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PETITIONER'S EXHIBIT #63
Excerpt from book

004178

MEMORANDUM

TO: JTP
FROM: CSM
DATE: May 10, 2007

RE: WM3: Research Project re: Wildlife Contact Information

Michael Warriner - Arkansas Natural Heritage Commission - 501-223-6428

I spoke with Mr. Warriner May 10, 2007 about 12:30PM.

His work is with rare and endangered turtles of Arkansas.

He stated the 6 turtles I have listed (Common Snapping, Alligator Snapping, Eastern River Cooter, Three-Toed Box, Mississippi Mud, and Spiny Softshell, turtles) are all common turtles in Arkansas.

Although he is not familiar with the 10 Mile Bayou and Robin Hood Wood area, after my brief description, he did state that it sounded like a perfect place for turtles.

When asked about the credibility of *The Amphibians and Reptiles of Arkansas - Trauth, Robison and Plummer*, his exact words "it's like the bible".

Kelly Irwin - Herpetologist - Arkansas Game and Fish Commission - 877-847-2690

I spoke with Mr. Irwin May 10, 2007 about 1:30PM.

He is familiar with all manner of reptiles and amphibians in Arkansas.

He also stated the 6 turtles I listed (see above) are common turtles within Arkansas.

He too is not familiar with the 10 Mile Bayou but stated if the conditions are right turtles would indeed inhabit the waters.

NOTE: Mr. Irwin has been contacted by Brent Davis (he would not say when) regarding the WM3 case. Because this office has contacted him, he feels it is necessary to contact his legal department and find out what he can and cannot discuss with us. BUT he is still willing to talk to this office as long as it is within the legal parameter set by the AGFC legal department. When asked about the credibility of The Amphibians and Reptiles of Arkansas - Trauth, Robison and Plummer, he stated it is a very reliable reference book.

Mary Pounder - Biologist - WildCare of Marin County California - 415-456-7283

I spoke with Ms. Pounder May 10, 2007 about 1PM.

She has a BS in Marine Biology, is a member of IWRC (International Wildlife Rehabilitation Council) and The National Opossum Society. She has spent the last 8 years working with and researching opossums.

When I asked her about the feeding habits of opossums she stated they are opportunist and carrion feeders. If the winter months are cold and food is scarce, opossums will feed more diligently in spring in order to replenish the weight lost (usually 1/3 of its normal weight).

END

004179



MEMORANDUM

TO: JTP
FROM: CSM
DATE: April 12, 2007
RE: WM3: Wildlife contacts for West Memphis

The following is a list of contacts I have made.

I have asked the following people if it is possible that Tom Quinn contact them when he is in Arkansas (in about 2 weeks) and they have agreed.

I suggest that you contact them by phone to give them further information regarding the case and the possibility of an affidavit.

From the Arkansas Game and Fish Commission:

Blake Sasse - Non game mammals - 501-223-6370

He is willing to speak with you and see Tom (please have Tom set up an appointment prior to his trip). Blake has been at the AGFC since 2000 but had stated the small mammal population has not changed since the early 1990's. He also recommended a book titled "*Arkansas Mammals*" which he stated is a good source for the information we are seeking.

Kelly Irwin - Herpetologist - 877-847-2690

I called Thursday, 4/12/07. Left him a message.

West Memphis is in the East Central Regional Office of the AGFC.

Address: East Central Regional Office - 1201 North Highway 49 - Brinkley, AR
72021

1-877-734-4581

About 60 miles west, south west of West Memphis

(Note: When I call today I spoke briefly with a gentleman named DAVID, he said there are alligators that for north and he has seen them in West Memphis)

004180

From the Arkansas State University - Department of Biological Sciences:

Dr. James Bednarz - Professor of Wildlife Ecology

He is willing to speak with you and see Tom (please have Tom set up an appointment prior to his trip). Dr. Bednarz' primary interest is raptors. I feel he can be a person to get other contact information from.

Wildlife Rehabilitators:

Dr. Archie Ryan D.V.M. (see memo dated December 7, 2006 attached)

I initially spoke with Dr Ryan in early December 2006. He is willing to speak with you and see Tom (please have Tom set up an appointment prior to his trip).

West Memphis Animal Services/Control - 870-732-7599:

Angela Ross - Director

I called Angela on Tuesday, April 17th, regarding the wild/feral dog and cat population. Angela stated there is not a big problem as Animal Services does pick up all animals that are wandering in neighborhoods. She did state that many of the pets are allowed to roam without any human supervision. The WM Animal Services is also responsible for any nuisance animal calls. Angela said their records only go back 3 or 4 years. She also stated in the Southeast part of WM there are coyotes, bobcats, raccoons, and opossums. On the west side there skunks, beavers, raccoons, and opossums. She sent me an email with the following link www.ci.west-memphis.ar.us with instructions to open the *WARD* link (on the left hand side). I did but it is not very helpful to me and one cannot print the whole map. I opened the *City Map* link (the jpeg file version), again one cannot print the whole map. It appears that crime scene is in WARD 4 and might be considered in the Northeast part of WM

END

C:\Docs\ACTIVE-CASES\Arkansas-Cases\Experts\wildlife exp contacts.wpd

004181

Subj: **Requested info**
Date: 4/17/2007 12:35:36 PM Pacific Daylight Time
From: HSEA72301
To: JTPoffice

Christine,

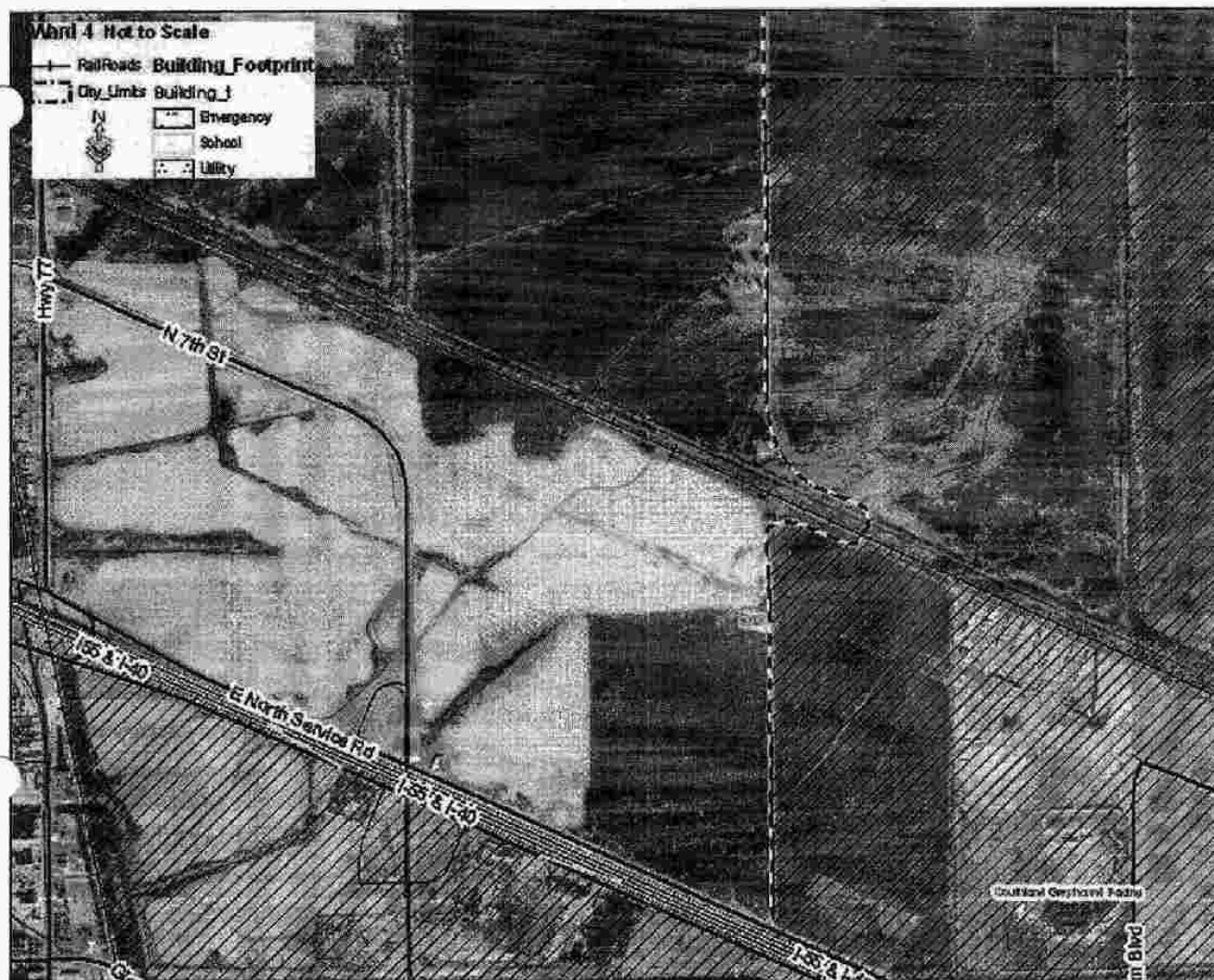
Go to www.ci.west-memphis.ar.us , on the left side click link to see ward info. This will show you who the representative for that ward is and a map of the ward/district. Hope this helps
Angela

See what's free at AOL.com.

004182

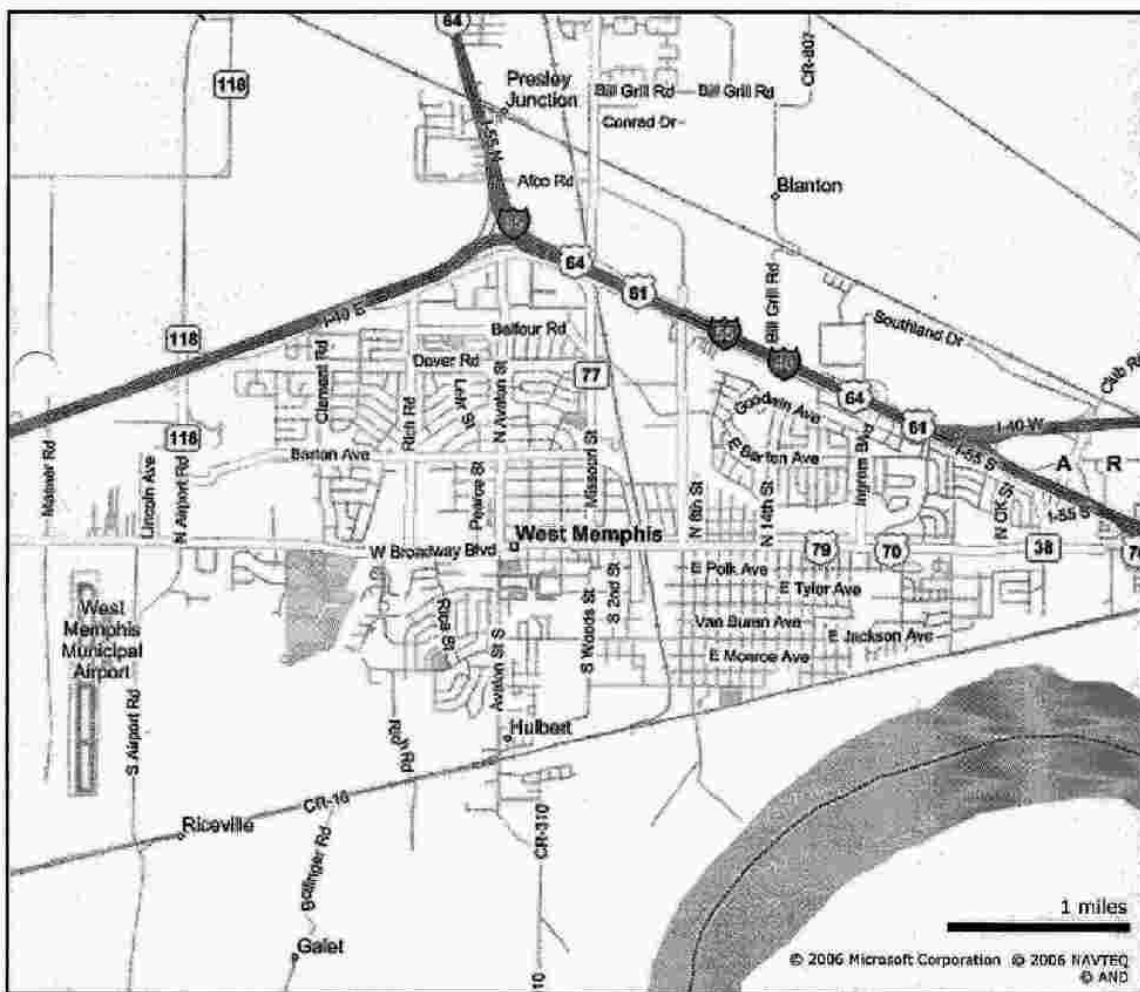
Tuesday, April 17, 2007 America Online: JTPoffice

ADD 2635

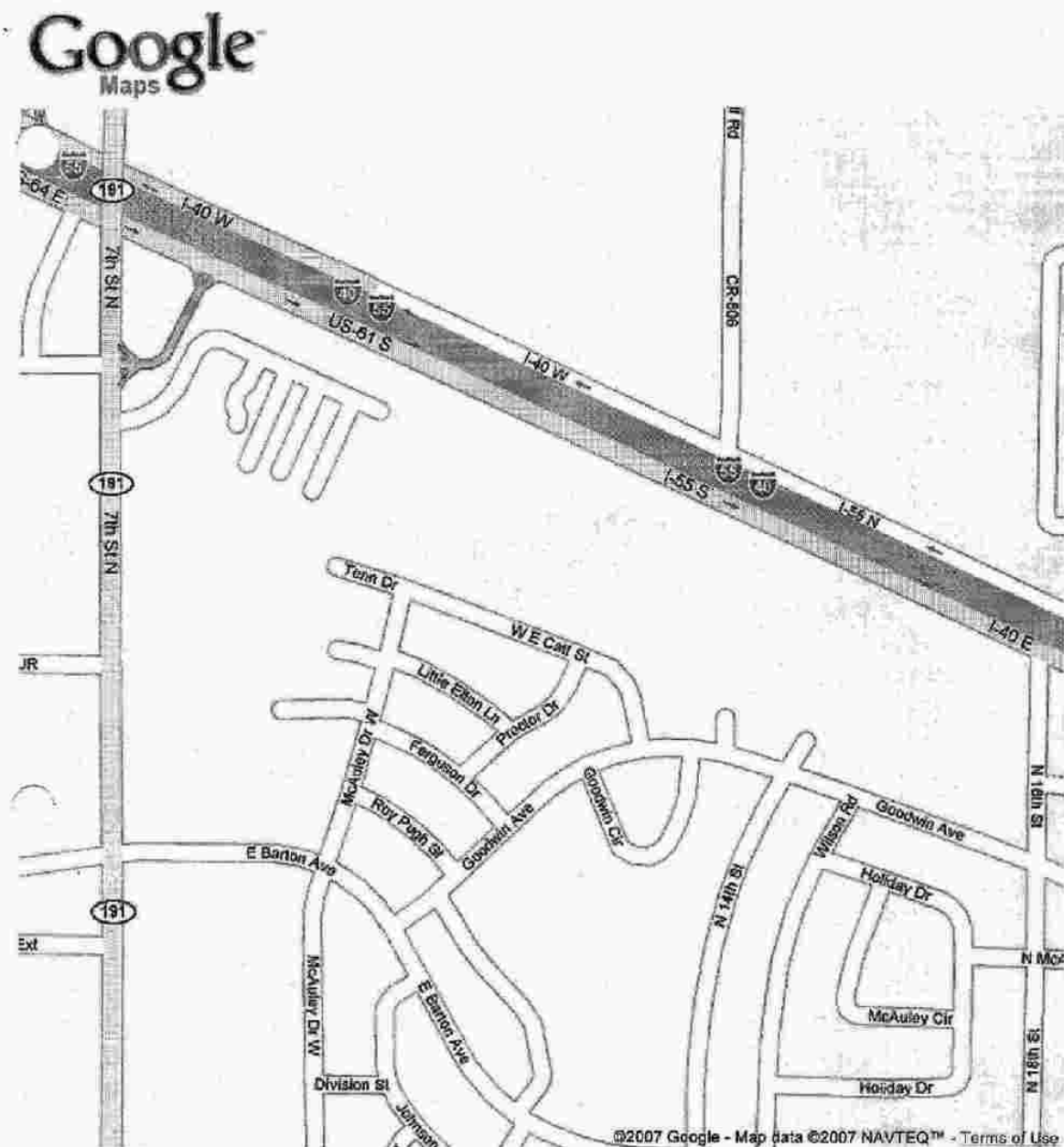




Live Search



004184



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- **Mark** your favorite places on your map.
- **Draw** lines and shapes to highlight paths and areas.
- **Add** your own text, photos, and videos.
- **Publish** your map to the web.
- **Share** your map with friends and family.

Create a new map

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Featured Maps

[America's Highway: Oral Histories of Route 66](#)

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<http://maps.google.com/maps/ms?msa=b&ie=UTF8&z=16&ll=35.159863,-90.169687&spn=0.005245,0....> 4/17/2007



Live Search



004186



Live Search



004187



Live Search



004188

MEMORANDUM

TO: JTP
FROM: CSM
DATE: May 7, 2007

RE: WM3: Research Project re: Wildlife in the West Memphis Area

My references are:

*The Amphibians and Reptiles of Arkansas - Stanley E. Trauth, Henry W. Robison
and Michael V. Plummer*

*Arkansas Mammals, Their Natural History, Classification, and Distribution
John A. Sealander and Gary A. Heidt*

REPTILES (Information from *The Amphibians & Reptiles of Arkansas*)

1. Common Snapping Turtles - Inhabitant of virtually every type of aquatic habitat in which there is some cover in the form of vegetation, muck or obstructions. Primarily nocturnal. Omnivorous & opportunistic. Large head with hooked beak (Photo depicts long sharp claws). Maximum shell length 49.4 cm /19.25 ins. Diet consists of invertebrates, vertebrates, plant matter, and CARRION. This species is common throughout the state. (See pages 214 & 215 attached)
2. Alligator Snapping Turtles - Thoroughly aquatic inhabitant of medium to large sized rivers, sloughs, oxbows and lakes. Massive head with well defined formidable hooked beak. Maximum shell length 60 cm/23.5 in. Uses a wormlike appendage in mouth to attract fish, staple of diet BUT anything actively encountered may be eaten including CARRION. Most likely statewide BUT it is a possible threatened species in the state. (See pages 216, 217 & 218 attached)
3. Eastern River Cooter - Found in a variety of aquatic habitats but it is partial to streams and rivers, also found in lakes, ponds, borrow pits and oxbows. The crushing surface of the upper jaw has a ridge or tuberculate (module or small eminence - the cusp of a tooth) row extending parallel to its margin while the cutting edge of lower jaw is coarsely serrate (Photo depicts long sharp claws). Maximum shell length 37.5 cm/14.75 in. This turtle is mostly herbivorous will feed on any soft vegetation. CARRION or other animal matter may be consumed occasionally. This species is common throughout the state. (See pages 226, 227, and 228. See page 211 for a drawing of the mouth of this species also known as *Pseudemys concinna*.)

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4. Three-Toed Box Turtle - These turtles are active from early April through late October. In summer, early spring and late fall they can be found in forested areas. Considered terrestrial turtles and they are familiar to most people in the state where they are referred to as "tarrapins". Maximum shell length is 16.5 cm/6.5 in. There is no information on the characteristics of the mouth/beak (Photo depicts long sharp claws). This turtle is omnivorous, anything it comes in contact with may be eaten this includes CARRION. This species is common throughout the state. (See pages 228, 229 and 230)
5. Mississippi Mud Turtle - This turtle is abundant in Arkansas and may be found in different aquatic habitats but prefer stationary or slow moving bodies of water with abundant aquatic vegetation and soft bottoms. Maximum shell length is 12.1 cm/4.75 in. There is no information on the characteristics of the mouth/beak (Photo depicts long sharp claws). This turtle is omnivorous, with CARRION on its diet list. This species is common throughout the state. (See pages 234, 235, and 236)
6. Spiny Softshell - This aquatic turtle inhabits a large variety of water areas, everything from small streams, ponds and *road side ditches* to large rivers and lakes. Maximum shell length is 54 cm/21.25 in. This turtle is known to be difficult to handle because it is pron to biting with a sharp beak and scratching (Photo depicts long sharp claws). This is a carnivorous turtle that also includes CARRION in its diet. This species is common throughout the state. (See pages 241, 242, and 243)
7. Key to the Turtles of Arkansas - copied from *The Amphibians and Reptiles of Arkansas* (pages 207 thru 213).

