked throat teeth that tear the food as it passes on its way to the stomach.

For reproduction to occur in an animal, the egg cell must be penetrated by a sperm cell. Because of their aquatic environment, fishes have become adapted in several ways to ensure reproductive success. The mating process in fishes is referred to as **spawning**. A series of specialized behavior patterns bring about a synchronized release of eggs and sperm. The eggs are then fertilized by the motile sperm cells. Some fishes show parental care while others show none. In species which show no parental care, large numbers of eggs must be produced to ensure survival during the larval stage.

Fish eggs contain a food substance known as **yolk**. During its life within the egg, the embryo obtains nourishment from this substance. After hatching the young larvae, called **fry**, are nourished by the yolk retained in a sac beneath their body. They continue to

to absorb nourishment from this sac until they are able to feed on their own. Growth of a young fish is normally rapid. Often in pond situations, overcrowding of the species can lead to slow growth and stunting. Overcrowding "may be" or "is often" due to a low population of predator fish within the pond.

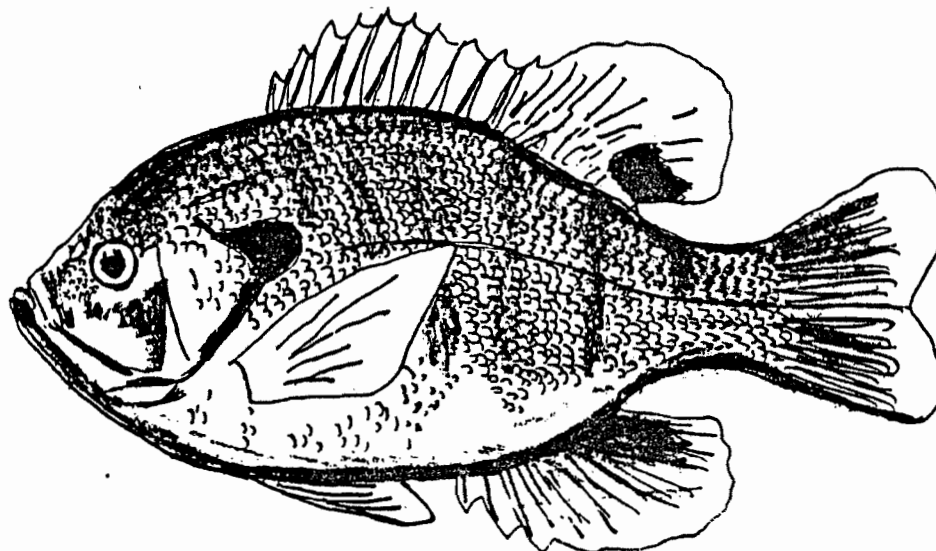
In varying combinations, the following six species of fishes have been recorded in the ponds of LBL: Bluegill (*Lepomis macrochirus*), Golden Shiner (*Notemigonus crysoleucas*), Fathead Minnow (*Pimephales promelas*), Green Sunfish (*Lepomis cyanellus*), Mosquitofish (*Gambusia affinis*) and Largemouth Bass (*Micropterus salmoides*): Other species may yet be discovered and will be incorporated in future editions of this guide.

KEY TO THE FISHES

- 1a. Tail fin notched, slightly or deeply 2
- 1b. Tail fin not notched. . . .MOSQUITOFISH - *Gambusia affinis* (p. 19)
- 2a. Dorsal and anal fins without spines 3
- 2b. Dorsal and anal fins with spines 4
- 3a. Lateral line incomplete, not extending to tail
 FATHEAD MINNOW - *Pimephales promelas* (p. 15)
- 3b. Lateral line complete, forward portion of line curved strongly downward
 GOLDEN SHINER - *Notemigonus crysoleucas* (p. 16)
- 4a. Upper jaw reaches or extends past center of eye 5
- 4b. Upper jaw does not reach eye; prominent ear flap present
 BLUEGILL - *Lepomis macrochirus* (p. 14)
- 5a. Most posterior spine of dorsal fin longer than spines anterior to it
 GREEN SUNFISH - *Lepomis cyanellus* (p. 17)
- 5b. Most posterior spine of dorsal fin shorter than spines anterior to it
 LARGEMOUTH BASS - *Micropterus salmoides* (p. 18)

BLUEGILL

Lepomis macrochirus Rafinesque



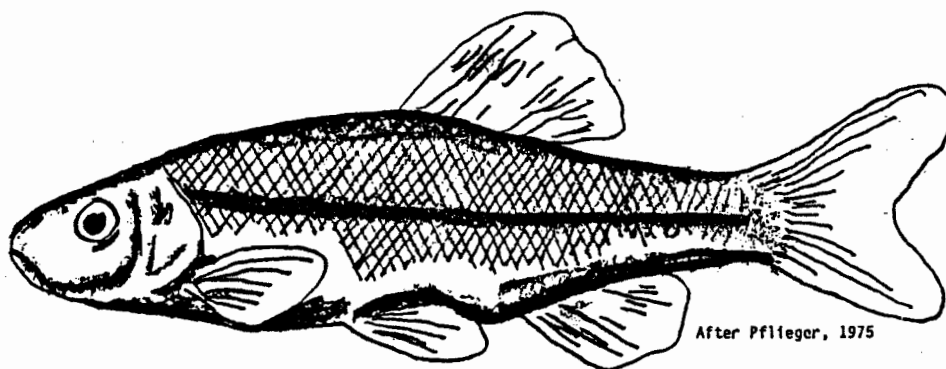
After Pflieger, 1975

Identification: Body length 6 1/2-9 inches (165-228 mm). Spinous part of mouth relatively small. **Dorsal fin** with ten spines broadly connected to the soft rayed portion. **Anal fin** contains three spines. **Lateral line** scales range from olive to green. **Belly** coloration yellow to reddish-orange. **Ear flap** entirely black.

Additional Notes: The bluegill is a **gregarious** fish often found with as many as 20 to 30 individuals in a group. The main food of this species is insects. Algae may also be eaten when animal food is scarce. Its small mouth limits the size of prey taken.

FATHEAD MINNOW

Pimephales promelas Rafinesque

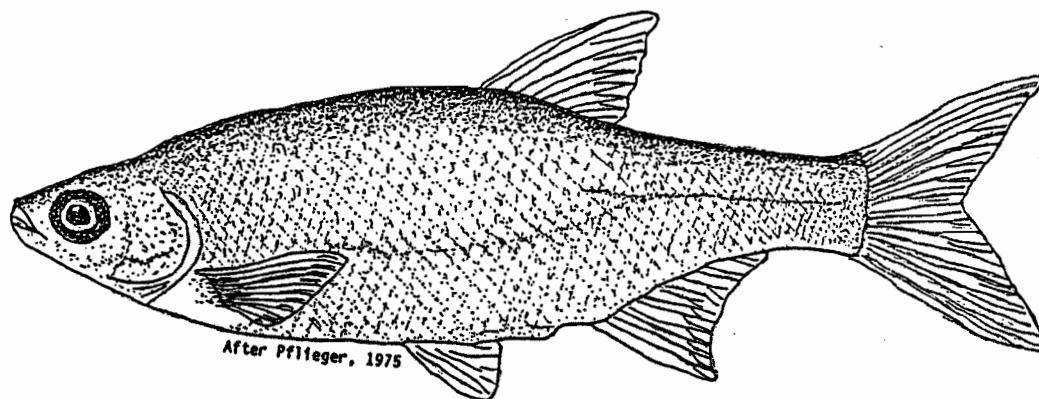


Identification: Body length 2 to 3 inches (50-76 mm). Body chubby with a blunt, rounded head. Dorsal fins rather flat. Anal fin with seven rays. Middle of the back contains a dusky stripe. Dark spot present at base of tail fin. Scales along lateral line range from 42 to 48. Ground color a pale brown to yellow. Sides silvery, often with a dusky stripe. Belly usually silvery-white.

Additional Notes: This minnow lives in large schools near the bottom of the water. It is often raised in ponds for use as bait. It feeds mainly on algae, but aquatic insects may also be eaten.

