



# Frogs

of the

University of Mississippi

Field Station

Edmund D. Keiser, *Chair Emeritus and  
Emeritus Professor of Biology*

*photo by Ed Keiser*

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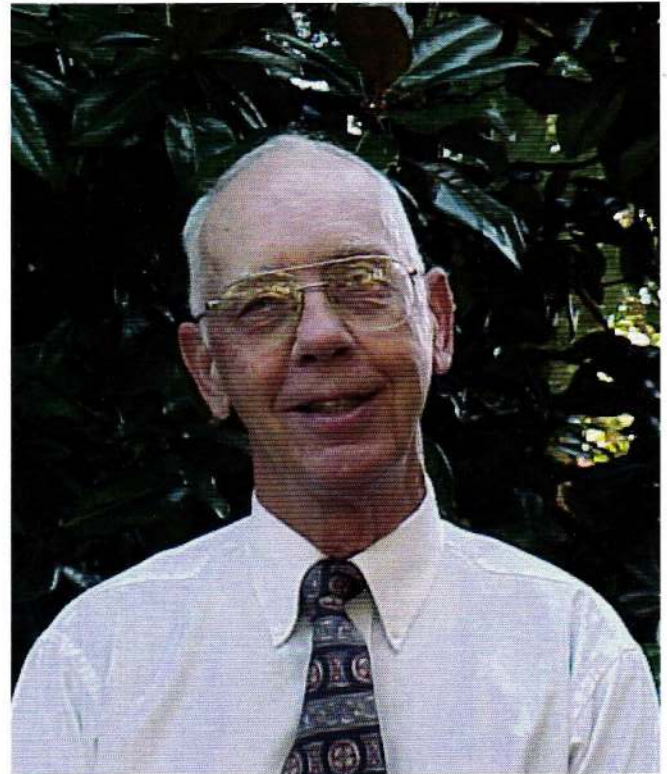


## About the Author

It is always a pleasure to acknowledge colleagues that contribute their time and expertise to help others. This volume on frogs is Dr. Edmund Keiser's third contribution to the University of Mississippi Field Station publication series. His previously published guides tell us about salamanders and turtles of the Field Station and northern Mississippi in general.

Dr. Keiser retired from the Biology Department in 2005, following a 30-year career at UM. Ed remains active in the Biology Dept and now teaches half time. He also does contracted field surveys for the Mississippi Dept. of Wildlife, Fisheries and Parks and for the U. S. Fish and Wildlife Service. We are very pleased and grateful that Ed volunteered to write the guide to Frogs of the University of Mississippi Field Station, our 22nd official publication, as a service to the Field Station, the University and the community. Dr. Keiser is not only an expert on amphibians and reptiles but an excellent field naturalist with many years of experience at the Field Station, dating to its establishment in the mid-1980s. It is not surprising then, that we view Ed Keiser as a major resource and we look forward to his continued regular presence at the Field Station and his next contribution to our series of field guides.

*Dr. Raymond C. Highsmith, Director  
U. M. Field Station*



*Dr. Ed Keiser*

## FROGS OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

Frogs are moist-skinned, scaleless, flat-headed amphibians which are tailless except for the larval stages. All frogs have four legs and their toes have no claws. The rear legs are considerably longer than the fore legs. Collectively, frogs are often called "anurans" or "salientians." The term "toad" is applied mostly to members of the Family Bufonidae, although the term is also used for certain frogs in other families (ex. Spadefoot Toad).

Frogs belong to the Order Anura within the Class Amphibia. There are approximately 21 families and 3,500 species in the world today. Including a recently described form, 30 species are native to Mississippi and at least one introduced species has established itself along the Mississippi coast. Sixteen species are found within or near the station. These are summarized in the checklist (p. 9) and covered in more detail in the key to species (p. 10) and the species accounts (p.20).

Anuran courtship and breeding may occur in damp land habitats or in the water. Male frogs rely on their vocalizations ("calls") to attract females. Groups of calling males are known as "choruses."

During the warm, rainy nights of spring and early summer, frog choruses at the field station can be almost deafening. When the female approaches, males of most frog species will mount the female from the rear in a position called "amplexus."

Fertilization is external in nearly all frog species. Ova are typically fertilized by the amplexed male as the eggs leave the female's cloaca. All Mississippi frogs and most other frogs deposit their eggs in the water, but egg deposition in many species may be in a variety of situations, including rock crevices, rotting logs, plants with moisture pockets, foam nests, etc. Many tropical species even deposit their eggs in water-retaining plants within the forest canopy. A typical frog life cycle is shown on page 5. Frog eggs have protective gelatinous envelopes but lack shells. Eggs may be deposited singly, in jelly strings, in small groups, or in large masses often referred to as "plinths." Eggs have a large supply of yolk for nourishment of the developing embryo.

Frog embryos within the gelatinous envelopes develop into young which lack eyelids and have tails with fins and external gills. External gills are respiratory structures extending outward from the side of the neck. The period from egg

deposition to hatching depends upon temperature and other environmental factors surrounding the egg. Hatching occurs when the young become mobile enough to free themselves from the envelopes.

After hatching, the free-swimming young soon begin foraging for food. Free-swimming, foraging young respire by means of external gills and are called "larvae." The external gills of early larvae are soon covered by a membrane called an "operculum." Once this occurs, the larvae have the typical shape commonly known as "tadpoles." Tadpoles around the world come in a variety of shapes and sizes, but all Mississippi species are easily recognizable as tadpoles. Most tadpoles are vegetarian, though many are omnivorous and some species are carnivorous. A few are even cannibalistic.

The duration of the larval stage is dependent upon environmental factors such as food availability, water temperature and depth, and the animal's internal physiology and genetic traits.

Prior to leaving the water, the larva will undergo changes known as "metamorphosis." Metamorphosis involves the loss of larval features (e.g. gills, larval mouth parts, tail fins and tail) and the development of adult features (e.g. lungs, adult tongue, eye lids, legs).

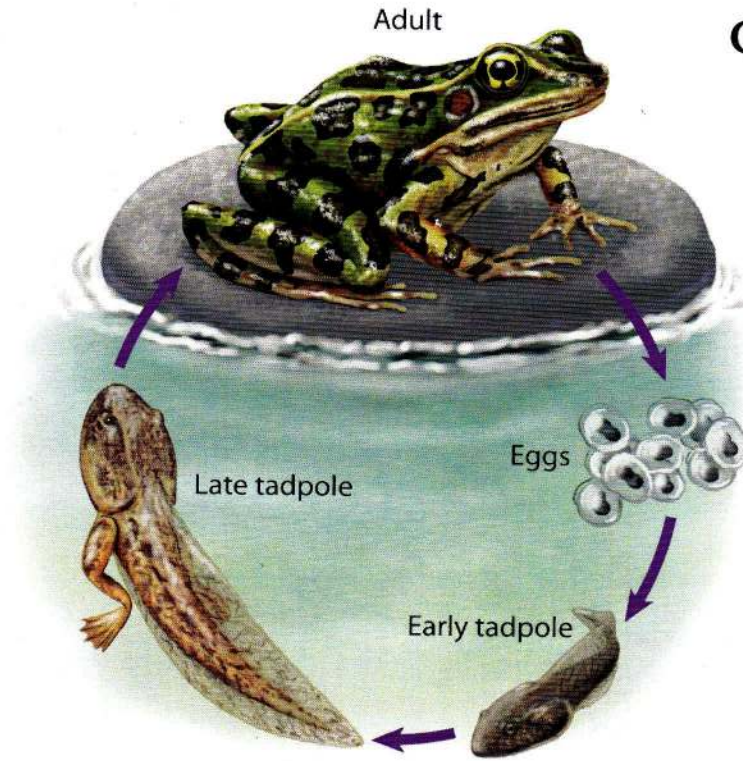
As the larval stage ends, the young frogs move onto land and are called "metamorphs" or "froglets." Young and adult frogs feed mostly on invertebrate animals (insects, millipedes, crustacea, etc.) and some species (e.g. bullfrogs, pig frogs) may capture small vertebrates including birds and mammals.