MAMMALS (Information from *Arkansas Mammals, Their Natural History*)

8. Virginia Opossum - The opossum is about the size of a large domestic cat.
It is common statewide.
It prefers bottomland forests along streams.
Opossums are nocturnal and omnivorous, they will eat almost any kind of available food.
(See pages 43 - 45 attached)
9. Marsh Rice Rat - The rice rat is small to medium sized.
It is common statewide except for a few northern counties adjacent to Missouri.
It is semiaquatic, inhabits wet meadows and dense vegetation bordering marshes, swamps, bayous, streams ditches, drainage canals and ponds.
It is an adept swimmer and diver, often swimming for some distance under water.
Rice rats are active around the clock but exhibit greater activity at night. They are omnivorous.
(See pages 148 - 149 attached)

004190

10. **Black Rat** - The black rat is medium sized.
It probably occurs statewide in and around human habitations. It is not abundant, but is more common in the southern part of the state and along the Arkansas and Mississippi rivers.
The black rat is omnivorous and eats a wide variety of vegetable and animal matter.
(See pages 180 - 181 attached)
11. **Norway Rat** - The Norway rat is a large, robust rat.
It is common statewide; it generally lives in or near buildings.
It is primarily nocturnal.
These rats will eat virtually anything that is edible, garbage of all kinds and grain are favored.
(See pages 182 - 184 attached)
12. **Coyote** - The coyote is slender and medium sized, resembling a small German Shepherd dog.
The coyote occurs statewide, but is more common in western Arkansas. They inhabit open fields, brushlands, second-growth woodlots, and forest edge habitats.
Mainly nocturnal, coyotes are sometimes seen in daytime along highways and in open fields.
Coyotes are omnivorous. They are opportunists feeders, their diet is *composed of foods that are most abundant and easily available*. Deer and domestic livestock are sometimes found in their stomachs, such remains mainly represent CARRION. Poultry and livestock eaten by coyotes often are CARRION again these animals are opportunists feeders.
(See pages 196 - 198 attached)
13. **Raccoon** - The raccoon is medium sized and heavily built, about the size of a large cat.
It occurs statewide and is common. They prefer wooded areas with a water source near by.
Raccoons are omnivorous and opportunistic feeders.
(See pages 213 - 216 attached)
14. **Mink** - The mink is small sized and slender.
It occurs statewide and is common. It is a semiaquatic animal that is found near rivers, bayous, sloughs, reservoirs, and lakes where it gets much of its food.
The mink is carnivorous and an opportunistic feeder it will eat whatever is most available.
(See pages 220 - 223 attached)

004191

15. Striped Skunk - The striped skunk is medium sized, heavy bodied and about the size of a cat.
They occur statewide and are abundant. They can live anywhere as long as a water source is near by.
Striped skunks are omnivorous and CARRION from road kills or hunting cripples is frequently eaten.
(See pages 228 - 230 attached)
16. Bobcat - The bobcat is about twice the size of a domestic cat.
Bobcats occur statewide and have a good stable population.
They prefer rocky outcrops and canyons where available but are also found in heavily wooded uplands and brushy areas, swamps, and semi-open farmlands. They are seldom sighted even where they are abundant. They are mainly nocturnal and seldom active in daytime.
It is almost exclusively carnivorous with rabbit being its main staple. Deer, mostly CARRION, are eaten during autumn and winter following hunting season.
(See pages 238 - 240 attached)

END

004192

004193

Family Chelydridae

Snapping Turtles

This family is distributed from extreme southeastern Canada through much of the central and eastern United States southward to central and northern South America. Two monotypic genera are recognized, both of which occur in Arkansas. These are large, strongly aquatic, bottom-walking species, with fierce dispositions. The carapace has 24 marginal scutes and is strongly serrated posteriorly. The narrow bridge connects with a greatly reduced plastron. Details of the shell are frequently obscured by thick growths of algae. Males grow larger and have a longer pre-anal tail length (which places the anus beyond the carapacial margin) than females. The young have more rugose carapaces than those of adults and have proportionally longer tails.

Common Snapping Turtle—*Chelydra serpentina serpentina* (Linnaeus)

Description: The common snapping turtle (Fig. 281) is a large aquatic turtle that attains a maximum carapace length of 49.4 cm. Adult males are slightly larger than

females. The carapace is relatively smooth, light horn brown to black in coloration, and has three weak longitudinal tuberculate keels (often inconspicuous or lacking in medium to large individuals). The plastron is small and cruciform, exposing soft underparts. The tail is long, and the underside is covered with a double row of large scales; the topside has three rows of tubercles (middle row largest). The head is large with the snout terminating in a hooked beak (Fig. 282). The eyes are directed dorsolaterally; this is evident from dorsal view (Fig. 269). The chin has two small barbels, and the neck is long with numerous small papillae. Young turtles possess a white spot on the underside of each marginal.

Arkansas Distribution: (Fig. 283). Statewide.

Habitat and Habits: The common snapper is an inhabitant of virtually every type of aquatic habitat in which there is some cover in the form of vegetation, muck, or obstructions. Streams, lakes and ponds of all sizes (natural or man-made), oxbows, ditches, and sloughs all may have snapper populations. Although it is a highly aquatic species that basks less frequently than other turtles, occasional terrestrial movement ensures dispersal to even small farm ponds. Because viable sperm may

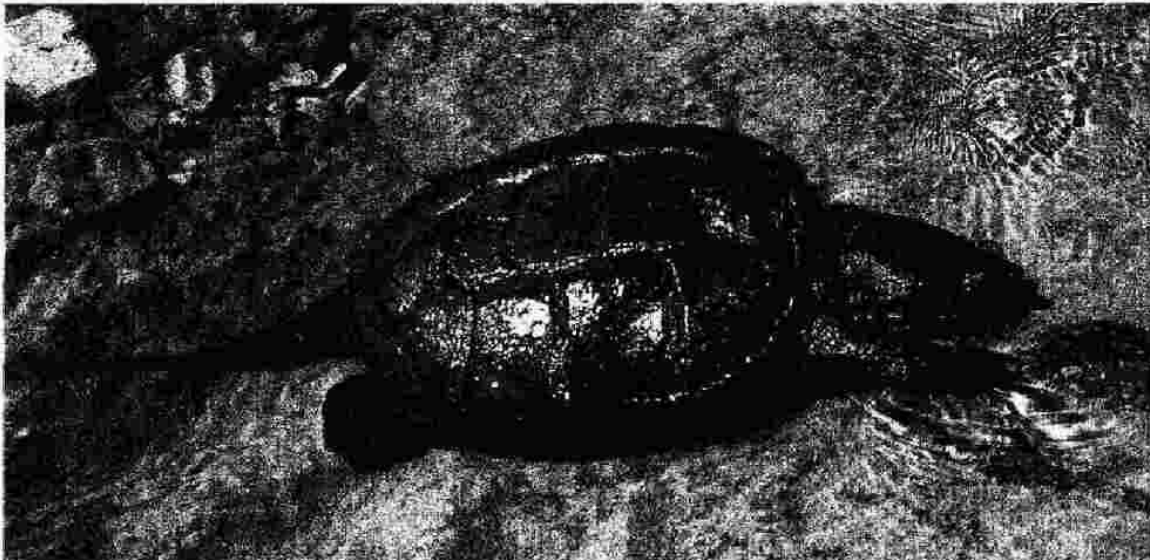


FIG. 281. Adult common snapping turtle (Marion County).

004194

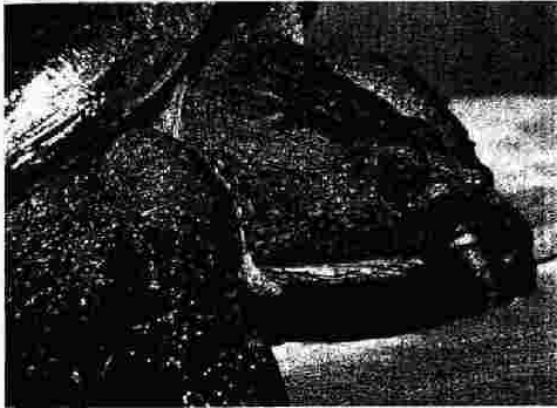


FIG. 282. Head of common snapping turtle.

remain in the female for several years, a single turtle has the ability to colonize a body of water. Snappers frequently burrow in the muck or vegetation in water shallow enough so that the long neck can be periodically extended to obtain air. They are primarily nocturnal, spending the night bottom-walking in search of food. However, there may be considerable diurnal activity in some populations. Whether actively foraging or lying in ambush, snappers are omnivorous and opportunistic. Invertebrates, vertebrates, plant matter, and carrion are consumed. This species is known for its winter activity, including movements under ice, even in the northern portions of its range (Ohio). Reported population densities vary from less than one to about 60 turtles per ha.

Annual migrations to specific nesting areas may occur. For nesting sites, various substrates and degrees of vegetation cover are chosen from about 1–300 m from the water. White and Murphy (1973) studied the reproductive cycle of this species in Tennessee. Females lay one clutch of 12–42 eggs, depending upon the size of the female, between mid-May to mid-June. Clutch sizes of up to 109 eggs have been reported in other areas. The spherical leathery-shelled eggs have an incubation period of about 55–100 days. Overwintering in the nest may occur in colder areas or in nests laid at the end of the nesting period. In less than 1 percent of the eggs, twins are produced but generally neither or only one of the turtles survive. In Iowa, Christiansen and Burken (1979) found that males matured in their fourth or fifth year at about 19.1 cm carapace length. Females first ovulated during their sixth or seventh year at about 22.9 cm. Males grow larger than females. Specimens have been kept in captivity for almost 39 years.

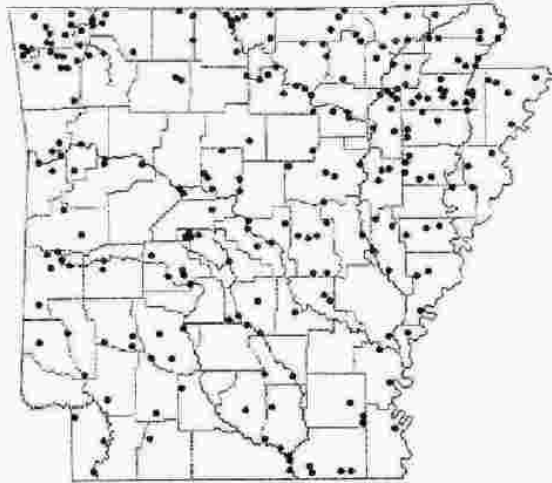


FIG. 283.
Distribution of
Chelydra serpentina
in Arkansas. Small
map depicts range
of species in the
United States.



In the water, common snappers are rather inoffensive; however, on land they can be fierce and aggressive, repeatedly lunging and striking at their captors. They also have well-defined defensive postures consisting of dipping the front or one side of the shell while raising the back or opposite side; the head is retracted and the mouth is held open. Because of the extremely long serpentine neck, do not attempt to handle these turtles by the shell. The long tail provides a convenient carrying handle for specimens of all sizes. When first caught, specimens may exude an unpleasant smelling fluid from their musk glands.

Conservation Status: None. This species is common throughout the state.

Arkansas Literature and Remarks: Published localities and life-history information is found in Albritton (1981), Ball (1981), Blihovde and Irwin (2001a); Bonati (1980), Dellinger and Black (1938), Dowling (1956, 1957), Gibbons et al. (1988), Hurter and Strecker (1909), Martin (1981), Parker (1947), Schuier et al. (1972), Schwardt (1938), Strecker (1908), Taylor (1935), and Vance (1985). McAllister et al. (1990b, 1994c) reported two new coccidian parasites from the common snapping turtle from Arkansas.

004195

004196

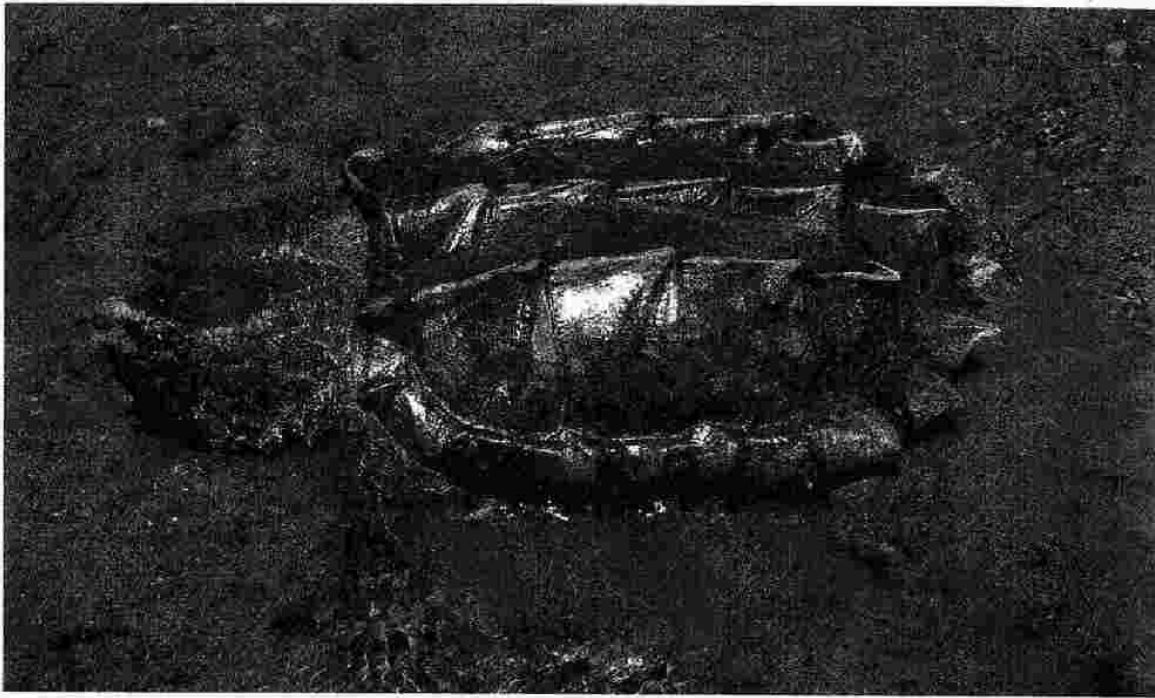


FIG. 284. Adult alligator snapping turtle (Independence County).

Alligator Snapping Turtle—*Macrochelys temminckii* (Harlan)

Description: The alligator snapping turtle (Fig. 284) attains a maximum carapace length of over 60.0 cm and a weight of over 90 kg and is the largest freshwater turtle in North America. Adult males grow slightly larger than females. The carapace is rough, dark olive brown, with three prominent longitudinal coarsely serrate keels; a row of 3–5 supramarginal scutes lies between the marginals and costals on each side (Fig. 268). The plastron is small and cruciform thereby exposing soft underparts. The tail is very long, and the underside is covered with irregularly arranged small scales. The head is massive with an elongated snout terminating in a strongly hooked beak. The eyes are directed laterally, not evident from dorsal view (Fig. 268); the chin and neck have numerous papillae.

Arkansas Distribution: (Fig. 285). Probably statewide. See Remarks.

Habitat and Habits: The alligator snapper is a thoroughly aquatic inhabitant of medium- to large-sized rivers, sloughs, oxbows, and lakes. It usually is not found in isolated ponds or lakes as is the common snapper. It



FIG. 285. Distribution of *Macrochelys temminckii* in Arkansas. Small map depicts range of species in the United States.



004197



FIG. 286. Wormlike tongue (above); radio-tagged alligator snapping turtle (Jackson County).



FIG. 287. Alligator snapping turtle eggs and hatchlings from the Pearrow/Jones turtle farm (Independence County).

rarely basks and apparently leaves the water only to nest. Most of its time is spent immobile or walking about on the bottom; however, they are no more adept at surviving without atmospheric oxygen than other turtles. Their lifestyle is complimented by a unique structure that is functional even in hatchlings. Lying on the bottom with mouth agape, a bifurcated, wormlike appendage in the floor of the mouth (Fig. 286) may be wiggled back and forth. This luring device, inconspicuous when nonactive but very apparent when engorged with blood, attracts fish of various kinds to the open mouth.

Fish, however, are not the only prey. Virtually anything actively encountered may be eaten including carrion, occasional plant matter, nuts, small mammals, birds, other turtles (including chicken turtles, mud and musk turtles, map turtles, painted turtles, and common snappers). Experiments have shown that at least two species of musk turtles can detect the odor of nearby alligator snappers and take measures to avoid them. An extreme example of a "sit-and-wait" predator, alligator snappers are known to forage (sit-and-wait) in one spot for over 30 days before moving to another site. However, this foraging pattern does not mean that these large turtles cannot move extensively (Harrel et al., 1996). For example, using mark-recapture and radiotelemetry on alligator snappers in Dota and Salado creeks (Independence County), Trauth et al. (1998) recorded considerable short-term movements. Furthermore, in an Oklahoma river, one alligator snapper moved upstream 30 km in three years, and in Kansas, a radio-tracked individual moved 6.5 km upstream in one year!

Data obtained from slaughtered Louisiana, Arkansas, and Mississippi specimens in a commercial facility in Louisiana have provided most of our knowledge on reproduction and growth (Dobie, 1971; Tucker and Sloan,



004198

1997). Nesting occurs from late April to early June. The tail, which is quite prehensile in the young, may be used in adults to assist in digging or covering the eggs. Nests have been found in a broad variety of substrates and degree of vegetation cover ranging from 1.5 to 72 m from the nearest water. One clutch of 9–52 eggs, depending upon the size of the female, is laid per season. The spherical, rough, leathery-shelled eggs have an incubation period of about 80–114 days; hatchlings measure about 42 mm in carapace length (Fig. 287). Sexual maturity in males is reached in about 11–21 years at a carapace length of about 40 cm; females mature in about 13–21 years at a carapace length of 33–37 cm. Males grow larger than females. Specimens have been kept in captivity for over 70 years.

The alligator snapper is not as agile and fierce out of the water as is the common snapper. Beached individuals mostly gape at their captors, but can strike with great speed at a finger that wanders too close. The force exerted by the jaws in a bite has been grossly exaggerated. However, human flesh is much less resilient than the oft-stated (falsely) broom handle that is bitten in half. Because the neck is shorter than that of the common snapper, individuals may be safely handled with one hand gripping the carapace above the head and the other at the posterior margin of the carapace.

Conservation Status: The Arkansas Natural Heritage Commission has ranked alligator snappers as possibly being in peril in the state, and it is unlawful to collect or molest this species in Arkansas. The alligator snapper may be threatened or endangered in many parts of its range (Pritchard, 1989) and is now a species of concern in every

state within its range (Buhlmann and Gibbons, 1997). Fortunately, Arkansas may be one of the few remaining areas where overexploitation has not yet depleted alligator snapper populations beyond the possibility of natural recovery (Trauth et al., 1998). McCallum and Trauth (2000) reported the discovery of a curly-tail deformity in several hatchlings incubated at a turtle farm in Independence County. They suggested the unlikelyhood that these individuals would survive in the wild.

Arkansas Literature and Remarks: In addition to the records in Fig. 285, alligator snappers are known from Oklahoma close to the Arkansas border in the Red River drainage northwest of Texarkana, in the Arkansas River drainage west of Fort Smith, and in the Neosho River drainage northwest of Benton County (Webb, 1970). Paul Anderson (1965) recorded a Missouri specimen taken from Bull Shoals Lake (Taney County, Missouri and Boone and Marion counties, Arkansas). Pertinent locality data and life-history information are found in Albritton (1981), Ball (1981), Dellinger and Black (1938), Dowling (1956, 1957), Hurter and Strecker (1909), Johnson and Johnson (1978), Martin (1981), McCallum and Trauth (2000), McLain (1971), Parker (1947), Schwarzd (1938), Sloan and Lovich (1995), Taylor (1935), Trauth et al. (1998), Tucker and Sloan (1997), Tumblison et al. (1992), Vance (1985), and Wagner et al. (1994, 1996). Upton et al. (1992a), McAllister et al. (1994c), and McAllister et al. (1995f) reported parasites from *M. temminckii* in Arkansas. Crother (2000) pointed out that the genus name, *Macrochelys*, had precedence over the incorrect genus name (*Macroclmys*) for this turtle.

Family Emydidae

Pond, Marsh, and Box Turtles

This is the largest turtle family and is widely distributed on each habitable continent except Australia and much of Africa. Of the 10 recognized genera (Zug et al., 2001), five occur in Arkansas. The family is morphologically and ecologically diverse and includes small to large aquatic and terrestrial forms. Most of our conspicuous basking turtles are members of this family. All Arkansas emydids (except *Terrapene*) have rigid unhinged shells; the carapaces are dark olive, green, brown, or black with numerous paler lines, circles, or other marks. The skin is dark and is profusely marked with light lines on the head, neck, and limbs. Marginal scutes number 24; plastral scutes number

12. The pectorals contact the marginals (Fig. 268). The shells of many species often become stained with a reddish-brown deposit that may conceal important identification characters. Fortunately, the stain may be easily removed by scraping. In most species females are larger than males. Adult males have a longer pre-anal tail length than females, which places the anus beyond the carapacial margin; males may have very long foreclaws, which are used in courtship. The young are often difficult to identify. Generally, they have more rugose carapaces and evidences of a middorsal keel. Color patterns may be vivid. Ten of the 31 United States species occur in Arkansas.

004199

004200

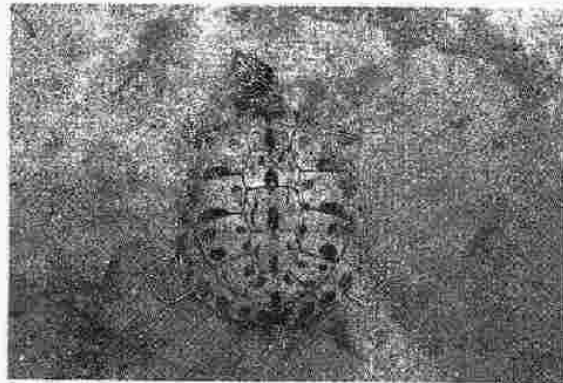
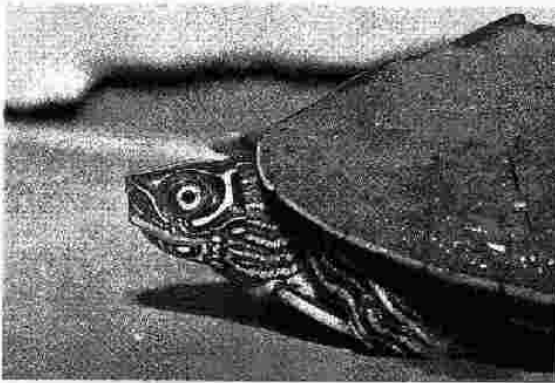


FIG. 299. Left: head of Mississippi map turtle (Ouachita County); right: adult from Strawberry River (Lawrence County).

Tinkle (1958b) attempted to census the number of map turtles along a 480 m stretch of river. Thirty turtles were captured, marked, and released, but since only one was recaptured, an accurate estimate could not be obtained.

Conservation Status: None. This species is common throughout the state.

Arkansas Literature and Remarks: The nomenclatural identities of the Mississippi map turtle and the

Ouachita map turtle have been unclear for some time. Formerly known as *G. kohnii* and *G. p. ouachitensis*. We follow Vogt (1993) in assigning *kohnii* as a subspecies of *G. pseudogeographica* and elevating *ouachitensis* to specific rank. Pertinent literature includes Albritton (1981), Ball (1981), Dellinger and Black (1938), Dowling (1956, 1957), Hurter and Strecker (1909), Martin (1981), Parker (1947), Schwardt (1938), Tinkle (1958b), Vance (1985), and Vogt (1980b). McAllister et al. (1994c) found one species of coccidian parasite in this species.



FIG. 300. Distribution of *Graptemys pseudogeographica kohnii* in Arkansas. Small map depicts range of species in the United States.



