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life tracks II
Supplement to *Wisconsin Natural Resources*

Wisconsin's endangered reptiles, fish and molluscs

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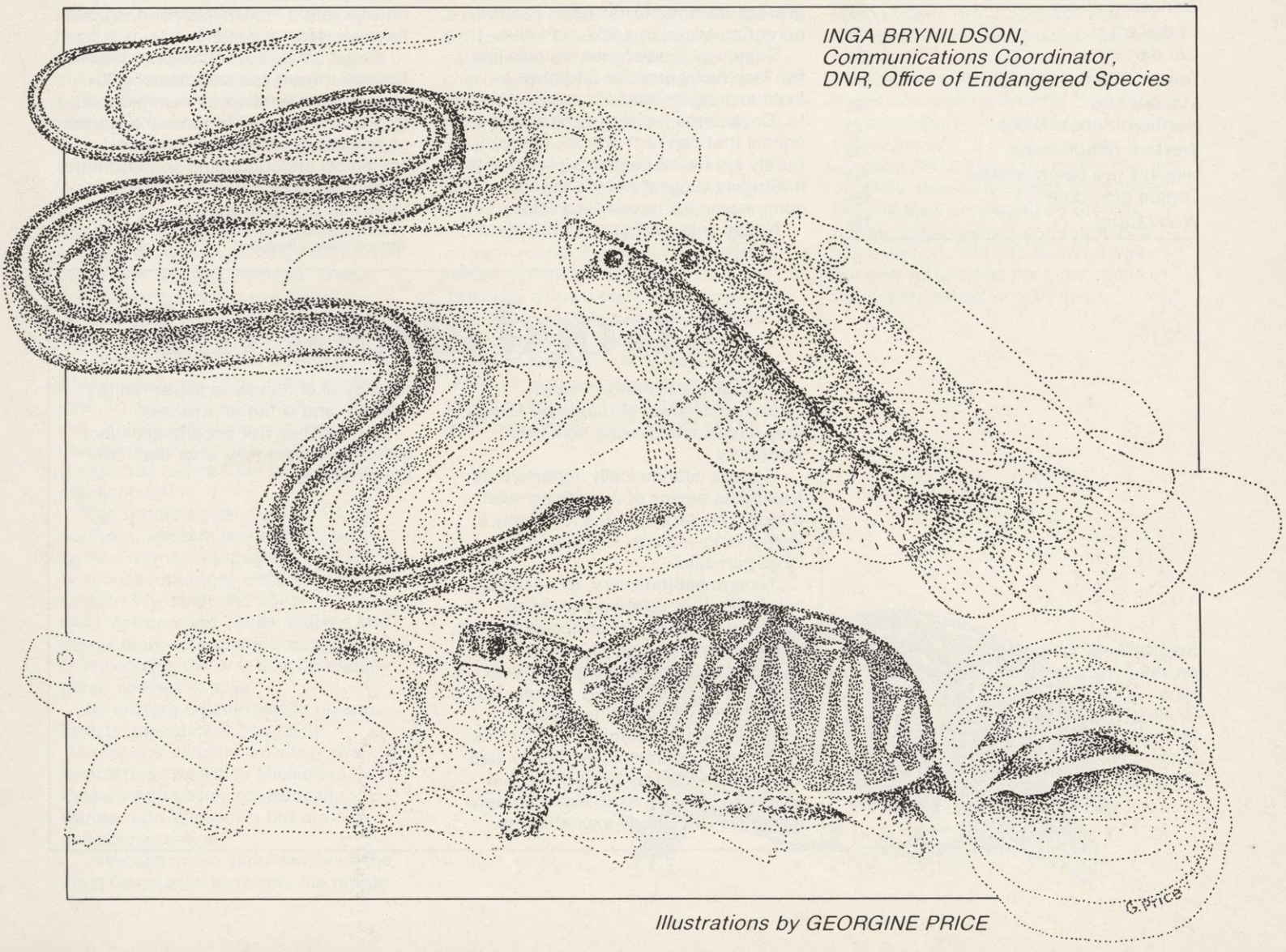


Illustrations by GEORGINE PRICE

life tracks II

"If you talk to animals they will talk with you and you will know each other. If you do not talk to them you will not know them, and what you do not know you will fear. What one fears one destroys."

From My Heart Soars by Dan George, Indian Chief, Nez Percé Tribe

Contents

The first Life Tracks* dealt with Wisconsin's endangered birds and mammals; the feathered and the furry! The mischievous little pine marten evokes concern and so does preserving our regal national symbol, the bald eagle.

But what about reptiles, amphibians, fishes and molluscs? These animals suffer from the "out of sight-out of mind" dilemma. There are millions of zealous birdwatchers across the nation, but how many "clam watchers?" How about a salamander as National Wildlife Federation poster animal of the year? For some reason, the bluntnose darter, a tiny fish that threads its gentle way through watery grasses doesn't stir the heart like the peregrine falcon in a 200 mph dive.

Some say it's because animals like fish lack facial muscles and have a fixed expression humans can't relate to. Or perhaps, we feel more akin to an animal that can turn or cock its head. Surely eyes have something to do with it. Studies suggest people have more compassion for terrestrial wildlife.

Not so with marineland attractions like dolphins and killer whales. These aquatic mammals win our hearts with responsiveness to human command. Maybe the easier an animal is to manipulate, the more intelligence we attribute to it.

Snakes particularly suffer from an image problem. In Judeo-Christian theology, if not for the snake in the Garden of Eden, we'd all still live in paradise. In Native-American religions too, snakes symbolize bad luck.

Environmental and outdoor educators attempt to heal the split by encouraging students to handle non-poisonous species. They realize that snakes are not cold and slimy, that although hardly more than a tube of muscle with a hole in each end, snakes have survived and evolved.

Prejudice against snakes, or indifference toward fish and clams, influence political and social commitments to preserve them. The natural histories given here are meant to enhance ecological understanding so that future decisions about the fate of these creatures can be made wisely.

*Life Tracks I August-September 1979, Wisconsin Natural Resources

Special help with Life Tracks II was provided by James B. Hale, Ruth L. Hine, Don M. Fago, Clifford L. Brynildson, George J. Knudsen, Charles M. Pils and Richard C. Vogt. Thanks to these people for their valuable contributions.

A word about fish

Though little is known about Wisconsin's seven endangered fishes, they have some striking common attributes.

None is economically important by traditional means of measuring such things. The largest of the lot is only 6 inches long—barely a mouthful to large game fish.

Though habitats vary, all need clean water. Murk or siltation caused by inadequate floodplain protection is the greatest threat.

Since we are terrestrial creatures we find it difficult to study aquatic life. It is even more difficult to study a species when the human impact of its life or death is unfelt. Our society justifies its expenditures by benefits that accrue to our own kind. Unfortunately the single DNR study exploring the ecology of endangered fishes ran dry of funds and is out of business.

These fishes risk becoming extinct before we even know what their lives are all about.

Bluntnose darter

(Etheostoma chlorosomum)

The smallest of the endangered fishes, the bluntnose darter grows no more than two inches long. The Greek root of its scientific name means strained-mouth, greenish-yellow. In reality, it is a pale, sandy-colored fish with dark "x" and "w"-shaped blotches on its sides. A dark band bridles its bluntly rounded snout, eye to eye. The two dorsal, or back, fins are spread far apart which helps distinguish it from the more common, look-alike relative, the johnny darter.

