

EASTERN MASSASAUGA

Sistrurus catenatus catenatus

Identification, Status, Ecology, and Conservation in Midwest

IDENTIFICATION

General Appearance

Characteristic of all rattlesnake species, the Eastern Massasauga has a rattle on the end of its tail and heat sensing pits situated between the eyes and nostrils (see photo next page). The background color of the Eastern Massasauga is typically gray or brownish gray, with a row of dark-brown to black dorsal blotches and three rows of small brown to black spots on each side of the body. The dorsal or side blotches in some individuals may be connected, giving the appearance of stripes. Some Eastern Massasaugas may be black, or nearly so, in some areas. In this melanistic phase a pattern is not readily discernable. Apart from the tail and rattle, juvenile Eastern Massasaugas appear very similar to adult snakes. The tails of juveniles are bright yellow, and lack a fully formed rattle: instead, they are born with a “button” on the tips of their tails. Eastern Massasaugas are considered medium-sized rattlesnakes with adults reaching lengths of up to one meter.



Eastern Massasaugas typically have a light brown or gray background color with darker brown or gray blotches intermixed. Photo by A. Fortin.



Massasaugas may be melanistic (black). Photo by G. Lipps, Jr.

Subspecies

The Eastern Massasauga is one of three subspecies of *S. catenatus*. The other two subspecies are the Western Massasauga (*S. c. tergeminus*) and the Desert Massasauga (*S. c. edwardsii*). Some controversy surrounds the correct taxonomic arrangement of these snakes. Perhaps ultimately they will be viewed as two or three species. Range alone is generally sufficient to distinguish amongst them. However, in northcentral Missouri, the eastern and western subspecies co-exist and intergrades are present. The Eastern Massasauga is generally larger, has fewer ventral scales, fewer dorsal blotches and may vary slightly in coloration (Gloyd 1940, Klauber 1972, Wright and Wright 1957).

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Confusing Species

Massasaugas are in the pigmy rattlesnake (*Sistrurus*) group. Differentiation between Eastern Massasaugas and other species of rattlesnake in the genus *Crotalus* (for example, the Timber Rattlesnake) is possible from their less angular head, and much smaller body size. Another readily discernable difference relates to the number of plates found on the crown of their heads: **Massasaugas have a set of nine large plate-like scales, while *Crotalus* species possess numerous tiny scales.**



Massasaugas possess nine large plate-like scales on the crown of their heads. Photo by A. Fortin.



Timber Rattlesnakes possess dark chevron shaped crossbands on their dorsum. Photo by S. Gibson.

Across their range the Eastern Massasaugas preference for wetter habitats generally sets them apart from other rattlesnake species. However, where their distributions overlap, the Eastern Massasauga is often confused with the Timber Rattlesnake. In addition to the differences mentioned above, body pattern can easily help in identification between the two. Timbers possess dark, often chevron shaped, crossbands along their dorsal surface, in contrast to the dorsal and lateral blotching on massasaugas.

Several other snakes with similar habitat needs and or blotched patterns may also cause confusion: Water Snakes (*Nerodia spp*), the Eastern Hognose Snake (*Heterodon platirhinos*) and the Western Hognose Snake (*H. nasicus*), and Milksnakes (*Lampropeltis triangulum*). While coloration in these species may be similar to that of the Massasauga, they are easily discerned by their long pointed tails and the absence of a caudal rattle.

As a final note, the Western Pygmy Rattlesnake (*S. miliarius streckeri*) also occurs in Missouri, however its range does not overlap with that of the Eastern Massasauga; the western pygmy is found in southern Missouri.



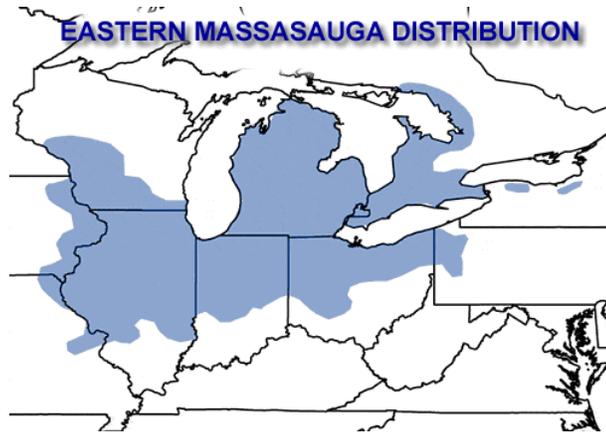
Eastern Hognose (above) and Western Hognose Snakes can look like Massasaugas. Lower photo by Scott Ballard.

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DISTRIBUTION AND STATUS

Distribution

The Eastern Massasauga ranges from western New York and southern Ontario, extending westward to Iowa and Southward to Missouri. Apparently, they used to be quite common in many areas. Unfortunately, since European settlement, habitat loss and indiscriminant persecution have led to the species' overwhelming decline across its entire range. Extirpation of the species from its native range varies by state from 33% in Michigan to as much as 100% in Minnesota.