Eastern River Cooter—*Pseudemys concinna* (Le Conte)

Description: The eastern river cooter (Fig. 301) is the largest emydid turtle in North America, attaining a maximum carapace length of 37.5 cm. Adult females are much larger than males. A highly variable carapacial pattern is present and usually exhibits dark along with numerous pale lines. The posterior margin of the carapace is serrated and flaring. The undersides of marginals are thick with dark circular marks containing pale centers. The bridge has dark spots or longitudinal marks, whereas the plastron is yellow with dark markings especially along the anterior seams (markings become obscure with age). The crushing surface of the upper jaw has a ridge or tuberculate row extending parallel to its margin while the cutting edge of lower jaw is coarsely serrate. The underside of chin is flat. Young turtles exhibit a greenish-brown carapace. Two subspecies occur in the state (see **Subspecies and Remarks**).

Arkansas Distribution: (Fig. 302). Statewide.

Habitat and Habits: The eastern river cooter may be found in a variety of aquatic habitats. It is partial to

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streams and rivers, but also may be found in lakes, ponds, borrow pits, and oxbows. The basking habit is well developed. Individuals or aggregations may be observed on gently sloping banks, logs, thick aquatic vegetation, and other exposed sites. As wary turtle, this species slides into the water at the slightest disturbance. These turtles are largely herbivorous and may feed on almost any soft vegetation. Carrion or other animal matter may be consumed on occasion. In the New River in West Virginia, radio-tracked cooters moved within home ranges averaging 1.2 ha and did not move between pools in the river. Telemetered turtles hibernated in shallow backwaters away from the main river channel. Other than reproductive biology, the ecology of cooters has not been studied in Arkansas; the nearest study was in southern Illinois (Dreslik, 1997) where the species is classified as endangered.

Nests are usually constructed in proximity of water, but nesting behavior has not been described. Data on females collected in Garland and Pike counties by Iverson (2001) suggest that cooters lay 2–3 clutches of 9–18 flexible-shelled eggs beginning in mid-May and continuing through June. Female cooters from Arkansas mature at 215–230 mm plastral length, and adults average about 243 mm plastral length. Clutch size is related to turtle size. A female (260 mm plastral length) collected on 24 May 1980 in White County contained 30 shelled eggs



FIG. 302. Distribution of *Pseudemys concinna* in Arkansas. Small map depicts range of species in the United States.



FIG. 301. Adult male eastern river cooter (Jackson County).

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measuring about 23 x 32 mm, 29 ova (about 21 mm in diameter), and 13 ova (about 15 mm). This individual possibly would have produced three large clutches during the year. Iverson (2001) reported average egg sizes of 36–44 mm in length and 23–28 mm in width. Hatching takes place after 84–92 days of incubation; hatchlings measure about 35 mm in carapace length. Jackson (1970) found that growth rate is greater in females than in males, but in both sexes the rate progressively declines through time. In Florida, cooters lay three clutches of 17–19 flexible-shelled eggs (Jackson and Jackson, 1968). Population densities in Arkansas may be similar to those in southern Illinois (5.1–7.8 turtles per ha). Specimens of this species have been maintained in captivity for over 40 years.

Subspecies: *Pseudemys c. hieroglyphica* (hieroglyphic river cooter). Light concentric whorls and a posterior facing C-shaped mark on second costal scute. Distributed primarily in the Delta of eastern Arkansas. *Pseudemys c. metteri* (Missouri river cooter). Concentric whorls lacking on second costal scute, which may or may not contain a C-shaped mark. Distributed primarily in the Interior Highlands of western Arkansas. See **Remarks**.

Conservation Status: None. This species is common throughout the state.

Arkansas Literature and Remarks: Considerable past and current disagreement exists regarding the identity of cooters (*P. concinna* and *P. floridana*), especially for western populations. Several workers have reported specimens with intermediate characters presumably due to hybridization (e.g., Louisiana—Zweig and Crenshaw, 1957; Dundee and Rossman, 1989; Illinois, Smith, 1961; Kentucky—Barbour, 1971; southwestern Alabama—Mount, 1975; Missouri—P. Anderson, 1965). In Louisiana, Fahey (1980) found such extensive intermediacy that he proposed synonymizing the two species into *P. floridana*, and in Oklahoma, Webb (1970) arbitrarily considered all specimens as *P. floridana*, but stated that *P. concinna* "probably ranges into eastern Oklahoma and occasionally hybridizes" with *P. floridana*. In contrast, Ward (1984) concluded that *P. floridana* did not occur west of the Mississippi River or anywhere within the supposed range of the western subspecies *P. f. hoyi* (Conant, 1975). Ward synonymized *P. f. hoyi* into *P. concinna*, an arrangement also supported by Seidel's (1981) analysis of cranial morphology. However, Ward's (1984) conclusions are not without suspect (Dundee and Rossman, 1989; Ernst et al., 1994). We are unsure of the status of Arkansas cooter populations and will follow Ernst et al. (1994) in allocating all Arkansas populations to *P. concinna* pending definitive study of variation in *P. concinna* and *P. floridana* throughout their ranges. Pertinent literature includes

Albritton (1981), Ball (1981), Bonati (1980), Burger et al. (1949), Dellinger and Black (1938), Dowling (1956, 1957), Hurter and Strecker (1909), Iverson (2001), Martin (1981), Parker (1947), Schwardt (1938), Schwartz (1956), Strecker (1908), Taylor (1935), and Vance (1985). McAllister et al. (1994c) found that 20 percent of the turtles examined harbored coccidian parasites.

Three-toed Box Turtle—*Terrapene carolina triunguis* (Agassiz)

Description: The three-toed box turtle (Fig. 303) is a small terrestrial species that attains a maximum carapace length of 16.5 cm. Adult females are slightly larger than males. The carapace is weakly keeled, highly arched, and flaring slightly posteriorly (occasionally the flare is absent in females); the plastron exhibits anterior and posterior movable hinged lobes, capable of closing tightly against the carapace. In addition, the plastron is usually shorter than the carapace. The shell coloration is extremely variable, with pale (yellow, orange) or dark (olive, brown) colors predominating. The carapace often has a pattern of radiating pale lines on each darker scute, or most commonly, is plain yellowish-brown or horn colored. The plastron is usually unmarked on adults, whereas the head and forelimbs often possess yellow or orange spots. The head sometimes is red, and the beak is hooked. Three (sometimes four) toes occur on each hind foot, and the males (Fig. 304) often exhibit red eyes (female brown) and a slight plastral concavity. The young possess a prominent middorsal keel (Fig. 304), low shell, and a poorly developed plastral hinge. Their carapace is mostly grayish brown with a yellowish-white spot on each scute.

Arkansas Distribution: (Fig. 305). Statewide.

Habitat and Habits: Reagan's (1974c) analysis of habitat selection in northwestern Arkansas demonstrated that three-toed box turtles are active from early April through late October. The turtles utilize grasslands in late spring and early fall but shift their activities to forested areas in summer, early spring, and late fall. Activity in grasslands coincided with moderate temperatures and peak moisture conditions. At other seasons, turtles burrowed just beneath the litter in wooded areas. These shallow burrowing sites ("forms") were selected on the basis of their temperature, moisture, and amount of cover. For an ecological study in Missouri, Schwartz and Schwartz (1974) and Schwartz et al. (1984) captured over 3,000 turtles using trained Labrador retrievers to locate turtles in their forms. These common terrestrial turtles are familiar

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FIG. 303. Adult male three-toed box turtle (Garland County).

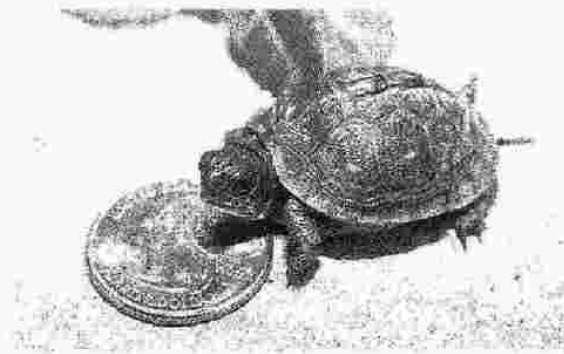


FIG. 304. Head of male and hatchling of the three-toed box turtle.

to just about everyone in the state where they are frequently referred to as "terrapins." In early spring or after a rain following a dry spell they are frequently encountered crossing roads and in hot, dry weather are sometimes found in temporary shallow water habitats. In Missouri, box turtles spend most of their lives in well-established home ranges varying in size from 2.2 to 10.6 ha and are capable of homing from up to several km. Some individuals remained in the same home range for periods of up to 35 years (Schwartz, 2000). In this population, three of every four turtles were permanent residents, whereas one was transient, living in the area only temporarily. They are also omnivorous, but like many emydids, eat more veg-

etable matter with age. Almost anything encountered may be ingested including various invertebrates, small vertebrates, eggs, carrion, roots, stems, leaves, and fruit. Females can store viable sperm and are capable of producing fertilized eggs for up to four years after mating. Nest cavities are usually constructed in the soil in open areas. Box turtles from extreme northeastern Louisiana lay 1–6 clutches of 1–7 elliptical, flexible-shelled eggs each season (Messinger and Patton, 1995). Clutches are deposited approximately every 19 days and the incubation period varies from 80–102 days. Occasionally, twins are produced from one egg (Crooks and Smith, 1958). A clutch of five eggs, each containing a living fully formed

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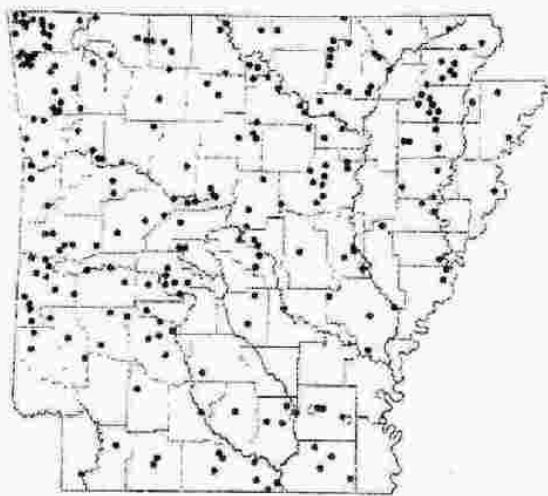


FIG. 305.
Distribution of
T. c. triunguis in
Arkansas. Small
map depicts range
of species in the
United States.

turtle, found near Searcy on 8 March 1980 suggests that hatchlings may overwinter in the nest. In northeastern Louisiana, eggs measure 3.4 cm in length, 2 cm in diameter, and 8 g in mass (G. M. Patton and M. A. Messinger, pers. comm.). Hatchlings differ greatly in appearance from the adults. They have a keeled, flattened, brownish-gray carapace with a large yellowish spot on each scute (Fig. 302). The hinges are not functional. Hatchlings, which are rarely seen, measure about 3.1 cm in carapace length (carapace length and width, 2.9 cm and 2.6 cm, respectively; G. M. Patton and M. A. Messinger, pers. comm.) and grow rapidly until sexual maturity is reached in about 4–5 years after which growth slows considerably. Between 8–13 years of age, turtles increase carapace length by about 5–7 percent per year and by about 2–3 percent per year between 14–19 years of age. Growth of older turtles is negligible. Stickel (1978) studied a population in Maryland for over 30 years where today, several turtles still live at ages in excess of 70 years (Hall et al., 1999). Likewise, Schwartz (2000) estimated maximum longevity to exceed 70 years in Missouri. There are a few records for centenarian box turtles. In Missouri, density in one population was 17–35 turtles per ha. In an Indiana population, density reductions of over 50 percent were

observed in the years 1960s–1980s, and minimum natural survivorship for both sexes was 45–50 years after being first marked as adults (Williams and Parker, 1987). Specimens have been kept in captivity in excess of 24 years. In South Carolina, box turtles hibernate in shallow (<4 cm under the surface) burrows covered with leaf litter in wooded areas. In Missouri and more northerly regions, winter mortality, presumably due to freezing, may be a significant factor in the population dynamics of this species. These turtles are extremely timid and usually close up the shell tightly when molested.

Conservation Status: None. Although presently common throughout the state, extensive commercial collecting of this species to satisfy the heavy international demand for pet box turtles should cause concern for possible change in the status of populations. According to AG&FC regulations (section 18.17), the possession limit for hand-caught box turtles is six.

Arkansas Literature and Remarks: The influence of *T. c. carolina* can be seen in extreme northeastern and southeastern Arkansas where occasional specimens have four toes on the hind feet, heavy plastral markings, and other characters indicative of *T. c. carolina* (Tumlinson and Rocconi, 2000). There are reports from other states of presumed hybrids between this species and the ornate box turtle (*T. ornata*) in localized areas of sympatry and ecological disturbance. Literature includes Albritton (1981), Ball (1981), Bonati (1980), Dellinger and Black (1938), Dowling (1956, 1957), Hurter and Strecker (1909), Martin (1981), Ortenburger (1929), Parker (1947), Reagan (1974c), Schuier et al. (1972), Smith and Sanders (1952), McAllister (1987b), McDaniel and Gardner (1977), Parker (1947), Schwardt (1938), Strecker (1908), Taylor (1935), Vance (1985), and Ward (1978). McAllister et al. (1994c) found that 33 percent of the turtles from Arkansas harbored one species of coccidian parasite.

Ornate Box Turtle—*Terrapene ornata* *ornata* (Agassiz)

Description: The ornate box turtle (Fig. 306) is a small terrestrial species which attains a maximum carapace length of 14.6 cm. Adult females are slightly larger than males. The carapace is highly arched and somewhat flattened on top. The plastron has anterior and posterior movable lobes, capable of closing tightly against the carapace. In addition, the plastron is equal to or longer than carapace. Light lines radiate downward from the posterior-dorsal corner of each costal scute; the plastron is

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reported two nests of 6 eggs each from DeValls Bluff. Eggs maintained in the lab at 30°C hatch in 68–70 days. Hatchlings (about 3.1 cm plastral length) may overwinter in the nest. Growth is rapid until attainment of sexual maturity when growth slows significantly. In Oklahoma, males mature at 9–10 cm plastral length at an age of about 3 years, whereas females mature at about 17 cm plastral length at about four years. Like many turtles, annual adult survivorship is relatively high (> 85 percent). Specimens have been kept in captivity for over 30 years and are known to live in nature for over 25 years. This species, along with painted turtles, have been studied more in the laboratory and field than any other turtle species (summarized in Gibbons, 1990).

Conservation Status: None. This species is presently common throughout the state. However, the high demand for red-eared sliders in the international pet trade should cause us to be alert to possible changes in the status of Arkansas populations. Recent research in Louisiana has revealed that heavy commercial exploitation significantly impacted the body size structure of many populations of this species (Close and Seigel, 1997).

Arkansas Literature and Remarks: Locality information can be found in Albritton (1981), Ball (1980), Bonati (1980), Dellinger and Black (1938), Dowling (1956, 1957), Hurter and Strecker (1909), Martin (1981), Parker (1947), Schwardt (1938), Taylor (1935), and Vance (1985).



FIG. 311. Red-eared slider laying eggs in sandy back yard (Conway County).

Family Kinosternidae

Mud and Musk Turtles

This family is widespread in the eastern and southern United States and extends southward to Central and northern South America. Four genera are recognized, two of which occur in Arkansas. These are rather small, drab, strongly aquatic species, but being poor swimmers, are most often seen in shallow water crawling on the bottom. Marginal scutes number 22, plastral scutes 10 or 11; the pectorals do not contact the marginals (Fig. 269). Details of the shell are frequently obscured by thick growths of algae. Tails are relatively short but adult males have a longer pre-anal tail length than females, which places the anus beyond the carapacial margin; their tails have a claw-like tip; the tails of females are mere nubbins. Generally, the carapaces of young are more rugose with prominent keels, plastral hinges are absent, and light spots are contained within each marginal (except *Sternotherus carinatus*). Three of the nine United States species occur in Arkansas.

Mississippi Mud Turtle—*Kinosternon subrubrum hippocrepis* Gray

Description: The Mississippi mud turtle (Fig. 312) is a small aquatic species that attains a maximum carapace length of 12.1 cm. Adult females are slightly larger than males. The carapace is smooth, pale olive brown to black, and dome shaped (or flattened on top); the carapace drops precipitously to the posterior margin. The plastron is plain yellowish brown and marked with various amounts of dark pigment. The relatively large anterior and posterior lobes are slightly movable; the pectoral scute appears triangular in shape (Fig. 313). The head has two light longitudinal stripes (sometimes obscured with dark pigment).

Arkansas Distribution: (Fig. 314). Widely distributed throughout most of the state. Largely absent from the Ozarks.

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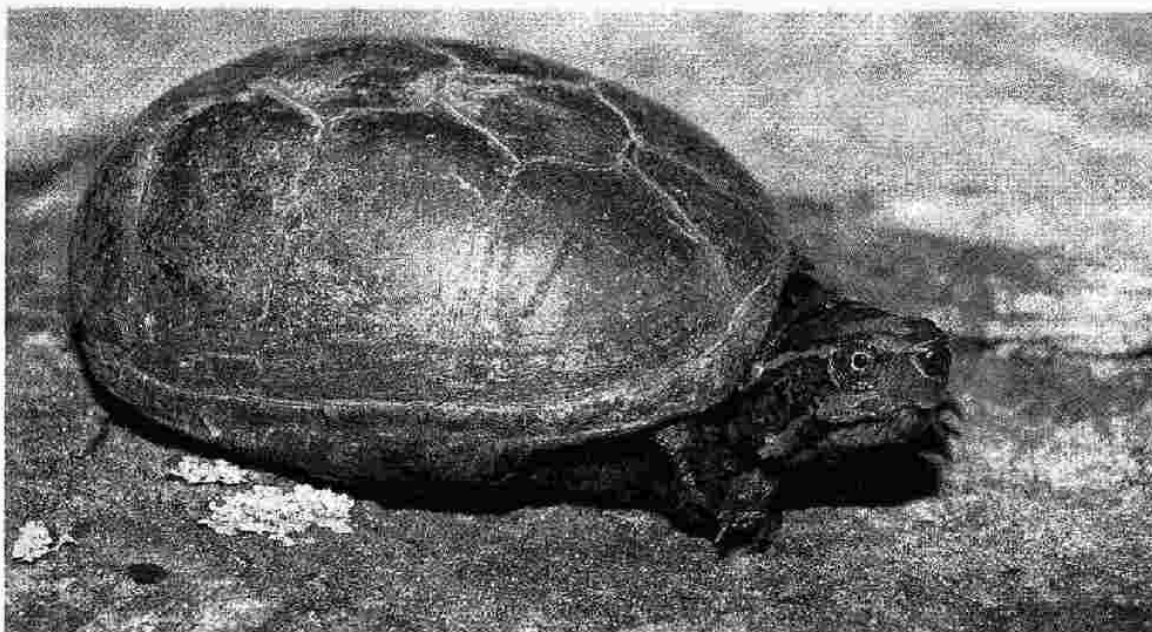


FIG. 312. Adult Mississippi mud turtle (Miller County).

Habitat and Habits: The Mississippi mud turtle is abundant in Arkansas and may be found in many different aquatic habitats. Preferred are stationary or slow-moving bodies of water with abundant aquatic vegetation and soft bottoms. These turtles are especially abundant in the numerous drainage ditches of the Mississippi Alluvial Plain. Mud turtles seldom bask but frequently wander about on land. They may migrate to terrestrial wintering sites several hundred m from the water. They are omnivorous, eating invertebrates, small amphibians, carrion, and aquatic vegetation. They are primarily nocturnal bottom feeders. Reported population densities vary from about 17–260 turtles per ha.

Various aspects of the ecology of mud turtles have been studied in Oklahoma (Mahmoud, 1967, 1968, 1969) and Mississippi (Parker, 1996). Iverson (1979b) described reproduction and growth in a population from Garland County, Arkansas. Eggs may be deposited in a prepared nest or they may simply be deposited in muskrat burrows, on the surface of the ground or under debris. Apparently, there is not a great deal of effort to conceal the eggs. Arkansas females lay at least 3 clutches of 1–6 eggs each, depending upon the size of the turtle, from late April through July. The elliptical, brittle-shelled eggs have an incubation period of 90–119 days. Some hatchlings may overwinter in the nest. Females mature in their sixth to eighth year at a carapace length of 80–85 mm. Males

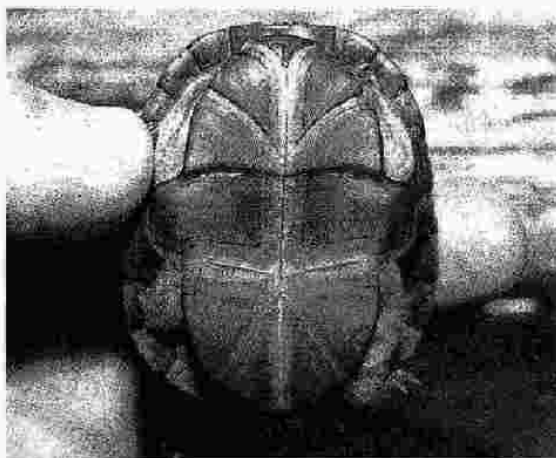


FIG. 313. Triangular pectoral scute in the Mississippi mud turtle.

mature somewhat earlier at a smaller size but grow to be slightly larger than females. Specimens of this species have been kept in captivity for 38 years and are known to live in nature for almost 25 years. Captive mud turtles vary in their disposition. Some species bite unhesitatingly at their captor while others are very timid. The musk of mud turtles is not as strong smelling as that of the stinkpot and snapping turtles.

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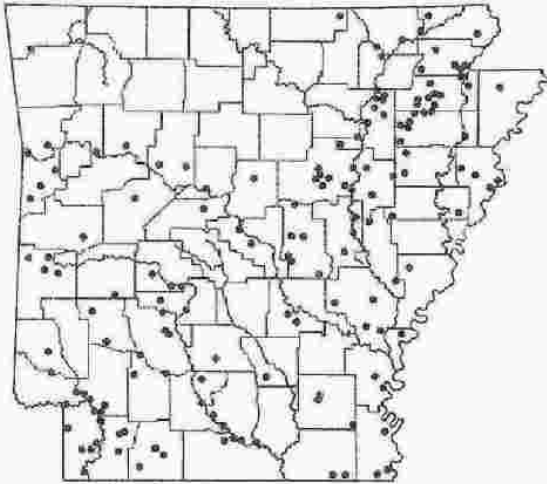


FIG. 314.
Distribution of
Kinosternon sub-
rubrum hippocrepis
in Arkansas. Small
map depicts range
of species in the
United States.