GOLDEN SHINER

Notemigonus crysoleucas (Mitchill)

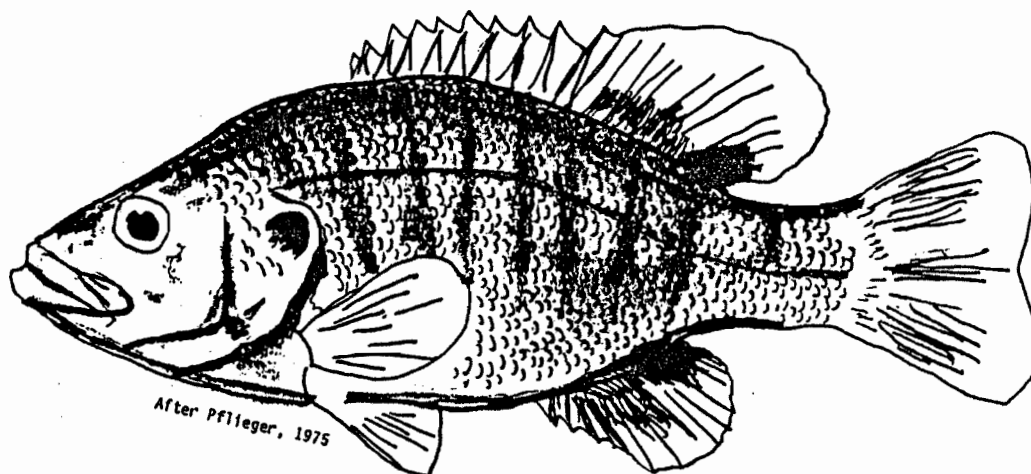


Identification: Body length 3 to 6 inches (76-152 mm). A deep-bodied, slab-sided minnow with a strong downward curve in lateral line. Belly behind pelvic fin has a fleshy scaleless keel (ridge). Mouth strongly upturned (oblique) and upper jaw not reaching front of eye. Dorsal fin contains 8 rays. Back greenish above, sides golden, and belly silvery-white.

Additional Notes: Golden Shiners live in small loosely associated schools usually near the water's surface. Their main diet is algae, small crustaceans, and snails. They frequently spawn over nests of Largemouth Bass and are commonly used as food by these and other game species. They are considered an excellent bait minnow.

GREEN SUNFISH

Lepomis cyanellus Rafinesque

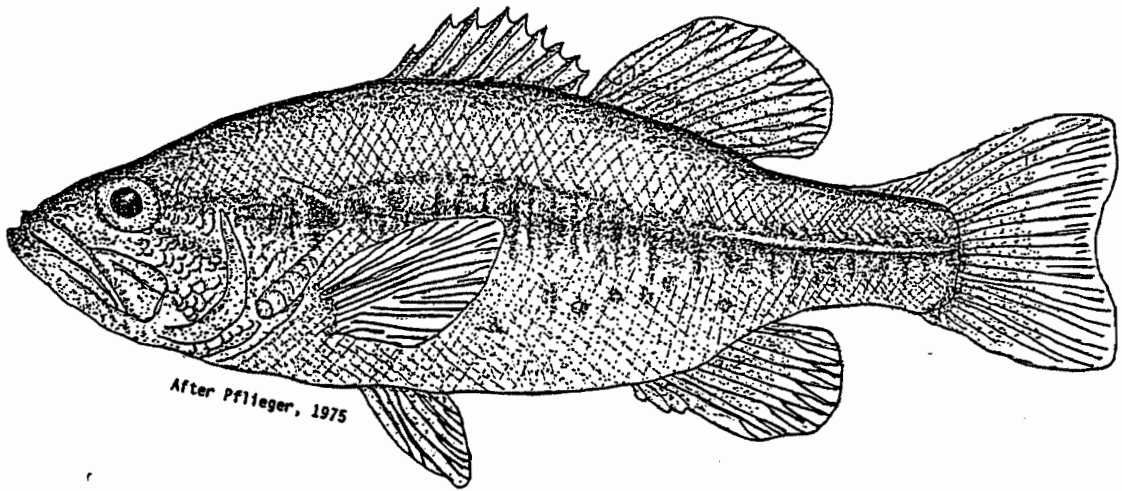


Identification: Body length 5 to 9 inches (127-230 mm). Body thick and mouth larger than that of most sunfish of comparable size. Spinous part of dorsal fin with ten spines and broadly connected to the soft rayed portion. Anal fin with three spines. Lateral line scales 41 to 52. Scales on gill cover (operculum). Back and sides bluish-green blending into a pale yellow or white on the belly. Ear flap black with a whitish margin.

Additional Notes: This species is a hardy pioneer fish that can tolerate a wide range of environmental conditions. Green Sunfish feed mainly on insects, small fish, and crayfish.

LARGEMOUTH BASS

Micropterus salmoides (Lacepede)

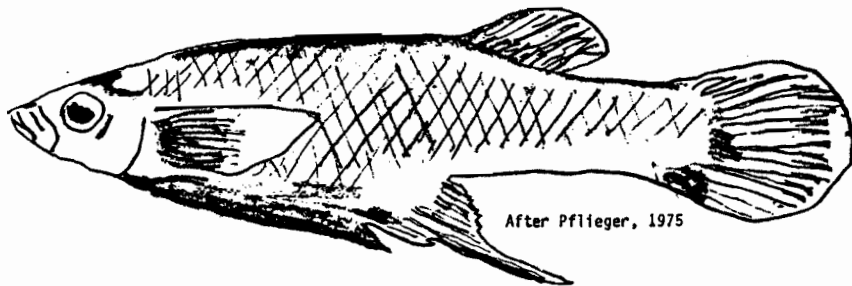


Identification: Body length 10 to 20 inches (254-508 mm). A slender streamlined sunfish with a very large mouth; upper jaw reaches far beyond rear margin of eye in adults. Dorsal fin is separated into a spinous and membranous (soft) portion by a central notch. Dorsal part of body with a green metallic luster; venter whitish. Tail fin of young is distinctly bi-colored.

Additional Notes: Largemouth Bass adults spend the day lurking in deep water, where submerged brush provides cover, then move into shallower water for evening feedings. Their diet consists of insects, crustaceans, small fish, frogs, and sometimes mice. An important game fish, the Largemouth Bass responds well to a variety of artificial lures.

MOSQUITOFISH

Gambusia affinis (Baird and Girard)



Identification: Body length 1 to 3 inches (25-75 mm). A small fish with strongly upturned mouth. Tail fin rounded and scales present on head. Usually a V-shaped bar beneath the eye. Scales number 27 to 30 along midsides. Back and sides yellowish-brown with dark edges on scales forming a cross-hatched pattern.

Additional Notes: Mosquitofish remain near the surface of the water moving about singly or in a small group. Their basic food consists of insects, spiders, small crustaceans, snails, and occasionally aquatic plants, such as duckweed. These fish are live bearers and the females are somewhat larger than the males.

THE AMPHIBIANS

In the world of vertebrates, the amphibians play a unique role. These were the first vertebrates to successfully develop a lifestyle suited for land. In achieving this, these animals had to solve two basic problems. First, they had to develop new types of appendages (limbs) for support and locomotion in the much less dense medium of air. Second, to acquire oxygen and to get rid of excess carbon dioxide, a new method of gas exchange had to be developed.

During the Devonian period (345 to 405 million years ago), the oceans were teeming with **carnivorous** fish. Any aquatic animal of that period that could haul itself out of the water, and perhaps lay its eggs on land, would certainly lower its mortality rate. Other advantages also awaited the animal that could make the transition. Abundant food was available in the form of plants and insects. An animal that could utilize this new resource would certainly have an advantage. In addition, air contains approximately 20% oxygen, whereas water seldom contains more than 4%, so a different type of respiratory structure would be required. The amphibian's move away from the water was at best incomplete.

Amphibians were the first **tetrapods**, or animals with four appendages. Using these new structures for movement permitted them to exploit the resources available to a terrestrial species. Although these structures served to provide locomotion in their land environment, they were not that efficient. The legs of most **caudates** (salamanders) for instance, are very short, thin, and rather weak. As a result they must flex laterally to initiate a movement forward.

Some amphibians have developed a body that is quite different from that of salamanders. The bodies of **anurans** (frogs) have become somewhat shorter. Many of their vertebrae are fused and their legs have become specialized for jumping rather than walking. The powerful legs of frogs have two distinct advantages. They enable the animals to move about to search for food and provide an efficient escape from enemies. The sudden leap of a frog may surprise many predators in the wild.

Most amphibians rely on two methods for obtaining oxygen. Many salamanders absorb oxygen directly through their skin or through the delicate membranes within their mouth. This method of gas exchange restricts the animal to moist environments. The skin surface must be kept moist to allow gases to pass across **plasma membranes**. The second method for acquiring oxygen was the development of lungs. The lungs of most salamanders are relatively simple and not totally sufficient for the necessary oxygen intake. Oxygen absorption is supplemented by diffusion through a moist skin.

There is a third restriction that ties the amphibian to a moist habitat. The amphibian egg has no shell to hold in moisture. Because of this, the eggs must be laid in either a moist terrestrial location or submerged in water. Not all amphibians, however, begin their life in such a manner. Some frogs (none from LBL) house their eggs in pouches on the mother's back. Others carry their young in vocal pouches. The female of one species even carries the tadpoles in her stomach.

During its early stages of life within the water, the young aquatic amphibian is quite fishlike. When the larvae or tadpoles hatch, they possess a **caudal fin** for movement, and gills for removing oxygen from the water. In this stage of life, larval

anurans spend time feeding on algae and aquatic plants while **caudate** larvae search for small invertebrates on which to feed. Development continues until the body transforms into the adult.