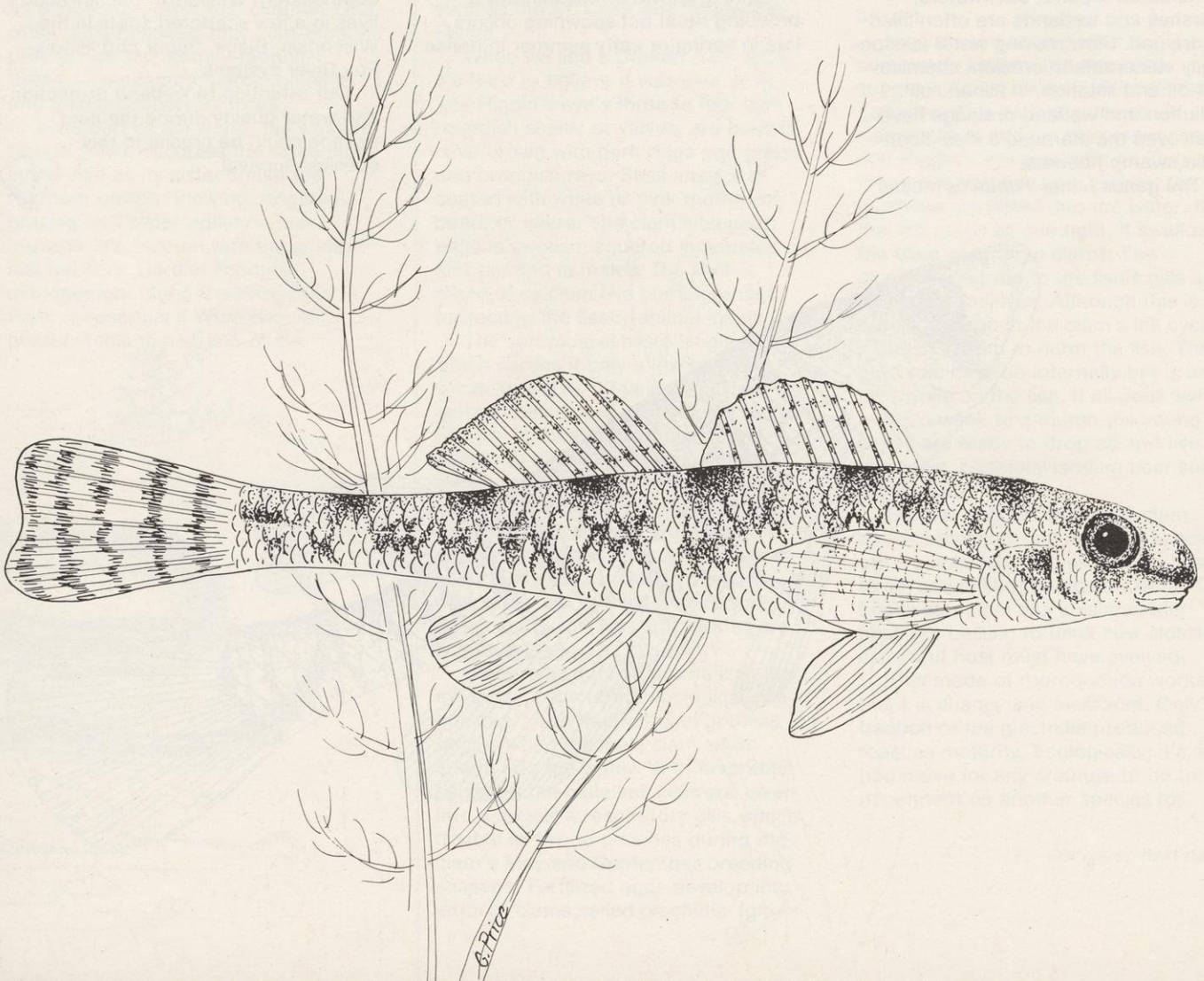
The tiny bluntnose is tube-shaped for quick swimming and escape from predators. A slightly flattened belly reveals it as a bottom-feeder which eats organic debris and algae. Partly due to its size, the bluntnose darter prefers slow, sluggish lowland streams and muddy backwaters where it spawns early in May.

Probably the rarest fish in Wisconsin, the bluntnose was discovered in 1976 in the Mississippi River at the far southwest corner of the state. Before that it had been found only in Minnesota and Iowa waters of the Mississippi in the 1940's.

The distinction of being the smallest and rarest also means that no one knows much about it. It *is* known however, that the bluntnose darter is becoming more and more scarce throughout its range which extends south from Minnesota and Wisconsin to parts of Alabama and Texas.

The shallow backwater habitat it lives in is susceptible to filling with silt from floodplain cultivation and development. Intensive land and waterway use along the Mississippi River endanger its sole home in Wisconsin.

The bluntnose darter is an obscure fish no bigger than your index finger. Will its extinction really matter much in the whole scheme of things? That question enters a gap in our knowledge. We don't know.



Starhead topminnow *(Fundulus notti-Agassiz)*

Two-and-a-half inches fullgrown, the starhead topminnow has an olive back fading to yellow toward its belly. Lines of red, blue and green flecks run cheek to tail. Cross-wise dark green bars complete a gridwork on the sides of male fish. Tightly rayed fins are placed far back, and in males are red-spotted. Both sexes have steel blue tear-drop streaks below the eyes. A large metallic gold spot crowns its head to give the starhead its name. A smaller spot stars its back in front of the dorsal fin.

The starhead lives in clear, still backwaters thick with submerged plants such as cut-off ponds, swamps, marshes, and shallows of streams and lakes. Some are stagnant waters which flow only during flooding.

As cities expand, backwaters, marshes and wetlands are often filled or drained. Slow moving water is especially vulnerable to erosion, chemical run-off and siltation. In Illinois, oil pollution and wetland drainage have destroyed the starhead's ideal flood-plain swamp habitats.

The genus name *Fundulus* means "bottom," contradicting the starhead's true ecological niche. It is actually well adapted to the life of a surface skimmer. A top set mouth makes feeding easy. It eats algae, snails, crustaceans, aquatic insects and terrestrial insects that fall into the water.

In much the same way that trout or salmon jump waterfalls, topminnows rise out of the water to escape danger. According to a DNR fish researcher, topminnows hop across the water surface. Starheads have been known to actually jump onto the bank for several minutes when pursued by predators such as bass. This odd behavior brings to mind evolutionary theories which suggest that it was the lowly fish which first emerged from the aquasphere onto land.

Little is known of this minnow's breeding ritual but spawning occurs late in spring or early summer in dense beds of submerged vegetation.

The starhead has a mild disposition and with its rainbow body is a favorite of freshwater aquarium hobbyists. But don't forget to cover the aquarium, or you'll have topminnows on the floor.

It is illegal to take wild starhead topminnows from Wisconsin waters. In addition, a special permit is needed to keep endangered species in captivity.

Aquarium starheads are either bred by hobbyists or collected from other states where they are numerous. Techniques for raising topminnows in captivity may someday help restore wild populations if the need arises.

The original range was from Iowa across to southern Michigan and central Ohio, then south to Texas. Wisconsin is the northern boundary. In southeastern Wisconsin the starhead lives in a few scattered spots in the Wisconsin, Black, Sugar and Illinois-Fox River systems.

Our attention to wetland protection and water quality during the next decade could be crucial to this species' survival.

Crystal darter

(*Ammocrypta asprella*)

Common and scientific names often describe lifestyle or appearance. The "crystal" darter is so named for its see-through slender body which is silvery yellow above and white below. Although seven-inch crystal darters are known, few grow beyond two inches. Large, fan-like fins and a forked tail give it a feathery look. Three or four dark saddle marks straddle its back, side to side, and are met by irregular dark patches along its midlines. A finely scaled fish, it has as many as 100 rows of scales running from head to tail. Its cheeks and belly are naked or scaleless.

"Crystal" also refers to its need for clear, "crystalline," deep, fast-flowing rivers. The genus name, *Ammocrypta,* means "sand concealed," for its habit of lying buried in bottom sand or gravel.

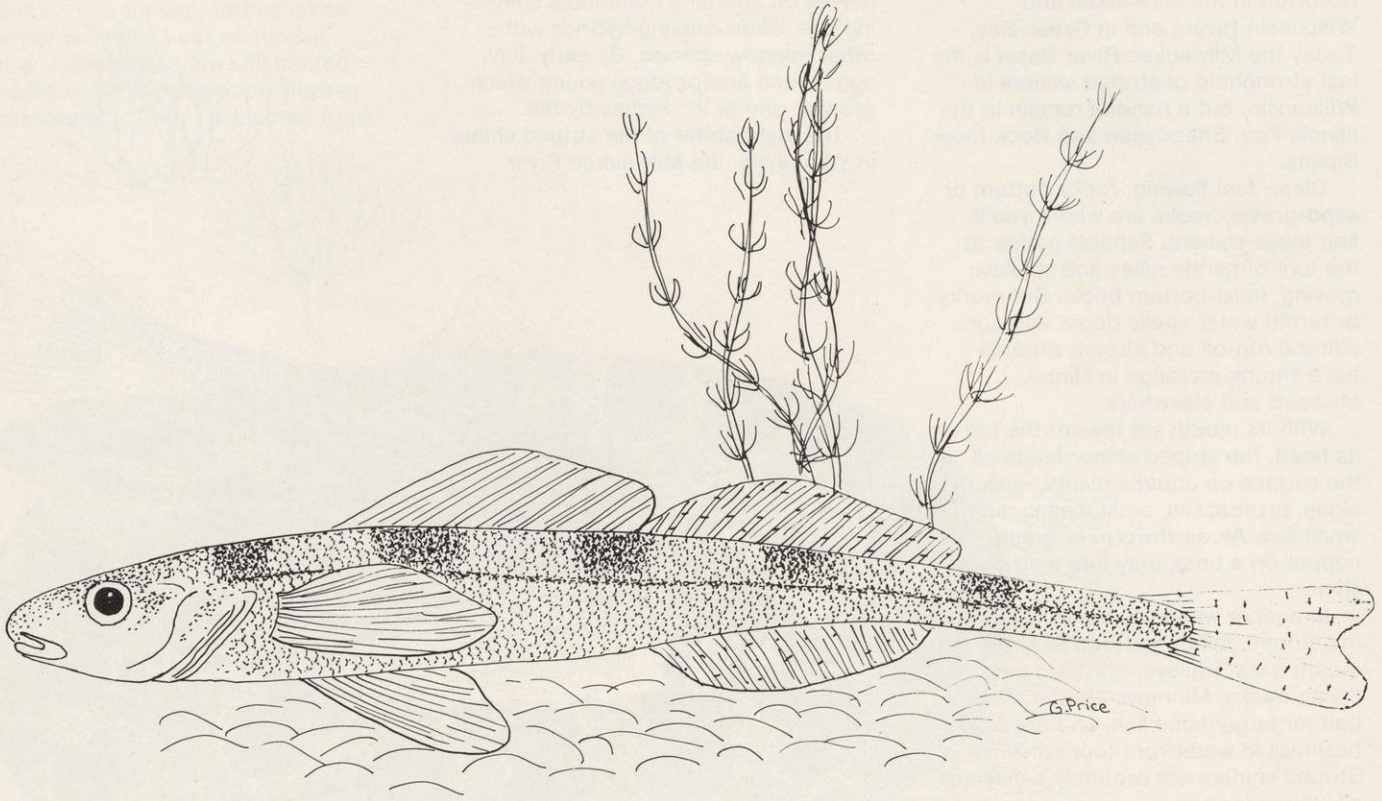
Nothing is known of how this fish feeds or breeds. However, it is nocturnal and judging by its low-set mouth is probably a bottom feeder.