Only in recent years have biologists appreciated the tremendous influence that frogs and other amphibians have on woodland and aquatic ecosystems and on populations of other species of vertebrates, as well as invertebrates. Frog populations are extremely sensitive to environmental changes. Extreme habitat loss, widespread use of insecticides and herbicides, and parasite/predator relationship changes due to factors associated with global warming, have all taken tolls on frog populations around the world. Numerous frog species have become extinct in recent years and some populations (e.g. Crawfish Frogs, Gopher Frogs) are dangerously near extirpation in Mississippi. Populations of American Toads and Upland Chorus Frogs have noticeably declined at the field station in recent years.



# General Life Cycle of a Frog

*Illustration by Emily Damstra*



## THE UNIVERSITY OF MISSISSIPPI FIELD STATION

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

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







*photo by Robert Jordan*

## IDENTIFICATION OF UMFS FROGS

Identification of adult UMFS frogs is not difficult. A checklist of the 16 species known for the vicinity of the 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 frogs. With these guides and a little practice, one can quickly learn to identify the field station 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, the user begins at couplet 1 and compares the frog to be identified with the two choices in the couplet. The choices will either lead to the vernacular name of a species or to the number of the next couplet to be considered.

For example, if the specimen to be identified in couplet 1 has conspicuous parotoid glands that are longer than wide, you are directed to couplet 2. If it has no parotoid gland or a round one, you are directed to couplet 3.

The couplet choices usually have accompanying figures illustrating the described features. You must decide which couplet pathway best fits the specimen in hand and then proceed to that couplet and again make a choice. Used correctly, the key will lead you to the correct identification of the specimen in hand.

All key determined identifications should be verified by reading the species account descriptions and studying the color plates.

Technical terminology in this booklet is minimal. The few terms that are used in the keys and species accounts are illustrated or defined in the glossary.



## CHECKLIST OF FROGS OF THE UNIVERSITY OF MISSISSIPPI FIELD STATION

### FAMILY BUFONIDAE

- American Toad ..... *Anaxyrus americanus*  
Fowler's Toad ..... *Anaxyrus fowleri*

### FAMILY HYLIDAE

- Northern Cricket Frog ..... *Acris crepitans*  
Southern Cricket Frog ..... *Acris gryllus*  
Bird-voiced Treefrog ..... *Hyla avivoca*  
Cope's Gray Treefrog ..... *Hyla chrysoscelis*  
Green Treefrog ..... *Hyla cinerea*  
Barking Treefrog ..... *Hyla gratiosa*  
Spring Peeper ..... *Pseudacris crucifer*  
Upland Chorus Frog ..... *Pseudacris feriarum*

### FAMILY MICROHYLIDAE

- Eastern Narrowmouth Toad ..... *Gastrophryne carolinensis*

### FAMILY RANIDAE

- Bullfrog ..... *Lithobates catesbeianus*  
Green Frog ..... *Lithobates clamitans*  
Southern Leopard Frog ..... *Lithobates sphenoccephalus*  
Pickerel Frog\* ..... *Lithobates palustris\**

### FAMILY SCAPHIOPODIDAE

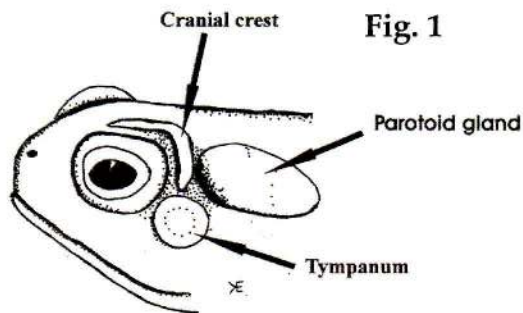
- Eastern Spadefoot ..... *Scaphiopus holbrookii*

\*There are currently no definite records of Pickerel Frogs from within the boundaries of the field station. This is an uncommonly encountered species in north Mississippi but proximity records suggest that future on-site investigations may reveal this species within the site boundaries.

## KEY TO THE ADULT FROGS of the University of Mississippi Field Station

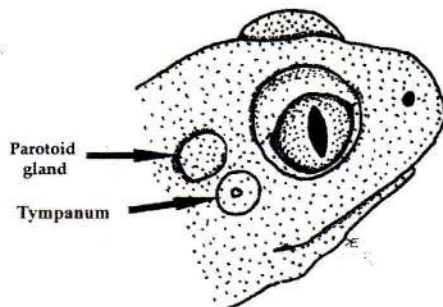
1. Parotoid glands conspicuous and obviously longer than wide (Fig. 1); skin dry with numerous large and conspicuous warts. .... 2

Parotoid glands absent or inconspicuous and round (Fig. 2); skin not dry and warts absent or small and inconspicuous. .... 3



**Fig. 1**

**Fig. 2**



2. Parotoid glands oval and in contact with cranial crests (Fig. 3A); dark spots on dorsum large and typically surrounding 3 to 5 small warts (Fig. 3A). ....  
FOWLER'S TOAD (p. 23)

Parotoid glands kidney-shaped and either not in contact with transverse bar of cranial crest (Fig. 3B) or connected to transverse bar by a small rear extension (Fig. 3C); dark spots on dorsum small and each usually surrounding the base of one or two large warts (Fig. 3B, 3C). ....  
AMERICAN TOAD (p. 21)



3. Transverse fold of skin behind eyes (Fig. 4), no tympanum (Fig. 4). ..... EASTERN NARROWMOUTH TOAD (p. 41)

No transverse fold of skin behind eyes, tympanum present..  
..... 4

Fig. 3

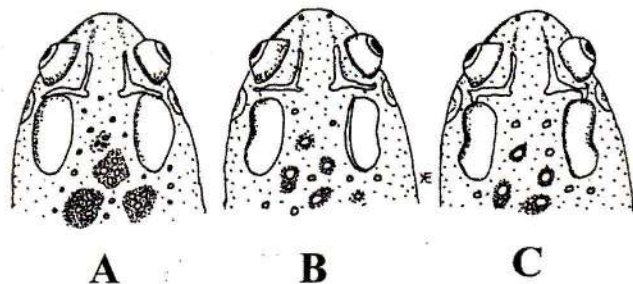
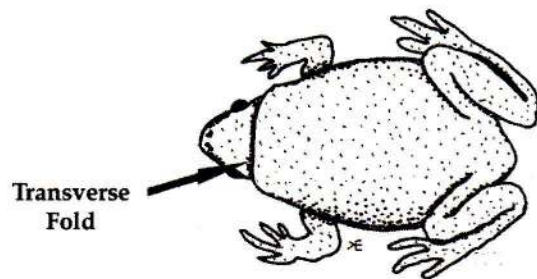


Fig. 4



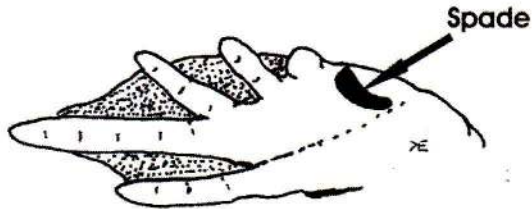
4. Pupil of eye vertically elliptical (Fig. 2); dark horny, sickle-shaped spade on hind foot (Fig. 5); round parotoid glands present (Fig. 2). ..... SPADEFOOT TOAD (p. 51)

