



Natural Heritage & Endangered Species Program

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Massachusetts Division of Fisheries & Wildlife

Copperhead *Agkistrodon contortrix*

State Status: **Endangered**
Federal Status: **None**

DESCRIPTION: Copperheads get their name due to their solid, relatively unmarked, coppery-colored head resembling the color of an old copper coin. As with all pit vipers, Copperheads have broad, triangularly shaped heads, with a distinct narrowing just behind the head. The eyes have vertically elliptical (catlike) pupils. There is a very thin line on each side of the face that separates the richer copper color of the top of the head from the lighter color of the lip area. The iris of the eye is pale gold, and the pupil is dark. On the body there is a series of dark brown to reddish, hourglass-shaped, cross bands. These are narrow in the middle of the body and broad to the sides. The ground color ranges from beige to tan. Body markings are continuous over the entire length of the body, including the tail. Young snakes are replicas of adults, except that the body has an overtone of light grey and the tip of the tail is yellow.

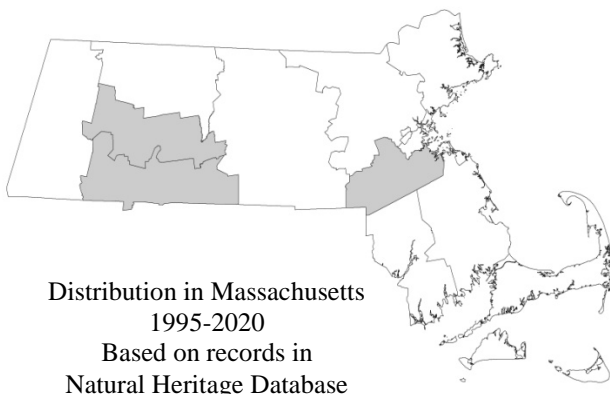
Adult Copperheads usually measure 60–90 cm (24–36 inches) in length; the newborn young are usually 18–23 cm (7–9 inches). Males usually have longer tails, but females can grow to greater total lengths (up to 4 feet). There is no reliable external cue to differentiate the sexes. The Copperhead has weakly keeled scales (i.e., a



Adult from Hampshire County; photo by Mike Jones/MassWildlife

ridge protrudes from the middle of each scale), giving the snake a relatively rough-skinned appearance.

SIMILAR SPECIES IN MASSACHUSETTS: The Timber Rattlesnake (*Crotalus horridus*) is the only other pit viper in Massachusetts, but is generally yellow or brown with black, brown, or rust-colored blotches separated by crossbands rather than the hourglass pattern of the Copperhead. The Eastern Milk Snake (*Lampropeltis triangulum*) may exhibit similar coloration, but the markings are in blotches and spots rather than the distinctive hourglass pattern. Its body and head are considerably thinner than those of the Copperhead and the pupils are round, as they are in all of our non-venomous species. The Northern Water Snake (*Nerodia sipedon*) has a similar coloration and markings, but has a thinner, dark-colored head and is rarely encountered far from water.



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RANGE AND HABITAT IN MASSACHUSETTS:

The range of the Copperhead is from southern New England to southwest Illinois, south to central Georgia and through central North Carolina.

In Massachusetts, the Copperhead is usually associated with deciduous forest and shows a preference for traprock (basalt) ledges with extensive rock slides below. The Copperhead is a relative of the Eastern Cottonmouth and, like that species, is fond of moist, damp habitats. Some copperhead wintering dens are on the fringes of swamps, reservoirs, rivers, and streams.

The entrances to the hibernacula (dens) have southern, southeastern, or southwestern exposures, allowing the Copperhead to sun itself in the spring and fall. The rock slides generally are interspersed with deciduous trees, Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron* spp.), lichens, and damp leaf litter. Stands of Red Cedar (*Juniperus virginiana*), pine (*Pinus* spp.), and Hemlock (*Tsuga canadensis*), along with cool, damp meadows, are characteristic of Copperhead habitat in Massachusetts.

The summering grounds of the Copperhead are near wetlands, wooded swamps and marshes, or lakes and reservoirs; they also may frequent areas. During this time, this species may also inhabit fields and meadows, wet woodlands, and quarries.

LIFE HISTORY AND ECOLOGY: Copperheads belong to the family of snakes known as pit vipers. Like other reptiles, they are vertebrates (they have backbones) and they are ectothermic (they cannot control their body heat by physiological means and must move to a warmer or cooler environment to control their body temperature). The term “pit viper” derives from the characteristic loreal pits. There is one pit on each side of the head, lying midway between the nostril and eye but below their level. Each pit contains sensitive nerve ends that react to radiant heat. The primary function of these sensory units is to assist the snake in detecting warm-blooded prey in darkness. Sight is fairly keen within a limited range; moving objects are perceived more readily than stationary ones.