Wisconsin's first crystal darter was found in 1935 in the Mississippi River near Cassville in Grant County. Since then it has occupied major Mississippi River tributaries—the Wisconsin, Trempealeau, Red Cedar, Chippewa and St. Croix Rivers and recently, only in a few spots in the latter two.

Wisconsin is the northernmost range of the crystal darter. Never common, it originally inhabited the Mississippi River Valley south to the Gulf of Mexico. Today, it is gone from much of this range including Illinois and Ohio.

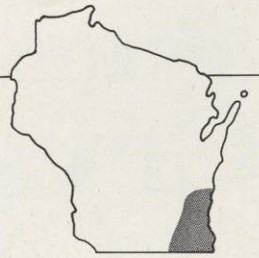
In *The Fishes of Ohio,* Milton B. Trautman writes, ". . . before 1800 the crystal darter was rather well distributed . . . before the greatly increased siltload and subsequent silting smothered the sandy riffles, extensive sandbars and sandbottomed pools." Trautman also notes, "Conversely, species demanding turbid, quiet waters and/or silted bottoms were benefited and some of these, such as the carp, are now among the most numerous species found in these waters."

Carp are the starlings or grackles of the fish set. Every fisherman knows that when carp are present, something is amiss in the watershed. The ever increasing ditching, dredging, draining and tilling brought the silt and the carp. With such competition the name "crystal" must also symbolize the fragile place this darter holds on Earth.



Striped shiner

(*Notropis chrysocephalus-Rafinesque*)



The stripes which give this minnow its name form numerous dark V's running head to tail down its back. Its compressed body casts a greenish or slate blue iridescence mottled with dark pigment. Among minnows the striped shiner is distinguished by very few midline scales in front of the dorsal or back fin, having only 13 to 21 compared to more than 24 rows of scales in similar minnows. It is also set apart by its dusky or bruised-looking chin and its over-sized head and eyes. The striped shiner is large as minnows go, reaching seven inches in length with a record 9.3 inch whopper collected in 1939.

Formerly called the Mississippi shiner, it ranges widely north to south in east-central United States. In Wisconsin, before 1950 it was found in the Rock, Illinois-Fox and Milwaukee River Basins. Then until 1970, it occurred in the Milwaukee and Wisconsin Rivers and in Green Bay. Today the Milwaukee River Basin is the last stronghold of striped shiners in Wisconsin, but a handful remain in the Illinois-Fox, Sheboygan and Rock River Basins.

Clear, fast flowing, rocky bottom or sand-gravel creeks are where you'll find these shiners. Schools gather at the foot of gentle riffles and shallow, moving, hard-bottom pools. But murky or turbid water spells doom and agricultural run-off and stream siltation have shrunk its range in Illinois, Missouri and elsewhere.

With its mouth set toward the top of its head, the striped shiner feeds off the surface on aquatic plants, insects, algae, protozoans, crustaceans, and small fish. An earthworm or grasshopper on a hook may lure a striped shiner.

In deeper water, minnows such as the striped shiner are food to smallmouth bass, walleye, northern pike and diving ducks. Minnows are the staple bait for large game fish, and are big business in waterfront tourist towns. Striped shiners are probably occasionally taken for bait.

Striped shiners spawn for 10 days in late May or June during daylight when water temperatures reach 15 to 18°C. During spawning, the male becomes bright blue on top of its head and back, while its sides and fins turn deep rose-pink. Knobby lumps, called nuptial tubercles, appear on the front of its head and jaws.

With these horny outgrowths, the male dislodges stones and excavates a shallow scrape nest in gravel riffles. Or if he can out compete another nest-building species, he will take over an available crater. Tubercles are also his weapons to defend his nest from competing fish. Females lack the bright courtship colors and remain downstream until male territories are settled.

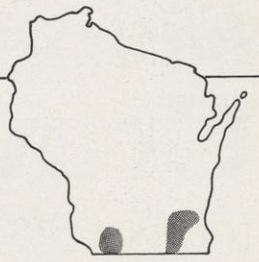
On the spawning grounds the male uses his body to force the eggs from the female. The spawning act which takes only a fraction of a second is repeated many times, each time about 50 one and a half millimeter orange eggs are released. During peak spawning, a continuous succession of fish moves on and off a communal spawning site, often causing hybrids with other minnow species. By early July, eggs hatch and produce young which grow to one or 2½ inches by fall.

The last habitat of the striped shiner in Wisconsin, the Milwaukee River Basin, is faced with the increasing stress of urban demands. Erosion from construction sites, shoreline recreation, boating, agricultural, urban and industrial runoff all cloud the water.

The question again arises: are we, the people of Wisconsin, committed to ensuring clear, gravel riffles so that the likes of a striped shiner can spawn?

Slender madtom

(Noturus exilis)



The slender madtom is rare in Wisconsin mainly because it has always been rare. Once found in the Illinois Fox River basin, it is now restricted to a few miles of stream in the Rock and Pecatonica basins.

In Minnesota and Wisconsin, slender madtom populations are remnants isolated by glacial ice. Here it is so far north of its main range in south central US that nobody believed early records.

Reported from southeastern Illinois, Michigan and across to West Virginia, it is common in upper Ozark streams of Missouri, Kansas, Arkansas and Oklahoma. Where abundant, the slender madtom is collected by freshwater aquarium hobbyists.