Pupil of eye horizontally elliptical or oval (Fig.1); no spade on hind foot and no parotoid gland. .... 5

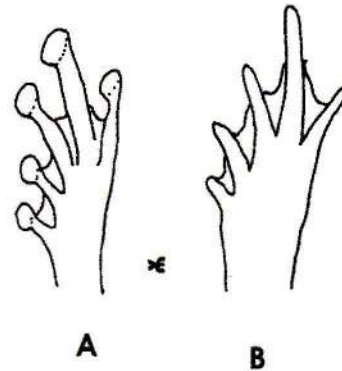
5. Skin of belly granular; tips of toes slightly or conspicuously expanded to form adhesive pads (Fig. 6A). ..... 6

Skin of belly smooth; tips of toes not expanded to form adhesive pads (Fig.6B). ..... 13

**Fig. 5**



**Fig. 6**





6. Skin warty; dark triangle between eyes (Fig. 7); adhesive disks on toe tips not noticeably wider than ends of toes (Fig. 8B). .....7

Skin not warty; usually without dark triangle between eyes; if triangle present, adhesive disks are noticeably wider than ends of toes (Fig. 8A). ..... 8

Fig. 7

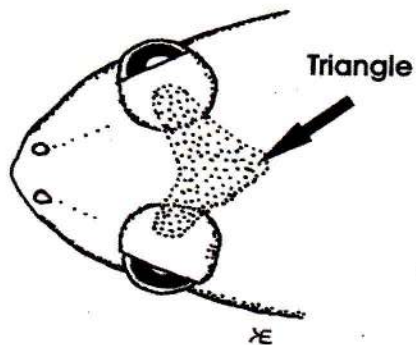
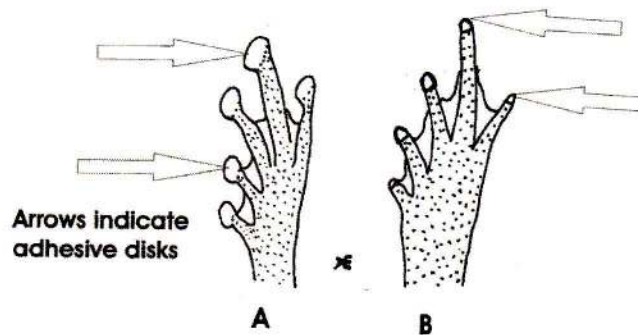


Fig. 8



7. Innermost toe not webbed to adhesive pad; usually 3 terminal segments of longest toe of hind foot free of web or only narrowly webbed (Fig. 9A); webbing adjacent to 4th toe deeply indented between adhesive disks of adjacent toes (Fig. 9A); dark stripes on rear of thighs with sharply defined edges bordered by light stripes (Fig.10A). .... SOUTHERN CRICKET FROG (p. 27)

Innermost toe (1st) webbed to or near adhesive disk; less than two terminal segments of longest toe (4th) of hind foot unwebbed (Fig. 9B); webbing adjacent to 4th toe not deeply indented (Fig. 9B); dark stripes on rear of thighs with ragged, vague edges blending more or less gradually into adjacent light stripes (Fig.10B)..... NORTHERN CRICKET FROG (p. 25)

Fig. 9

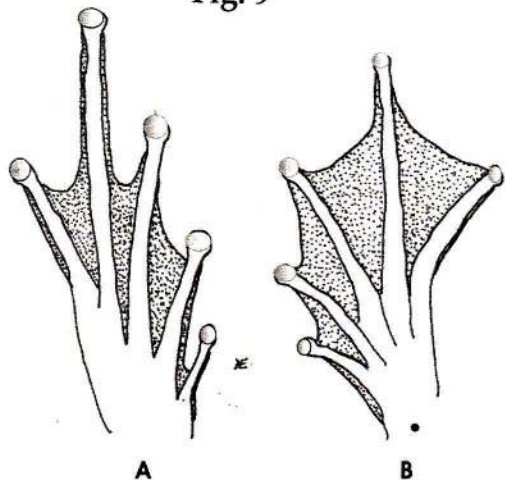
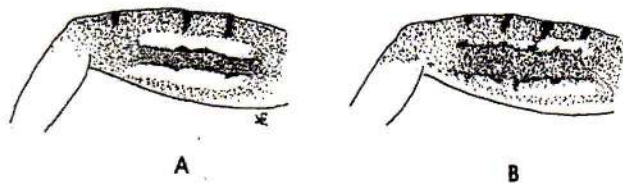


Fig. 10





8. Dorsum tan, with X-shaped dark brown mark (Fig. 11).....  
SPRING PEEPER (p. 37)

Dorsum tan or not tan but lacking X-shaped dark brown  
mark. .... 9

9. Terminal adhesive disks no wider or barely wider than  
tips of toes (Fig. 12A). ..... UPLAND CHORUS FROG (p. 39)

Terminal adhesive disks distinctly wider than tips of  
toes (Fig 12B). .... 10

Fig. 11

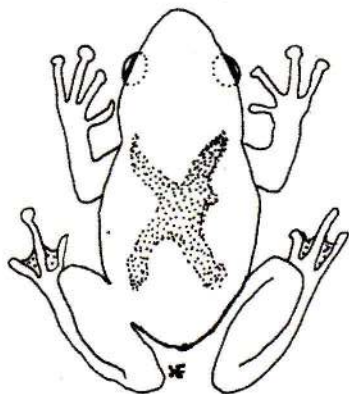
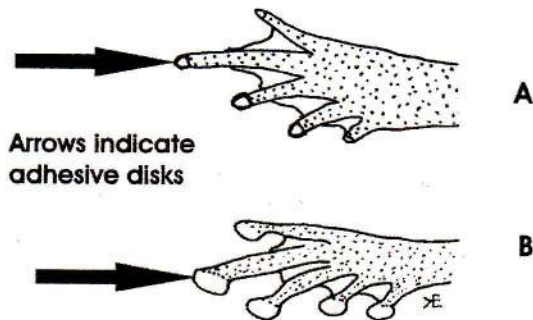


Fig. 12



10. White spot below each eye (Fig.13). ..... 11
- No white spot below each eye. .... 12
11. Rear of thigh yellow or orange between dark markings. .  
COPE'S GRAY TREEFROG (p. 31)
- Rear of thigh greenish between dark markings. ....  
BIRD-VOICED TREEFROG (p. 29)

12. Dorsum usually bright green (sometimes tan) and with or without gold flecks; prominent, usually well-defined white stripe on side of lips and body (Fig. 14); skin smooth, not granulate in texture..... GREEN TREEFROG (p. 33)

Dorsum usually a subdued green with numerous, round, dark-bordered spots (infrequently uniform green or brown with darker brown spots); white stripe on lips and lateral body is ragged and often bordered by purple below; skin granulate..... BARKING TREEFROG (p. 35)

Fig. 13

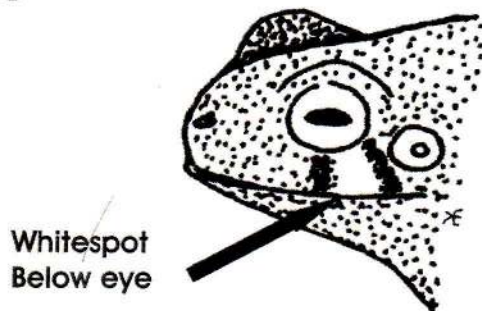
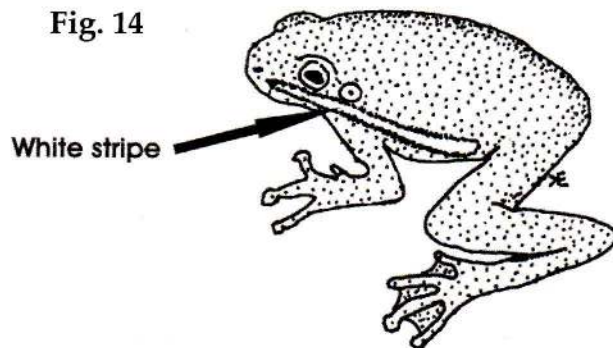