Status

The Eastern Massasauga is listed as state Endangered in all Midwest states save Michigan, where it is considered a species of Special Concern. As a result of the tremendous declines experienced by this species, the Eastern Massasauga has been added to the U.S. Fish and Wildlife Service's Candidate Species List. Candidate species are threatened by extinction in the foreseeable future and await listing as threatened or endangered under the Endangered Species Act of 1973.

ECOLOGY

Habitat

Eastern Massasaugas are unusual among rattlesnakes in that they rely heavily on wetland habitats. They have been described to occur in a wide variety of wetland types, including wet prairies (Seigel 1986), peatlands (Johnson 2000), fens, bogs, and sedge meadows. In addition to representing primary habitat, wetlands are also of critical importance to the Eastern Massasauga due to their hibernation requirements. This species survives the lethal freezing temperatures of winter by hibernating in groundwater that does not freeze.

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Massasaugas may be found in wet prairie habitats. Photo by B. Kingsbury.

Massasaugas from many populations utilize drier upland habitats during the summer months. These areas are believed to be sought to satisfy their thermoregulatory needs and for the prey found there. In the areas occupied by some populations, the wetland habitats in which snakes hibernate have a lower abundance of prey than surrounding upland habitats. **Within upland habitats, Eastern Massasaugas generally associate with areas of more open vegetative structure, such as meadows and old fields.** These snakes sometimes do utilize areas of closed canopy forest, though this is not typical. **In general, closed canopy forests are avoided, and snakes that do enter these habitats are often located where light gaps penetrate the forest canopy.**

Patterns of Movement

Radiotelemetry studies on Eastern Massasaugas have shown that there is considerable variation in patterns of movement between rattlesnake populations. In some populations, movements are small, and centered in the same habitats in which snakes will hibernate. **In most populations studied, snakes show directed seasonal movements away from these wetlands and into drier upland habitats in the spring, returning back to the wetlands in the fall.** Within a population, Eastern Massasaugas tend to demonstrate short directed movements followed by periods of relative inactivity. This trend is thought to be associated with prey seeking behavior: periods of inactivity likely correspond with sit and wait foraging, followed by directed movements to nearby patches of high prey density.

Movement patterns may also vary with sex and reproductive condition. Male snakes typically move longer distances than females during the active season. These longer movements reflect mate seeking behavior during the mating season. Gravid females tend to have very small patterns of movement during the active season, and will center their movements around important gestating sites which provide favorable thermoregulatory opportunities.

Only one study to date has attempted to mark and track juvenile rattlesnakes, and consequently very little is known about the spatial ecology of this age class. In this study, juvenile snakes were observed to demonstrate similar patterns of movements and activity ranges as non-gravid female snakes. Interestingly, gravid females at this site (located in Wisconsin) had chosen gestation sites in dry upland habitats, and after parturition juvenile snakes had to migrate back towards the wetlands in order to find suitable hibernating sites (King, 1997).

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Activity Range

Activity range size of individual Eastern Massasaugas varies greatly, for example a study in northern Indiana observed areas of less than 5 ha (Marshall 2002), while a study in southern Ontario recorded snakes using areas greater than 25 ha (Weatherhead and Prior 1992).

Sex and reproductive condition influence activity range size. Males typically have larger activity ranges; a phenomenon associated with extended mate searching behavior during the mating season. Gravid females tend to have very small home ranges in contrast to males and non-gravid females, and center their activities on areas within their home range that provide the most optimal thermoregulatory opportunities for gestation. However, it should be stressed that considerable variation does exist between populations, and as such consistent trends are unclear.

Diet and Foraging

The diet of the Eastern Massasauga consists primarily of warm blooded prey, such as small rodents (voles, jumping mice, and shrews); however birds and frogs may also occasionally be taken.

Like most other rattlesnakes, Massasaugas are thought to be sit and wait foragers. Likely, snakes actively seek areas in which high densities of prey are detected (probably determined through chemosensory cues), and then coil up to wait for unsuspecting prey to pass by. Warm blooded prey is detected through the use of thermal pits, situated on either side of the head. Once a snake has identified prey, it will strike, envenomate, and then release the animal and wait for the venom to do its work. Snakes will then trail the mortally wounded prey until it dies, after which the prey will be consumed.

Some ontogenetic variation in diet seems to exist between juvenile snakes and adults; juveniles seem to be opportunistic and will feed upon small snakes, frogs, and insects (Keenlyne and Beer 1973, Seigel 1986, Johnson 1995). Juvenile snakes are known to use an unusual strategy for attracting prey known as caudal luring (Schuett et al., 1984). A snake utilizing this strategy uses its brightly colored tail tip (which Massasaugas possess as juveniles) as a lure, wiggling the tail in a way that is designed to mimic the appearance of certain invertebrates, such as worms or insects. Potential prey items, such as frogs, are attracted to this movement, thinking the tail of the snake to be a potential meal.