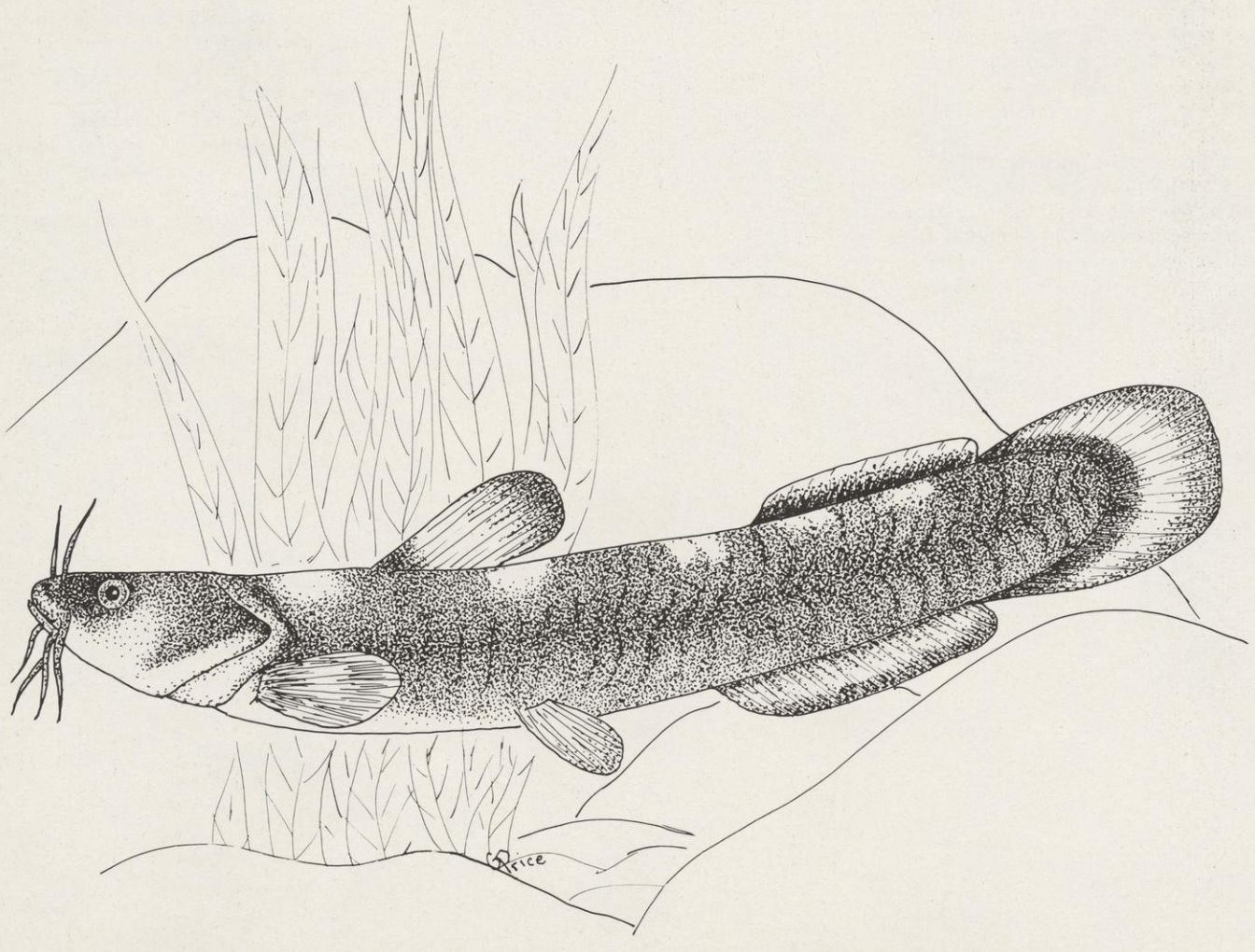
Its home is gravel riffles of clear, fast creeks or pools with enough current to free the bottom of silt.

Four to six inches long, its body is pale grayish yellow-brown, faintly mottled with irregular dark blotches. Belly and throat are creamy white. A catfish, the slender madtom's flattened body is well adapted for bottom-dwelling. Sensory barbels above and below its snout act like cat whiskers, guiding it beneath rocks where it hides by day, and along gravelly bottoms where it forages by night. It lacks the catfish's stereotyped overbite.

Its many rayed fins are bluntly rounded with black-edged dorsal, anal and tail fins. The pectoral fins, just behind the gills, have a saw-like lower margin that can give a predator or an unwary hand a hefty sting. These spines and one on the dorsal fin are reinforced by nearby poison glands for added defense. The genus name, *Noturus,* is Greek for "back tail" referring to its nearly fused back and tail fins.

The slender madtom spawns in late spring. Eggs are deposited in a shallow scrape dug beneath a flat rock. One parent, probably the male, guards eggs and newly hatched young.

The slender madtom is disappearing across northern and eastern US. Since 1970, two of its known Wisconsin localities have been lost to stream channelization. This little catfish is a unique remnant of Wisconsin before the age of ice and people.



Gravel chub

(Hybopsis x-punctata)

The gravel chub is a minnow with a mysterious past. Until 1956 it was confused with another species and went by the name "spotted shiner."

After being collected in 1908 from the Sugar River in Green County, it wasn't seen again in Wisconsin until 1970. Since then, the gravel chub has shown up in Turtle Creek, and in the Rock, Sugar and Pecatonica Rivers near the Illinois border. The Pecatonica population is sparse.

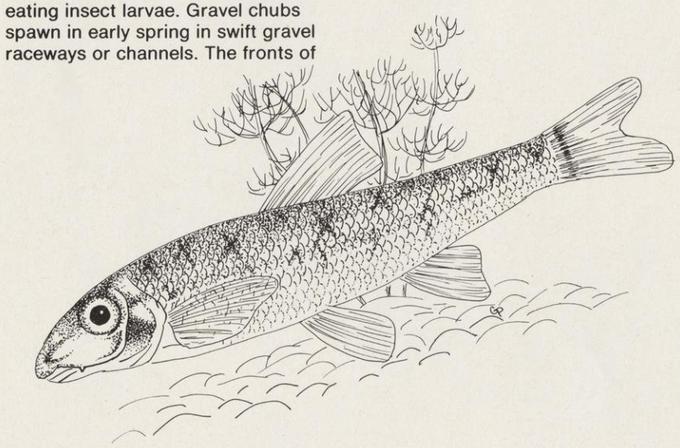
Although once occurring as far north as Ontario, the gravel chub now ranges from Minnesota east to Pennsylvania, south to Kentucky and across to Missouri.

This chub's silvery body is highlighted with a dark midline stripe down an olive back. Scales outlined in black form x and y-shapes on its sides, thus its species name *x-punctata* or "x-spotted." The genus name *Hybopsis* describes its "rounded snout" and protruding upper jaw. The record for this minnow is 3.9-inches, though few grow bigger than three inches. It has about 40 rows of large scales running end to end. The fins and forked tail are colorless.

The diet is still a mystery, but it probes bottom crevices with its barbeled (whiskered) snout, perhaps eating insect larvae. Gravel chubs spawn in early spring in swift gravel raceways or channels. The fronts of males deck out with minute knobby outgrowths, nuptial tubercles similar to those of the striped shiner. By fall, young are one to 2½ inches long.

The "gravel chub" is so named because of its affinity for slow-moving, deep, gravel-bottom streams. But if downstream waters become murky, it will move to shallow riffles upstream.

Like most other endangered fish, gravel chubs can't tolerate silty or turbid water and for this reason have disappeared from many Illinois streams. There are only two good-sized populations left in Wisconsin, both just above the Illinois line.



Gilt darter

(Percina evides)

So striking in appearance is this three inch darter, that it is named "gilt", after the color of gold gilt.

About seven saddle-bands straddle the dorsal ridge of its olive-bronze body, joining an equal number of blotches midside. Dusky teardrop marks streak each cheek.

This pattern is exaggerated in breeding males during late spring spawning as bands turn brilliant blue-green with copper-red between. Transparent fins change to orange above and dark blue below. The scaleless head and breast, and two round spots at the tail base, become deep orange-red.

It is rare throughout most of its range in east central United States, where three subspecies have recently been identified. However, it is common and widespread in high-gradient Ozark streams of Missouri, Arkansas and Oklahoma.

The ceiling of its range is northwest Wisconsin where it lives in the St. Croix and Black Rivers. A few survive in the Chippewa.

This is a darter of large, fast streams, preferring gravel riffles with attached algae or other vegetation. Little else is known about the gilt darter, other than that silt is its worst enemy.

Queen snake

(Regina septemvittata)

The queen snake has many aliases.

The queen used to be called "striped water snake," "yellow-bellied snake," "leather snake" and even "water moccasin." Of course it isn't a water moccasin, as all Wisconsin water snakes are nonpoisonous and have round not elliptical eye pupils. The green is the only water snake with the double-banded belly.

It can also be called "the snake with seven stripes" after its species name "septemvittata." Three black stripes line its musty brown back, met on its sides by a matching set of canary yellow bands. Its 2 foot body fades to a pale yellow belly twice streaked with black.

The queen snake is *pushing* its living limits here; in southeastern Wisconsin, it is at the northwest corner of its range. Its kingdom extends from lower New York south to the Gulf of Mexico—rare on the edges, but common in Illinois and Ohio.

In Wisconsin the queen has disappeared from former haunts, and is now found in only one watershed in Walworth County. This is a bad move ecologically. With all its eggs in one basket, so to speak, it could easily be wiped out due to water pollution, wetland drainage and poor flood plain soil conservation practices.

Queens, as could be expected, are fussy about their choice of living quarters, needing clear, fast flowing, spring-fed streams with rocky bottoms. These must be year round streams in hardwood forests with water at or above 18°C.

Unlike other water snakes, you'll hardly ever see queens basking on rocks or branches in the sun. Instead queens float on the water or stow away underwater beneath rocks.