Fig. 14

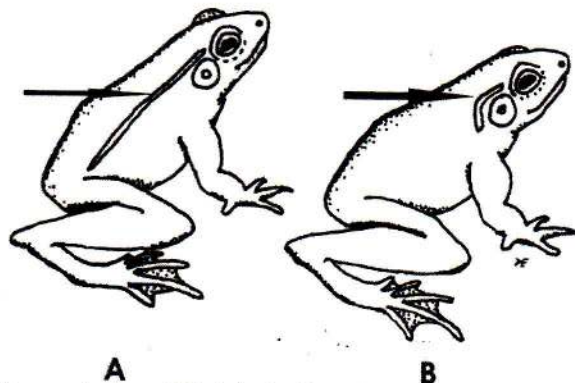




13. Dorsolateral folds extend down the back and do not curve downward behind the tympanum (Fig. 15A). ..... 14

Dorsolateral folds (Fig.15B) curve downward around posterior edge of tympanum.....BULLFROG (p. 43)

Fig. 15



A B  
Dorsolateral folds indicated by arrows.

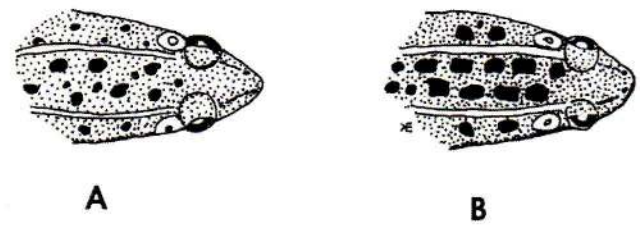
14. Dorsolateral folds extend along sides of trunk but end well anterior to groin; folds colored similarly to dorsum; dorsum typically dark green and with or without small dark spots which are typically smaller than diameter of pupil of eye..... GREEN FROG (p. 45)

Dorsolateral folds continuous to groin and usually dull yellow or gold in color; dorsum typically dark green with very large and dark, rounded, oval, or rectangular spots or blotches with irregular edges; spots or blotches considerably larger than pupil of eye..... 15

15. Dorsal dark spots and blotches more or less rounded and typically not in parallel rows between the dorsolateral folds (Fig. 16A); groin white or cream in life. .... SOUTHERN LEOPARD FROG (p. 47)

Dorsal dark spots and blotches mostly rectangular and in two parallel rows between the dorsolateral folds (Fig. 16B); groin yellow or orange in life. .... PICKEREL FROG (p.49)

Fig. 16



“Only in recent years have biologists appreciated the tremendous influence that frogs and other amphibians have on woodland and aquatic ecosystems and on populations of other species of vertebrates, as well as invertebrates. Frog populations are extremely sensitive to environmental changes.”

Ed Keiser





*photo by Ed Keiser*



## AMERICAN TOAD

*Anaxyrus americanus* (Holbrook)

### Identification

Toads are easily recognized as dry skinned, warty amphibians. They typically hop rather than jump. American Toads have one or two large warts within the irregularly-arranged, black dorsal spots. The prominent parotoid glands are kidney-shaped with the indented border toward the ground. The glands on each side are usually separated by less than the length of one gland. The prominent cranial crests are separated from the parotoid glands or only in contact by a postorbital spur. The belly of an American Toad may be uniformly cream or have numerous dark spots anteriorly, although some individuals may have dark pigments over most of the belly. Most adult American Toads at the field station are from 2 ½ to 3 inches in body length.

### Similar Species

The American Toad can only be confused with Fowler's Toad. Fowler's Toad has larger dorsal black spots and most have 3-5 small warts within them. The parotoid glands are oval in shape and are in direct contact with the cranial crests. The two parotoid glands of Fowler's Toads are separated by more than the length of one gland. The belly of a Fowler's Toad typically has a single pectoral spot or no spot.

### Taxonomic Comments

American Toads were formerly in the genus *Bufo*. Some authors continue to use this generic designation. Two subspecies may be present at the field station. *Anaxyrus americanus americanus*, the Eastern American Toad, is the subspecies supposedly characteristic of this area. However, many individuals found at the station appear to have affinities with *A. americanus charlesmithi*, the Dwarf American Toad. Some authorities are considering the possibility that *charlesmithi* should have full species status (e.g. *Anaxyrus charlesmithi*).

### General Comments

American Toads were abundant at the field station 30 years ago but their numbers have radically declined and they are now only occasionally encountered. American Toads typically begin calling during very late February or early March and continue into late spring months. Their call is a prolonged high-pitched trill of varying length which is easily distinguished from the nasal call of Fowler's Toad. The eggs are deposited in long tubes of jelly-like matrix. Eggs are laid in rain pools, water-filled ditches, and ponds. Hatching occurs in a few days to two weeks. Tadpoles are mostly black and about an inch long when nearing metamorphosis. Time to metamorphosis is dependent upon environmental and physiological factors, but usually occurs 5 to 9 weeks after egg deposition. Recently metamorphosed individuals are about a half inch in length.







## FOWLER'S TOAD

*Anaxyrus fowleri* (Hinckley)

### Identification

This is another dry skinned, warty amphibian that typically hops rather than jumps. Fowler's Toads have three, four or five small warts within the large dark brown or black dorsal spots. The prominent parotoid glands are elongate and usually lack ventral borders. The two parotoid glands are typically separated from each other at their closest point by more than the length of one gland. The cranial crests are usually in contact with the parotoid gland. The belly is typically dull cream with a single dark pectoral spot or no spot. Fowler's Toads at the field station typically range from 2 to 3 inches in body length.

### Similar Species

The American Toad has smaller dorsal dark brown or black spots and most spots have only one or two large warts within them. The parotoid glands of American Toads are kidney-shaped and either not in direct contact with the cranial crests or touching only a small postorbital extension. The cranial crests are more prominent than those of Fowler's Toad and the parotoid glands are separated at their closest point by less than the length of one gland.

### Taxonomic Comments

Most authors today no longer use the generic name *Bufo* for North American toads. In past years, Fowler's Toads were recognized as a subspecies (*Bufo woodhousei fowleri*), but today this taxon is considered to be a distinct species.

### General Comments

Fowler's Toad is abundant and frequently seen and heard at the field station. These toads begin calling during warm nights of early to late March and continue into early summer months. Their call is a nasal waaaaaah of varying length which is easily distinguished from the high trill of the American Toad. The eggs are deposited in long tubes or strings of jelly-like matrix. Eggs are laid in rain pools, water-filled ditches, and ponds. Hatching usually occurs a few days to a week after deposition. Tadpoles are mostly black or very dark brown and about 3/4 inch long when nearing metamorphosis. Time to metamorphosis is dependent upon environmental and physiological factors, but usually occurs 5 to 7 weeks after egg deposition.





photo by Ed Keiser



## NORTHERN CRICKET FROG

*Acris crepitans Baird*

### Identification

These are small, high-jumping, warty-skinned frogs common around the shorelines of field station ponds, rain pools, springs, creeks and sometimes within the nearby fields and woodlands. Cricket Frogs have dark triangles between the eyes, ragged dark brown to blackish stripes on the rear of the thighs, and extensive webbing between the toes of the hind feet. The tip of the snout is slightly rounded. Many individuals have a mid-dorsal orange, reddish, yellow, brown, green, or black stripe. The innermost toe of the hind foot is extensively webbed. Only 1½ phalanges of the 4th toe are free of webbing. The post-femoral stripe is ragged with fuzzy or indistinct edges. Cricket Frog adults range from 3/4 inch to slightly over one inch in body length.