Conservation Status: None. This species is common throughout the state.

Arkansas Literature and Remarks: Published locality data and literature includes Albritton (1981), Ball (1980), Dellinger and Black (1938), Dowling (1957), Hurter and Strecker (1909), Iverson (1977, 1979b), Martin (1981), Meshaka (1988a), Parker (1947), Schwardt (1938), Taylor (1935), and Vance (1985). McAllister et al. (1994c) found that 33 percent of the turtles examined from Arkansas contained one species of coccidian parasite.

Razorback Musk Turtle—*Sternotherus carinatus* (Gray)

Description: The razorback musk turtle (Fig. 315) is a small aquatic species that attains a maximum carapace length of 14.9 cm. Adult females are slightly larger than males. The carapace has slightly overlapping scutes and a prominent middorsal keel (Fig. 316); in addition, the carapace is highly arched (sharply sloping), pale olive brown to black with irregular dark streaks and spots (plain horn-colored in old adults). The plastron is relatively small; the anterior lobe is slightly movable, and the pectoral scute is quadrangular in shape (gulars absent;

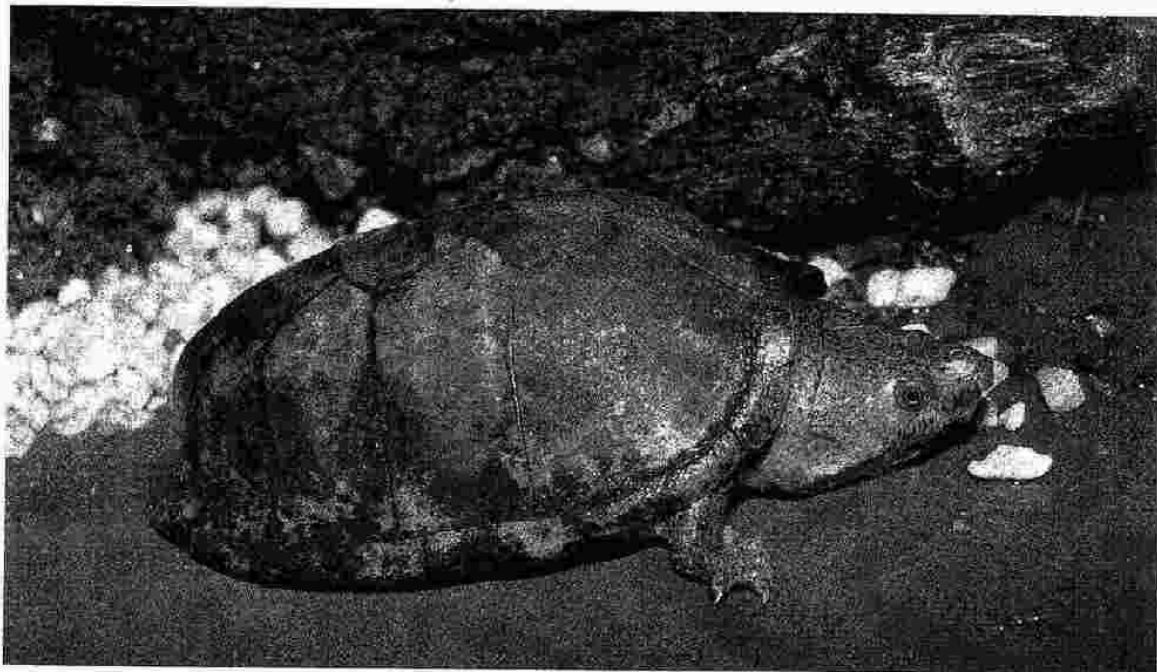


FIG. 315. Adult male razorback musk turtle (Little River County).

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have the highest ratio of body to egg lipids known among turtles. High levels of hatchling lipids may be important to survival during early life stages, such as dispersal from nest, movement to aquatic habitats, and the period prior to which hatchlings begin to feed readily. Hatchlings grow rapidly until sexual maturity (11.2 cm in males; 19.6 cm in females) is reached, but thereafter grow very slowly. Sexual maturity takes about four years for males and about nine years for females. Population densities may reach 1.2 turtles per linear m of river. Smooth softshells (especially females) can be highly mobile, moving as much as 4 km in a day.

In contrast to spiny softshells, smooth softshells are rather inoffensive and rarely attempt to bite. However, a large specimen can scratch quite vigorously when attempting to escape.

Conservation Status: None. Although this species is apparently common in appropriate habitats statewide, its abundance likely has been reduced greatly because of the damming of large rivers and resultant loss of clean sand-bar habitat.

Arkansas Literature and Remarks: Published locality information is found in Albritton (1981), Ball (1980), Dellinger and Black (1938), Dowling (1956, 1957), Hurter and Strecker (1909), Martin (1981), McLain (1971), Nagle et al. (2003), Plummer et al. (1994), Schwardt (1938), Taylor (1935), Vance (1985), and Webb (1973a).

Spiny Softshell—*Apalone spinifera* (Le Sueur)

Description: The spiny softshell (Fig. 323) is a large aquatic turtle that attains a maximum carapace length of 54.0 cm. Adult females are much larger than males. The carapace is sandpapery and leathery-like, covered with soft skin; carapace color is olive gray to yellow brown with various markings that are usually replaced by large irregular blotches in most subadult and adult females. The edge of the carapace is pale colored, bordered by a dark line; the leading edge has numerous blunt tubercles or spines (Fig. 324). The feet are strongly streaked and spotted. The head has two longitudinal light stripes, and the nostrils are crescentic, with transverse ridges on the septum (Fig. 280). Three subspecies occur in the state (see **Subspecies and Remarks**).

Arkansas Distribution: (Fig. 325). Statewide.

Habitat and Habits: The spiny softshell is a thoroughly aquatic inhabitant of a wider variety of habitats than the smooth softshell. Small streams to large rivers,



FIG. 322.

Distribution of *Apalone mutica mutica* in Arkansas. Small map depicts range of species in the United States.



small ponds to large lakes, and even roadside ditches may house spiny softshells. A wide variety of substrates from mud to loose rock also seem acceptable. As with smooth softshells, these wary turtles bask frequently and spend great amounts of time burrowed in the substrate under shallow water. They are much more likely to bask on emergent rocks, logs, and other objects than are smooth softshells. They occasionally move overland. Spiny softshells are largely carnivorous throughout their life. Insects, crayfish, mollusks, carrion, and some vegetable matter form the bulk of the diet. In Gin Creek, a small stream in White County, radiotelemetric tracking revealed that individual spiny softshells limited their movements to specific home ranges within a 2.5 km portion of the 6 km long stream (Plummer et al., 1997). In winter, Gin Creek softshells hibernated by shallowly burrowing into soft bottom substrates where they occasionally extended their heads into the water column to breathe (Plummer and Burnley, 1997).

Webb (1962) summarized much of the existing knowledge of spiny softshells throughout its range. Robinson and Murphy (1978) studied reproduction in this species

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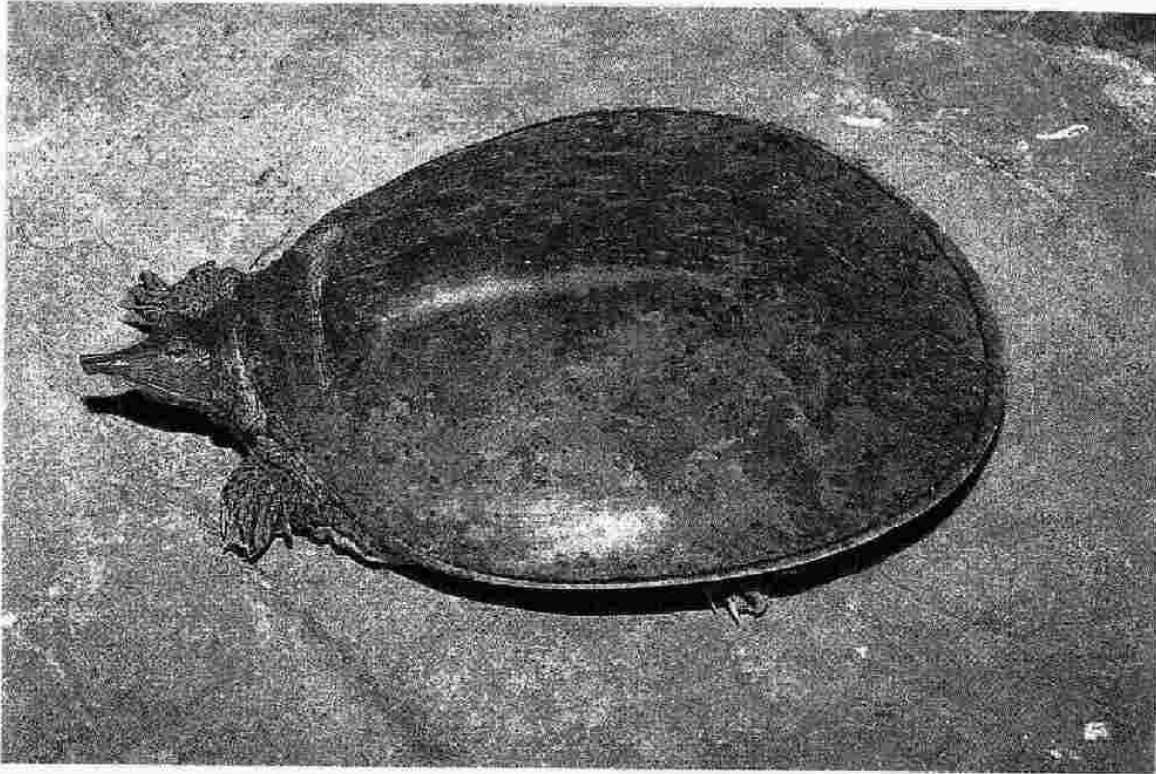


FIG. 323. Adult spiny softshell (Poinsett County).

in Tennessee. Egg deposition occurs from late May through July in open areas. Nests are usually in proximity of water but may be constructed at considerable distances from water. Two or more clutches of 3–39 eggs, depending upon the size of the female, are laid each season. Two nests found on the banks of the Little Red River near Searcy contained 15 and 16 eggs. Nests containing over 50 eggs have been found but these probably represent the communal deposition of two or more females. The spherical, brittle-shelled eggs have an incubation period of 65–75 days. Flooding is an important source of mortality for eggs of both our softshell species in Louisiana (Doody, 1995). Hatchlings measure about 3.5 cm in carapace length and grow rapidly until sexual maturity (about 12.5–14.0 cm in males; 25.0–28.0 cm in females). Sexual maturity is reached in about 8–9 years in females and about four years in males. Specimens have been kept in captivity for over 25 years.

Their long necks, sharp beaks, and propensity for scratching and biting make spiny softshells difficult (and painful) to handle. Probably the safest way to hold them is to grasp the posterior margin of the carapace with one hand and the anterior margin with the other while press-

ing down on the back of the neck with the back of one's fingers.

Subspecies: *Apalone s. spinifera* (eastern spiny softshell): Adults attain a maximum carapace length of 23.5 cm for males and 43.2 cm for females (Fig. 323). This subspecies is similar to the species description except that the carapacial markings consist of well-defined dark ocelli

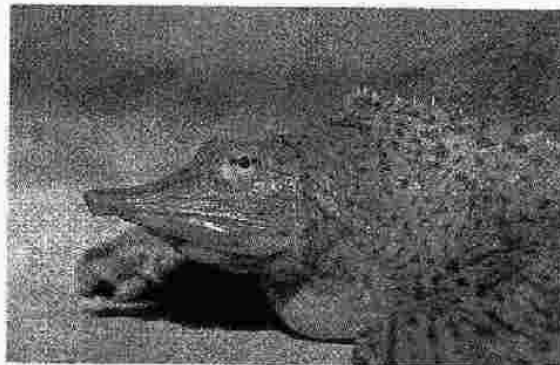


FIG. 324. Head and anterior carapace of spiny softshell (Craighead County).

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and spots that are much larger in the center of the carapace. This race is distributed primarily in the Delta (see **Remarks**). *Apalone s. hartwegi* (western spiny softshell): Adults attain a maximum carapace length of 18.4 cm for males and 45.7 cm for females. This subspecies is also similar to the species description except that carapacial markings consist of small dark spots or ocelli that are approximately equal-sized over the carapace. This race is distributed primarily in the Interior Highlands (see **Remarks**). *Apalone s. pallida* (pallid spiny softshell): Adults attain a maximum carapace length of 21.8 cm for males and 41.5 cm for females (Fig. 326). Again, this subspecies is similar to species description except that the plain brown carapace is marked with small white tubercles or dots that are most numerous on the posterior half. This race is distributed primarily in the West Gulf Coastal Plain (see **Remarks**).

Conservation Status: None. This species is common throughout the state.

Arkansas Literature and Remarks: *Apalone s. hartwegi* exists in a pure sense only in northwestern Arkansas.

In the Gulf Coastal Plain broad areas of intergradation between *A. s. spinifera* and *A. s. hartwegi* exist. A bewildering array of phenotypes ranging between typical *hartwegi* to typical *spinifera* may be found. Probably all Gulf Coastal Plain populations should be considered as intergradient between these two subspecies. *Apalone s. pallida* presumably is limited to the Red River drainage in extreme southwestern Arkansas (Fig. 325) and probably intergrades with *A. s. hartwegi* X *A. s. spinifera* populations in the streams between the Red River and Ouachita River drainages (Webb, 1962). The largest reported specimen of *A. spinifera* (54.0 cm carapace length, 11.7 kg) was an intergrade captured near Monroe, Louisiana. Locality information and pertinent literature are found in Albritton (1981), Ball (1980), Bonati (1980), Dellinger and Black (1938), Dowling (1956, 1957), Martin (1981), Parker (1947), Plummer and Burnley (1997), Plummer et al. (1997), Schuier et al. (1972), Schwardt (1938), Taylor (1935), Trauth and Worley (1997), Vance (1985), and Webb (1973b). McAllister et al. (1994c) found no species of coccidian parasites in three specimens from Arkansas.



FIG. 325. Distribution of *A. s. hartwegi* X *A. s. spinifera* (solid circles) and *A. s. pallida* (open circles) in Arkansas. Small map depicts range of species in the United States.

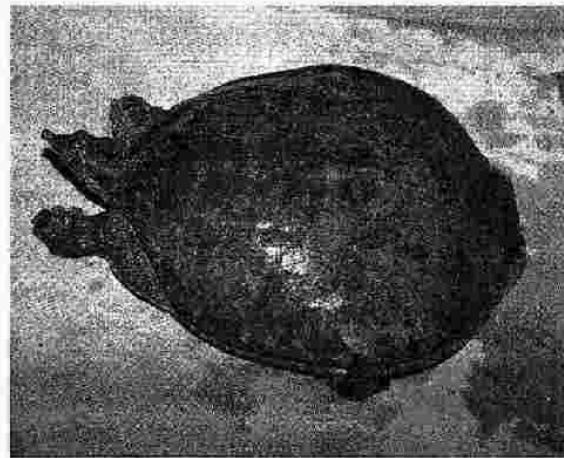


FIG. 326. Female pallid spiny softshell (Little River County).

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KEY TO THE TURTLES OF ARKANSAS

- 1a. Shell covered with horny scutes (Fig. 267A); cutting edges of upper jaws not concealed by fleshy lips; snout not terminating in tubular proboscis2

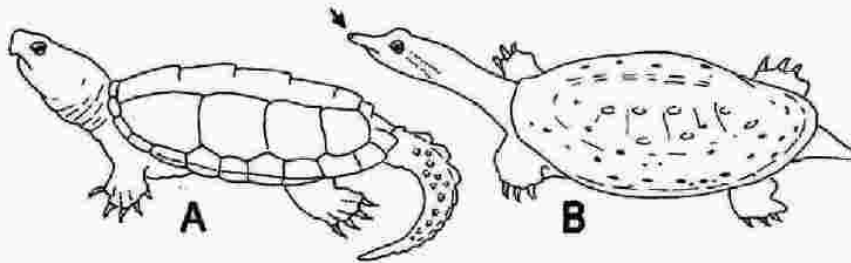


FIG. 267. A. Turtle shell covered with horny scutes and with head lacking a tubular proboscis.
B. Turtle shell covered by a leathery skin (no scutes) and with a tubular proboscis (arrow).

- 1b. Shell covered with leathery skin (Fig. 267B); cutting edges of upper jaws concealed by fleshy lips; snout terminating in tubular proboscis (Fig. 267B; family Trionychidae)15
- 2a. Plastron small and cruciform (cross-like), exposing soft underparts (Fig. 268A, B); tail longer than half the carapace length (Fig. 268B; family Chelydridae)3

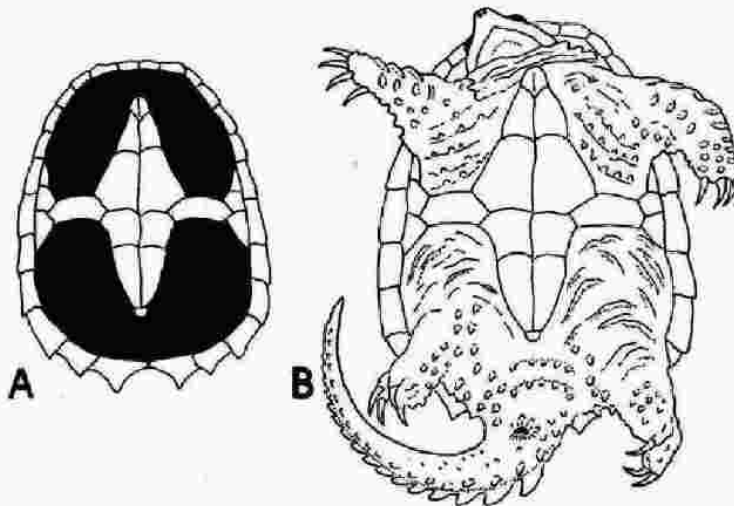


FIG. 268. Characteristics of the family Chelydridae. A. Ventral view of shell, showing cruciform shape of plastron. B. Same view illustrating soft underparts exposed and long tail.

- 2b. Plastron large and oval, covering soft underparts; tail shorter than half the carapace length4

004216

- 3a. Three to 5 supramarginal scutes between marginals and costals on each side (Fig. 269A); underside of tail covered with irregularly arranged small scales (Fig. 269C); eyes directed laterally, not evident from dorsal view (Fig. 269E) Alligator snapping turtle, *Macrochelys temminckii*
- 3b. No supramarginal scutes (Fig. 269B); underside of tail covered with double row of large scales (Fig. 269D); eyes directed dorsolaterally, evident from dorsal view (Fig. 269F) Common snapping turtle, *Chelydra serpentina serpentina*

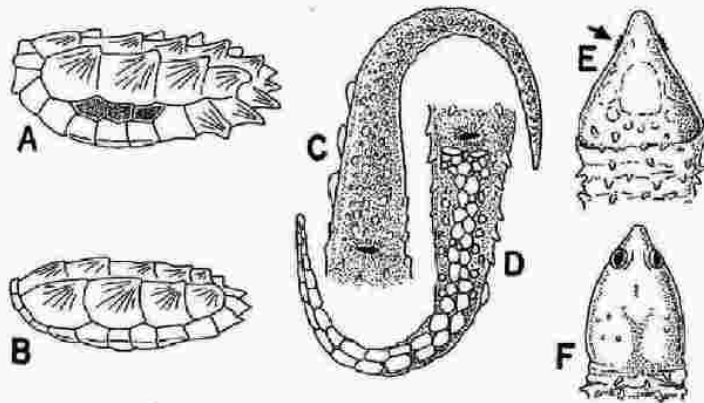


FIG. 269. Characters distinguishing snapping turtles. A. Carapace of *Macrochelys temminckii* showing three supramarginal scutes (stippled). B. Carapace of *Chelydra serpentina* showing absence of supramarginal scutes. C. Ventral view of tail of *M. temminckii* showing irregular arrangement of small scales. D. Same view of tail of *C. serpentina* showing a double row of large scales. E. Dorsal view of head of *M. temminckii* showing location of eyes (arrow), not visible from above. F. Same view of *C. serpentina*, with eyes visible from above.

- 4a. Plastron composed of 12 horny scutes; carapace with 24 marginals; pectorals in contact with marginals (Fig. 270A, B; family Emydidae) 7
- 4b. Plastron composed of 10 or 11 horny scutes; carapace with 22 marginals; pectorals not in contact with marginals (Figs. 270C; 270A, B; family Kinosternidae) 5

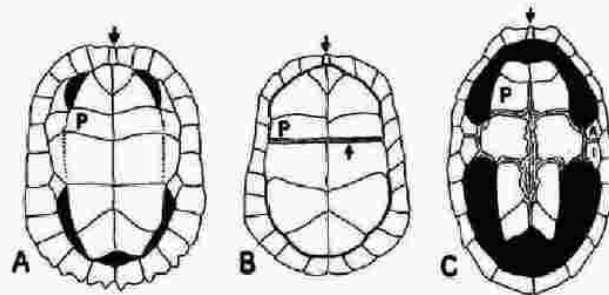


FIG. 270. Ventral views of turtle shells showing the plastron. A and B. The plastron of *Trachemys scripta* (A) and *Terrapene carolina* (B) showing 12 horny scutes and the pectoral scutes (designated by the letter "P") in contact with the marginals (scutes forming a circle around the shell). Carapaces of both illustrations have 24 marginals (note: the small scute at the arrow in A, B, and C is the cervical, also called nuchal). The plastron of A is rigid; that of B is hinged (arrow). C. Plastron of *Sternotherus carinatus* showing 10 horny scutes, 22 marginals, and pectorals not in contact with marginals. Inframarginals (A = axillary; I = inguinal) connect plastron with carapace.