Another adaptation which enhances the success of amphibians in a terrestrial habitat is the external eardrum capable of receiving soundwaves from the air. **Anurans** exploited this feature by developing vocal pouches for a voice. Many tropical frogs also developed a strong **toxin** which is effective in discouraging predation. Some of these **anurans** also possess colorful markings which provide an effective warning to other animals.

Adult amphibians are basically **carnivores** that feed on worms, insects, and other invertebrates. Solitary by nature, amphibians (**anurans** in particular) have developed a useful tool compatible with this lifestyle. This invention is a sticky tongue. Because of its attachment in the front of the mouth, the amphibian tongue can be extended much further than can the tongue of other vertebrates. When flicked forward, its sticky and muscular end can grasp prey and pull it into the mouth. Although amphibians do not chew their food, their several sets of teeth assist in grasping and swallowing prey and their tongue produces abundant mucous.

Being **ectothermic** (obtaining body heat from surroundings), amphibians must hibernate during the cold winter months. During this period, metabolic rate slows down and the animal survives on stored energy from within. In the hot summer months, many amphibians become active by night or seek shelter by burrowing into the cool mud, a process called **aestivation**.

The amphibians which utilize the ponds of LBL fall into two orders. Order Anura contains the frogs (some of which are called toads) and order Caudata contains the salamanders. Within the ponds sampled thus far, nine anurans and five caudates have been identified. These include the Bullfrog (*Rana catesbeiana*), Cope's Gray Treefrog (*Hyla chrysoscelis*), Green Frog (*Rana clamitans*), Northern Cricket Frog (*Acris crepitans*), Southern Leopard Frog (*Rana utricularia*), Spring Peeper (*Pseudacris crucifer*), American Toad (*Bufo americanus*), Eastern Narrowmouth Toad (*Gastrophryne carolinensis*), Woodhouse's Toad (*Bufo woodhousii*), Eastern Newt (*Notophthalmus viridescens*), Marbled Salamander (*Ambystoma opacum*), Mole Salamander (*Ambystoma talpoideum*), Spotted Salamander (*Ambystoma maculatum*), and Tiger Salamander (*Ambystoma tigrinum*).

As with the fish, there is a possibility that one may encounter a species of amphibian not included in this section. Should you suspect this is the case, consult the references listed at the end of this guide for additional information.

KEY TO THE LARVAL AMPHIBIANS

- 1a. Legs present; external feathery gills on head 10
- 1b. No legs present; no external gills on head 2
- 2a. No oral disc; no horny beaks; no labial teeth; spiracle median near anus
 - EASTERN NARROWMOUTH TOAD - *Gastrophryne carolinensis* . (p. 33)
- 2b. Oral disc; horny beaks present; spiracle sinistral (to left of body axis) 3
- 3a. Anus median; spiracle ventral or lateral below the body axis; eyes dorsal 4
- 3b. Anus dextral (to right of body axis), to left when viewed ventrally; spiracle lateral on or near the body axis 5
- 4a. Dorsal side unicolored (one color); snout sloping when viewed laterally; ratio of tail length to tail height 2:7 or less; tail usually bicolored; small eyes
 - AMERICAN TOAD - *Bufo americanus* (p. 30)
- 4b. Dorsal side with light mottling; snout rounded when viewed laterally; ratio of tail length to tail height 2:8 or more; tail not bicolored; large eyes
 - WOODHOUSE'S TOAD - *Bufo woodhousii* (p. 43)
- 5a. Dorsal eyes; emarginate oral disc; usually large tadpole size.
 - (Ranidae family) 6
- 5b. Lateral or dorsal eyes; oral disc not emarginate; usually small tadpole size
 - (Hylidae family) 8
- 6a. Wide lower jaw; gut showing through the skin of the belly
 - SOUTHERN LEOPARD FROG - *Rana utricularia* (p. 39)
- 6b. Narrow lower jaw; gut does not show through the skin of the belly 7

- 7a. **A-2 gap** about 2/3 or less of either lateral row; eye above lateral axis; tadpole length to about 140 mm . . . **BULLFROG** - *Rana catesbeiana* (p. 31)
- 7b. **A-2 gap** about 6.0 to 11.0 X either lateral row; eye on the lateral axis; tadpole length to about 110 mm. . . . **GREEN FROG** - *Rana clamitans* (p. 35)
- 8a. **Lower labium** containing two rows of teeth; **A-2 gap** wide; tip of tail black; eyes dorsal and inside the lateral outline when viewed from above
NORTHERN CRICKET FROG - *Acris crepitans* (p. 38)
- 8b. **Lower labium** containing three or four rows of teeth; **A-2 gap** narrow; tip of tail not black; eyes lateral 9
- 9a. **Papillary border** with a posterior gap; tail mottled; tail fins clear or with large dark blotches on edges; second labial row longer than first labial row
SPRING PEEPER - *Pseudacris crucifer* (p. 41)
- 9b. **Papillary border** with no posterior gap; scarlet to orange tail with black blotches; third labial row at lease 0.5 times as long as second and definitely longer than upper jaw . . . **COPE'S GRAY TREEFROG** - *Hyla chrysoscelis* . . . (p. 32)
- 10a. Head with a lateral longitudinal stripe through the eye 11
- 10b. Head without a longitudinal stripe 12
- 11a. Head relatively large; snout rounded; body with a lateral white line
MOLE SALAMANDER - *Ambystoma talpoideum* (p. 37)
- 11b. Head relatively small; snout tapered; body without a lateral white line
EASTERN NEWT - *Notophthalmus viridescens* (p. 34)
- 12a. Throat well-pigmented; dark dorsal stripe extending to tail

	MARBLED SALAMANDER - <i>Ambystoma opacum</i>	(p. 36)
12b.	Throat without pigment or pigment confined to border of jaws; no dark dorsal stripe extending to tail	13
13a.	Toes flattened, broad at base, pointed at tip	
	TIGER SALAMANDER - <i>Ambystoma tigrinum</i>	(p. 42)
13b.	Toes not flattened, not broad at base, not pointed at tip	
	SPOTTED SALAMANDER - <i>Ambystoma maculatum</i>	(p. 40)

KEY TO ADULT AMPHIBIANS

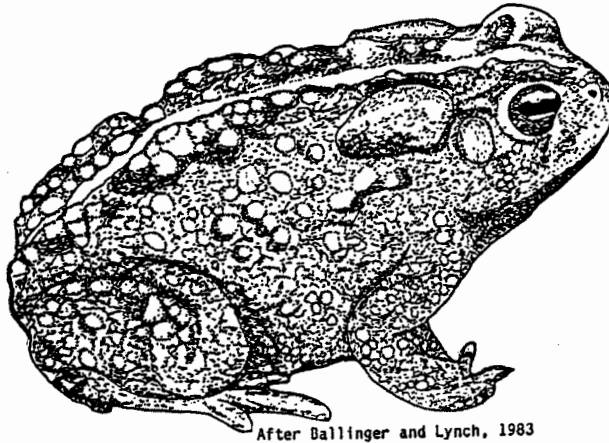
- 1a. Skin dry and warty or moist and smooth, without scales; tail absent2
- 1b. Skin rough and dry or moist and smooth, without scales; tail present10
- 2a. Skin dry and warty3
- 2b. Skin moist and relatively smooth4
- 3a. Dark spots on dorsum with 1-2 warts; glands behind eyes kidney-shaped, not touching bony ridges behind eyes
 AMERICAN TOAD - *Bufo americanus* (p. 30)
- 3b. Dark spots on dorsum with 3-4 warts; glands behind eyes oval and touching bony ridges behind eyes . . . WOODHOUSE'S TOAD -*Bufo woodhousii* . . (p. 43)
- 4a. Adult frogs usually less than 40 mm SVL (snout vent length); if larger (32-60 mm), enlarged toe pads present 5
- 4b. Adult frogs larger than 50 mm SVL; 7
- 5a. Fold of skin across back of narrow, pointed head concealing tympanum; body plump, smooth and moist (22-38 mm SVL)
 EASTERN NARROWMOUTH TOAD - *Gastrophryne carolinensis* . . (p. 33)
- 5b. No skin fold across back of head; tympanum visible6
- 6a. Toe pads enlarged, wider than toe 7
- 6b. Toe pads not noticeably wider than toe, dark triangular markings between eyes, skin warty (16-38 mm SVL)
 NORTHERN CRICKET FROG - *Acris crepitans* (p. 38)