### Similar Species

Northern Cricket Frogs closely resemble Southern Cricket Frogs and separation may be difficult. Southern Cricket Frogs have pointed snouts, sharply defined post-femoral stripes, and 2½ to 3 phalanges of the 4th toe have little or no webbing. Both species have warty skin and dark triangles between the eyes. Both may have mid-dorsal stripes of various colors.

### Taxonomic Comments

The subspecies present at the field station is *Acris crepitans crepitans*.

### General Comments

This species is considerably less common than the Southern Cricket Frog at the field station. The population appears to be declining in recent years. It has been suggested that Northern Cricket Frogs may have been introduced years ago when mats of water hyacinths were added to field station ponds. The calls of Northern Cricket Frogs resemble glass marbles clicking together in rapid succession, initially speeding up, then slowing down. This frog calls during warmer periods of all months of the year. Eggs are deposited in ponds, ditches, streams, and springs during warmer months and usually lie on the bottom in small masses. Tadpoles may reach over an inch in length and metamorphosis usually occurs about two months after egg deposition.





photo by Ed Keiser



## SOUTHERN CRICKET FROG

*Acris gryllus* (Le Conte)

### Identification

These are small, high-jumping, warty-skinned frogs which occur along shorelines of ponds, rain pools, springs, and creeks. Individuals often range into the woodlands of the bordering hills and valleys of the field station. Cricket frogs have dark triangles between the eyes, ragged dark brown to blackish stripes on the rear of the thighs, and extensive webbing between the toes of the hind feet. Many individuals have a mid-dorsal orange, reddish, yellow, brown, green, or black stripe. The two cricket frog species at the field station are not easy to separate. The Southern Cricket Frog has 2  $\frac{1}{2}$  phalanges of the 4th toe free of webbing and the innermost toe is only  $\frac{1}{2}$  webbed. The snout is pointed rather than rounded. The post-femoral stripes are less ragged and have well-defined edges. Cricket Frog adults range from  $\frac{3}{4}$  inch to slightly over one inch in body length.

### Similar Species

Southern Cricket Frogs closely resemble Northern Cricket Frogs and separation may be difficult. Northern Cricket Frogs have rounded snouts, more ragged and less defined post-femoral stripes with indistinct edges,

only  $1 \frac{1}{2}$  phalanges of the 4th toe free of webbing, and the innermost toe is webbed to the terminal disk.

### Taxonomic Comments

The subspecies present at the field station is *Acris gryllus gryllus*.

### General Comments

This species is much more common at the field station than the Northern Cricket Frog. The calls of Southern Cricket frogs resemble the well-defined, somewhat metallic, gick, gick, gick, gick of a Halloween clicker. This frog calls during warmer periods of all months of the year. Eggs are deposited in small plinths on the bottoms of ponds, ditches, streams, and springs during warmer months. Tadpoles may reach over an inch in length and recently metamorphosed individuals are most commonly found in June and July.



*photo by Ed Keiser*



## **BIRD-VOICED TREEFROG**

*Hyla avivoca* Viosca

### **Identification**

This is a moderate-size treefrog with expanded adhesive pads. The dorsal surface may be green, gray, or even tan, and are overlain with a highly irregular dark blotch pattern. Very young specimens may lack the dark blotch and individuals of all ages can change colors. A conspicuous white spot is on the jaw line below the eye. The belly is white or cream, but the groin and posterior thigh are greenish. The skin is only slightly granular and noticeably smoother than in other treefrogs of similar appearance. These frogs typically reach sizes between 1 and 2 inches in body length.

### **Similar Species**

Bird-voiced Treefrogs are similar in color to Cope's Gray Treefrog. Cope's Gray Treefrog has all dorsal color phases described above but the inner aspects of the hind leg and groin are yellow or orange and the skin is noticeably more granular and the granules are detectable by touch as well as sight. Cope's Gray Treefrog also tends to reach larger sizes, averaging about 1/4 inch longer in body length, and the call is a trill rather than a series of whistles.

### **Taxonomic Comments**

No subspecies are currently recognized.

### **General Comments**

Bird-voiced Treefrogs are abundant at the field station, but more frequently heard than seen.

This frog is named for its bird-like call sequence of rapidly repeated whistles, usually made from within low trees adjoining or overhanging potential breeding waters. Calls may be heard on rainy, warm afternoons and nights during the warmer months of the year but large choruses are most frequent from late March through June. Individuals tend to prefer swamp-like ponds or ponds bordered by willows for egg deposition. Eggs are deposited on pool bottoms within small plinths. Hatching occurs about 2 days after deposition and tadpoles typically metamorphose in four to six weeks.





photo by Ed Keiser



## **COPE'S GRAY TREEFROG**

*Hyla chrysoscelis* (Cope)

### **Identification**

This is a moderate-size, chunky-bodied treefrog with expanded adhesive pads. The dorsal surface may be green, gray, or even tan, and overlain with a highly irregular dark blotch pattern. Very young specimens may lack the dark blotch and individuals of all ages can change colors. A white spot is present on the jaw line below the eye. The belly is white or cream, but the groin and posterior thigh are yellow or orange in color. The skin is granular and the granules are noticeable to the touch. These treefrogs typically reach maturity between 1 and 2 1/4 inches in body length.

### **Similar Species**

Cope's Gray Treefrog is similar in appearance to the Bird-voiced Treefrog. The Bird-voiced Treefrog has the dorsal color phases described above but the inner aspects of the hind leg and groin are greenish and the skin is noticeably less granular and smoother to the touch. The Bird-voiced Treefrog is generally smaller than mature Cope's Gray Treefrogs and the call is a series of whistles.

### **Taxonomic Comments**

No subspecies are currently recognized.

### **General Comments**

This is an abundant and conspicuous species at the field station. Males of this species call with a short, loud, somewhat nasal trill or a sequence of trills. Choruses occur within ponds, drainage ditches, woodland and field rain pools, and water-filled road ruts from mid-March through mid July, but individual calls may be heard almost anytime the weather is rainy and warm. The flimsy egg masses are free-floating or attached to underwater objects. Hatching occurs a few days after deposition. Most tadpoles metamorphose within one to two months, although a few have been taken in winter months in field station ponds.





*photo by Ed Keiser*

## **GREEN TREEFROG**

*Hyla cinerea* (Schneider)

### **Identification**

This is a medium-size, bright green or occasionally tan, treefrog with conspicuous adhesive pads on the toe tips. A sharply defined bold white stripe extends from the upper lip backward toward the groin. The ventral surface is white. The dorsal surface may or may not have scattered gold flecks. All treefrogs found in Mississippi can change colors, so anticipate variation in individuals. Green treefrogs typically reach adult sizes between 1 ½ and 2 ½ inches in body length.

### **Similar Species**

Adult Green Treefrogs resemble Barking Treefrogs, but Barking Treefrogs have the white stripes on the low sides of the body not sharply demarcated, sometimes branching, and bordered by extensive areas of purple. There are usually large, round, dark purple spots on the back and gold flecks are not present. Barking Treefrogs are also chunky and somewhat toad-shaped while Green Treefrogs are comparatively slender. Very young individuals may be somewhat similar to metamorphs of other treefrogs but discrimination will improve with experience.