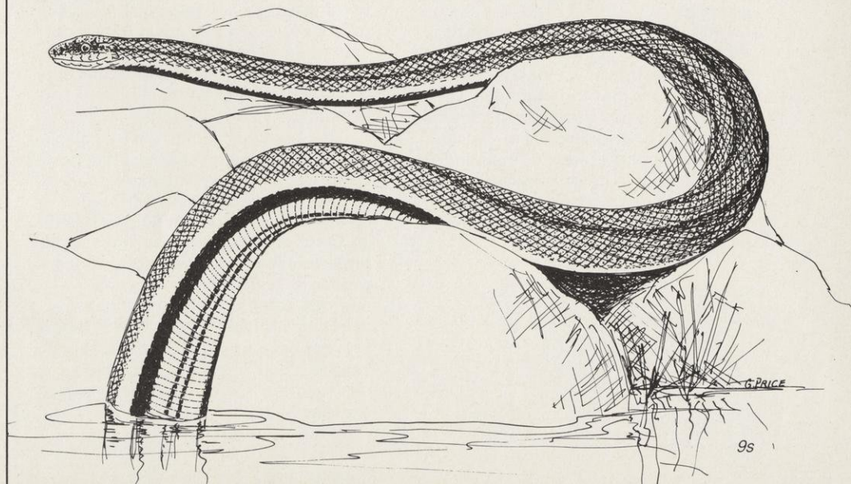
Queens hibernate seven months of the year in Wisconsin, active only May through September. Where more common, queen snakes hibernate over winter in groups of 20 or 30. Males more than two and females 3 years old mate in spring and fall. Five to 23 young are born alive in August or early September. Although many snakes breed in fall before hibernation, development is apparently suspended until normal spring breeding begins.

Queen snakes rely on smell to find food. Meals include tadpoles, frogs, newts, minnows, snails, fairy shrimp and most of all crayfish. Young, soft-shelled crayfish are one main course.

Some fishermen suspect water snakes of eating game fish. But there is no need to fear, watersnakes generally go after slower, smaller, easier-to-catch varieties.

Queen snakes themselves are occasional meals for great blue herons, raccoons and larger fish.

The far reaches of a species range are often occupied by the hardiest of its kind. The queen snake gene pool in Wisconsin may some day prove to be the vital adaptive link in its survival on earth.



Massasauga

(Sistrurus catenatus)

You may not recognize a massasauga, but you probably can imagine the likes of a "swamp rattler." It's in the "pygmy rattlesnake" genus and is the smaller of Wisconsin's two poisonous snakes. The massasauga is two feet to a yard long. Timber rattler's by contrast are usually longer than three feet.

Also nicknamed "black rattlesnake," the massasauga's rich chocolate brown backsaddles and triple rows of side blotches merge with a marbled or solid black belly. Body blotches are edged in white. On the tail they join top to bottom in five to seven cigarband rings around a thick, grayish earthbrown body. The head is flattened and broad. One white and three dark stripes radiate from its face. Nine enlarged plate scales helmet its head. The timber rattler does not have these large plates, but only small, random head scales.

"Massasauga" is the Chippewa for "great river mouth", so named because the snake's home is riverbottom forest and nearby fields. Timber rattlers usually live in the upland.

Wisconsin is the center of the massasauga's range from central New York and southern Ontario to Iowa and Missouri. Some of the largest populations once thrived in the lower third of Wisconsin. Early settlers of Madison found massasaugas along the Yahara River and where the state capitol now stands. Milwaukee and Racine are also built on former massasauga stamping grounds.

Today the southwestern edge of Wisconsin and Walworth County are the massasauga's last stands. Endangered in Iowa and threatened in Minnesota, it has been proposed as a federal endangered species.

Draining and dredging, the hog pasturing did in its swampwater habitat. While plows and bulldozers took over adjacent fields where it migrates during flooding.

As autumn cools, massasaugas individually hibernate in crayfish and mammal burrows, or sawdust piles. The use of crayfish burrows is especially vital and illustrates an ecological linkage in the web of life, we hear so much about.

Crayfish build riverbottom dugouts with above ground mud chimneys. Massasaugas take over burrows for the winter, hibernating at water level. Since massasaugas cannot build burrows, protection of this snake must also include crayfish.

Massasaugas re-emerge with the spring thaw, anchoring themselves on beaver dams and brush during snowmelt floods. They're out and about in the early morning and also stay active on warm, humid overcast days, sometimes sunning themselves along roads or railroad beds.

Massasaugas mature in two years and may live up to 14. Breeding takes place in spring and fall with young born in August. In pre-mating competition males loop their bodies and raise their heads higher and higher, one trying to out do the other. Odors and a head bobbing ritual are part of courtship.

Massasaugas are viviparous, that is, the young are born alive rather than hatched from eggs. However, a nonfunctional egg tooth suggests that massasaugas evolved from egg layers. Young are born in thin egg sacs from which they escape in minutes. Newborn are the size of a lead pencil and could coil on a silver dollar. Eight to 20 are born beneath a log, wood pile or rock ledge. A rattlesnake den is said to smell like freshly sliced cucumbers. Young stay in the den about four days while they shed their skin, exposing a "button" rattle.

The infamous rattles are actually modified epidermal scales with a bony core. They are not a measure of age, but rather indicate the number of changes of skin. Depending on health and rate of growth, massasaugas shed three to five times a year, but rattles wear and break off. Rattling is a nervous defensive threat like a dog's growl. It is meant to scare off intruders, prevent encounters and conserve venom. You can be fooled by non-rattlesnakes that shake their tails in dry leaves to bluff predators.

Rattlesnakes decorated Revolutionary War flags with the slogan "Don't Tread on Me." They were thought to represent honor, always warning before striking. Actually, rattlesnakes do not always rattle first. Some rattlesnakes don't even have rattles. The human hunting tactic of listening for a rattle and killing the snake may be increasing the occurrence of rattleless rattlesnakes.

Rattlesnakes strike because their venom must be injected into the bloodstream to be toxic. A three foot snake can strike only about 12 inches. When unused, the massasauga's fangs are rotated backward against the roof of its mouth. Each fang can be moved separately at will. Venom glands and ducts secrete their juice into hollow fangs.

Although drop for drop massasauga venom is more poisonous than the timber rattler's, the snake is small and its bite would probably not cause severe injury to an adult person. Since 1900, when the state started keeping track of such things, there have been no deaths in Wisconsin due to snake bite.

Massasaugas are shy, secretive animals and aren't likely to strike unless molested. If you fear encounters with snakes, wear high hiking boots, walk noisily, know first aid and stay calm if bitten.

Rattlesnakes are "pit vipers," having pits under the eyes which are sensitive heat detectors alerting the snake to prey or intruders. Raccoons, hogs, skunks, foxes, hawks and eagles prey on massasaugas.

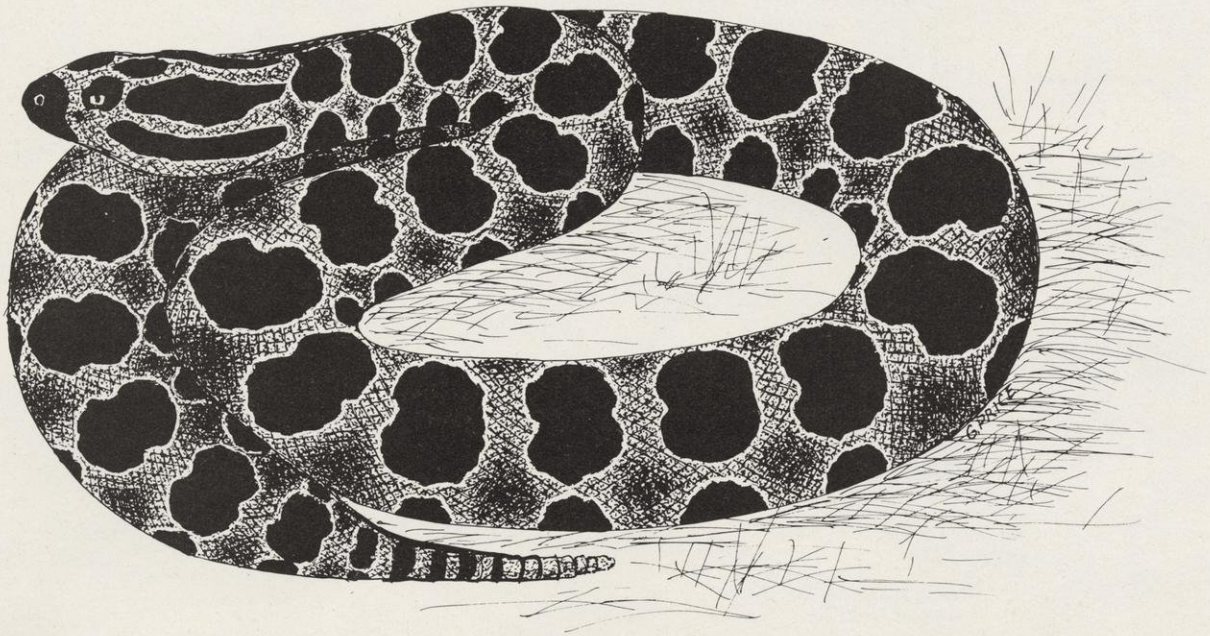
Unlike the timber rattlesnake, the massasauga will eat cold-blooded prey like frogs and other snakes, but given a choice prefers mice, voles, shrews and an occasional blackbird.