- 7a. Irregular x-shaped pattern on back; skin relatively smooth (19-35 mm SVL)
 SPRING PEEPER - *Pseudacris crucifer* (p. 41)
- 7b. Light spot or line on upper jaw below eye, orange wash on inner thigh
 (30-60 mm SVL)
 COPE'S GRAY TREEFROG - *Hyla cryoscelis* (p. 32)
- 8a. Dorsolateral fold absent; toes extensively webbed (80-205 mm SVL)
 BULLFROG - *Rana catesbeiana* (p. 31)
- 8b. Dorsolateral fold present; toes on hind feet not extensively webbed9
- 9a. Dorsolateral fold extending to **sacral hump** (54-102 mm SVL)
 GREEN FROG - *Rana clamitans* (p. 35)
- 9b. Dorsolateral fold extending past sacral hump to groin (151-127 mm SVL)
 SOUTHERN LEOPARD FROG - *Rana utricularia* (p. 39)
- 10a. **Costal grooves** not conspicuous, skin rough or smooth, two parallel ridges
 between eyes
 EASTERN NEWT - *Notophthalmus viridescens* (p. 34)
- 10b. **Costal grooves** distinct, skin slimy and smooth, no parallel ridges between
 eyes 11
- 11a. Body marked with distinct yellow or orange pattern12
- 11b. Body plain dark gray to brown or marked with light gray to white pattern13
- 12a. Yellow or orange markings in two irregular rows which do not extend to
 lower sides
 SPOTTED SALAMANDER - *Ambystoma maculatum* (p. 40)

- 12b. Yellow or orange markings extending onto lower sides
 - TIGER SALAMANDER - *Ambystoma tigrinum* (p. 42)
- 13a. White or light gray markings over entire length of body
 - MARbled SALAMANDER - *Ambystoma opacum* (p. 36)
- 13b. Body plain dark gray to brown, lacking a white or light gray pattern
 - MOLE SALAMANDER - *Ambystoma talpoideum* (p. 37)

AMERICAN TOAD

Bufo americanus Holbrook



After Ballinger and Lynch, 1983

Identification: 2 to 3 inches (50-75 mm). The American Toad is often confused with Woodhouse's Toad in the LBL area, but there are a few differences between the two.

In the American Toad:

- (1) the **parotoid glands** are kidney-shaped
- (2) the hind legs contain more "warts" on the upper surface
- (3) the **ventral surface** is often spotted
- (4) the spots on the back often contain only 1 or 2 "warts".

Additional Notes: This species prefers a cooler climate and is an early breeder. The American Toad and Woodhouse's Toad may occasionally interbreed. The musical trill of the American Toad usually lasts more than 5 seconds.

BULLFROG

Rana catesbeiana Shaw



Identification: 3 1/2 to 8 inches (88-200 mm). The coloration of this frog is a plain green above with brown or gray blotchings. The ventral surface tends to be white, becoming yellow near the throat on adult males. This species lacks a dorsolateral fold.

Additional Notes: *Rana catesbeiana* breeds from late February to early October. Its voice pattern resembles the phrase "jug-o'-rum." Bullfrogs can often be heard over a mile away. The adult male's eardrum (tympanum) is about twice the size of the eye. The adult female's eardrum is about equal to the size of the eye.

COPE'S GRAY TREEFROG

Hyla chrysoscelis Cope

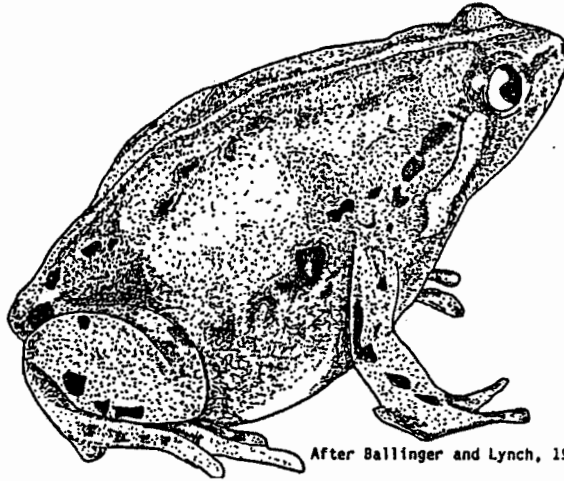


Identification: 1 1/8 to 2 inches (28-50 mm). The normal coloration of this treefrog is gray to green with many variations. Its inner thighs reveal a very bright orange when extended. Adult frogs of this species have a light spot on the upper jaw beneath the eye.

Additional Notes: *Hyla chrysoscelis* breeds from late April to June. *H. chrysoscelis* is very similar in appearance to *H. versicolor*, but their voice patterns distinguish them in the field. The call of *H. versicolor* is a slow trill in contrast to the fast higher pitched trill of *H. chrysoscelis*. Through studies of the chromosomes in both frogs conducted in 1981 by Dr. Ray Burkett, Professor of Biology, Shelby State Community College, *H. chrysoscelis* was found to be the species of gray treefrog in LBL.

EASTERN NARROWMOUTH TOAD

Gastrophryne carolinensis (Holbrook)

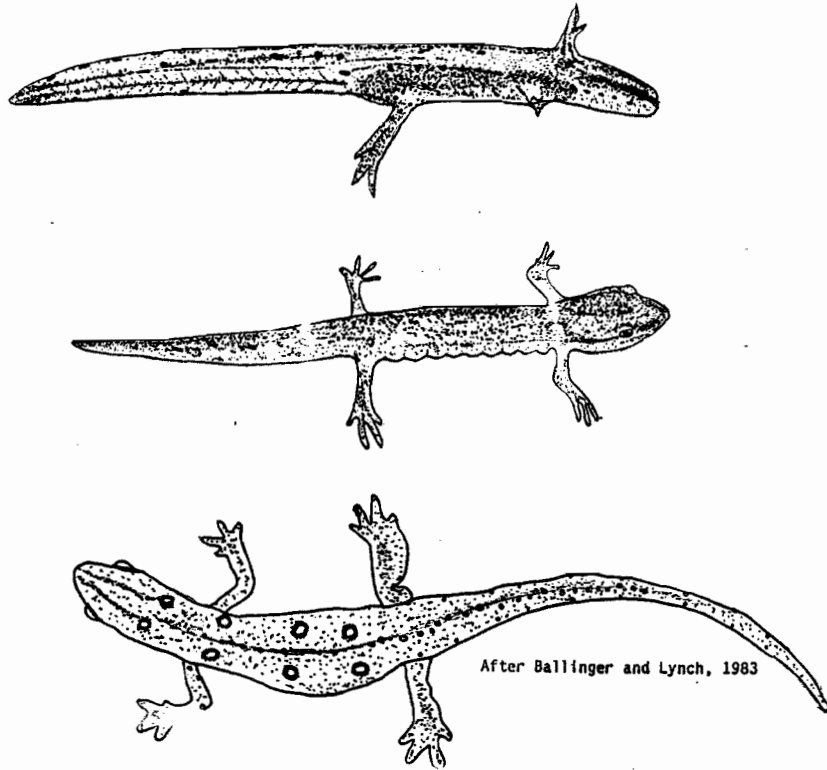


Identification: 1 inch (25 mm). A small plump smooth-skinned toad with a pointed snout. Narrowmouth Toads are reddish brown to gray dorsally, with strongly mottled bellies.

Additional Notes: Rains in the spring usually initiate breeding of Eastern Narrowmouth Toads, which continues from early April through October. Their voice resembles an "electric buzzer" or the weak bleat of a sheep.

EASTERN NEWT

Notophthalmus viridescens (Rafinesque)

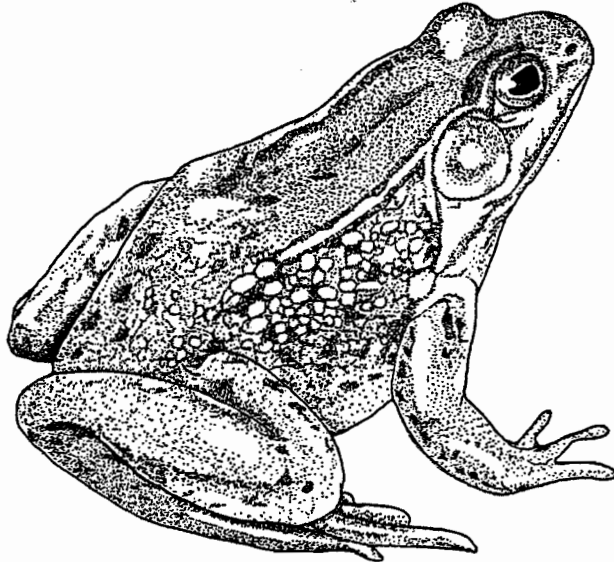


Identification: 2 to 4 inches (50-100 mm). Aquatic adults are olive green to greenish-brown with a lateral row of red spots. Back and belly are peppered with black dots. Skin is somewhat rougher than that of other salamanders.

Additional Notes: Newts may remain active all winter beneath the surface of the pond. The Eastern Newt also has a post-larval stage found on land. In this terrestrial stage, commonly referred to as a red eft, the newt is bright orange with black dots.