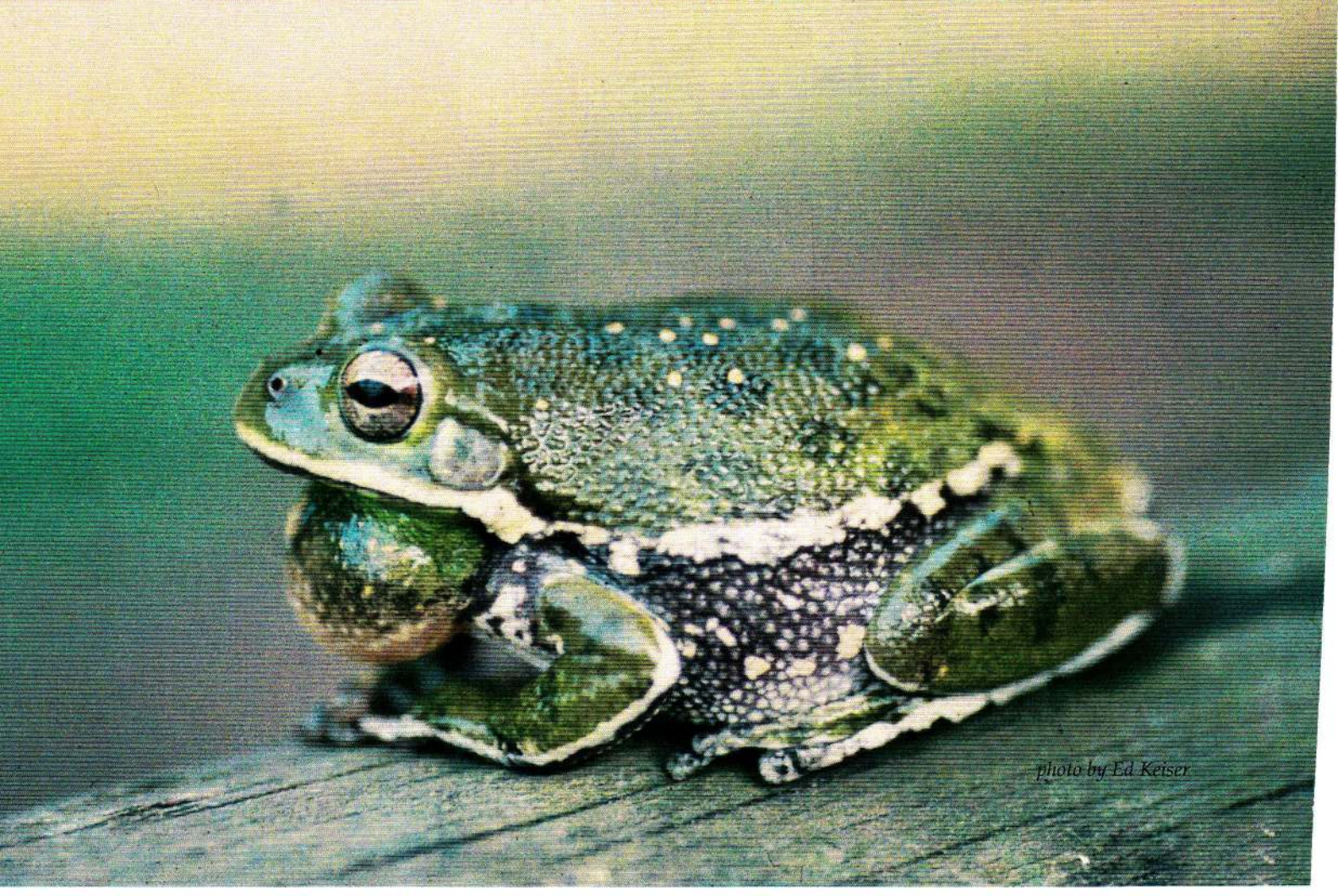
### **Taxonomic Comments**

No subspecies are currently recognized. It should be noted that Green Treefrogs and Barking Treefrogs may occasionally hybridize at the field station. The hybrid offspring often have color traits of both parent species and behavioral patterns unlike either.

### **General Comments**

Many consider this species to be America's most beautiful frog. This is an abundant and easily observed species at the field station. Breeding choruses may be heard on warmer nights as early as March and into August but the most active period is from mid-April through middle June. The male call is a ducklike, monotonic "quonk" issued repeatedly. A chorus of these frogs sounds similar to ducks at a distance. Males typically call from small trees or emergent vegetation within or bordering the breeding ponds, swamps, or marshes. Eggs are laid in floating jelly masses attached to objects in the water. Tadpoles metamorphose about two months after egg deposition.





*photo by Ed Keiser*



## **BARKING TREEFROG**

*Hyla gratiosa* (Le Conte)

### **Identification**

This is a large, chunky bright green, greenish yellow, tan, or brown treefrog with conspicuous digital adhesive pads. Typically, there are large, rounded, dark purple spots scattered over the dorsum although at times these may be inconspicuous or absent. Very small white spots on the backs of some individuals. A white stripe extends from the upper lip backward toward the groin. The stripe is irregularly edged and less well-defined behind the head and may branch on the sides of the belly where it is usually bordered above and below by dark and light purple. The skin on the back is exceptionally granular. It should be noted that all treefrogs in Mississippi can change colors. Barking Treefrogs reach body lengths between 2 and 2 5/8 inches.

### **Similar Species**

Barking Treefrogs can be confused with Green Treefrogs. Green Treefrogs are slender, not chunky, and the lateral white stripe is well-defined on the sides. The belly is white and has no extensive purple areas below the white stripe which never branches. There are no large, dark purple spots on the dorsum and tiny gold flecks may be present. There is no white spot below the eye.

### **Taxonomic Comments**

No subspecies are currently recognized. Barking Treefrogs and Green Treefrogs may occasionally hybridize at the field station. The hybrid offspring have color traits of both parent species and behavioral patterns unlike either.

### **General Comments**

This is an abundant species at the field station. Breeding choruses may be heard on warmer nights from late March and into July but the most active period is from mid-April through mid-June. The common name of this frog refers to the harsh, bark-like, repeating syllables call of males located within tree canopies. The male mating call, however, is a monotonic "tonk" or "bonk" issued singly or doubly, and repeated after a brief interval. Males typically call while floating within the breeding ponds, swamps, or marshes. The calls are often difficult to hear when choruses of the louder Green Treefrogs are calling. Eggs are laid on the pond bottoms, often singly. Tadpoles may reach over 2 1/2 inches in total length, the largest of field station hylid tadpoles. They metamorphose at less than an inch long in the summer and early fall.





*photos by Ed Keiser*

## **SPRING PEEPER**

*Pseudacris crucifer* (Wied)

### **Identification**

This is a small, usually tan treefrog. Brown, yellow-brown, and olive-gray color phases may be seen. Whatever the ground color, there is usually a dark, crude X on the dorsum and a dark, transverse bar between the eyes. The belly is pale yellow, cream, or cinnamon in color. The skin is smooth and not granular. Adhesive pads on the toe tips are obvious and the skin is smooth. Adults attain body lengths of 3/4 inch to 1 1/4 inch.

### **Similar Species**

Spring Peepers are usually easy to recognize. Cope's Gray Treefrog and the Bird-voiced Treefrog have a single white spot under each eye. The Upland Chorus Frog has stripes or lines of dark spots on the back. Cricket frogs have warty skins.

### **Taxonomic Comments**

The subspecies occurring at the field station is *Pseudacris crucifer crucifer*, the Northern Spring Peeper.