Reproduction

Courtship and mating takes place in the summer and early fall, however female Eastern Massasaugas do not give birth until the following summer and early fall. Like other snake species, females overwinter with the sperm, and impregnation occurs the following spring (Johnson et al. 2000). Similar to other rattlesnakes, Eastern Massasaugas bear live, fully developed offspring, and clutch sizes may vary from 3 to 19 (Seigel 1986).

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After parturition, females and their offspring will remain in the same location for several days; however no direct parental care is deferred by the female.

During gestation, female Eastern Massasaugas will select sites that provide the most optimal thermoregulatory opportunities. Typically, these areas are open in vegetative structure, or areas which allow extended access to sunlight during the day.

The reproductive frequency of female Eastern Massasaugas appears to vary regionally. In some populations, females reproduce annually (Keenlyne 1978), while in others females reproduce on a biennial cycle (Reinert 1981, Seigel 1986, Johnson 1995).

Interestingly, male Eastern Massasaugas have been observed to display competitive “combat” behavior during the summer courtship period, much like other rattlers. During this time males may be observed elevating the first third or so of their body and wrestling back and forth until one concedes to the other.

Hibernation

Eastern Massasaugas primarily overwinter in crayfish burrows, but will also utilize other crevices such as at the bases of sphagnum hummocks or rotted trees. These structures are believed to facilitate access to the water table, and in turn, to temperatures that do not fall below freezing. This is very important because unlike some temperate zone reptiles, Massasaugas are not freeze tolerant, and must avoid subfreezing temperatures to survive the winter.

Eastern Massasaugas have been demonstrated to show high fidelity to their hibernacula, returning to the same area year after year. It has been assumed that Massasaugas do not hibernate communally, but recent work has found that at some sites multiple individuals may be found sharing a hibernaculum, and that Massasaugas will also hibernate with other snake species (J. Sage, *pers. comm.*).



Eastern Massasaugas primarily hibernate in crayfish burrows. Photo by B. Kingsbury.

THREATS TO EASTERN MASSASAUGAS

Continued habitat degradation, loss, and fragmentation pose the greatest threat to Eastern Massasauga populations. Loss of wetlands is one of the primary factors contributing to snake declines; much of the Midwest has lost greater than 50 percent of its original wetlands, and some Midwestern states have lost greater than 80 percent. In addition to wetland loss, loss of suitable upland habitat surrounding wetlands also has contributed to declines.

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Roads can be a major source of mortality in many populations. Roads present a major barrier to movement for these snakes, and those that do attempt to cross are often hit by cars.

Eastern Massasaugas are often intentionally killed due to the fact that they are venomous and present a presumed risk to humans. While the actual risk these animals pose to humans is minimal, people still continue to kill snakes out of fear.

Illegal collection for the pet trade is also a factor cited in Eastern Massasauga declines. These small, attractive snakes can fetch a high price on the black market, and their venomous nature makes them more appealing to some collectors.

MANAGEMENT GUIDELINES

Land management practices can have a tremendous negative or positive impact on populations.

Development of proper management techniques is of critical importance, as populations often reside on managed properties. Manipulation of hydrological periods, such as winter drawdowns, can put hibernating individuals at risk of desiccation or freezing. Bush-hogging and controlled fires, necessary for maintaining the early



Photo by S. Gibson.

successional habitat structure eastern massasaugas are associated with, can also have negative impacts if they are conducted when individuals are likely to be active (i.e. April through October).

Conservation concerns are not restricted to habitat loss and degradation. Illegal collection and indiscriminant persecution have had and can continue to have enormous negative impacts on eastern massasauga populations. For example, during early European settlement of the Midwest there were reports of hundreds and thousands killed in Wisconsin (Johnson et al. 2000). Formal persecution reached even greater levels in the 20th Century (Johnson et al. 2000) and was aided by the development of bounty systems in several states (Vogt 1981, Szymanski 1998). Today the Eastern Massasauga is legally protected in every state and province in which it occurs. Any suspected illegal collection or persecution should be reported to local authorities, conservation officers, or wildlife biologists.

WHAT IF YOU ARE BITTEN BY A MASSASAUGA?

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The bite of an Eastern Massasauga is a serious thing and should be addressed immediately. Death from such a bite is highly unlikely. Nevertheless, individuals often get quite ill, and complications due to local tissue death is a possibility. Despite their shy demeanor and hesitancy to bite under most circumstances, massasaugas will do so when harassed or handled. **The most important thing to do initially is to stay as calm as possible. Someone should get the bite victim to a hospital as soon as possible.** No incisions at or around the wound should be made, nor should a tourniquet be applied. If possible, the bite should be kept below level with the heart, and if the bite is on a finger, toe, or limb, then an area just a little closer to the heart can be firmly but not tightly wrapped as you would a sprain. For example, the wrist of a person might be wrapped if the bite was on the hand. **You should also call ahead to the hospital if possible to let them know you are coming.**

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