GREEN FROG

Rana clamitans Latreille



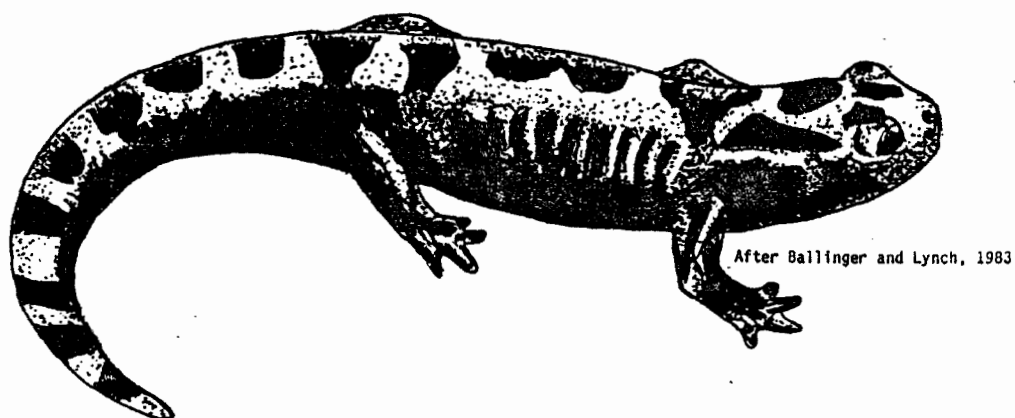
After Ballinger and Lynch, 1983

Identification: 2 1/4 to 3 1/2 inches (57-89 mm). The skin coloration of this species ranges from brown to green. Variable dark markings are often present on the upper body. Underneath, the color pattern is white with dark mottling extending onto the sides. A **dorsolateral fold** can be observed on the side extending to the **sacral hump**.

Additional Notes: Breeding occurs from late spring to summer. The voice of a green frog sounds like a loosened banjo string plucked once as a single note or repeated 3 or 4 times. Their notes become progressively softer as they sing.

MARbled SALAMANDER

Ambystoma opacum (Gravenhorst)

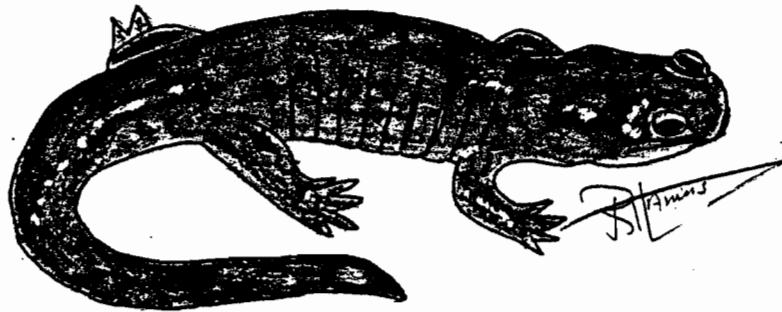


Identification: 3 1/2 to 4 inches (85-100 mm). A chunky, dark gray salamander marked by bold white to silver crossbands. The coloration of these bands can often be used to sex the animal. They often appear gray in females and white in males.

Additional Notes: Marbled Salamanders lay their eggs in sheltered depressions in leaf litter, which later fill with rainwater. The female remains with the eggs until the depression fills.

MOLE SALAMANDER

Ambystoma talpoideum (Holbrook)



Identification: 3 to 4 inches (75-100 mm). The most unusual feature of this animal is the large size of the legs and feet which seem out of proportion with the rest of the body. Mole salamanders range in color from black to brown with occasional bluish white flecks.

Additional Notes: This salamander represents the smallest of the lung-breathing terrestrial salamanders with the exception of the eft stage of the newt.

NORTHERN CRICKET FROG

Acris crepitans Baird

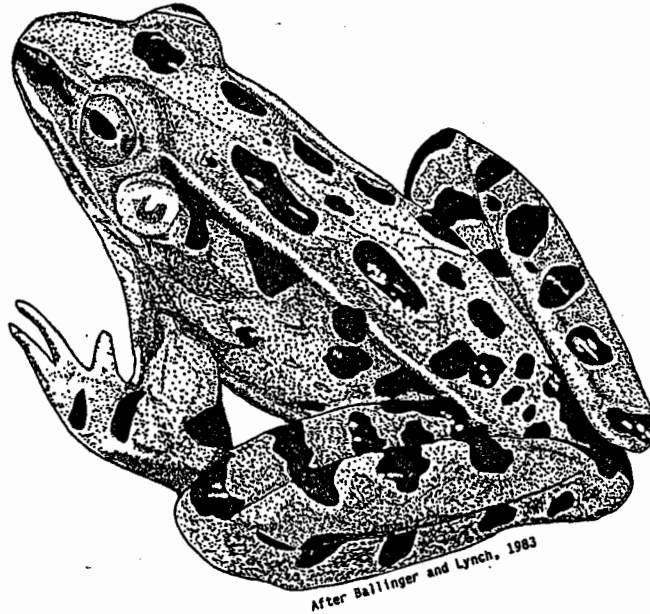


Identification: 5/8 to 1 3/8 inches (16-35 mm). Color may vary from gray to brown, or occasionally greenish-black. The back has several dark markings with a dark triangular pattern between the eyes. The first toe is completely webbed.

Additional Notes: *Acris crepitans* is a late breeder, laying a few hundred eggs from April to July. Its voice resembles two pebbles being tapped together in rapid succession for 20 to 30 beats picking up speed as it continues.

SOUTHERN LEOPARD FROG

Rana utricularia Harlan

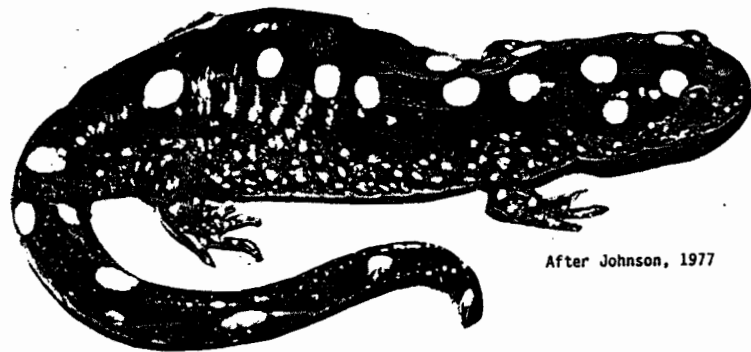


Identification: 2 to 3 1/2 inches (50-89mm). Slender and narrow-headed, the Southern Leopard Frog is marked with large dark splotches on its back and sides. These frogs often have a light spot in the center of their eardrum and a light line along their upper jaw. A **dorsolateral fold** extends beyond the **sacral hump** to the groin.

Additional Notes: The Southern Leopard Frog is an early breeder laying eggs from late February throughout the spring. Its voice pattern resembles a short chuckle-like guttural trill. This sound can be simulated by rubbing your fingers across an inflated balloon.

SPOTTED SALAMANDER

Ambystoma maculatum (Shaw)

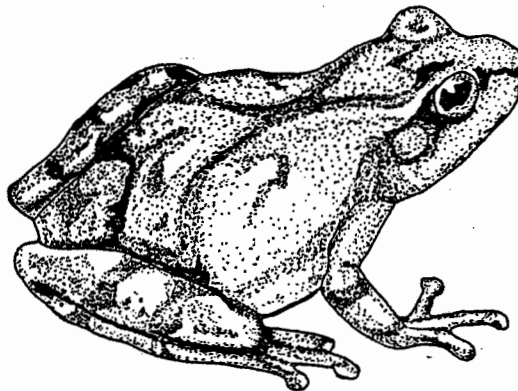


Identification: 6 to 8 inches (150-200 mm). A stout gray to blue-black salamander with 2 irregular rows of bright round yellow or orange spots. The ventral side of this animal is usually gray.

Additional Notes: This species is an early breeder. Eggs are laid in late January or early February. The males usually engage in a ritual dance of courtship.

SPRING PEEPER

Pseudacris crucifer (Wied-Neuwied)



After Ballinger and Lynch, 1983

Identification: 3/4 to 1 1/4 inches (19-32 mm). The skin color varies from brown or gray to olive marked by a characteristic dark X pattern on the back. A dark line may also extend between the eyes.

Additional Notes: Breeding continues from late February until May. The voice of *P. crucifer* is a high, piping whistle, which when heard in chorus, resembles the jingling of tiny bells.