### **General Comments**

Spring Peepers are abundant and easily observed at the field station. These are woodland treefrogs that gather in large numbers to breed in woodland and field rain pools and along the heavily vegetated margins of ponds, swamps, and marshes. Breeding choruses can be heard on warm days and nights from February through early June, but calling individuals can be heard in trees on almost any rainy day or night when temperatures are above 60 degrees Fahrenheit. The call is a high pitched, bird-like peep, usually emitted in series. Eggs are deposited singly and attached to underwater vegetation and dead branches. Tadpoles average just over an inch in length and, two to three months after hatching, metamorphose into froglets that are considerably smaller.





*photo by Ed Keiser*

## **UPLAND CHORUS FROG**

*Pseudacris feriarum* (Baird)

### **Identification**

This is a small, tan or gray treefrog with a dark lateral stripe extending from the snout tip through the eye to the groin. A white lip stripe is below the dark stripe in the head region. Typically, three narrow, longitudinal dark stripes occupy the mid-back although these stripes may be broken into linearly arranged spots on some individuals. The adhesive pads on the digit tips are not obvious and the skin is smooth. Adults attain body lengths of 3/4 inch to about 1 1/4 inch.

### **Similar Species**

Chorus frogs may be confused with Spring Peepers and Cricket Frogs. Spring Peepers have a dark bar between the eyes and a dark X-shaped mark on the back. Toe pads are obvious. Cricket frogs have warty skins and a dark triangle between the eyes.

### **Taxonomic Comments**

No subspecies are presently recognized.

### **General Comments**

Upland Chorus Frogs are abundant and often heard but rarely observed at the field station. These frogs are among the earliest callers of the year. They breed in woodland and field rain pools and along heavily vegetated margins of ponds, swamps, and marshes. Choruses may be heard on cool to warm nights from February through April. Individuals may call at other times of the year, particularly during and after rains. The low pitched, vibrating calls of this species may be difficult to discern within large choruses of Spring Peepers. Many describe the call as being similar to drawing the teeth of a comb across the lip of a drinking glass. Eggs are deposited under water in small jelly masses attached to vegetation and debris. Individuals may metamorphose in about a month.





*photo by Ed Keiser*

## **EASTERN NARROWMOUTH TOAD**

*Gastrophryne carolinensis* (Holbrook)

### **Identification**

This is a small, somewhat flattened, chunky frog with a tiny head. The snout is pointed and there is a transverse skin fold behind the eyes. The color is gray-black or gray-brown dorsally, often with weakly defined, tan, gray, or dull red light stripes laterally. The belly is mottled gray-black or gray-brown. The skin is smooth. Adults attain body lengths of about an inch.

### **Similar Species**

Eastern Narrowmouth toads are distinct in appearance and not easily confused with other field station species.

### **Taxonomic Comments**

No subspecies are currently recognized.

### **General Comments**

These are abundant at the field station. However, they are often heard but rarely seen. They may be found within woodlands or fields, but are most common around the margins or in the shallow waters of ponds, swamps, and marshes during the breeding season. Temporary rain pools may also serve as breeding sites. Large numbers may assemble for courtship and their calls may be heard on warm days and nights from late March through early October. Their calls have been described as sounding like an electric buzzer or the bleat of a sheep. The egg masses float in a surface film and hatching occurs within two or three days. The period to metamorphosis is highly variable, typically taking place from 3 weeks to 2 ½ months after hatching.





*photo by Ed Keiser*

## **BULLFROG**

*Lithobates catesbeianus* (Shaw)

### **Identification**

This is the largest frog in Mississippi. The dorsal colors are highly variable, but are usually shades of green, olive, or olive brown. The back may or may not be darkly mottled and many individuals have widely dispersed, black dorsal spots. The snout is usually greenish and not mottled and the jaw line does not have alternating white and dark spots. The belly may be solid white or cream or have extensive dark mottling. A good recognition trait is the prominent fold behind the eyes which curves downward immediately behind the tympanum and does not extend down the back. Bullfrogs adults may attain body lengths up to 8 inches.

### **Similar Species**

Bullfrogs most closely resemble Green Frogs in color and shape. Green Frogs are much smaller as adults and have a pronounced dorsolateral fold extending on each side from the eye to about 2/3 of the way down the back. The jaw lines of Green Frogs have alternating white and dark spots.

### **General Comments**

These are abundant and conspicuous frogs at the field station. Adults are active primarily during warmer days and nights but juveniles may be active on shorelines even during freezing rains. Bullfrogs are large enough to be eaten, thus their capture is regulated by Mississippi law. Males begin calling sporadically on warm nights in late February and large choruses may be heard from late March into July if the temperatures are above 70 degrees Fahrenheit. The calls can be heard for long distances and they have been described as "jug-o-rum" or "brrrwooom." Eggs are deposited in large floating films among masses of vegetation. The eggs hatch in less than a week. The tadpoles reach very large sizes, many reaching over 6 inches in total length. They may take over a year to metamorphose. Their tadpoles can be seen swimming below the ice when field station ponds freeze over.





photo by Ed Keiser



## GREEN FROG

*Lithobates clamitans* (Latreille)

### Identification

Green Frogs are moderately large frogs with brown, green, or bronze coloration dorsally. Most individuals have poorly defined, small dark spots scattered irregularly over the back. The belly may be white, cream, or heavily mottled with dark pigment. The snout above the upper lip line is most often green, while the lip line itself has alternating dark and light spots. The dorsolateral ridges are well-developed, colored similarly to the back, and extend about 2/3 of the way toward the hind limb insertion. Adults attain body lengths between 2 1/4 and 3 inches.

### Similar Species

Green Frogs most closely resemble Bullfrogs in color. The dorsolateral ridges of Bullfrogs curve downward behind the tympanum and do not extend down the back. The lip line does not have alternating dark and light spots. Southern Leopard Frogs and Pickerel Frogs have dull yellow or gold dorsolateral ridges extending to the groin and large, well-defined dark blotches on the back and sides.

### Taxonomic Comments

The subspecies occurring at the field station is *Lithobates clamitans clamitans*, which has the common name "Bronze Frog." The correct common name for field station individuals depends upon whether the intended reference is to the species (Green Frog) or the subspecies (Bronze Frog). These frogs have, until recently, been placed in the genus *Rana*.

### General Comments

Green Frogs do not grow as large as Bullfrogs and are thus less desirable for human consumption. These are abundant and easily observed frogs at the field station. Except during freezing weather, they are active during all seasons. Individual males may call during every month of the year, but breeding choruses primarily occur from the warmer days of March through August. The calls have been described as sounding like a plucked banjo string or as a "clung" or double-syllabled "c'tung." Mating match-ups can occur in almost any body of water including flowing streams with slow currents and rain pools. Eggs enclosed in two jelly envelopes are deposited in floating surface masses usually within aquatic vegetation. Tadpoles can metamorphose in as little as two months but most take considerably longer. Many tadpoles overwinter in ponds at the field station. Recently metamorphosed individuals are most common from the spring months through early fall.





*photo by Eli Keiser*

## SOUTHERN LEOPARD FROG

*Lithobates sphenoccephalus* (Harlan)

### Identification

This is a moderately large frog with large, oval or rounded, dorsal dark spots, irregularly arranged on a green, gray-brown, or light brown ground color. The dull, gold dorsolateral ridge is usually prominent and it runs from the eye to the groin. A white or gold line runs along the upper lip and over the forearm. The tympanum has a white spot in the center and the rear of the thigh has dark brown or black bars. The belly and underside of the groin and hind legs are white. Adults attain body lengths between 2 and 3 ½ inches.

### Similar Species

Southern Leopard Frogs are similar in appearance to Pickerel Frogs. Pickerel Frogs have squared or rectangular dark blotches in two rows down the back and the underside of the groin and hind legs are bright yellow to orange. The dorsolateral stripe is wider and more prominent than on Southern Leopard Frogs.