Going through life as a rattlesnake has its drawbacks. Folklore and myth exaggerate their deadliness and cast them as more vicious than they are. "A real snake in the grass," "what a sidewinder," and "lower than a snake's belly" are words to defame character. Music in suspense movies and detective shows pique our fear with the crescendo of a rattlesnake.

Until 1975 rattlesnakes in Wisconsin were worth $5 a tail to bounty hunters. When the bounty was lifted and massasaugas placed on the endangered species list, some people thought DNR had lost its head for sure. Newspapers were full of quotes like: "Who wouldn't want 'em to go extinct?" "Let 'em put 'em on the endangered species list, and they'll get thicker than blue blazes." "I never thought I'd see the day when people wanted to protect rattlesnakes. I don't want to be anywhere near one."

Since 1975 though, rattlesnakes have not multiplied out of control. Timber rattlesnakes are still hunted and sold to biological supply houses. Massasaugas, though protected from hunting, are limited by wetland drainage and human habitation.

While we wouldn't want massasaugas in our gardens, we shouldn't assume that they pose a threat to us in their secluded natural habitats. It seems odd that our society can readily live with mounting tons of hazardous toxic waste chemicals, yet cringe at the meager ecologically contained existence of native venomous snakes. Have we yet, learned to tell environmental good from evil?



Northern ribbon snake

(Thamnophis sauritus)

Ribbon snakes are among that well known group known as garter snakes. To snake watchers or "herpetologists" garter snakes are about the same as warblers are to bird watchers—confusing! They look alike; individuals differ from one place to the other; habitat requirements are general; and they're widespread. In Wisconsin we tend to pass off all snakes in the grass as garter snakes.

The northern ribbon snake, until recently called the eastern ribbon snake is only two and a half to three feet long and a half inch thick, with a tapering tail that takes up about a third of its body length. Of the six species of garter snakes in Wisconsin it is said to be the most "filamentous."

Its velvety black back is crested with a yellow ribbony stripe. Another yellow stripe runs along each side three or four scale rows up from its belly. Its whitish yellow belly shades to darker yellow near the tail and is edged with a wide, chestnut brown band. A row of large, white, unmarked scales rings its upper jaw.

The northern ribbon snake ranges east of the Mississippi River north to lower Ontario and Maine and south to Florida. It is endangered in Illinois.

It lives in damp woods and swampy meadows along streams and sphagnum bogs. Once there were six small populations in eastern Wisconsin, now there are only two—in Sheboygan and Dane Counties. Both of these bogs are also home to eastern garter and water snakes.

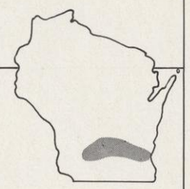
Northern ribbon snakes are semi-aquatic. Diving and swimming with the agility of a water snake, they can stay submerged several minutes hidden beneath plants to escape predators. It is also a good climber, threading its body in serpentine fashion up small trees and low brush. Like most snakes, it breeds in spring and bears up to a dozen live young by late summer.

Active April to October, it feeds on a diet of small fish, tadpoles, frogs, earthworms and salamanders. The northern ribbon snake relies on movement to spot prey. One researcher postulates that a ribbon snake while eating will thrash its tail around to attract visual attention of other ribbon snakes and warn them away from the food.

Northern ribbon snakes are very sensitive to habitat disturbance caused by farming or development. The bogs where they still live in Wisconsin are protected from disturbance. Such places are vital to these and many other species of wildlife.

Western ribbon snake

(Thamnophis proximus)



The western ribbon is more brightly striped than the northern ribbon. The midstripe on its jet black back is orange-red, those along its sides are pale whitish green, the same as its belly. Western ribbon snakes from Texas and Mexico have green backs with red striping. The western lacks the russet side margins of the northern. Facial markings are white with two fused spots on its head. Similar spots on the northern ribbon do not touch. At the long end of two and a half to three feet, the western ribbon is slightly thicker with a tail only one-fourth its length. Females tend to outgrow males. Early in the century a two-headed western ribbon snake was found near Menomonee Falls in Waukesha County.

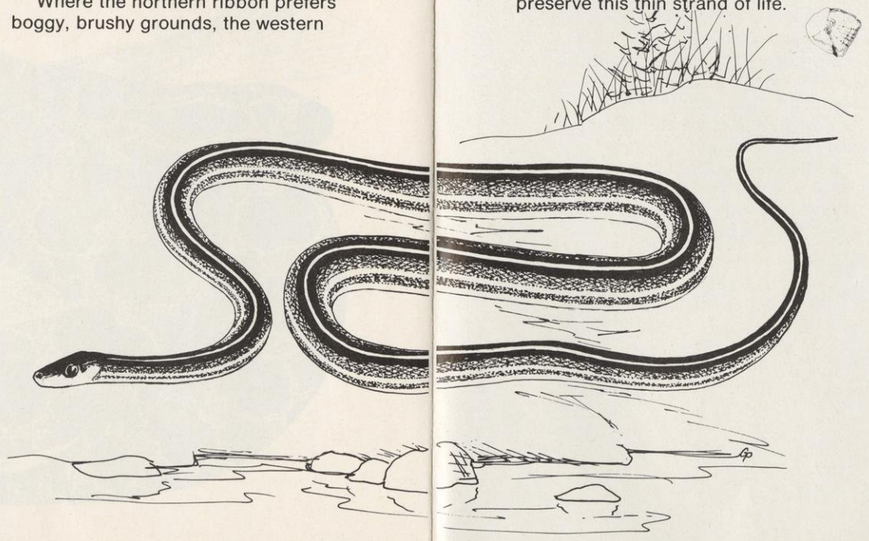
It ranges more southwest than the northern ribbon snake, extending from Indiana across to eastern Nebraska, south to Louisiana and Texas, and even into Central America. In years past the western ribbon snake populated five sites in the southern third of Wisconsin, but recently only the Wisconsin River floodplain in Sauk County.

Where the northern ribbon prefers boggy, brushy grounds, the western ribbon snake lives on sandy floodplains and damp margins of rivers, lakes and marshes. Western ribbon snakes migrate to nearby upland woods and bluffs. It is thought to bunk in over winter with rattlesnakes and other reptiles in rock crevices.

At the northern edge of its range in Wisconsin, the western ribbon snake doesn't wake from hibernation until May. Soon after, mating begins among snakes two years old or older. Four to 27 live young are born in late July to August.

The western ribbon snake is noted for its quick movements and capability as a swimmer, diver and climber. Like other garter snakes, only cold-blooded prey are on the menu—tadpoles, toads, salamanders, perch, bluegills and a smorgasbord of frogs.

In its part of the world, the western ribbon snake occupies the same niche in the wild as its sister snake the northern ribbon. Plowing, irrigation, grazing and water pollution are hazards which come with the ecological territory. Careful floodplain management along the Wisconsin River is essential if Wisconsin is to preserve this thin strand of life.



Higgins-eye pearly mussel

(Lampsilis Higginsii)

When we think of shells, it's easy to imagine colorful conchs on a tropical seashore. In Wisconsin, we expect little more than battered, brown, dull river clam shells. And a clam's a clam, right? Actually, Wisconsin's fresh waters are inhabited by 40 to 50 clam species. One is endangered in Wisconsin. The Higgin's eye pearly mussel, first identified in 1928, was added to the U.S. endangered species list in 1976.

The world range of this ordinary looking mussel is the upper Mississippi River, from Hudson, Wisconsin south to Iowa. As well as larger tributaries such as the St. Croix and Wisconsin Rivers.

When we find a broken clam shell, it's hard to believe it was ever alive. The Higgin's eye's three to four inch roundish shells, or valves, are golden-olive brown with dark rings and green and orangish rays. Shell interior is coated with white or pink mother-of-pearl, or nacre. The clam's hinged edge is swollen, squared in females and pointed in males. The shell is made of calcium like our fingernails, protecting the fleshy animal inside.

The soft mussel has a single "foot" which carries it only a few hundred yards during its 30-year life. Clams embed themselves partly open, hinged end up, in river-bottom clam beds. A siphon to take in food and water is aimed upstream while an output siphon releases wastes downstream.

The Higgin's eye is a deep water clam of fast currents in larger rivers. Natural predators include muskrats, otters, raccoons, minks, and some fishes and birds. The soft insides are sometimes used as fish bait.