TIGER SALAMANDER

Ambystoma tigrinum (Green)



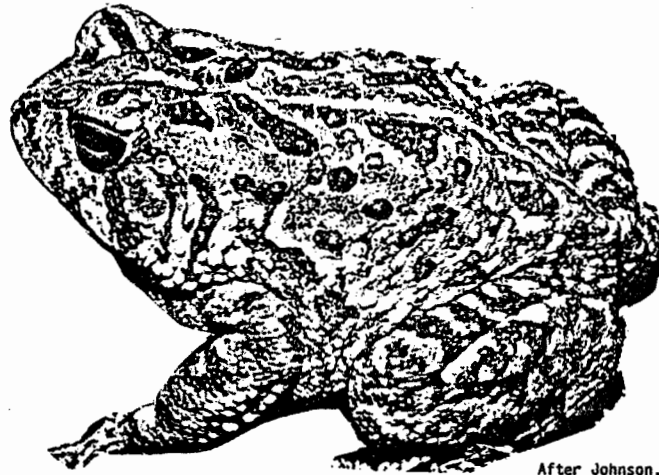
After Ballinger and Lynch, 1983

Identification: 7 to 13 inches (178-330 mm). This stout broad-headed salamander with small eyes is the world's largest land-dwelling salamander. The dark brown to black skin is irregularly marked by light olive blotches.

Additional Notes: Like the Spotted Salamander, this species breeds early, soon after winter ice melts.

WOODHOUSE'S TOAD

Bufo woodhousii Girard



Identification: 2 to 3 inches (50-75 mm). This species of toad may be mistaken for the American Toad. Color is basically useless in the identification. To decide which toad you have, contrast the four characteristics mentioned in the description of the American Toad with those below for Woodhouse's Toad:

- (1) oval **parotoid** glands
- (2) fewer warts on upper surface of hind legs
- (3) an unpigmented **ventral** surface
- (4) 3 or 4 warts in the **dorsal** spots.

Additional Notes: Begins breeding in April, somewhat later than American Toads. The call is of shorter duration than that of the American Toad.

THE REPTILES

By virtue of two adaptations, reptiles became the first truly successful land vertebrates. The possession of dry, waterproof skin and the practice of internal fertilization freed reptiles from the water and allowed them to disperse many miles inland.

Reptiles manage to survive and breed great distances from water. Their egg, enclosed in a shell which is watertight, yet porous enough to permit gas exchange, makes this possible. Combined with internal fertilization, this leathery egg shell is the key to reptilian success on land.

Reptiles share several amphibian features. The body plan of some reptiles, such as lizards, resembles that of salamanders. Both groups are ectothermic, causing them to seek shelter or hibernate during the cold winter months. They also exhibit parental care in many instances. Yet there are basic differences between the two groups. Reptiles possess clawed toes and a dry, scale-covered skin.

Of the major groups of reptiles found in the ponds of LBL, turtles are evolutionarily the oldest. One contributing factor may be their excellent means of protection. Armed with a bony carapace and plastron (upper & lower shells), the turtle becomes a virtual tank able to withdraw head and limbs to escape an enemy. Most turtles are aquatic. This is advantageous since on land the weight of a shell impairs movement and costs extra energy to transport. Turtles found in the ponds of LBL leave the water temporarily to deposit their porous eggs in a terrestrial setting.

A second group of reptiles that utilize, to some degree, the ponds of LBL are the snakes. According to some authorities, snakes evolved fairly recently from the legless lizards. Nature has provided an effective means of movement in these animals despite the fact that they are limbless. They flex the powerful muscles located on their flanks and begin to draw their body into a series of s-shaped contractions. As the muscular waves pass down the body, the animals are drawn forward with the aid of large ventral scales which grip the ground for needed traction. Very few species of snakes, at the time of this writing, had been found utilizing the ponds in LBL. Those that had are water snakes (genus *Nerodia*) that feed on fish, frogs, salamanders, and the many larval forms found there.

Snakes feed in two basic ways. The venomous species which are found in the LBL area kill their prey by injecting a powerful toxin which renders the victim helpless. The snake can then feed at its leisure. Specially adapted front teeth called fangs deliver this lethal substance. Retracted into a sheath to prevent self-injury, fangs work like hypodermic syringes delivering the venom. Special facial pits which act like infrared heat sensors are present on many venomous species. This allows the snake to hunt nocturnally, when most of its prey are active.

Non-venomous species usually feed by constriction. The snake wraps its body around its victim and using powerful lateral muscles, coils so tightly that its victim cannot breathe. The teeth are arranged pointing toward the rear in rows. As the snake works its jaws, its food is drawn in and forced toward the throat. Because their jaws are loosely connected, snakes are able to swallow prey much wider than their own heads.

Another group of modern-day reptiles found in the LBL area (but not in ponds) is the lizards. Members of this group may occasionally be mistaken for salamanders. There are several differences that can be noted upon close examination. Lizards possess a dry, watertight covering composed of scales. Amphibians lack these structures and possess a moist skin through which they breathe. The reptilian scale has developed into two basic patterns. The rough surface of most lizards is due to the presence of rough horny scales. Skinks, on the other hand, have developed scales that link together making them smooth to the touch. Reptiles may also be distinguished from amphibians by their clawed digits.

In the ponds sampled to date across LBL, seven reptilian species (five turtles and two snakes) have been documented. These include the Eastern Mud Turtle (*Kinosternon subrubrum*), Common Musk Turtle (*Sternotherus odoratus*), Snapping Turtle (*Chelydra serpentina*), Painted Turtle (*Chrysemys picta*), Slider (*Trachemys scripta*), Northern Water Snake (*Nerodia sipedon*), and Plainbelly Water Snake (*Nerodia erythrogaster*).

As with the groups already covered, it is quite possible that other reptilian species occur in LBL's ponds. If you feel you have found one not described here, one or more of the references listed at the end of this guide should enable you to obtain its identification.

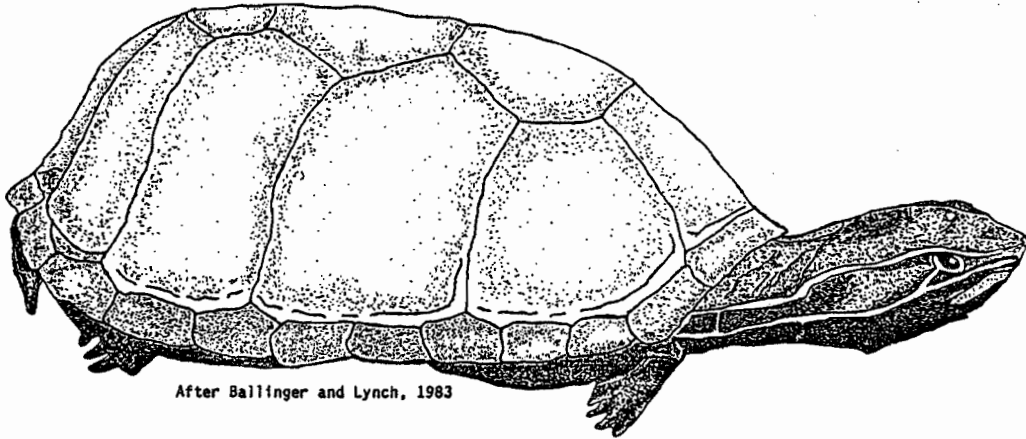
KEY TO THE REPTILES

- 1a. Body with 4 appendages; shell present 2
- 1b. Body without appendages; shell absent 6
- 2a. Carapace with 3 well-defined longitudinal keels (ridges) and serrated (toothed) toward back; long saw-toothed tail; extremely large head; small unhinged **plastron** **SNAPPING TURTLE - *Chelydra serpentina*** (p. 55)
- 2b. Carapace, if keeled, not serrated toward back; tail short; head small; **plastron** not greatly reduced 3
- 3a. Carapace dark and patternless, small, oval and lacking a keel; **plastron** double-hinged and composed of 11 scutes (plates); odor offensive
EASTERN MUD TURTLE - *Kinosternon subrubrum* (p. 50)
- 3b. Not as above 4
- 4a. Carapace highly domed, smooth or with 3 keels; unserrated; carapace of juveniles may be patterned; **plastron** small with a single inconspicuous hinge; face marked by 2 light stripes and barbels on chin; odor offensive
COMMON MUSK TURTLE - *Sternotherus odoratus* (p. 49)
- 4b. Carapace strongly patterned, at least at margin; flattened and weakly keeled to unkeeled; neck, legs, and tail usually bear variable red, yellow, or orange markings 5

- 5a. Carapace olive to black with red bars and crescents on marginal scutes; yellow, red, or orange stripes on neck, legs, and tail; upper jaw notched; plastron may be plain yellow or patterned
 PAINTED TURTLE - *Chrysemys picta* (p. 52)
- 5b. Carapace olive to brown or with pattern ranging from a network of bars and stripes to eyelike spots; prominent red, or yellow-orange blotch behind eye
 SLIDER - *Trachemys scripta* (p. 54)
- 6a. Body with dark crossbands; black or reddish half-moons on ventral surface
 NORTHERN WATER SNAKE - *Nerodia sipedon* (p. 51)
- 6b. Body plain brown; orange to orange-red ventral surface
 PLAINBELLY WATER SNAKE - *Nerodia erythrogaster* (p. 53)