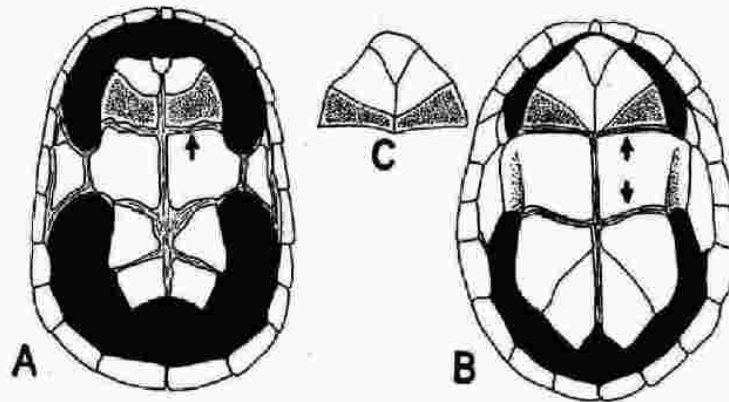


FIG. 271. Characteristics of the family Kinosternidae. A. View of the plastron of the genus *Sternotherus* showing quadrangular pectoral scutes (stippled, above arrow), and single indistinct transverse hinge (at arrow). B. Plastron of *Kinosternon subrubrum* showing triangular pectorals (stippled) and the presence of two transverse hinges bordering abdominal scutes (arrows). C. Anterior plastron as in B showing variation in shape of pectorals (stippled).

- 5a. Pectorals mostly squarish or quadrangular (Fig. 271A); a single indistinct transverse hinge between pectorals and abdominals (Fig. 270A; genus *Sternotherus*)6
- 5b. Pectorals mostly triangular (Fig. 271B, C); 2 transverse hinges bordering abdominals (Fig. 271B)
Mississippi mud turtle, *Kinosternon subrubrum hippocreps*

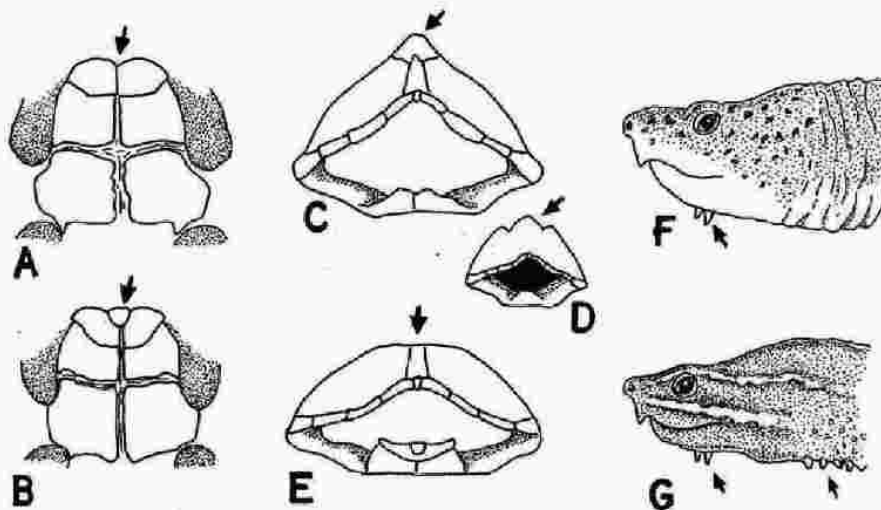


FIG. 272. Characters of the genus *Sternotherus*. A. Arrow indicates lack of gular scute on anterior of plastron. B. Arrow indicates gular present. C. Carapace highly arched and keeled as in adult *S. carinatus*. D. Juvenile with 3 keels. E. Carapace arched as in *S. odoratus*. F. Head of *S. carinatus* showing pattern of black spots with no light stripes, and barbels on chin only (arrow). G. Head of *S. odoratus* showing two light stripes and barbels on chin and throat (arrows).

004218

- 6a. Gular absent (Fig. 272A); carapace highly arched (Fig. 272C) with sharp middorsal keel (3 keels in juveniles, Fig. 272D); no light stripes on side of head; barbels on chin (Fig. 272F) Razorback musk turtle, *Sternotherus carinatus*
- 6b. Gular present (Fig. 272B); carapace not conspicuously keeled (Fig. 272E), except in juveniles; 2 light stripes on sides of head; barbels on chin and throat (Fig. 272G) Stinkpot, *Sternotherus odoratus*
- 7a. Plastron hinged (Fig. 270B; genus *Terrapene*) 8
- 7b. Plastron rigid (Fig. 270A) 9
- 8a. Carapace slightly keeled, rounded above (Fig. 273A); plastron mostly unmarked; hind foot with 3 toes (occasionally 4) toes Three-toed box turtle, *Terrapene carolina triunguis*
- 8b. Carapace not keeled, slightly flattened above (Fig. 273B); plastron heavily streaked with black and yellow reticulations with sharp and distinct edges (Fig. 273C); hind foot with 4 toes Ornate box turtle, *Terrapene ornata ornata*

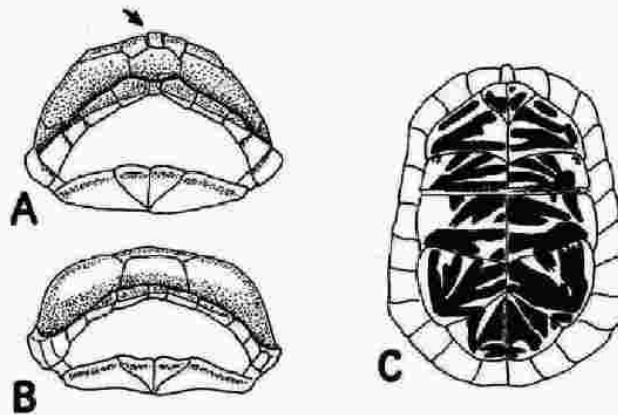


FIG. 273. Characters of box turtles. A. Carapace slightly keeled (arrow) and rounded above, typical of *Terrapene carolina*. B. Carapace not keeled and flattened above, typical of *T. ornata*. C. Plastron heavily streaked with black and yellow, as seen in *T. ornata*.

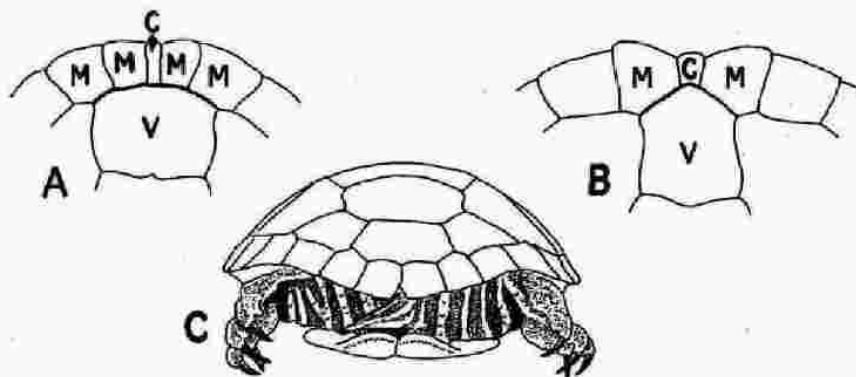


FIG. 274. A. Anterior view of the carapace of *Deirochelys reticularia*, showing first vertebral scute (V) in contact with the cervical (C) and 4 marginal (M) scutes. B. Same view of other turtles (*Cryptemys ouachitensis* illustrated) showing first vertebral in contact with the cervical and only 2 marginals. C. Rump of *Deirochelys reticularia* showing vertical pattern of black and yellow stripes.

004219

- 9a. Neck long (when extended, distance from snout to shoulder approximately equal to plastron length); first vertebral contacts cervical and 4 marginals (Fig. 274A); rump with conspicuous vertical black and yellow stripes (Fig. 274C) Western chicken turtle, *Deirochelys reticularia miaria*
- 9b. Neck moderate (when extended, distance from snout to shoulders approximately equal to half plastron length); first vertebral contacts cervical and 2 marginals (Fig. 274B); rump usually with horizontal stripes 10
- 10a. Posterior edge of carapace mostly smooth (Fig. 275A); light middorsal carapacial stripe present Southern painted turtle, *Chrysemys picta dorsalis*
- 10b. Posterior edge of carapace coarsely serrate (Fig. 275B); no light middorsal carapacial stripe 11

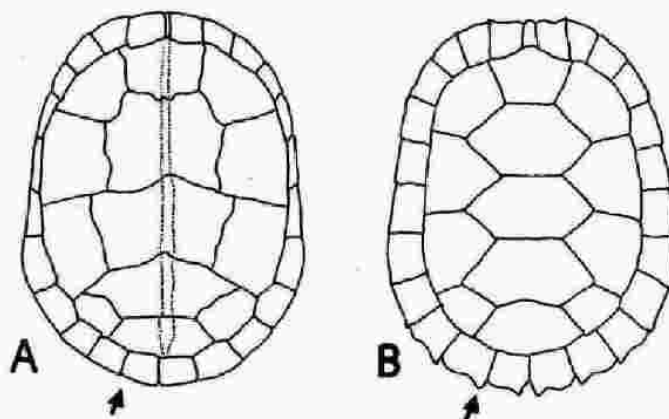


FIG. 275. A. Carapace of *Chrysemys picta* showing smooth posterior edge (arrow) and position of light middorsal stripe. B. Carapace of other turtles (*Trachemys scripta* illustrated) showing coarsely serrate posterior edge (arrow) and lack of middorsal stripe.

- 11a. Crushing surface of upper jaw with a ridge (Fig. 276A) or tuberculate row (Fig. 276B) extending parallel to its margin; apex of lower jaw pointed (Fig. 276A, B); cutting edge of lower jaw smooth or serrate (genera, *Trachemys*, *Pseudemys*) 12

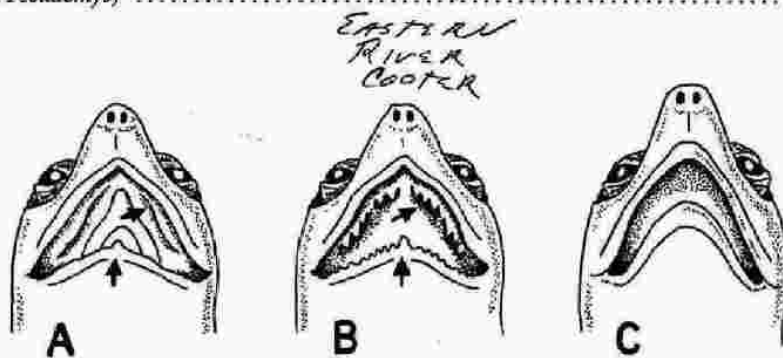


FIG. 276. Mouthparts of turtles. A. Upper jaw with a ridge inside of, and parallel to, the horny outer ridge of the jaw (upper arrow), and apex of lower jaw pointed (lower arrow), as seen in *Trachemys scripta*. B. Upper jaw with a tuberculate row inside of, and parallel to, the horny outer ridge of the jaw (upper arrow), and apex of lower jaw pointed (lower arrow), as seen in *Pseudemys concinna*. C. Upper jaw without tuberculate row, apex of jaw rounded, and cutting edge of lower jaw smooth, as seen in *Graptemys pseudogeographica*.

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- 11b. Crushing surface of upper jaw without a ridge or tuberculate row extending parallel to its margin (Fig. 276C); apex of lower jaw rounded (Fig. 276C); cutting edge of lower jaw smooth (*Graptemys*)13
- 12a. Plastron with numerous dark spots or ocelli (Fig. 277A, B), or mostly black posteriorly (large females), or buff except for black concentrated along sutures (melanistic males); enlarged reddish postorbital bar (Fig. 277C; pale in melanistic males); cutting edge of lower jaw smooth or finely serrate (Fig. 277A); underside of chin roundedRed-eared slider, *Trachemys scripta elegans*
- 12b. Plastron not as above; no enlarged postorbital bar (Fig. 277D); cutting edge of lower jaw coarsely serrate (Fig. 276B); underside of chin flatRiver cooter, *Pseudemys concinna*

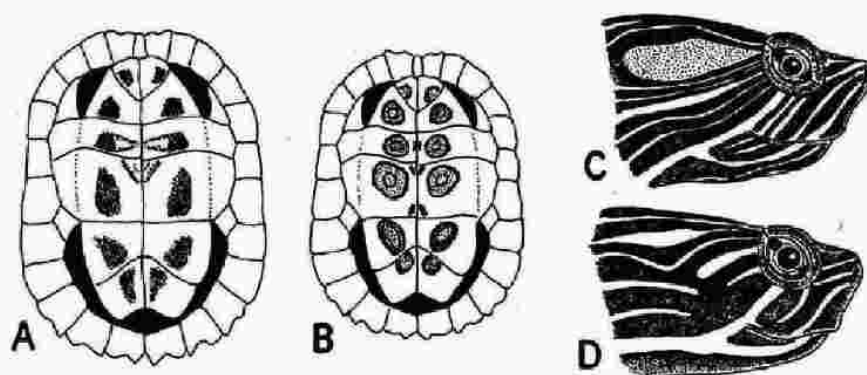


FIG. 277. A and B. Patterns of dark spots (A) or ocelli (B) on the plastron of *Trachemys scripta*. Pattern in A is more representative of medium-sized specimens and that in B of hatchlings. C. Head of *T. scripta* showing enlarged postorbital bar. D. Head of *Pseudemys concinna* showing pattern without enlarged postorbital bar.

- 13a. Vertebral keel poorly developed (Fig. 278A), without prominent knobs (except in hatchlings); detached yellow spot behind eye separated from eye by short vertical or diagonal lines (Fig. 278C)Common map turtle, *Graptemys geographica*

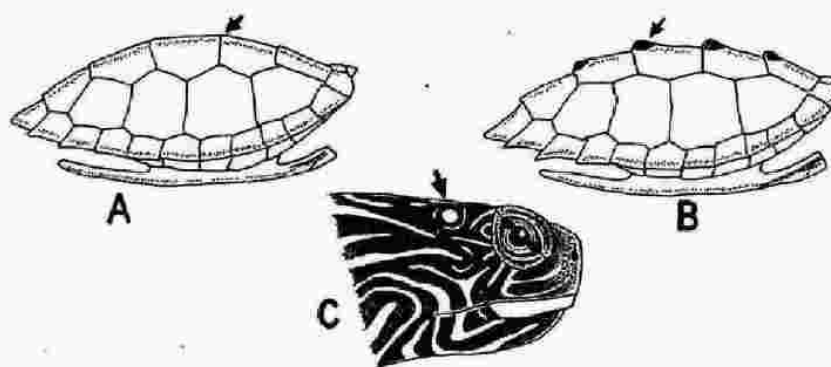


FIG. 278. Characters of some turtles of the genus *Graptemys*. A. View of the shell of *G. geographica* showing the lack of a developed vertebral keel (arrow). B. Shell of other *Graptemys* showing well-developed keel with prominent dark knobs (arrow). C. Head of *G. geographica* showing yellow spot separated from eye by short lines (arrow).

004221

- 13b. Vertebral keel well developed, with prominent dark knobs (Fig. 278B); head stripe forming large spots or narrow crescent-shaped mark behind and below eye (Fig. 279)14



FIG. 279. Patterns on the heads of *Graptemys pseudogeographica kohnii* (A), showing a crescent behind and below the eye, and *G. ouachitensis* (B), showing enlarged postorbital, suborbital, and mandibular spots.

- 14a. Head stripe forming narrow crescent behind and below eye (Fig. 279A); suborbital and mandibular spots, if present, smallMississippi map turtle, *Graptemys pseudogeographica kohnii*
 14b. Head stripe forming broad, broken crescent or spots behind and below eye; suborbital and mandibular spots large (Fig. 279B)Ouachita map turtle, *Graptemys ouachitensis*
 15a. Nostrils without horizontal ridges projecting from septum (Fig. 280A); leading edge of carapace without tubercles or spines (Fig. 280C)Smooth softshell, *Apalone mutica*
 15b. Nostrils with horizontal ridge projecting from each side of septum (Fig. 280B); leading edge of carapace with tubercles or spines (Fig. 280D)Spiny softshell, *Apalone spinifera*

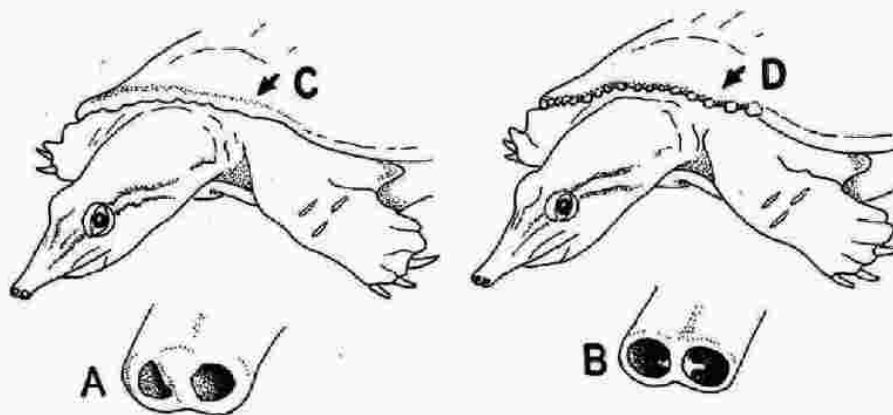


FIG. 280. Characters of softshell turtles. A. Enlargement of nostrils of *Apalone mutica* showing lack of horizontal ridges. B. Nostrils of *A. spinifera* showing position of horizontal ridges. C. Front of carapace without spines (arrow), as seen in *A. mutica*. D. Carapace with tubercles or spines (arrow), as seen in *A. spinifera*.

004222

004223

Order Marsupialia *Marsupials*

Marsupials are characterized by the presence of a marsupium or pouch on the abdomen of females. Gestation in most species is brief, and the young are small and incompletely developed at birth. After birth, they attach to mammary glands in the pouch where they complete their development until they are able to move about independently. The order Marsupialia is a very primitive one, and the greatest species diversity is found in Australia and adjacent islands. Several species occur in South America, but only one species, the Virginia opossum, occurs in the United States and Canada.

FAMILY DIDELPHIDAE

NEW WORLD OPOSSUM

Members of this family are in the oldest known family in the order. They originated in North America, but are presently found primarily in tropical and subtropical areas. The general characteristics of this family are as follows: Long, nearly naked, grasping tail; long nose; five toes on front and hind feet, inner toe on hind

foot opposable and without a nail; very pronounced crests on midline and back of skull; 50 teeth.

VIRGINIA OPOSSUM

Didelphus virginiana

NAME From the Greek word *didelphis*, meaning double womb. The specific name, *virginiana*, means "of Virginia." Opossum is derived from the Algonquin Indian name, *apasum*.

IDENTIFICATION AND DESCRIPTION The opossum is about the size of a large domestic cat. It has a long, scaly, flesh-colored, scantily haired, grasping tail. The muzzle is long and slender. The ears are thin and naked. The legs are short and the feet have five toes with the inner toe on each hind foot thumb-like, without a nail, and opposable. Females have a fur-lined pouch on the abdomen. The fur is long and coarse, and is usually grizzled gray in color but ranges from nearly white to cinnamon or black. Males are larger than females.

Didelph

Skull of

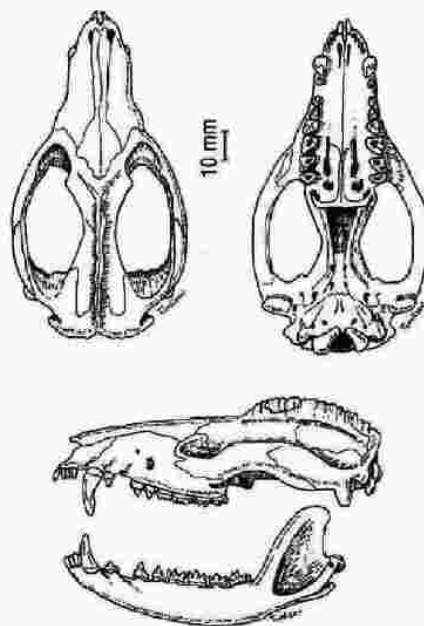
004224



Didelphus virginiana, Opossum. Phil A. Dotson

MEASUREMENTS AND DENTAL FORMULA

Total Length: 600–850 mm (24–33.5 in)
 Tail Length: 250–350 mm (9.8–13.8 in)
 Hind Foot: 50–75 mm (2–3 in)
 Ear: 45–60 mm (1.8–2.5 in)
 Skull Length: 90–125 mm (3.5–5 in)
 Weight: 3–6 kg (6.6–13 lb)
 Dental I 5/4, C 1/1, P 3/3,
 Formula: M 4/4 = 50



Skull of *Didelphus virginiana*

ARKANSAS DISTRIBUTION AND ABUNDANCE

The opossum is common statewide, particularly in heavily timbered bottomlands and mountainous regions of state.

LIFE HISTORY The opossum is generally an inhabitant of deciduous woodland. It prefers bottomland forests along streams and is found less frequently in dry upland woods. Opossums nest or make dens in sheltered spots such as hollow logs, brush piles, rockpiles, under exposed roots of uprooted trees or partially undermined trees along streams, or under buildings. The opossum is an excellent climber but is most often observed on the ground. On the ground, opossums generally move with a slow, ambling gait and as a result are one of the most



LEGEND

- ACTUAL SPECIMENS
- ★ REPORTED SPECIMENS

Distribution of the opossum, *Didelphis virginiana*

frequent "road kills" observed along highways in the state. When surprised, the opossum exhibits a characteristic death-feigning behavior pattern (commonly called "playing possum"). If picked up while in this state it offers no resistance, but if it is left alone it soon recovers and makes its escape (Fitch and Sandidge 1953).

Opossums are slow-witted, non-aggressive, largely nocturnal mammals. Usually they are silent but may give low growls, snarls, or hisses if disturbed. They are omnivorous and will eat almost any kind of available food. Persimmon is a favorite fruit, but the seeds are rarely eaten. Scats with large numbers of persimmon seeds are more likely to be from raccoons or coyotes. Corn and fruits constitute a substantial portion of its diet in fall and early winter. Contrary to popular belief, the opossum seldom molests poultry.

In northern Arkansas the opossum breeding season begins during the first week in February, but it may begin in mid-January in southern Arkansas. A second breeding period occurs from early April to mid-June. Females may produce two litters per year, and both males and

females reach sexual maturity during the first year after birth. Females are characterized by having two vaginas opening into the urogenital sinus. In order to facilitate breeding, males have a forked penis, which may give rise to the myth that opossums breed through the nose.