### Taxonomic Comments

The subspecies currently recognized for the field station is *Lithobates sphenoccephalus utricularius*. These frogs have, until recently, been placed in the genus *Rana*.

### General Comments

These are frequently encountered, high-jumping frogs that occur in virtually all aquatic field station habitats. Individuals frequently wander overland into fields and woodlands for considerable distances away from water. Males may call and females may lay eggs during every month of the year, but the peak season for courtship is during the moderately cool periods of March through May and to a somewhat lesser extent, again in September and October. The call has been described as chuckling, quacking, and sounding like twisting an inflated balloon. Eggs are deposited in masses and either attached to vegetation, floating free, or sinking to the bottom. Hatching occurs within two to three weeks and metamorphosing individuals, while most common in mid-summer, can be found in every month of the year. Many tadpoles overwinter in field station ponds.





*photo by Ed Keiser*

## PICKEREL FROG

*Lithobates palustris* (Le Conte)

### Identification

This is a moderately large frog with square or rectangular dorsal dark spots arranged in two linear rows on a green, gray-brown, or light brown dorsal ground color. The prominent gold dorsolateral ridge is wide and it runs from the eye to the groin. A white or gold line runs along the upper lip and over the forearm and the rear of the thigh has dark brown or black bars. The tympanum usually lacks a white spot. The belly is white but the underside of the thigh and groin are pigmented with bright yellow or orange. Adults reach body lengths between 2 and 3 inches.

### Similar Species

Pickereel Frogs are similar in appearance to Southern Leopard Frogs. Southern Leopard Frogs have large oval or rounded, dark spots irregularly arranged on the back and the underside of the thigh and groin is white. The dorsolateral ridge of Southern Leopard Frogs is narrower and most specimens have a white spot in the center of the tympanum.

### Taxonomic Comments

No subspecies are currently recognized. These frogs have, until recently, been in the genus *Rana*.

### General Comments

Pickereel Frogs are infrequently encountered in northern Mississippi and they have, as yet, not been found at the field station. However, they are known from the proximity of the field station and from spring and ravine habitats similar to those found at the station. It is very possible that specimens have been overlooked because of pattern similarities with the much more abundant Southern Leopard Frog. The species is included in this booklet in anticipation of it being found on the site in the near future. The mating call has been described as a low-pitched snore. Breeding is associated with rains and may occur from late February through late spring. Eggs hatch in less than 2 weeks and metamorphosis occurs within 3-4 months.





*photo by Ed Keiser*

## **EASTERN SPADEFOOT**

*Scaphiopus holbrookii* (Harlan)

### **Identification**

This is a medium-sized, toad-like frog with a round parotoid gland, vertically elliptical eye pupils, a fairly smooth skin with relatively few tubercles, and a single, black spade-like, horny tubercle on the inner surface of each hind foot. The dorsal color is brown or gray-brown with two dull yellow stripes extending from the dorsal eyelid down the back. Cranial crests are not present.

### **Similar Species**

Eastern Spadefoots are distinct in appearance and not easily confused with other field station species. They are most similar to toads of the genus *Anaxyrus* (formerly *Bufo*), but these have elongated parotoid glands, much more warty skins, and distinct cranial crests.

### **Taxonomic Comments**

No subspecies are currently recognized.

### **General Comments**

These frogs are infrequently encountered at the field station. Their burrowing habits and surface appearances primarily in times of heavy rains are factors influencing encounters with humans. They may be found within woodlands, adjacent fields, and burrowed into pond levees. Breeding congregations assemble around rain pools during or after torrential rainfalls from mid-February into June. The mating call has been described as very loud, nasal "quonks." Eggs are deposited in strings that are not enclosed inside tubular jelly envelopes. Hatching is almost immediate and the larval period usually lasts from as little as two weeks to a month. Metamorphs may be fairly common around field station springs when metamorphosis occurs. Care should be exercised in handling Spadefoot Toads as their skin secretions can irritate the eyes and nose and facilitate prolonged sneezing.









*photo by Michelle Edwards*



## GLOSSARY OF TERMS AND ABBREVIATIONS

<b>Adhesive disk</b>	An expanded, disk on the ends of the toes of some frogs.
<b>Adult</b>	A frog that is sexually mature.
<b>Amplexus</b>	The sexual embrace of frogs and toads. Typically, the grasping of the female's body by the male's forelimbs from a dorsal position.
<b>Anterior</b>	Toward the head end of the body.
<b>Anuran</b>	An adjective or noun referring to frogs and toads.
<b>Cloaca</b>	The common chamber into which the digestive, excretory, and reproductive ducts discharge their contents.
<b>Cranial crest</b>	An elevated bony ridge on the heads of toads.
<b>Dorsal</b>	Refers to the back region.
<b>Dorsolateral ridge</b>	An elevated ridge or skin fold that extends along the lateral aspects of the dorsum (= dorsolateral fold)
<b>Dorsum</b>	The back.
<b>Froglet</b>	A very young, recently metamorphosed frog.

<b>Groin</b>	The angle formed by the anterior margin of the hind limb and the body.
<b>Hatchling</b>	The stage where the young larva emerges from the jelly envelopes that surrounded it.
<b>Jelly coat</b>	A mucoid, gelatinous substance secreted by the oviducts and deposited on the eggs as they pass through.
<b>Larva</b>	The post-hatching, aquatic stage of a frog usually referred to as the tadpole stage.
<b>Lateral</b>	Toward the side.
<b>Metamorph</b>	A frog that is losing its larval features and moving onto land. This is between the larval (tadpole) and juvenile stages. A tail vestige is still evident.
<b>Mid-dorsal</b>	The mid-back region.
<b>Mid-ventral</b>	The mid-belly region.
<b>Parotoid gland</b>	An elongate or rounded, elevated poison gland located behind the eye in some anurans (e.g. toads).
<b>Phalanges</b>	Pleural of phalanx. Refers to the bones of the toes.
<b>Plinth</b>	Refers to a deposited mass of eggs and their protective jelly-like coating(s).



<b>Salientian</b>	Another name referring to frogs and their ancestors.
<b>Supraorbital</b>	Above the eye
<b>Tadpole</b>	The larva of an anuran.
<b>Tympanum</b>	The membrane covering the external opening of the frog middle ear (ear drum)
<b>UMFS</b>	Abbreviation for the University of Mississippi Field Station.
<b>Ventral</b>	Refers to the belly region.
<b>Venter</b>	The belly.

## RECOMMENDED SOURCES ON FROGS

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

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

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

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[There is no better reference on anuran tadpoles.]

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[An introductory volume on frogs around the globe.]

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[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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[This is an exceptionally detailed volume on aspects of the biology of frogs and other amphibians.]

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[An older but superbly accurate and very detailed volume on frogs.]

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This booklet is dedicated to my wife, Sue Keiser, for her continuing love and support and to Jenifer, Julie, Mark, and Skip, our now grown children who have proven to be very capable adults.



# University of Mississippi Field Station

## Our Mission:

To advance ecosystem stewardship by providing a natural laboratory for research, education, and service.

The University of Mississippi Field Station is a 740-acre educational and research facility located approximately 11 miles from the UM campus in Oxford.

More than 200 spring-fed ponds and mesocosms and over 90 acres of diverse types of natural and constructed wetlands make the Field Station one of the foremost facilities of its kind in the world. This diverse, species-rich environment offers extraordinary opportunities for scientific training, educational outreach, and basic and applied research across an extensive range of disciplines.

*“Nature’s Laboratory at Ole Miss”*



*photo by Michelle Edwards*