COMMON MUSK TURTLE

Sternotherus odoratus (Latreille)

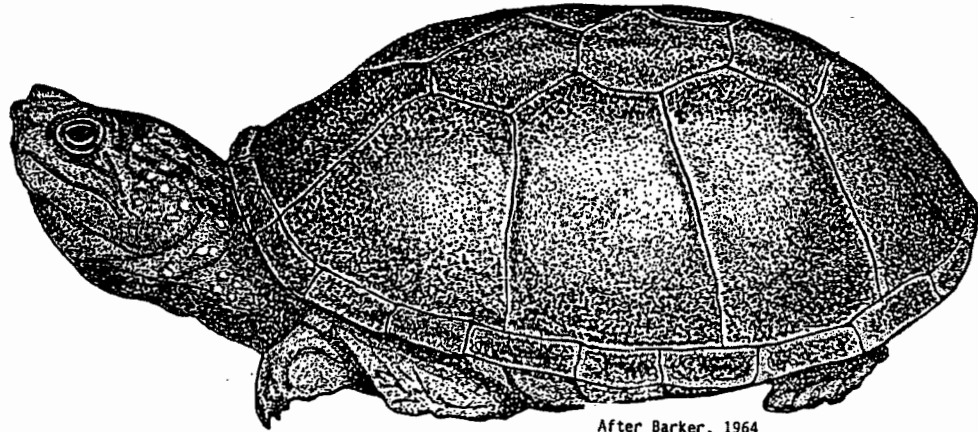


Identification: 3 to 6 inches (75-150mm). This aggressive little turtle can be recognized by the whisker-like **barbels** on its chin, its two light facial stripes and its offensive odor. The **carapace** is usually dark olive-brown to gray. The **plastron** is small and bears one inconspicuous hinge. Like the Mud Turtle, male Musk Turtles (and sometimes females) bear a hard bony tip on their tails.

Additional Notes: Commonly called "stinkpots", Musk Turtles breed in early spring and place their eggs in a shallow nest beneath a rotted stump or occasionally in a muskrat lodge. When disturbed, males bite readily. Musk Turtles have been reported to live over 50 years in captivity.

EASTERN MUD TURTLE

Kinosternon subrubrum (Lacepede)

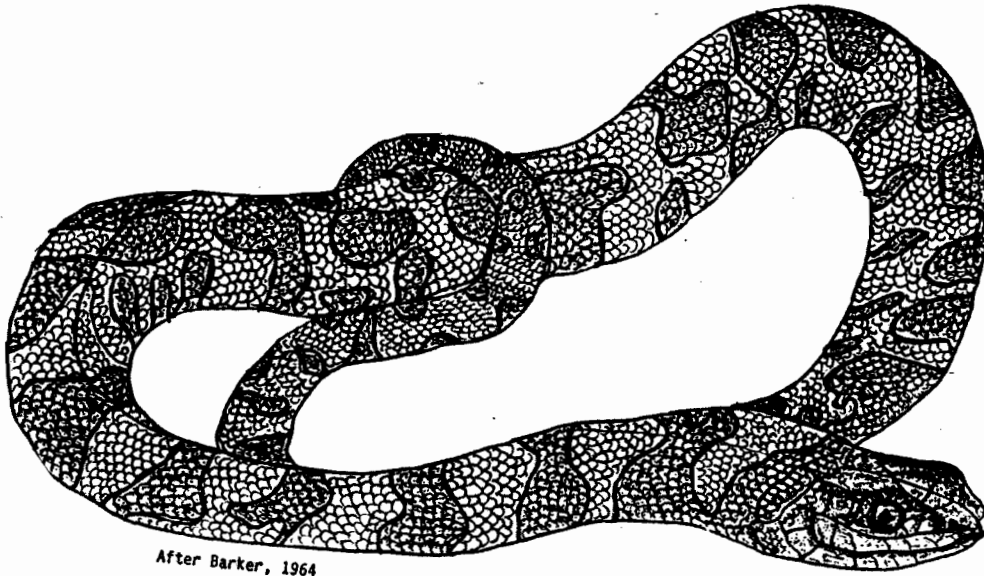


Identification: 3-5 inches (75-125mm). A plain, dark olive-brown **carapace** without a keel distinguishes this turtle. The **plastron** is double-hinged and lighter in color than the **carapace**. Male Mud Turtles have a spine-tipped tail.

Additional Notes: Breeding occurs in spring, after which females deposit their eggs in a shallow nest cavity they dig with their hind legs. A variety of shallow-water habitats (ponds, ditches, sloughs, swamps, and marshes) are utilized.

NORTHERN WATER SNAKE

Nerodia sipedon (Linnaeus)

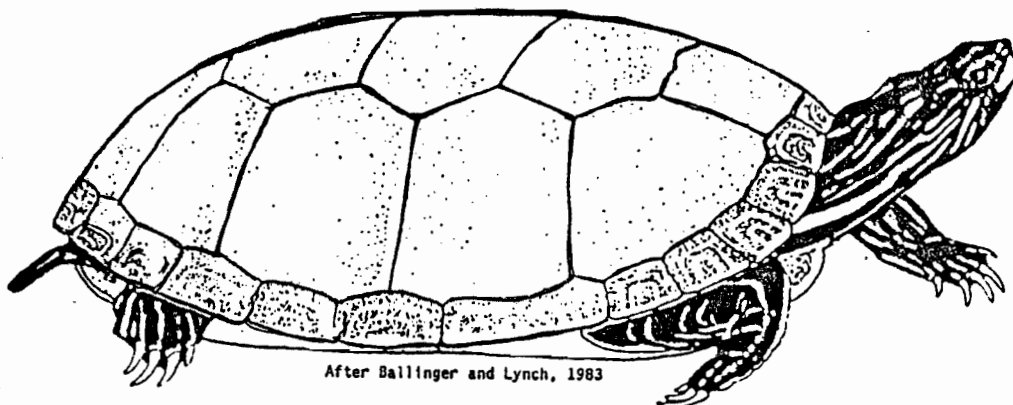


Identification: 24 to 42 inches (609-1066 mm). The principal features one notices on this species are the dark crossbands found on the head and neck, dark or reddish half-moons on the ventral surface, and dark patterns extending to the tip of its tail. The background color for these crossbands ranges from pale gray to dark brown. Some older adults may lose their typical crossband pattern completely. Their scales are keeled (ridged) and the scale over the anal opening (anal plate) is divided.

Additional Notes: This species is rather timid but when cornered can become quite aggressive. Some people may confuse this species with the venomous copperhead and/or cottonmouth. Northern Water Snakes usually mate in April.

PAINTED TURTLE

Chrysemys picta (Schneider)

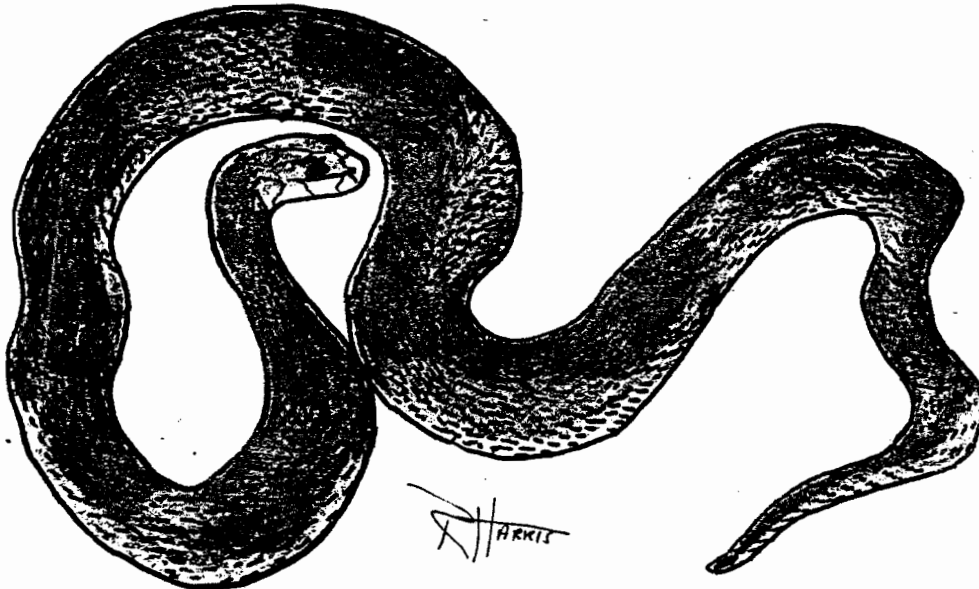


Identification: 4 to 8 inches (100-200mm). Although the **carapace** is frequently dark olive or black, its margin is brightly bordered with red bars or crescents; the **plastron** may be plain yellow or intricately patterned; head and appendages frequently marked with red and yellow stripes.