Litters may be produced in all months except October and November. As many as 20-25 young may be born at one time, but the number of milk-producing nipples in the pouch usually does not exceed 13, which sets an upper limit on the number of young that can be accommodated in the pouch. The average litter size varies from about seven to nine young, but the number of surviving young in a litter may be considerably less. The young are very tiny at birth, about the size of a honeybee, and embryolike in appearance. Young opossums remain firmly attached to the nipples until they are about 60 days old when they reach the size of a house mouse. When 70-80 days old, they are rat-sized and may leave the pouch for short periods. After leaving the pouch, the young may climb about the mother's body and make short trips to the ground, but they return to the pouch to nurse. They leave the mother when they are about 3 months old. Usually they move less than one-quarter mile from their place of birth (Hartman 1952).

Ticks, lice, fleas, flukes, roundworms, and tapeworms are known to parasitize opossums. In addition, opossums may contract or serve as reservoirs for many protozoan, fungal, viral, and bacterial diseases. Rarely, however, do they contract rabies. Major predators of opossums include dogs, foxes, bobcats, coyotes, great horned owls, and humans.

IMPORTANCE AND/OR MANAGEMENT Opossums are sometimes used for food, especially in the South. They have traditionally been major furbearers, although their fur has a low monetary value and is most commonly used to trim inexpensive coats. In terms of total harvest in Arkansas, between 1942 and 1984 the opossum ranked first, accounting for 36% of the total fur harvest. In pelt value, however, it ranked twelfth of thirteen furbearers. Region-

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ally, the Ozark Mountains (35%) produced the greatest number of pelts, followed by the Mississippi Delta (32%), the Gulf Coastal Plain (15%), and the Ouachita Mountains (13%); an additional 5% were unassignable (Clark et al. 1985; Peck et al. 1985).

Despite its low order of intelligence, the opossum has an extraordinary vitality which, coupled with its high reproductive rate, favorable habitat, and omnivorous feeding habits,

has enabled it to maintain and increase its numbers and extend its range as far north as southern Canada.

The subspecies found in Arkansas is *D. v. virginiana* (Gardner 1973; McManus 1974).

SELECTED REFERENCES

Fitch and Sandidge (1953); Gardner (1973, 1982); Hartman (1952); McManus (1974); Clark et al. (1985); Peck et al. (1985).

004228

MARSH RICE RAT

Oryzomys palustris

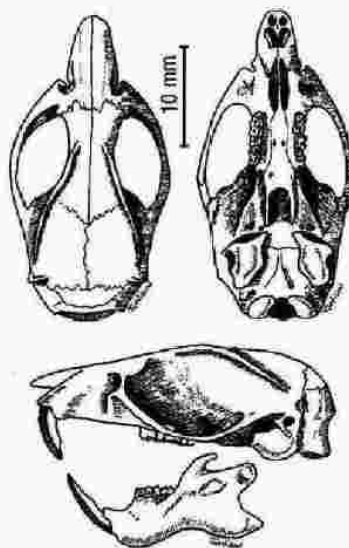
NAME *Oryzomys* is from two Greek words meaning "rice mouse"; *oryza* means "rice," and *mys* means "mouse." The specific name, *palustris*, is the Latin word for "marshy."

IDENTIFICATION AND DESCRIPTION The rice rat is small- to medium-sized with a sparsely haired, long, slender tail which is not sharply bicolored. The tail is nearly one-half the total length. It has prominent ears, moderately large eyes, and white feet. It is grayish brown to brown above and grayish white to grayish buff below.

Superficially the rice rat resembles the Norway rat. It may be distinguished by its smaller size, bicolored tail, longer and softer fur, and different cusp pattern on the molar teeth.



Oryzomys palustris, Marsh Rice Rat.
Richard K. Laval



Skull of *Oryzomys palustris*

MEASUREMENTS AND DENTAL FORMULA

Total Length:	186-305 mm (7.3-12.0 in)
Tail Length:	84-156 mm (3.3-6.1 in)
Hind Foot:	21-39 mm (0.83-1.5 in)
Ear:	10-18 mm (0.39-0.71 in)
Skull Length:	28-31 mm (1.1-1.2 in)
Weight:	31-78 g (1.1-2.8 oz)
Dental	I 1/1, C 0/0, P 0/0, M 3/3
Formula:	= 16

ARKANSAS DISTRIBUTION AND ABUNDANCE

The rice rat occurs statewide, except for a few northern counties adjacent to Missouri. It is not generally distributed but may be locally abundant.

LIFE HISTORY The semiaquatic rice rat inhabits wet meadows and the dense vegetation bordering marshes, swamps, bayous, streams, ditches, drainage canals, and ponds. It is sometimes found in submarginal habitat, such as densely vegetated old fields, pinelands, and bottomland forests. The rice rat is an adept swimmer and diver, often swimming for some distance under water (Hamilton 1946). In northwestern Arkansas, this species is not

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common but may be locally abundant in isolated localities where the habitat is suitable.

Rice rats show around-the-clock activity but are more active and show a wider range of movement at night. More daytime activity is apparent when the cover is dense. They feed on seeds and succulent parts of a variety of plants and also dine on insects, snails, crayfish, and other animals. In marshy areas, the rice rat constructs feeding platforms of freshly cut stems of marsh grasses. These may be as large as dinner plates and are a sure sign of the rice rat's presence.

Globular grapefruit-sized nests of closely woven dry grasses and leaves are constructed in a chamber at the end of a shallow burrow above high-water level or in a shallow depression amid tangled vegetation. In wet, marshy areas the nest is sometimes suspended well above water level in interlaced marsh grasses or clumps of cattails.

The length of the breeding season is quite variable, depending upon population density,

climate, and other factors (Negus et al. 1961). In the southern part of its range, reproductive activity may continue throughout the year under favorable conditions. In northern Arkansas, the breeding season probably extends from February through October or early November. Females bear litters of one to seven young after a 25-day gestation period. Older females generally produce four to five young per litter whereas the average litter size for young females is three. The litter size and number of litters produced annually also vary with population density, weather, and nutritional state (Negus et al. 1961). Fewer litters are produced during periods of food scarcity and inclement weather, and the litter size is reduced when the population density is high. Young rice rats attain sexual maturity when about 6 to 8 weeks old.

The average life span of the rice rat in the wild is about 7 months. Under natural conditions predators and disease take a heavy toll. Water moccasins and owls prey heavily upon rice rats; other predators include feral housecats, mink, foxes, raccoons, and weasels.

IMPORTANCE AND/OR MANAGEMENT Rice rats can cause serious economic losses to rice growers when ample cover is present on levees surrounding rice fields. In most rice growing areas of Arkansas, however, populations may be declining due to the lack of sufficient cover as a result of management practices that involve control of vegetation on levees by mowing or with herbicides.

The subspecies present in Arkansas is *O. p. texensis*.

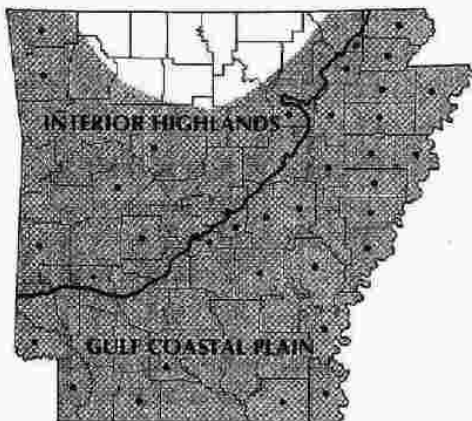
SELECTED REFERENCES

Hamilton (1946); Negus et al. (1961).

PLAINS HARVEST MOUSE

Reithrodontomys montanus

NAME *Reithrodontomys* is from three Greek words and means "groove-toothed mouse." *Re-*



LEGEND

- ACTUAL SPECIMENS
- ★ REPORTED SPECIMENS

Distribution of the marsh rice rat (*Oryzomys palustris*)

004231



Distribution of the southern bog lemming (*Synaptomys cooperi*)

types of grassland, weedy fields, and marshes. However, it also occurs in moist woodlands and in orchards (Connor 1959). The chief requirement of this species seems to be the presence of green, succulent sedges and grasses, which are its main source of food. It constructs runways through thick, heavily matted stands of grass and makes piles of fresh grass cuttings in the runways that resemble those of the prairie vole. However, the presence of bright green droppings in the runway indicates the presence of bog lemmings. They also dig burrows underground to a depth of about 15 cm (6 in) or more that are connected with the surface runways. Lemmings are active at all hours of the day and night, but most activity is during late afternoon and at night.

The nest of dry leaves and grass is lined with soft material such as fine grass, fur, or feathers. It is about 10–20 cm (3.9–7.9 in) in diameter and is usually placed in an underground chamber adjoining the burrow system. During warmer months, the nest is sometimes built above ground in thick mats of grass.

The breeding season extends throughout the year. Very little is known about the reproduction of this species in Arkansas, but peaks in breeding activity probably occur in spring and fall. Litter size varies from one to seven; the usual litter size is two to five. The gestation period is 23 days (Connor 1959) and the young weigh 3–4 g (0.10–0.15 oz) at birth. They are weaned when about 3 weeks old.

IMPORTANCE AND/OR MANAGEMENT No management or control measures are needed.

The subspecies present in Arkansas is *S. c. gossii*.

SELECTED REFERENCES

Connor (1959).

BLACK RAT

Rattus rattus

NAME Both the generic and specific name, *rattus*, is Latin for "rat." This species is also known as the roof rat.

IDENTIFICATION AND DESCRIPTION The black rat is medium-sized with a relatively slender body and a tail longer than its head and body.



Rattus rattus, Black Rat. Walter E. Howard

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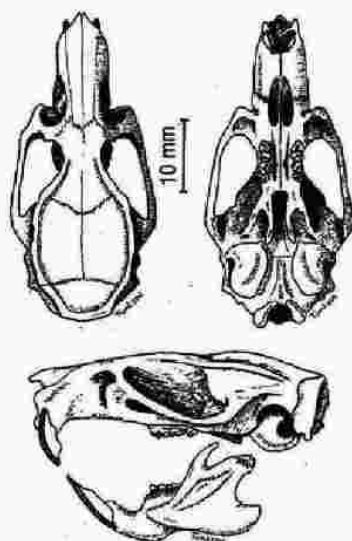
The almost naked ears are large and can be extended over the eyes. It has a pointed muzzle. The fur is soft and mixed with many long, harsh, bristly hairs. It is grayish brown to black above and gray to yellowish white or white below.

MEASUREMENTS AND DENTAL FORMULA

Total Length:	325-455 mm (12.8-17.9 in)
Tail Length:	160-255 mm (6.3-10.0 in)
Hind Foot:	27-42 mm (1.1-1.7 in)
Ear:	17-27 mm (0.67-1.9 in)
Skull Length:	41-48 mm (1.6-1.9 in)
Weight:	115-350 g (4.1-12.3 oz)
Dental	I 1/1, C 0/0, P 0/0, M 3/3
Formula:	= 16

ARKANSAS DISTRIBUTION AND ABUNDANCE

The black rat probably occurs statewide in and around human habitations. The black rat is not particularly abundant, but it is more common in the southern portion of the state and along the Arkansas and Mississippi rivers where it might be transported by river traffic.



Skull of *Rattus rattus*



LEGEND

- ACTUAL SPECIMENS
- ★ REPORTED SPECIMENS

Distribution of the black rat (*Rattus rattus*)

LIFE HISTORY The black rat or roof rat is a nonnative species that was first introduced into the United States in the early seventeenth century. It was once abundant in many parts of North America, but with the introduction of the Norway rat in the late eighteenth century, black rat populations declined to the point where this species became rare or extinct in many areas. Wherever they occur together, the larger, more aggressive Norway rat has displaced or driven out the black rat. They sometimes occur together but are behaviorally and ecologically separated. The roof rat, which is a much better climber, occupies the upper stories of buildings, and the Norway rat lives in lower levels of buildings, underground, and in sewer systems and garbage dumps of cities. Like the Norway rat, the black rat is omnivorous and eats a wide variety of vegetable and animal matter.

Black rats breed throughout the year. The gestation period is about 21 days, and the average litter size ranges from six to nine. Young rats are weaned when about 3 weeks old and become sexually mature and capable of breeding when about 3 months old.

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IMPORTANCE AND/OR MANAGEMENT Both the black rat and its relative, the Norway rat, constitute a serious public health problem where they live in close proximity to humans. They not only contaminate foodstuffs but also harbor numerous species of parasites and infectious organisms. They transmit such diseases as typhus, plague, leptospirosis, trichinosis, and rat-bite fever to humans through the parasites they harbor. For control measures, see the discussion in the Norway rat account.

The subspecies in Arkansas is *R. r. alexandrinus*.

SELECTED REFERENCES

Davis (1953); Lowery (1974); Worth (1950).

NORWAY RAT

Rattus norvegicus

NAME *Rattus* is from the Latin *rattus*, meaning "rat." The specific name, *norvegicus*, is a Latinized word meaning "of Norway," indicating the country for which the species was named.

IDENTIFICATION AND DESCRIPTION The Norway rat is a large, robust rat with a tail which is conspicuously annulated and shorter than its head and body. The small, hairy ears do not reach the eyes, and the muzzle is blunt. The fur is soft with few harsh, bristly hairs. The pelage is grayish brown or reddish brown above and pale gray to grayish brown below.

MEASUREMENTS AND DENTAL FORMULA

Total Length: 294–460 mm (11.6–18.1 in)

Tail Length: 122–220 mm (4.8–8.7 in)

Hind Foot: 30–46 mm (1.2–1.8 in)

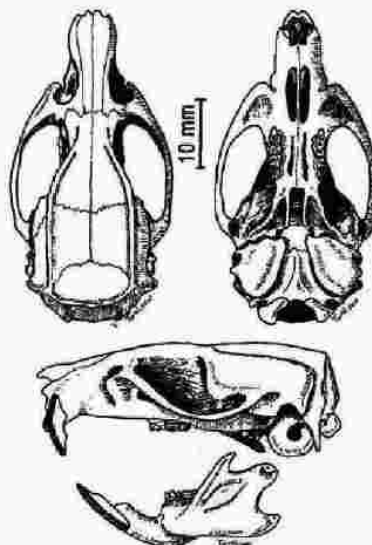
Ear: 15–25 mm (0.60–0.98 in)

Skull Length: 38–50 mm (1.5–2.0 in)

Weight: 168–485 g (5.9–17.1 oz)

Dental I 1/1, C 0/0, P 0/0, M 3/3

Formula: = 16



Skull of *Rattus norvegicus*

ARKANSAS DISTRIBUTION AND ABUNDANCE

The Norway rat is common statewide; it generally lives in or near buildings.

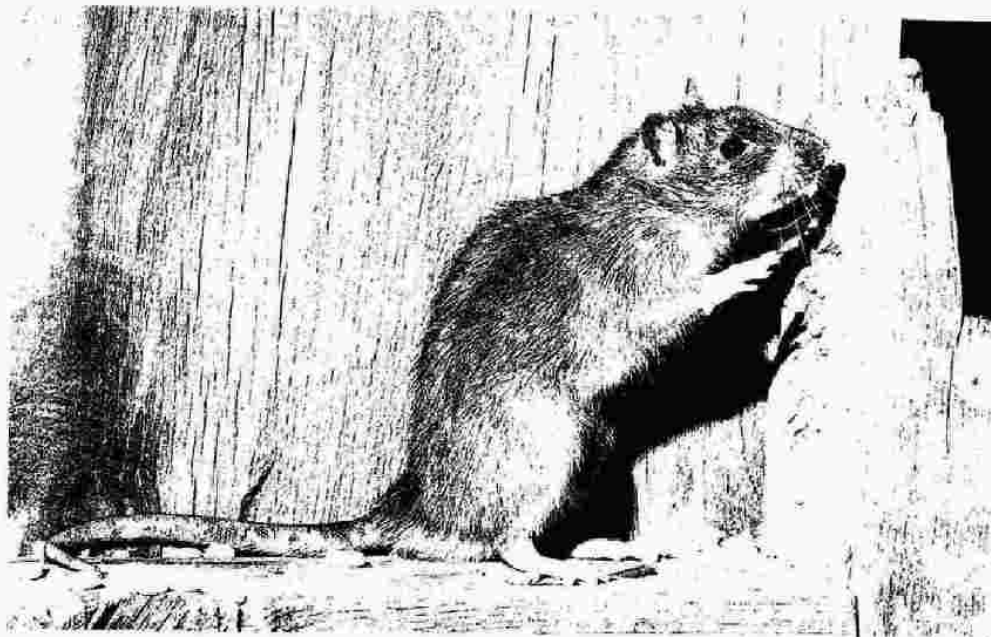
LIFE HISTORY The Norway rat lives in close association with man and his dwelling places. It is found in warehouses, commercial buildings, wharves, feed stores, farm buildings, and private residences. This species also is common in garbage dumps and sewers of cities, and it frequently lives apart from buildings in cultivated fields and meadows during the summer months. This rat is primarily nocturnal and during daytime lives in nests underground or in the walls, floors, and foundations of buildings. The nest is constructed of shredded paper, rags, and trash of various kinds.

Norway rats will eat virtually anything that is edible. This species is primarily vegetarian but will readily eat animal food of various kinds. In poultry houses, it often eats eggs and young chickens. In crowded tenements of large cities, hungry rats often bite children and adults while they are sleeping. Garbage of all kinds and grain are favored foods.

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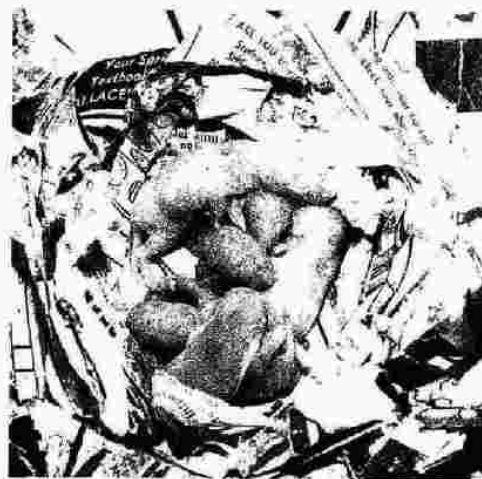


Rattus norvegicus, Norway Rat. Phil A. Dotson

This species is extremely prolific and breeds throughout the year. The gestation period is 21–23 days, and litters of from two to fifteen young are produced. The usual litter size is six to eight. The young are weaned when 3 weeks old, and they may begin breeding and producing litters when 3–4 months old. Under favorable conditions, a single female may produce from six to eight litters per year. The average life span is estimated to be between 2 and 3 years.

IMPORTANCE AND/OR MANAGEMENT The Norway rat is one of the worst scourges of mankind. It consumes or fouls tremendous quantities of human food, does great damage to property, and causes much human misery, suffering, and death by transmitting diseases and parasites.

While no one method can provide total control of rats, maintenance of cleanliness, and the elimination of cover and food may be the most effective long-term measures. Other control



Young of the Norway rat. John R. MacGregor



Distribution of the Norway rat (*Rattus norvegicus*)

measures include shooting, gassing, trapping, and poison bait. Poisons should be used with caution as they are also toxic to humans, domestic animals, and innocent wildlife. In addition, some populations of rats are demonstrating immunity to various poisons, particularly those which cause internal bleeding. Rats also rapidly learn to avoid poison bait.

The common laboratory rat which is used extensively in medical, biological, and behavioral research is the albino variety of the Norway rat.

SELECTED REFERENCES

Calhoun (1962); Davis (1953).

HOUSE MOUSE

Mus musculus

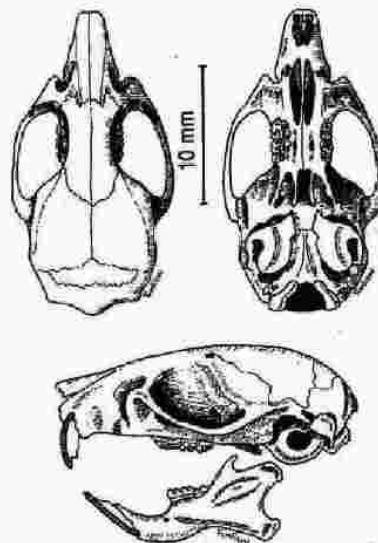
NAME *Mus* is the Latin word for "mouse." The specific name, *musculus*, is the Latin word for "little mouse" and refers to its size.

IDENTIFICATION AND DESCRIPTION The house mouse is small and has a long, nearly naked, scaly tail. It has moderately large, naked ears and a rather pointed rostrum. Its eyes are small. The pelage is mixed yellowish brown and black above and ashy gray below. There are a number of color variations, including the albino mouse, which is used in laboratories.

The house mouse can be easily distinguished from harvest mice by its lack of grooved upper incisors; from members of the genus *Peromyscus* by the lack of sharp color differences between the dorsal and ventral sides; and from the golden mouse by its coloration.

MEASUREMENTS AND DENTAL FORMULA

Total Length:	125–198 mm (4.9–7.8 in)
Tail Length:	58–102 mm (2.3–4.0 in)
Hind Foot:	15–24 mm (0.60–0.94 in)
Ear:	10–18 mm (0.39–0.71 in)
Skull Length:	19–23 mm (0.74–0.91 in)
Weight:	10–30 g (0.35–1.1 oz)
Dental	I 1/1, C 0/0, P 0/0, M 3/3
Formula:	= 16



Skull of *Mus musculus*

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COYOTE

Canis latrans

NAME *Canis* is the Latin word for "dog." The specific name, *latrans*, is the Latin word for "a barker."

IDENTIFICATION AND DESCRIPTION The coyote is slender and medium-sized, resembling a small German shepherd dog. The tail is bushy and tipped with black. It has a long, narrow, reddish brown or gray muzzle; erect, pointed ears; and long legs. The pelage is grizzled buff or gray overlaid with black-tipped hairs above and whitish, cream, or pale gray with yellowish tint below.

Melanistic coyotes, which resemble the black phase of the red wolf in all respects except size, occur in Arkansas, and it seems possible that red wolf genes have become incorporated into the gene pool of the predominant coyote population through introgressive hybridization (Gipson et al. 1974; Gipson 1976). Melanistic individuals that are pure coyotes are also possible.