Clam reproduction dramatizes the meaning of the term "ecological relationship." The multi-staged process begins when the male clam emits sperm into the water. With favorable currents, the male sex cells are taken into a female's respiratory gills, which double as brood pouches during the clam's May and September breeding seasons. Fertilized eggs develop into embryo clams called glochidia (glo-kĭd-ē-ah). The female expels these mini-clams into the water when an appropriate host fish gets in range. Some clams such as the Higgin's eye expose a fleshy mantle outside their shell that has on it a faint image of the particular host fish they want to attract.

Higgin's eye ecology is not completely known, but evidence suggests that a sauger *(Stizostedron canadense)* is its host species. A sauger taken early in the century had 600 Higgin's eye glochidia on its gills. When the host fish approaches, the glochidia are jetted into the water. If the fish reads its cue right, it swallows the blast of embryo clams. The glochidia migrate to the fish's gills and embed themselves. Although this is a parasitic stage in the clam's life cycle, it doesn't seem to harm the fish. The glochidia develop internally but grow little while on the fish. If all goes well, within a week to a month the young clams are ready to drop off and live on their own, hopefully landing near suitable habitat.

Studies suggest that each clam species has only one host fish species, but a single fish species may be host to several different kinds of clams. One freshwater clam has a salamander host! It's baffling to think how closely clam and host must have evolved!

This mode of reproduction works, but it is chancy and inefficient. Only a fraction of the glochidia produced reaches maturity. Ecologically, it's a bad move for any creature to be totally dependent on another species for

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Higgins-eye pearly mussel Cont'd.

survival. Loss of the host could mean loss of the clams. For example, the many dams up and down the Mississippi River led to the disappearance of the skipjack herring and could eventually mean the loss of the elephant ear and ebony shell mussels.

Although never considered a gourmet delight, freshwater clams have a history of economic value. Indians used clam shells for jewelry and tools such as spades, spoons, hoes and single-edged razors.

In 1887, German immigrant J.F. Boepple fathered what became a multi-million dollar pearl button industry on the upper Mississippi. Within thirty years, 200 U.S. plants were manufacturing pearl buttons, stamping and polishing them from the valves of 40-60,000 tons of freshwater clams every year. The Higgin's eye clam was considered a good button shell because of its thick valves, but was never as industrially important as the more common ebony shell. After World War II, the advent of plastic buttons wiped out the pearl button industry. The last plants closed in the 1960's.

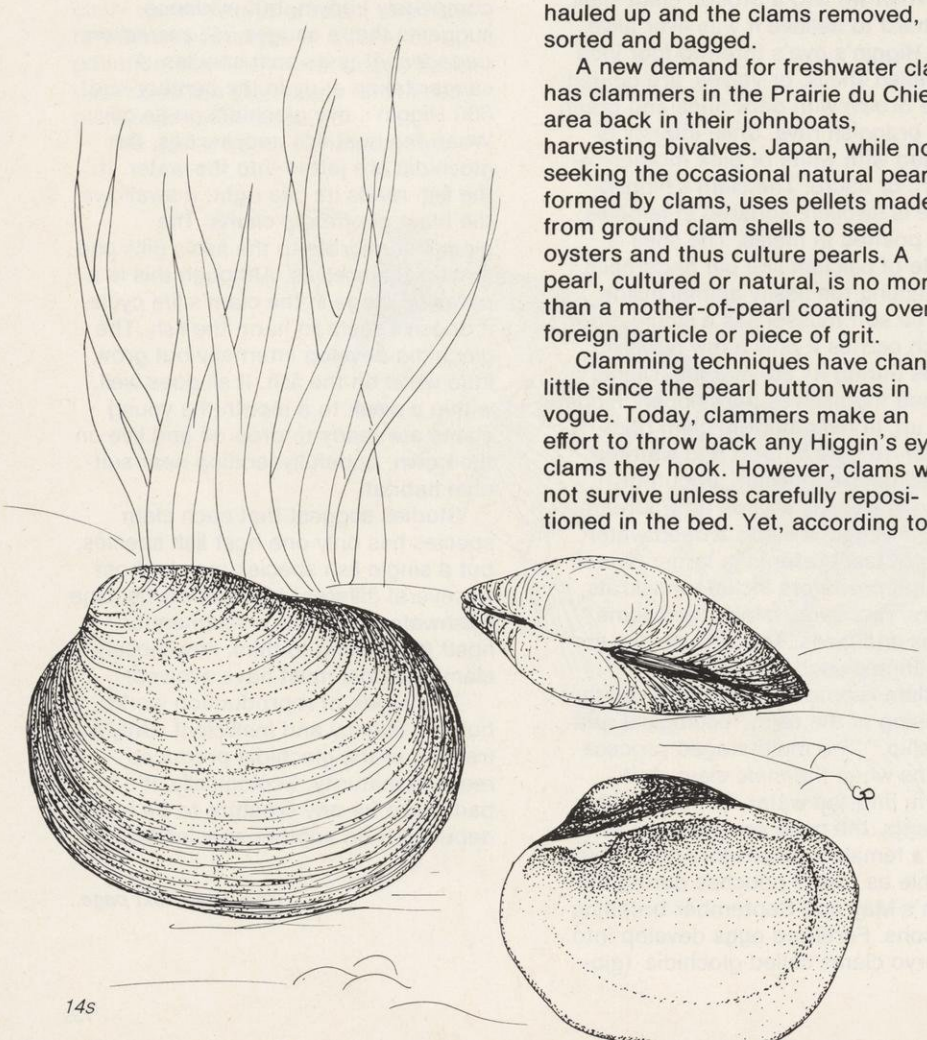
Clam harvesting has its own vernacular. Clammers or clam fishermen (not "musselmen") sail currents rather than breezes, using underwater canvas sails called "mules" in wooden, flat-bottomed "johnboats." A 20 foot "crowfoot" bar armed with chains three inches apart and a fray of flexible, solder-tipped strands or three-prong hooks is dragged down-current over clambeds. When thus disturbed, the mussel's simple tactile response is to clamp on. Every five minutes or so, the bar is hauled up and the clams removed, sorted and bagged.

A new demand for freshwater clams has clammers in the Prairie du Chien area back in their johnboats, harvesting bivalves. Japan, while not seeking the occasional natural pearl formed by clams, uses pellets made from ground clam shells to seed oysters and thus culture pearls. A pearl, cultured or natural, is no more than a mother-of-pearl coating over a foreign particle or piece of grit.

Clamming techniques have changed little since the pearl button was in vogue. Today, clammers make an effort to throw back any Higgin's eye clams they hook. However, clams will not survive unless carefully repositioned in the bed. Yet, according to mussel specialists, called malacologists, the fishermen do little harm to clam populations compared to the damage wrought by dams, dredging, pollution and misguided human priorities.

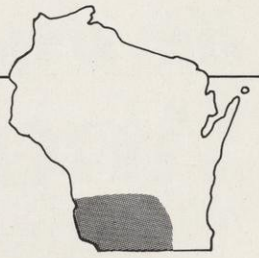
Clams are filter feeders living on a diet of microorganisms gleaned from rich currents. Dams may slow river currents so water is not adequately mixed and enriched. Clams also tend to store pesticides and heavy metals (zinc, copper and mercury), making clam shells natural records of the pollutants in our waterways. Clams are also vulnerable to dredging and waterway traffic, which can bury a clam bed in silt. Silt also clouds the water, cutting down light penetration and production of microorganisms, the clams' diet.

Surprisingly, the meek Higgin's eye pearly mussel is among the most controversial of Wisconsin's endangered species. Because the Higgin's eye depends on the water quality of its limited habitat, several Mississippi River development projects have been delayed due to needed clam impact studies. Some people wonder what the world has come to when a $40 million bridge or dam is held up for a clam. Others pass it off as bureaucratic hilarity or overkill by a bunch of screaming environmentalists. Certainly preserving endangered species cannot be argued in dollars and cents, but many people now realize that these don't have to be "either-or" issues. Moving a clam bed or choosing a new building site are possibilities which need exploring. We can then be assured of knowledgeable, long-range choices which bring us closer to living in harmony with all of earth's creatures. Even a clam.



Ornate box turtle

(Terrapene ornata)



Turtles are the oldest living reptiles. They're more ancient than extinct dinosaurs of which only fossils remain. Evolution, the dynamic process which adapts life to Earth's changes, has worked to shrink turtle's shells and thus reduce their burden. But not box turtles—with their oversize, bowl-shaped shells they are among the most primitive.