Additional Notes: This turtle inhabits slow-moving shallow streams, preferring those with abundant vegetation and adequate cover. Females deposit 20-30 elliptical eggs in a 4" cavity in the streambank.

PLAINBELLY WATER SNAKE

Nerodia erythrogaster (Forster)

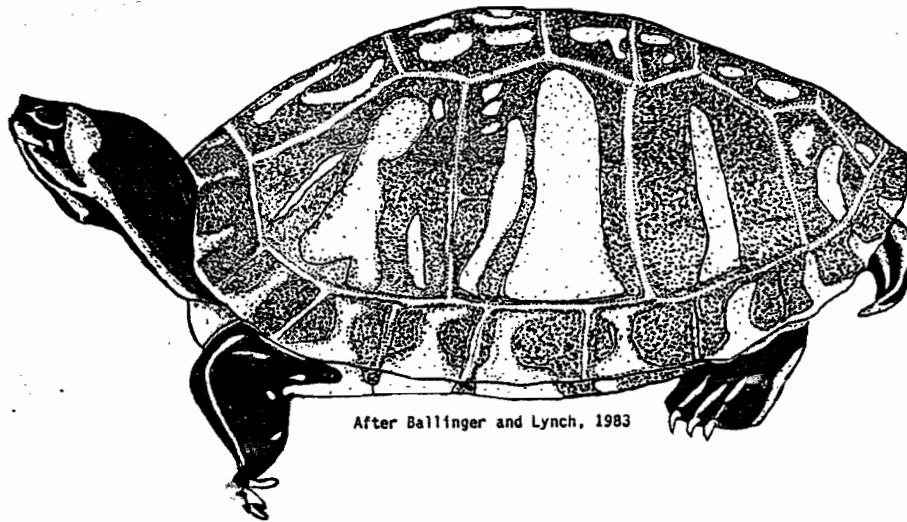


Identification: 30 to 48 inches (762-1219 mm). The best feature to identify this species of water snake is color of the belly. Sometimes referred to as the "Copperbelly", the ventral surface tends to be a bright orange-red. The dorsal surface is a gray to a greenish-olive color. The scales are keeled and the anal plate is divided.

Additional Notes: This snake can often be found far away from sources of water particularly in warm, humid areas. In the fall, water snakes may wander great distances in search of winter hibernation sites.

SLIDER

Trachemys scripta (Schoepff)

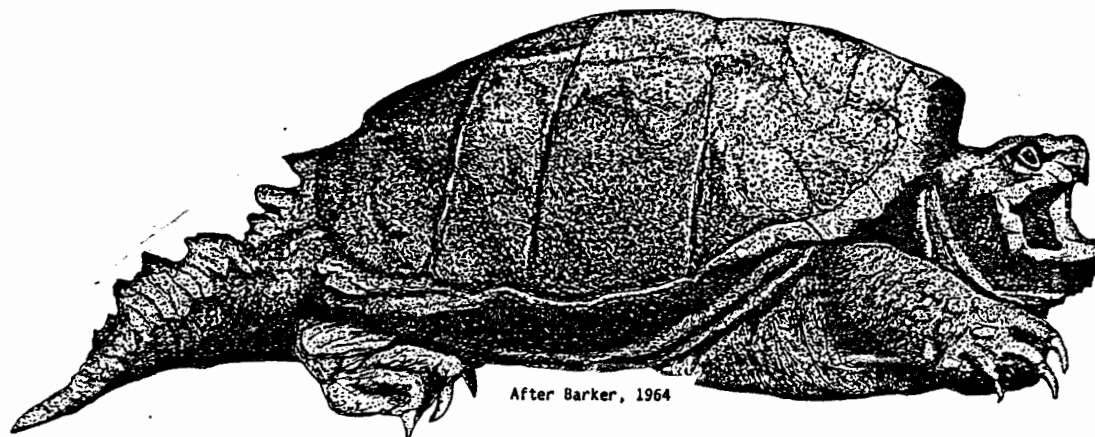


Identification: 5 to 8 inches (127-200 mm). The easiest way to identify most specimens of this turtle species is to look for the broad red stripes on each side of the head behind the eye. In rare instances, this streak may be yellow. The carapace is dark with irregular lines present in the juveniles. As they mature, they often lose this pattern through the development of dark pigments.

Additional Notes: This turtle is often called a Pond Slider or a "red-eared" turtle. These turtles were once commonly sold in stores as pets. Females may lay more than one clutch of eggs in a season.

SNAPPING TURTLE

Chelydra serpentina (Linnaeus)



Identification: 8 to 19 inches (200-480 mm). This large aquatic turtle may be easily recognized by its large head, small **plastron** and long tail. The color of the **carapace** may be black to light brown. The carapace of juveniles is also rough with three well-defined longitudinal keels becoming less distinct in larger individuals.

Additional Notes: This species is usually very inoffensive when encountered in water. Out of the water, however, this animal becomes aggressive, striking when provoked. They are most safely carried by their long tails with the lower part of their shell facing your body.

GLOSSARY

- A-2 gap** - Space between the second anterior tooth row in larval tadpoles.
- Adhesive discs** - Special pads on the toes of treefrogs which enable them to climb.
- Aestivate** - To undergo a period of dormancy during the summer or in dry seasons.
- Anal** - Referring to or pertaining to the anus, the posterior opening of the digestive tract.
- Anal plate** - In snakes, the scales covering the anus.
- Anuran** - Common name of the order including frogs and toads.
- Barbel** - A slender external process on the jaw or other part of the head of certain fishes and turtles.
- Carapace** - In the turtles, the dorsal part of the shell.
- Carnivore** - An animal which feeds primarily on meat.
- Caudal** - In fish, the main fin used for propulsion through the water; tail fin.
- Caudate** - A member of salamander Order Caudata.
- Costal grooves** - Lateral ridges corresponding to rib locations; useful in identification of salamanders.
- Crustacean** - Any chiefly aquatic arthropod of the class Crustacea, having a body covered by an exoskeleton.
- Ctenoid scales** - Rough-edged scales on a fish.
- Cycloid scales** - Smooth-edged scales on a fish.
- Dextral** - Pertaining to the right, not left.
- Devonian period** - Denoting or pertaining to a period of the Paleozoic Era, 345 to 405 million years ago.
- Dorsal (dorsum)** - Pertaining to the back or the upper surface.
- Dorsolateral fold** - Fold or ridge extending posteriorly along the sides of the back.

Ear flap - A dark patch found on the operculum of the fish in the genus *Lepomis*.

Ectothermic - An animal which has no means of regulating an internal body temperature; cold blooded.

Eft - A newt in its immature terrestrial stage.

Emarginate - In larval tadpoles, having a notch in the margin of the oral disc.

Facial pit - A pit located on the side of the head between the nostril and the eye.

Fangs - In the venomous snakes, modified hollow teeth used to inject toxin.

Gill filaments - One of the threadlike processes forming the respiratory surface of the gill.

Gregarious - Living or traveling in groups.

Herbivore - An animal which feeds primarily on plants.

Infrared - The part of the invisible spectrum lying just beyond the red end of the visible spectrum.

Labium (labial) - A lip or lip-like part.

Lateral axis - An imaginary line down the side of the body.

Lateral line - A line, or system of lines, of sensory structures along the head and sides of fishes.

Longitudinal fold - A ridge extending along the long axis of the body.

Median - Situated in the middle.

Midline scales (lateral line scales) - The scales extending along the median plane of the body of an animal.

Myomeres - Bands of muscle tissue in the sides of a fish.

Nocturnal - Active at night.

Omnivore - An animal which feeds on both plants and animals.

Opercular lobe - The technical name for the ear flap found in the genus *Lepomis*.

Operculum - The protective gill cover in fish.

Papillary border - A fringe of fingerlike projections around portions of the mouth disc.

Parotoid gland - In toads, a gland located behind the eye just above the eardrum.

Pectoral - Pertaining to the chest.

Pelvic - Pertaining to the pelvis.

Plasma membrane - The differentially permeable membrane enclosing the cytoplasm of a cell.

Plastron - The ventral part of the shell of a turtle.

Sacral hump - Pertaining to a bulge in the area of the sacrum.

Slime layer - A protective substance found on the scales of fish.

Spawn - To deposit eggs and sperm directly into the water.

Spiracle - An opening into a gill pouch or chamber which may be in a median, dextral, or sinistral location depending on its location on, to the right of, or to the left of the body axis respectively.

Swim bladder - A specialized internal structure in fish, which when filled with air allows the fish to float.

Tetrapod - An animal with four appendages.

Toxin - A poison.

Turbid - Cloudy or non-transparent because of stirred-up sediments.

Tympanum - A resonating membrane covering ear region in frogs and toads (eardrum).

Venomous - Able to inject toxin by way of specialized structures such as fangs.

Ventral - Pertaining to the underside or belly of an animal.

Ventral scales - Scales running along the belly or abdomen of a fish.

Yolk - The food substance found within an egg.

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