MEASUREMENTS AND DENTAL FORMULA

Total Length:	1000–1350 mm (39.4–53.1 in)
Tail Length:	267–440 mm (10.5–17.3 in)
Hind Foot:	166–220 mm (6.5–8.7 in)
Ear:	91–120 mm (3.6–4.7 in)
Skull Length:	171–219 mm (6.7–8.6 in)
Weight:	9–16 kg (19.8–35.3 lb)
Dental	I 3/3, C 1/1, P 4/4, M 2/3
Formula:	= 42

ARKANSAS DISTRIBUTION AND ABUNDANCE

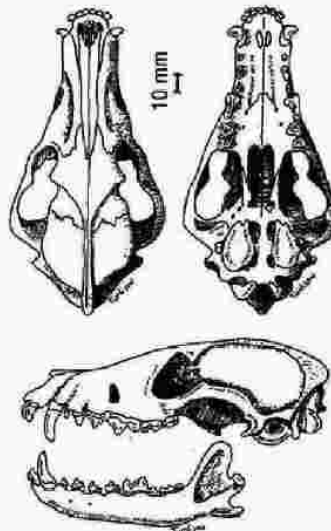
The coyote occurs statewide; it is more common in western Arkansas.

LIFE HISTORY Coyotes inhabit open fields, brushlands, second-growth woodlots, and forest edge habitat. In Arkansas, the coyote originally was found mainly in the more open areas of western Arkansas, but with changing agricultural practices, which involved clearing of timberlands and creation of more open lands, it had extended its range to the central part of the

state or beyond by the early 1950s and over the entire state by the early 1960s. Eastward expansion of the coyote population was accompanied by extensive hybridization with red wolves.

Although mainly nocturnal, coyotes are sometimes observed in the daytime along highways and in open fields. Their principal activity peak begins near sunset, and a smaller activity peak occurs near daybreak (Gipson and Sealander 1972).

Rabbits, various rodent species, and other animal food make up the principal part of the diet, but coyotes also eat considerable plant food, especially during summer and fall (Gipson 1974). Persimmons, muscadines, and melons, when available, are evidently relished by coyotes. Coyotes are opportunists, and their diet is composed of foods that are most abundant and easily available. Prior to the 1930s, no large-scale commercial poultry industry existed in Arkansas, and poultry made up only a small percentage of the coyote's diet. By 1950, poultry production in the state had expanded tremendously, poultry dumps were common, and poultry made up a large share



Skull of *Canis latrans*

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Canis latrans, Coyote. Phil A. Dotson

of the coyote's menu (Gipson and Sealander 1976). Deer and domestic livestock are sometimes found in coyote stomachs and, along with poultry, such remains mainly represent carrion.

Female coyotes produce one litter per year which averages about six pups (Gier 1968). Litter size ranges from two to twelve, but a litter of 19 has been recorded from Utah. The average litter in Arkansas is four to five pups. In Arkansas, females are bred from mid-February through the first week of March, and males are capable of breeding from late November through March (Gipson et al. 1975). The gestation period is about 63 days (between 58 and 65 days), and litters are born from late April through early May. Pups are weaned when about 5-7 weeks old (Bekoff 1977).

Gier (1968) reported a close correlation between food supply, especially rodents, and breeding success, because the condition in which female coyotes enter the breeding season

determines the number of females that will breed and the number of eggs ovulated. During good "mouse years," up to 80% of the old females produce litters. Usually females do not breed until their second year, but when rodents are plentiful in the diet, one-half or more of yearling females become pregnant.

IMPORTANCE AND/OR MANAGEMENT

The status of the coyote in Arkansas and other states is highly controversial. Coyotes are thoroughly disliked by farmers, stockmen, and some sportsmen who complain of coyote predation on poultry, livestock, especially calves, and game animals. Some complaints are justified, but in many cases packs of wild dogs are the real culprits. On the other hand, the coyote is highly esteemed by predator hunters and by sportsmen who enjoy pursuing coyotes and foxes with hounds.

Poultry and livestock eaten by coyotes often



Distribution of the coyote (*canis latrans*)

are carrion including dead chickens and turkeys dumped by growers or calves that have died through bad weather, disease, or outright neglect during the calving season. Deer remains in coyote stomachs are most often found during late fall and winter when deer are crippled during hunting seasons and become easy prey. A few fawns may be caught in spring when they are first dropped, and deer remains in some coyote stomachs consist of carrion obtained from road kills. The overall impact of the coyote on deer populations in the state appears to be minor.

As a furbearer, coyotes were not harvested until the 1950s, and 98% of the total harvest before 1983 occurred in the 1970s and early 1980s. The coyote ranked ninth in both size and value of the total furbearer harvests. Regionally, 37% of coyotes were harvested from the Ozark Mountains, 27% from the Mississippi Delta, 19% from the Ouachita Mountains, and 17% from the West Gulf Coastal Plain (Peck et al. 1985).

Any assessment of the economic effects of

coyotes must take into account not only the damage they do but also their beneficial role in consuming large numbers of rodents and rabbits, scavenging dead animals, and removing diseased and injured animals from deer populations. Large-scale control measures against the coyote generally are very costly and ineffective, whereas selective removal of nuisance animals by professional trappers is a more effective way of dealing with the problem.

Coyotes readily hybridize with domestic dogs, and the fertile offspring of such crosses are often referred to as "coydogs." When coyotes mate with German shepherd dogs, their offspring often are difficult to distinguish from either coyotes or red wolves. Extensive hybridization of coyotes and red wolves, which began in the 1930s and 1940s, resulted in the demise of the red wolf as a viable species over most of its former range. Occasional specimens which resemble red wolves in size, coloration, and other characteristics could result from crosses between hybrid parents (Gipson et al. 1974).

The subspecies present in the state is *C. l. frustror*.

SELECTED REFERENCES

Bekoff (1977, 1982); Gier (1968); Gipson (1974, 1976); Gipson and Sealander (1972, 1976); Gipson et al. (1974, 1975); Peck et al. (1985).

RED WOLF

Canis rufus

NAME *Canis* is the Latin word for "dog." The specific name, *rufus*, is the Latin name for "reddish."

IDENTIFICATION AND DESCRIPTION The red wolf is larger and more robust than the coyote, and its head, nose, and nose pad are broader. The legs are longer and the feet are larger; the ears are much larger; and its pelage is coarser. The red wolf has a bushy tail that is tipped with black. Its muzzle, ears, nape, and outer surfaces of the legs are tawny. The remainder of

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Mating occurs in April, and females produce a single annual litter of one to five young in May or June throughout the range. The usual litter size is three or four. The length of gestation may be 45–50 days, and the young weigh about 28 g (1 oz) at birth. They are fully haired and their eyes open at the age of 4–5 weeks. At this time, solid food becomes a part of their diet, but they may not be fully weaned until well into August when they are about 4 months old. Foraging with the parents begins when the young are 2 months old (Walker et al. 1968).

IMPORTANCE AND/OR MANAGEMENT Ringtails received the name “miner’s cat” in early days in parts of the western United States when they were tamed by miners and kept around their cabins as mousers. This species sometimes takes up residence in buildings occupied by humans because they are attracted by infestations of rats and mice.

This species is a well-known hitchhiker on railroad cars and may have extended its range into Arkansas and elsewhere by this means of

dispersal. It rarely conflicts with human interests and, over most of its range in the United States, is considered an attractive component of the mammal fauna despite its relatively minor economic importance.

SELECTED REFERENCES

Kaufmann (1987); Taylor (1954); Walker et al. (1968).

RACCOON ?

Procyon lotor

NAME *Procyon* is derived from two Greek words, *pro*, meaning “before,” and *kyon*, meaning “dog.” It is not known why this name was given to the raccoon. The specific name, *lotor*, is from the Latin, *lutor*, meaning “a washer,” referring to the raccoon’s habit of often manipulating its food in water.

IDENTIFICATION AND DESCRIPTION The raccoon is medium-sized and heavily built, and has a long bushy tail ringed with five to seven black rings terminating in a black band. The head is broad behind and tapers forward to a short, pointed muzzle. The ears are rounded, furred, and moderate in size; the feet are plantigrade with naked soles; and the toes are free and capable of being widely spread. The claws are nonretractile. There is a conspicuous black mask across the eyes and cheeks which is outlined with white. The pelage is grizzled gray, brown, and black above with paler sides, and dull grayish brown tinged with yellowish gray or white below.

MEASUREMENTS AND DENTAL FORMULA

Total Length:	603–1180 mm (23.7–46.5 in)
Tail Length:	190–300 mm (7.5–11.8 in)
Hind Foot:	82–138 mm (3.2–5.4 in)
Ear:	42–66 mm (1.7–2.6 in)
Skull Length:	107–127 mm (4.2–5.0 in)
Weight:	4–14 kg (8.8–30.9 lb)
Dental Formula:	I 3/3, C 1/1, P 4/4, M 2/2
	= 40



LEGEND

- ACTUAL SPECIMENS
- ★ REPORTED SPECIMENS

Distribution of the ringtail (*Bassariscus astutus*)



Procyon lotor, Raccoon. C. C. Lockwood

ARKANSAS DISTRIBUTION AND ABUNDANCE

The raccoon occurs statewide and is common.

LIFE HISTORY Raccoons prefer bottomland hardwood stands with a plentiful supply of den trees. They are also common in wooded uplands and in a variety of other habitats including bottomland swamps, farmlands (especially those with cornfields), and heavily wooded residential areas in cities. They are seldom found far from water, which has an important influence upon their distribution.

The den is usually in a hollow tree, in crevices in rock outcrops, in cavities beneath tree roots, and in old woodchuck or armadillo burrows. Raccoons are nocturnal and spend most of the daylight hours sleeping in the den. During cold winter weather, raccoons may "hole up" in the den for several days, living off their reserves of body fat, but they do not hibernate.

Raccoons are omnivorous and opportunistic

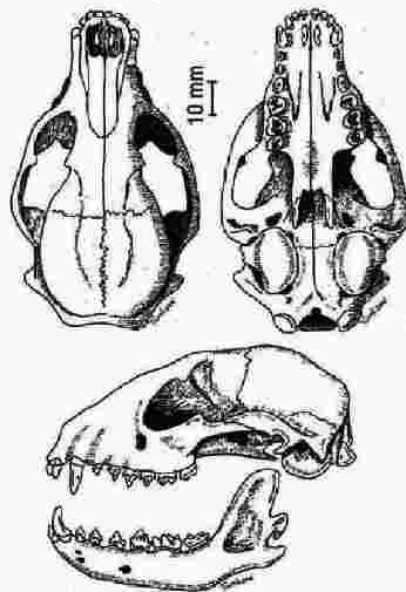
in their feeding habits. Plant foods include a variety of wild fruits and berries, acorns and other nuts, osage oranges, corn, and other garden produce. Animal foods include grasshoppers and other insects, crayfish, clams, fish, frogs, snakes, occasional small mammals, and eggs of turtles and birds. Fruits, insects, acorns, and crayfish are the main dietary constituents during fall and winter (Johnson 1970).

The mating season extends from December to June with peak breeding activity in February and March. The gestation period is 63 days, and the young are born from April to August. Females produce one litter of one to seven young per year. Most litters are born in April or May, but those from late matings may be born from June to August. The usual number of young in a litter is three or four, but there is a tendency for larger litters to be produced in the northern part of the species range (Johnson 1970). The young leave the den when about 10

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Skull of *Procyon lotor*

weeks old and begin foraging with their mother (Stuewer 1943). They are not completely weaned until about the age of 12–14 weeks. Young females are capable of breeding near the end of their first year, but males are not successful breeders until their second year.

IMPORTANCE AND/OR MANAGEMENT The raccoon is a favorite object of the chase in Arkansas and other southern states, where it provides exciting sport for coon hunters and their dogs. It has remarkable physical stamina, and its ability to defend itself is well known. In the water, it is a match for any dog.

The raccoon is the most important furbearer in Arkansas. Since the 1940s, raccoons have been harvested in greater numbers than any other species. Overall, this species has accounted for 36% of the total state harvest. Regionally, the Mississippi Delta has produced the highest number (42%), followed by the West Gulf Coastal Plain (23%), the Ozark Mountains (20%), and the Ouachita Mountains (12%). The reasons for the high harvests include the

ubiquitous nature of raccoons, their high population levels, and their high reproductive potential. They are also easily caught, there is great demand because of the high quality of their fur, and they are pursued by both trappers and sportsmen. In addition, attempts at ranching raccoons have failed (Peck et al. 1985; Sanderson 1987).

On the negative side, raccoons are among the animals most frequently reported as nuisance animals by wildlife agencies in urban and suburban areas of the United States (de Almeida 1987). Nuisance raccoons result in expenditures by government agencies and private citizens for removal and repairs to damaged property. Raccoons are also known predators of waterfowl and other birds (Llewellyn and Webster 1960). Raccoons are also known to harbor distemper and rabies. During the early 1980s, raccoon rabies reached epidemic proportions in the southeast and middle Atlantic states. In Arkansas, only two raccoons have been reported rabid from 1976 through 1987 (Heidt 1982, Arkansas Department of Health, unpublished records).



LEGEND

- ACTUAL SPECIMENS
- ★ REPORTED SPECIMENS

Distribution of the raccoon (*Procyon lotor*)

Raccoons have adapted extremely well to urban areas and can often be observed around decks and patios, particularly where there is pet food or other edible material available. People often feed raccoons and find they can be quite tame and amusing. However, it should be remembered that raccoons, no matter how tame they may appear, are wild animals that may literally bite the hand that feeds them. As with other wild animals, raccoons are better observed from a distance.

Most of the raccoons in the state are members of the subspecies *P. l. hirtus*, although those occurring along the southern and eastern borders of the state possibly may belong to the race *varius*.

SELECTED REFERENCES

de Almeida (1987); Heidt (1982); Johnson (1970); Kaufmann (1982); Llewellyn and Webster (1960); Peck et al. (1985); Sanderson (1987); Stuewer (1943).

FAMILY MUSTELIDAE

WEASELS AND ALLIES

This is a large family including weasels, mink, badgers, skunks, and otters. Mustelids can be found in virtually every type of terrestrial habitat, from the tropics to the arctic, and live in rivers, lakes, and oceans. In terms of distribution, they can be said to be cosmopolitan. In North America, mustelids appear in the fossil records in the early Oligocene.

Members of this family are small- to medium-sized carnivores, usually with an elongated body and short legs. They have five-toed feet with either partially retractile or nonretractile claws and are either plantigrade or digitigrade. Most species in the family have well-developed anal scent glands. Dietary habits of mustelids range from strictly carnivorous to largely omnivorous. Many members of the family are valuable furbearers.

Six species are found in Arkansas.

KEY TO SPECIES

WHOLE ANIMALS

1. Toes fully webbed; total length more than 800 mm (31.5 in); tail long, tapering, and noticeably thickened at base, more than 250 mm (9.8 in) long *Lutra canadensis*, River Otter
- Toes only partly webbed or not webbed; total length less than 800 mm (31.5 in); tail not thickened at base, less than 250 mm (9.8 in) long 2
2. Tail about as long as hind foot, about one-fifth to one-sixth length of head and body; claws on front foot much longer than those on hind foot; body thickset, heavy; single whitish stripe on top of head and neck *Taxidea taxus*, Badger
- Tail much longer than hind foot; about one-half length of head and body 3
3. Color some shade of brown or yellowish brown; body elongated; legs short; claws not retractile 5

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Distribution of the long-tailed weasel (*Mustela frenata*)

gopher, or other rodent; it may also den under tree roots, stumps, logs, or in a rockpile. The nest is made of grass and leaves and may be lined with rodent and rabbit fur.

The bulk of the weasel's diet consists of small mammals including cotton rats, deer mice, voles, pocket gophers, woodrats, chipmunks, shrews, and rabbits. On occasion small birds, reptiles, amphibians, earthworms, and insects are also eaten (Hall 1951b; Polderboer et al. 1941). The only carrion eaten by weasels apparently consists of carcasses stored in their burrows. Weasels are notoriously vicious killers and sometimes kill more than they can eat. Surplus kill may be cached but often decomposes before it can be eaten. The prey is killed by a bite at the base of the skull or in the neck (Hall 1951b). The brain is usually eaten first, after which the heart, lungs, and other parts of the carcass are eaten.

Mating occurs in July and August and females produce a single annual litter in April or May. The total length of gestation is between 205 and 337 days, averaging 279 days, but

during most of this time, the fertilized eggs remain quiescent in the blastocyst stage before implantation in the uterus. After implantation, development of the embryo resumes and is completed in 27 days or less (Wright 1948). The litter size varies from one to twelve but usually numbers between five and eight. The young, which weigh about 3 g (0.1 oz) at birth, are weaned when 6–8 weeks old and begin feeding on solid food. Shortly after weaning, the young begin foraging with their mother until nearly full grown. Females reach sexual maturity and mate during their first summer, when they are 3–4 months old. Males do not attain sexual maturity and breed until they are about a year old.

In the northern part of its range, this species turns white in winter except for the black tip on its tail. In Arkansas, weasels do not change color, but the winter coat may be lighter brown than in summer.

IMPORTANCE AND/OR MANAGEMENT Very little is known about this interesting mammal in Arkansas because of its scarcity, which may be more apparent than real due to its elusiveness, secretive nature, and the difficulty involved in trapping it. Weasels occasionally gain entry into poultry houses and kill young poultry, but they generally play a beneficial role around farm buildings by destroying a great many mice and rats. They are more active at night but often hunt during daylight hours.

The subspecies found in Arkansas is *M. f. primulina*.

SELECTED REFERENCES

Hall (1951b); Hamilton (1933); Polderboer et al. (1941); Wright (1948).

MINK

Mustela vison

NAME *Mustela* is the Latin word for "weasel." The specific name, *vison*, is obscure. It may come from the Swedish, *vison*, for "a kind of weasel."

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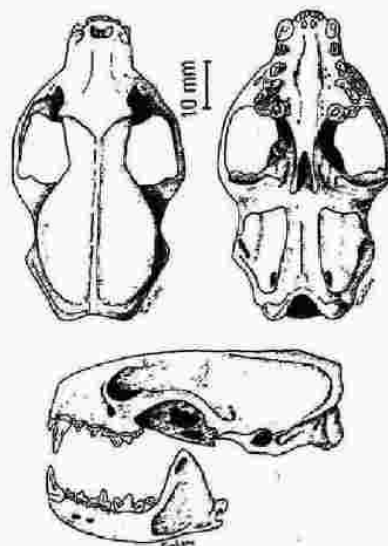


Mustela vison, Mink. Phil A. Dotson

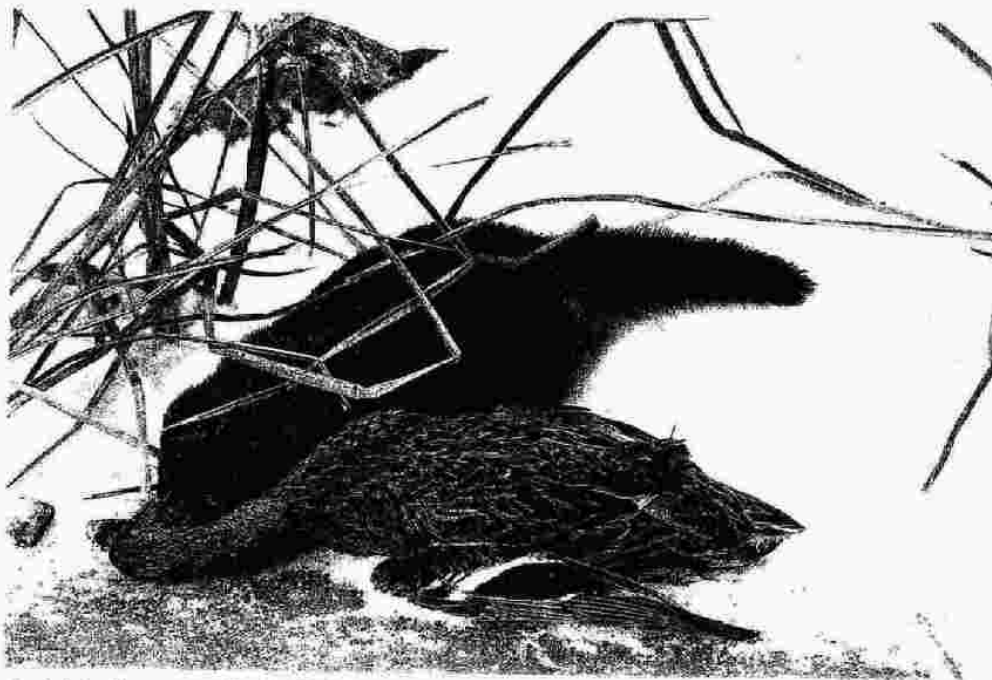
IDENTIFICATION AND DESCRIPTION The mink is medium-sized, slender, and considerably heavier-bodied than the long-tailed weasel. The head is small and flattened with a long neck. Its tail is long, well furred, brown basally, and blacker toward the tip. Mink have short legs and short, rounded ears. The pelage is uniformly dark, chestnut-brown above and paler brown below, except for white patches on chin, chest, and occasional white spots on the belly and anal region. Females are about one-fourth smaller than males.

MEASUREMENTS AND DENTAL FORMULA Lower limits represent females.

Total Length: 425–700 mm (17.0–28.0 in)
 Tail Length: 130–230 mm (5.1–9.1 in)
 Hind Foot: 50–80 mm (2.0–3.2 in)
 Ear: 19–27 mm (0.75–1.1 in)
 Skull Length: 57–69 mm (2.2–2.7 in)
 Weight: 560–1620 g (19.8–57.1 oz)
 Dental Formula: $1 \frac{3}{3}, C \frac{1}{1}, P \frac{3}{3}, M \frac{1}{2}$
 Formula: = 34



Skull of *Mustela vison*



A mink feeding on a mallard. Phil A. Dotson.

ARKANSAS DISTRIBUTION AND ABUNDANCE

The mink occurs statewide and is common.

LIFE HISTORY The mink is a semiaquatic species which is seldom found far from permanent bodies of water. It occurs along rivers, bayous, sloughs, reservoirs, and lakes where it procures much of its food. Brushy stream borders and streams partly blocked by windfalls and other debris are preferred habitat. Mink den under the tree roots along stream banks, in hollow trees, beneath logs or stumps, or in old muskrat or nutria burrows. The nest chamber is lined with grass, leaves, fur, and feathers.