The ornate box turtle is strictly a land dweller. So it depends on its shell to act as a helmet and shield the fleshy reptile. Its high-domed shell insulates it from gnawing predators like skunks, raccoons, opossums and foxes, as well as raptors and snakes. When threatened, *Terrapene* box turtles literally box themselves in. Tucking head and limbs inside, special hinges draw top and bottom shells so tight a knife blade can't pass between. But turtle shells are no defense against the rushing wheels of an auto, and highway deaths take their toll of many turtle species.

The ornate box turtle is a holdover from the era of Wisconsin's vast prairies. Today it is limited in southwestern Wisconsin to sandy pockets of dry prairie and oak savanna. These sandblows are Wisconsin's mini-deserts often marked by prickly pear cactus and pocket gophers.

A turtle's shell is not its home. Studies show that box turtles range over 5½ acres with overlapping territories. Homes, irrigation, cultivation, recreation and pine plantations drive ornate box turtles from sandy floodplain habitat.

The ornate's past names include northern, western and painted box turtle. From its northeastern border in Wisconsin, it ranges west to southeastern Wyoming and south to Colorado, Arizona and Texas. Indiana and Illinois mark its eastern boundary. As in Wisconsin, the ornate is an endangered species in Iowa.

Its eastern counterpart in upland forests, the eastern box turtle *(Terrapene carolina carolina)* is a threatened species in Michigan. Eastern box turtles occasionally wander into Wisconsin but are not considered native.

Although in the same family as the huge Galapagos tortoises, the ornate is only five inches long. The ornate box has a handpainted look about it. Yellow dashes crest its dark shell and radiate down the sides like fine brush strokes. In contrast, the eastern box turtle's markings are mottled, swirled and spotted like finger paint designs. The bottom plate of the ornate is brown with helter-skelter yellow lines. Dark limbs and head are also spotted. Reddish dashes and red eyes distinguish males, while females have lighter spots with yellow or brown eyes. Jaws are often lined yellow, the upper jaw slightly notched.

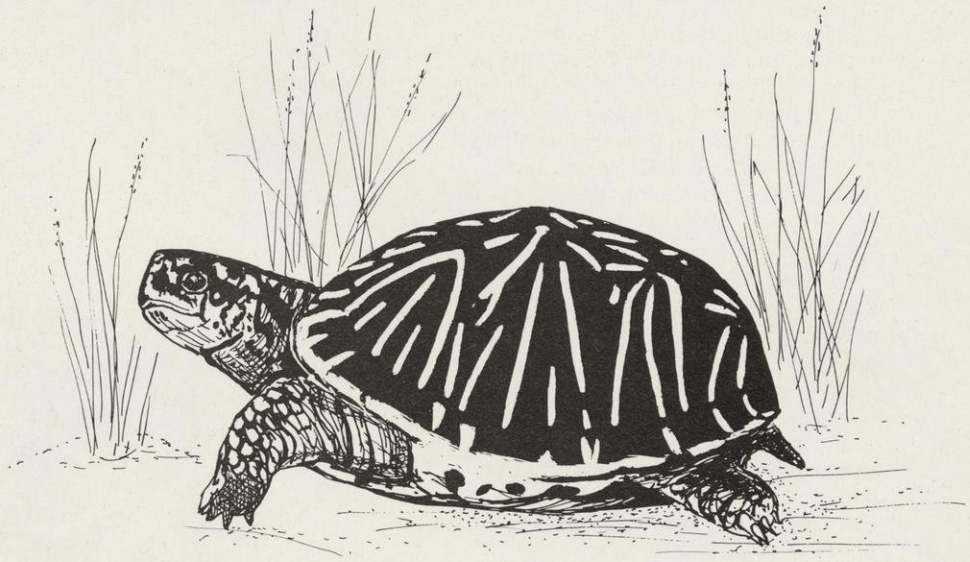
Turtles are toothless but have sharp, horny jaws. The ornate is quick to hiss and bite if handled. Box turtles aren't fussy about their diet, eating earthworms, beetles, grasshoppers, caterpillars, carrion, berries, ground cherries, prickly pear fruits, grasses and plants such as dandelions. True to its dry surroundings, the ornate drinks little water.

Box turtles emerge from winter storage in late April or May. During hot weather they seek shade, and are most active after a rain. Mating goes on year-round in captivity, but wild turtles generally mate only in spring. The male's lower plate is concave to rest on the female's dome shell. The male is specially equipped with a recurved first claw on its hind feet, which he wedges between the female's shells so she can't shut him out. Although we seldom think of turtles making sound, male ornate box turtles have a muffed, whistling courtship cry. Ornates may outlive a century, but are slow to mature, males at 8-9 years and females at 10-11.

In June, female turtles dig nest holes in open sandy areas. They lay two to eight brittle, white eggs, then cover the nest, sweeping away any trace. The eggs incubate in the earth about 70 days. Hatchlings are only as big around as a nickel. Young in late nests may overwinter right in the nest hole.

Fall triggers hibernation. Ornate box turtles dig burrows with their four-toed, webbed, hind feet, or borrow burrows from small mammals. Even during warm, active months, box turtles take shelter in burrows on cold nights.

Guarded only with its shell, the docile box turtle is an easy target for pet suppliers and casual collectors. Left in the wild, a box turtle may produce 300 offspring in its life. But in captivity, they're not given the chance. Despite laws protecting ornate box turtles, pet collecting and marketing still drain our wild population. Laws are only as good as the convictions of the people asked to obey them.



Wood turtle

(*Clemmys insculpta*)

The name "wood" suits this turtle. Each roundish segment of its six to eight-inch shell looks like a wood-grained cross-section of a branch, complete with growth rings and yellow rays radiating from protruding black-flecked centers. Its brownish, sculptured shell is a fusion of chiseled pyramids, hence its species name "*insculpta.*" When the shell is dry, the grooves take on a spider web pattern. A noticeable midrib or keel runs front to back. The bottom shell is yellow with each segment blotched black along its side. On males, the lower shell is concave for mating. A black, blunt head and brown limbs are highlighted red or yellow on throat and soft connecting flesh. Males have long, thick tails with the cloacal opening, or anus, located outside the shell's edge. Females have slighter tails with the cloacal opening within shell boundaries.

The wood turtle is also well-named because of its choice of habitat, but its genus, *Clemmys*, is known as the "pond turtles" group. Putting these together means the wood turtle is semi-aquatic, living along fast forest streams. Water pollution, irrigation, and forest erosion have tainted many of its former haunts.

Wood turtles are active by day, April to November. They eat a little of everything: insects, clams, carrion, berries, dandelions and other succulent herbs.

Like ornate box turtles, wood turtles mature late and live as long as 58 years. They mate in spring and fall, in or out of water. Females dig nests in June on communal gravel sites along banks or railroad beds. Wood turtles have been seen nesting along the Elroy-Sparta bike trail, formerly a railroad right-of-way.

But the nests don't always survive. Egg predation by skunks, raccoons and opossums is becoming a serious problem due to an increase in the number of these scavengers since human settlement.

If the nest makes it through, a clutch of 4 to 17 white, smooth eggs laid in June will hatch in September. Gray hatchlings look awkward with tiny bodies and oversized tails.

In late fall, wood turtles return to stream banks and hibernate over winter in large groups in community burrows. Before wood turtles were placed on Wisconsin's endangered species list in 1974, hundreds were taken from the wild each fall and sold to biological supply houses. One collector recalls taking over 100 from one stream bank in 1972. Today, no wood turtles are found there. Collecting for biological experiments and dissection may also be threatening other Wisconsin reptiles and amphibians, as well as many of the world's primates. Commercial overharvesting did in the now extinct passenger pigeon; no one ever thought we'd run out.

Collecting wood turtles for pets is another problem. The alert wood turtle is as quick as a rat in mastering a maze and it learns to become a responsive pet. But captive turtles are usually not given proper space and substrate to breed. This means lost wild wood turtles in the future.

Highway deaths take an uncounted number of "woodys." One stretch of road in northeastern Wisconsin often frequented by wood turtles is marked with a "turtle x-ing" sign.

Not uncommonly, well-intentioned people find a turtle near the side of the road, think it lost and take it home. Instead, they should try to guess which side of the road the turtle wants to be on and set it down well away from the road. Large turtles should be picked up by the tail, smaller turtles by the back of the shell. Watch out for flailing claws!

Wood turtles were once common throughout the state, except in the southwest. Today, small scattered populations exist in isolated habitat. This turtle's original North American range extended from Nova Scotia to eastern Minnesota, south to northeastern Iowa, east to Virginia and north to New York. It is now threatened or endangered in much of this range.

Humans could do a lot to help the wood turtle by learning to recognize the wood grain of its shell and to avoid disturbing it. Habitat destruction, overcollecting for pets and study, highway casualties and an unnatural increase in predation all splinter the chances for survival of this small chip off the block of life.