Male mink range over a wide area in search of food. Their linear range along stream banks ranges from 1.8 to 5 km (1.1–3.1 mi). Females and juvenile males have a much more restricted range (Gerrell 1970; Marshall 1936). Mink are chiefly nocturnal but daytime activity is not uncommon. The occurrence of characteristic

scat, frequently containing crayfish remains, on rocks or logs and easily identified footprints in mud along streambanks are signs of the mink's presence.

The carnivorous diet of the mink includes both aquatic and terrestrial animals. Favorite foods of the mink are frogs and crayfish, which make up a large part of its diet (Korschgen 1957b). The mink is an accomplished swimmer and fully capable of catching fish in water, but fish usually are not an important component of its diet. Where muskrats are abundant they sometimes make up the bulk of the diet (Hamilton 1940; Sealander 1943). However, the mink is an opportunist and will eat whatever is most available. Rabbits, rats, mice, and other mammals are eaten more often in winter in northern areas; but in the South, frogs, fish, crayfish, insects, clams, and other items are important constituents of the diet throughout the year. Larger male mink may consume larger prey, in-

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The breeding season extends from January through March. Delayed implantation of the fertilized eggs in the wall of the uterus occurs as in other mustelids, and the gestation period varies from 40 to 75 days with a mean of 51 days (Enders 1952). After implantation, development of the embryo to term takes 29–31 days. The number of young in the single annual litter ranges from one to eleven, with three to four in the usual litter. The kits are weaned 5–6 weeks after birth and begin foraging for themselves when about 8 weeks old. They reach adult size in 5 months. The young accompany the mother until autumn when dispersal occurs.

Like all mustelids, mink possess a pair of anal scent glands that emit a liquid with a very strong, musky odor. The scent may be discharged when the animal is overly excited or aggravated. In addition, the scent may be emitted during conflict with conspecifics. The scent is especially strong during breeding season (Linscomb et al. 1982).



LEGEND

- ACTUAL SPECIMENS
- ★ REPORTED SPECIMENS

Distribution of the mink (*Mustela vison*)

IMPORTANCE AND/OR MANAGEMENT Mink fur has long had a mystique associated with it. Because of this, the demand for mink pelts has always been high. The influence of mink ranching has also influenced the demand for its fur. Even though mink ranches produce millions of pelts annually, there is still a high demand for wild fur. In Arkansas between 1942 and 1984, mink ranked fourth in pelts harvested and second in total value; however, in recent years this has decreased somewhat, presumably due to commercial ranching operations. Regionally, mink are primarily harvested from the Mississippi Delta and the West Gulf Coastal Plain (Peck et al. 1985).

Two subspecies occur in Arkansas, according to Hall (1981). The race *M. v. mink* occurs in western and northeastern Arkansas, and the race *M. v. vulgivaga* is found in the central and southern portions of the state. However, geographic variation in this species has been studied very little in southern states, and the wide size and color variations due to age, sex, and season need additional study.

SELECTED REFERENCES

Eagle and Whitman (1987); Enders (1952); Gerell (1970); Hall (1981); Hamilton (1940); Korschgen (1957b); Linscomb et al. (1982); Marshall (1936); Peck et al. (1985); Sealander (1943).

BADGER

Taxidea taxus

NAME *Taxidea* is from Latin and Greek origins, *taxus*, meaning "badger," and *eidos*, meaning "like." The specific name, *taxus*, is the Latin for "badger."

IDENTIFICATION AND DESCRIPTION The badger is a large, squat, heavy-bodied mustelid. The head is broad and slightly flattened with a short, thick, muscular neck. The eyes are small; ears are small and rounded; the tail is short, bushy, and yellowish brown; the legs are short; and the forefeet are large and powerful with ex-

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pels it with considerable force against a wall or other object. This procedure may be repeated several times until the egg breaks.

The subspecies found in Arkansas is *S. p. interrupta*.

SELECTED REFERENCES

Crabb (1944, 1948); Manaro (1961); Mead (1968a, 1968b); Van Gelder (1953, 1959).

STRIPED SKUNK

Mephitis mephitis

NAME *Mephitis* is a Latin word meaning "bad odor," referring to the extremely strong scent of this species.

IDENTIFICATION AND DESCRIPTION The striped skunk is medium-sized, heavy-bodied, and about the size of a house cat. The head is slender with a pointed muzzle; the ears are short and rounded; the eyes are small; the legs are short; the feet are semi-plantigrade and the front feet are armed with long claws. The fur is dense and coarse. The pelage is black or brownish black with a narrow stripe on the middle of the forehead and white on the nape, which usually divides into two white stripes continuing for part or all of the body length. The pattern of white is highly variable and can be used to identify individual animals. Some specimens are almost entirely black, others are mainly white on the back. Females are as much as 15% smaller than males.

MEASUREMENTS AND DENTAL FORMULA

Total Length: 540–760 mm (21.3–29.9 in)
Tail Length: 200–280 mm (7.9–11.0 in)
Hind Foot: 57–82 mm (2.2–3.2 in)
Ear: 17–30 mm (0.67–1.2 in)
Skull Length: 57–79 mm (2.2–3.1 in)
Weight: 0.5–5.4 kg (1.1–12.0 lb)
Dental: $1\frac{3}{3}$, C $1\frac{1}{1}$, P $3\frac{3}{3}$, M $1\frac{1}{2}$
Formula: = 34

ORDER CARNIVORA



Mephitis mephitis, Striped Skunk. Phil A. Dotson

ARKANSAS DISTRIBUTION AND ABUNDANCE

The striped skunk occurs statewide and is abundant.

LIFE HISTORY The striped skunk lives in open meadows, brushlands, areas with rock outcrops, forest edges, and in farmlands with a mixture of pastures, cultivated fields, fence-rows, and open woodlots. It is seldom found at any great distance from water. Normally nocturnal, the striped skunk may occasionally be observed in daytime. Foraging for food ordinarily begins near sundown.

Rock cavities and crevices are favorite den

sites when the weather is cool. They sometimes dig for appropriate food, such as fox burrs, old outbuildings, or fox burrs.

Striped skunks are a wide variety of colors, but the general color is black. The fur consists of long, coarse hairs. The diet consists of berries, small mammals, and insects. They are very fat in the fall and may den in the winter. They are sometimes called "stripes" or "shaptons."

Breeding season is from early spring to early summer, as long as the weather is warm. Litter is usually born in April or about 30 days after mating. The litter is usually 6 to 12 young. The young are born blind and helpless. They are called "skunkies" or "skunk pups."

The skunk is a fair shot. It is a good swimmer. It is a good climber. It is a good digger. It is a good runner. It is a good jumper. It is a good leaper. It is a good flyer. It is a good swimmer. It is a good climber. It is a good digger. It is a good runner. It is a good jumper. It is a good leaper. It is a good flyer.

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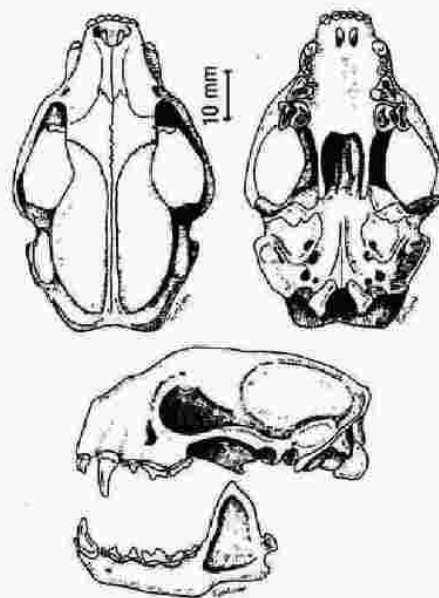
sites when this type of habitat is present. Skunks sometimes dig their own burrows but ordinarily appropriate abandoned woodchuck, armadillo, or fox burrows. Often dens are located beneath old outbuildings or abandoned houses.

Striped skunks are omnivorous and eat a wide variety of animal and vegetable matter. In general, their feeding habits are beneficial to farmers. More than one-half of the summer diet consists of insects (Kelker 1937) plus fruits and berries, but in winter, rats, mice, and other small mammals become important dietary constituents. Carrion from road kills or hunting cripples is frequently eaten. Skunks become very fat in late fall. They do not hibernate but may den up and sleep for several days during severe winter weather. Several individuals sometimes occupy the same den (Allen and Shapton 1942).

Breeding apparently occurs in late February and early March (Verts 1967). The gestation period usually varies from 62 to 66 days but may be as long as 75 days. The litter size ranges from two to ten, and the usual number of kits in a litter is six or seven. Young are born in late April or in May, and the average weight is about 35 g (1.2 oz); their subsequent growth is rapid. The young are able to eat solid food at about 6 weeks old when they begin to accompany their mother on hunting trips. Weaning apparently occurs when they are 8–10 weeks old. Most young skunks have broken the family ties by about mid-August.

The senses of sight and hearing are poor to fair. Striped skunks are not particularly social, although they will den communally. They occasionally utter low growls, grunts, snarls, churring, short squeals, shrill screeches, or hissing noises (Godin 1982).

They are relatively docile animals, but when provoked, they give warnings of displeasure and assume a defensive posture before discharging their scent. Warnings include arching the back, stamping the front feet, and shuffling backward. In addition, they may click their teeth, growl, or hiss. Immediately before scenting, a skunk raises its tail and bends into a U-shaped position, with both the head and tail



Skull of *Mephitis mephitis*

facing the enemy. It discharges its scent rapidly and can aim behind, to either side, or in front of itself. It can do this by changing the position of the two nipples just inside the anus. The jet of musk may be atomized as a fine mist or as a short stream of rain-sized droplets. It can spray accurately for a distance of about 3 m (10 ft) and can reach a distance of about 5 m (16.5 ft). The spray covers an arc of 30–45° (Verts 1967; Godin 1982).

Skunks generally avoid spraying themselves and will refrain from spraying if their tails are held tightly over the anus. A striped skunk can be handled if it is grasped around the neck with one hand and by the tail with the other. Contrary to popular belief, a skunk can spray while suspended by its tail. Furthermore, they do not scatter the scent with the tail.

Skunks have few natural predators, with the possible exception of the great horned owl. Most potential predators soon learn not to molest them after one encounter with their potent defense mechanism.



LEGEND

- ACTUAL SPECIMENS
- * REPORTED SPECIMENS

Distribution of the striped skunk (*Mephitis mephitis*)

IMPORTANCE AND/OR MANAGEMENT Skunks may occasionally raid poultry houses; however, they usually take one bird at a time. Wanton killing of poultry is usually done by some other species. Most complaints about skunks are a result of their denning under houses and other buildings. These animals can be trapped and transported to other areas (if one is careful, skunks will seldom spray when in a trap); a liberal dose of moth crystals placed under the building will often cause the skunks to leave, or the entrances may be closed after it has been ascertained that the animals have left. One-way doors can be placed over the entrance so that the skunk can leave but may not return, or one can tell by the tracks if the skunk has left by sprinkling flour around the entrance. The only problem with the latter technique is that an entire family of unknown numbers may be present.

Skunks are the major vector of wildlife rabies in the United States, averaging between 40–50% of all reported cases. In Arkansas, as would be expected, skunks also account for most of the reported rabies cases, averaging around 65% of

the total reported cases since 1950 (80% or more in each of the years since 1980). Between 1977 and 1979, Arkansas experienced a severe epidemic of skunk rabies. In 1979, at the peak of the epidemic, 301 laboratory-confirmed cases were reported; this ranked Arkansas first in the nation in reported cases per square mile. Previous to 1980, skunk rabies seemed to be confined to the Interior Highlands, but since then, cases have been reported from the Gulf Coastal Plain. A survey of human contacts with known rabid skunks in Arkansas revealed that, "the rabid skunk coming in contact with humans generally will be solitary, aggressive or unafraid, and found around buildings in the country during daylight hours (usually in the morning)" (Ferguson and Heidt 1980; Heidt 1982; Heidt et al. 1982).

Skunks tame easily and make interesting pets. Since the rabies virus may be latent for over a year and may become active when the animal experiences some type of stress, however, it is strongly advised that persons neither purchase pet skunks nor remove them from the wild. In addition, due to the incidence of rabies in Arkansas, the Arkansas Game and Fish Commission has banned the possession of skunks.

Until the late 1970s, striped skunks represented one of the major furbearers in Arkansas. Since that time, however, skunk harvests have drastically declined. This may be due, in part, to low prices and the justified fear of rabies (Peck et al. 1985).

Apparently two subspecies occur in Arkansas (Hall 1981). The race *M. m. mesomelas* occurs over most of the state, and the somewhat larger race, *M. m. nigra*, possibly occurs in the northeastern corner of the state. There has been insufficient study to determine where the zone of intergradation between the races occurs or whether both races are actually present.

SELECTED REFERENCES

- Allen and Shapton (1942); Ferguson and Heidt (1980); Godin (1982); Hall (1981); Heidt et al. (1982); Heidt (1982); Kelker (1937); Verts (1967).

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BOBCAT

Felis rufus

NAME *Felis* is the Latin word meaning "cat." The specific name, *rufus*, is the Latin word for "reddish," referring to the body color.

IDENTIFICATION AND DESCRIPTION The bobcat is medium-sized and about twice the size of a domestic cat. The tail is very short (usually shorter than the hind foot) with a black tip above and white below. Its ears are prominent with short black tufts (sometimes absent); the eyes are large with elliptical pupils; hair on the sides of the face is long, forming a ruff ("sideburns"). The pelage is reddish brown, olive-brown, or smoky gray (spotted or streaked with black) above and whitish, spotted with black below.

MEASUREMENTS AND DENTAL FORMULA

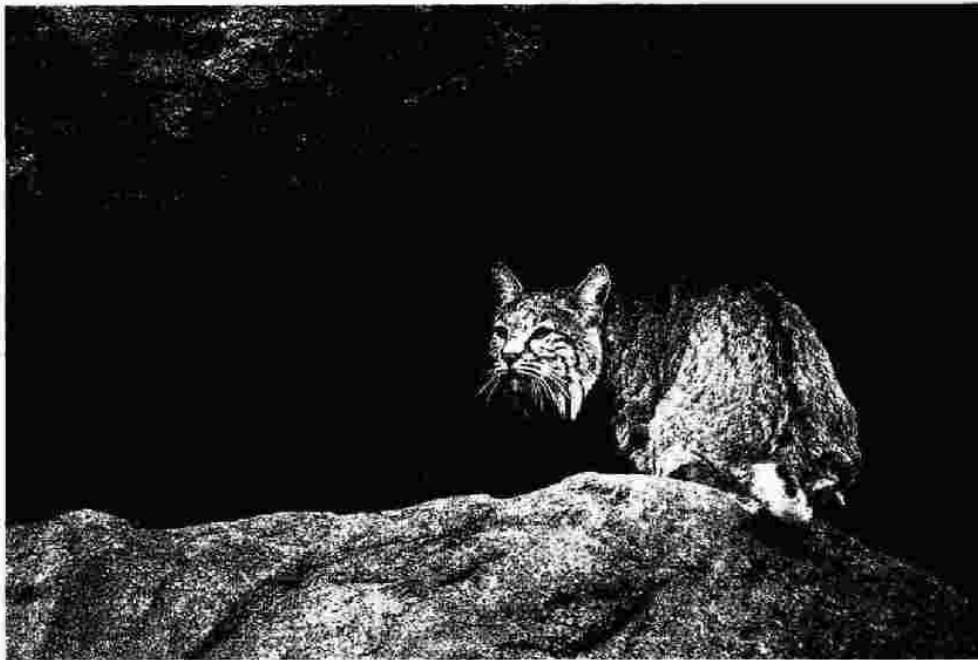
Total Length: 787–1015 mm (31–40 in)

Tail Length: 122–180 mm (4.8–7.1 in)
Hind Foot: 155–197 mm (6.1–7.8 in)
Ear: 61–76 mm (2.4–3.0 in)
Skull Length: 101–139 mm (4.0–5.5 in)
Weight: 4.5–20 kg (9.9–44.1 lb)
Dental: I 3/3, C 1/1, P 2/2, M 1/1
Formula: = 28

ARKANSAS DISTRIBUTION AND ABUNDANCE

Bobcats occur statewide and have good stable populations (Rucker et al. 1985).

LIFE HISTORY Bobcats occur in a wide variety of habitats but prefer rocky outcrops and canyons where such terrain is available. They are also found in heavily wooded uplands and bottomland forests, brushy areas, swamps, and semi-open farmlands. In the Ouachita Mountains, they seem to prefer 0–20 year regeneration areas and hardwood forests (Rucker et al. 1985). This species is primarily solitary and be-



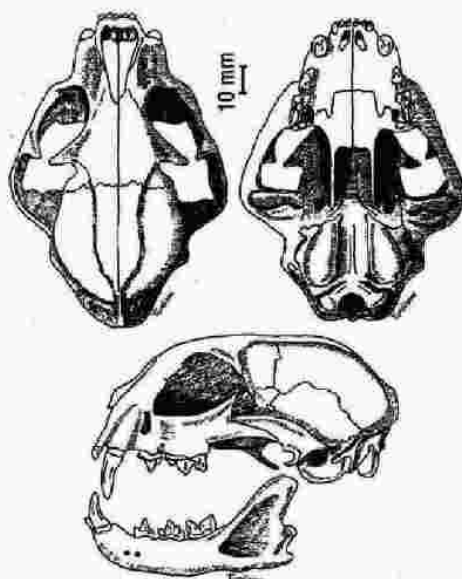
Felis rufus, Bobcat. C. C. Lockwood



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Skull of *Felis rufus*

cause of its covert habits is seldom sighted even where it is abundant. The bobcat is mainly nocturnal and is seldom active in daytime. Occasionally one may be fortunate to obtain a glimpse of a bobcat sunning on a log or on a ledge.

The bobcat is almost exclusively carnivorous. Statewide during all seasons and for both sexes, the most important food is rabbit (Fritts and Sealander 1978a; Tumilson 1983). Squirrels are an important supplementary food in the Interior Highlands, and rats and mice are important food items on the Gulf Coastal Plain. Rodents included in the diet, besides fox and gray squirrels, are chipmunks, flying squirrels, woodrats, cotton rats, white-footed mice, harvest mice, and pine voles. Deer, mostly carion, are eaten mainly during autumn and winter following deer hunting season. Although capable of killing deer, the bobcat is not a significant cause of deer mortality in Arkansas. Rabbits and rodents apparently serve as buffers against such predation. Other minor items in the bobcat's diet include opossum, raccoon, skunk, birds, and snakes.

In Arkansas, peak breeding activity occurs from early December to late February and then tapers off in March and April. Some breeding may occur as early as November or as late as August (Fritts and Sealander 1978b; Tumilson 1983). These findings are similar to those of Crowe (1975). Late summer litters could represent second litters of early breeding females or litters of females that failed to conceive during the early breeding season. Males are apparently in breeding condition all year. Most litters are produced from March through early May; parturition may occur from early February to as late as October. Litters are born after a gestation period of about 62 days. They consist of one to six (usually two or three) blind, well-furred kittens weighing about 140–340 g (4.9–12 oz) each. The nest of dead leaves, moss, and dried grass in which they are born is usually in an inaccessible recess under a large rock ledge, in a hollow tree or log, or in a cavity beneath roots of a tree. Kittens are weaned when 60–70 days old and are able to fend for themselves when about 6 months old. Family ties are



LEGEND

- ACTUAL SPECIMENS
- ★ REPORTED SPECIMENS

Distribution of the bobcat (*Felis rufus*)

not completely broken until the female mates and becomes pregnant again. In Arkansas, young females come into heat during their first year, but a high percentage does not conceive during this first estrus (Fritts and Sealander 1978a). Most young females apparently mate successfully when between 1 and 2 years old; most males become potential breeders by their second winter.

Density estimates vary considerably depending on various habitat types and relative prey density (McCord and Cardoza 1982). Rucker et al. (1989) conducted a two year study of bobcat ecology in the Ouachita Mountains and found the minimum density to average one bobcat/9.6 sq km (one bobcat/6 sq mi). While these estimates were lower than some in the southeastern United States, they were similar to those reported in the Ozark Mountains of southwestern Missouri—one bobcat/10–15 sq km (Hamilton 1982) and the Ouachita Mountains in Oklahoma—one bobcat/11 sq km (Rolley 1985).

Rucker et al. (1989) reported home ranges of 64.2 sq km (39.9 sq mi) for an adult male and an average of 24.5 sq km (15.2 sq mi). Home ranges varied in size in different seasons, but the animals remained in their general area throughout the study. These home range sizes fall within those reported in other studies (McCord and Cardoza 1982).

IMPORTANCE AND/OR MANAGEMENT Bobcats sometimes kill domestic poultry but generally render a service to farmers by reducing rabbit and rodent populations. The meat of the bobcat is quite edible, and this cat has provided a tasty meal to many hunters.

Historically, the bobcat in Arkansas was considered a predator with no closed season. In 1968, bobcats, together with coyotes and red wolves, were classed as furbearers even though there was not a closed season on these mammals. This was modified in 1973, when bobcats could be taken during specified hunting seasons. Beginning in 1978, bobcats could only be taken during the regular furbearer season.

The total value and number of bobcat pelts sold varied considerably between 1942 and 1984. However, 89% of the pelts were harvested after 1970, reflecting the increased value of bobcat in markets influenced by the international trade in felids. Regionally, bobcat harvests have been slightly higher in the Ozark Mountains and the Mississippi Delta (31% and 28%, respectively) and evenly balanced in the Ouachita Mountains and the West Gulf Coastal Plain (21% and 20%, respectively) (Peck et al. 1985).

Two subspecies of the bobcat occur in Arkansas. The race *F. r. floridanus* occurs over most of the Gulf Coastal Plain (Peterson and Downing 1952), and the race *F. r. rufus* occurs in the Interior Highlands (Hall 1981). Presumably the races intergrade through the foothills of the Ozarks and the Ouachita Mountains.

SELECTED REFERENCES

- Crowe (1975); Fritts and Sealander (1978a, 1978b); Hall (1981); Hamilton (1982); McCord and Cardoza (1982); Peck et al. (1985); Peterson and Downing (1952); Rolley (1985); Rollings (1945); Rucker et al. (1985, 1989); Tumblison (1983).

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