The Copperhead is extremely sensitive to ground vibrations and can detect very slight ground disturbances. These vibrations are transmitted to the



Sub-adult from Hampshire County, cryptic basking in leaves; photo by Mike Jones/MassWildlife

auditory nerve through the bones of the lower jaw. Its tongue is not a stinger, but rather a very delicate organ associated with a pair of cavities, known as Jacobson’s organ, located in the roof of the mouth. The tongue reaches out and brings in particles from the air. The Jacobson’s organ appears to be directly related to the nasal system and aids in smelling; however, each system can be used independently as well as together.

This species has two well-developed and enlarged venom-conducting fangs, located at the front of the mouth and secured to the upper jawbone. The fangs are movable and fold against the roof of the mouth when not in use. A fleshy sheath covers each fang when the mouth is closed. The fangs are not permanent; they are shed periodically. Each fang socket has several replacement fangs in various stages of development, located in the gum behind the functional fang. Before a fang is shed, a new one is already positioned. Each fang is connected internally to a venom gland. Through muscular action, venom is forced from the gland through a venom duct to the hollow fang and then into prey. Like most snakes, Copperhead will also bite in defense. Although the Copperhead is venomous and the bite can be painful, it is not considered life-threatening to a healthy human. In addition to these enlarged fangs, pit vipers have many curved smaller teeth on the palate and lower jaw.

In Massachusetts, the active season of the Copperhead runs from April to October. Beginning in mid-April, the Copperhead emerges from hibernation and begins basking on ledges during the day. It lingers in the area for several weeks. The Copperhead can be found

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sunning itself regularly, often in the same spot, with other Copperheads or other snake species nearby.

Copperheads are known to mate both in the spring and autumn. Males seem to be particularly active during courtship and have been observed in aggressive encounters with other males over territory during the spring and autumn mating seasons. Males are able to track females by sensing with their tongues the female's pheromones wafting through the air. Courting males will approach a female and begin moving his chin on the ground. If the female moves away, the male will follow and attempt to move alongside and place his head on some part of her body. The female responds with a series of tail movements: slow back-and-forth waving, rapid back-and-forth whipping, or extremely rapid tail vibration. The male will continue to rub his chin on the back and head of the female as he moves to align his body next to hers. This process may continue for an hour or more if the female does not respond. If the female is ready to mate, she will lift the rear part of her body and tail off the ground slightly allowing the male to maneuver his tail around and under hers. The duration of actual mating varies from 3 1/2 to 8 1/2 hours. This lengthy mating serves several important functions. Since females mate with only one male at a time, a long mating lessens the number of other males that could possibly mate with her. Also, the female's interest in mating may be reduced after prolonged mating. Males begin searching for new females within 24 hours.

After spring mating, most of the males and at least some of the females begin to migrate up to two miles from the den site. During the height of the summer, they are generally found in wetlands—wooded swamps and marshes—or lakes and reservoirs or may inhabit fields and meadows, wet woodlands, and quarries.

Females giving birth late in the season tend to gather together in areas called birthing rookeries, which may be at their winter dens or sometimes up to a mile away. Lingering at or near the den, to which the newborn young must return shortly after birth, eliminates the need for a long and presumably dangerous migration of the newborn that would arise if she had migrated some distance away.

The male and female Copperheads reach sexual maturity at five years with an estimated life span of 18 years. Breeding typically takes place in the spring (April-May)

but may also occur from August to September. The gestation period is 3-9 months. The Copperhead is ovoviviparous (their young are born alive). Three to ten young (normally 4-6), measuring 18-23 cm (7-9 inches) in length, are born sometime in August or September. The mother does not care for her young. Each of the young is equipped with venom, fangs, and a supply of egg yolk for nourishment in their abdominal cavities. In addition, the young Copperhead has a unique yellow tail tip which fades as it gets older and is usually gone by the third or fourth year. The belief is that the young snake wiggles its tail as a sort of lure to frogs or insects that might be looking for small, caterpillar-like prey. When the animal gets close enough, the Copperhead can strike out and thus acquire its meal.

The diet of young Copperheads differs from that of the adult, probably reducing the competition between them. Juveniles rely heavily on a large supply of insects, particularly caterpillars, for survival, while adults feed mostly on amphibians and mammals. Mice are the principal food, but small birds, frogs, and insects also are eaten. It is believed that a Copperhead eats only about eight meals in a single growing season (totaling no more than 200% of its body weight). This may be due to a combination of a slow metabolism and the difficulty of finding prey. Females who are carrying young may not eat at all during the summer due to the growing embryos that take up a large volume of the body cavity.

During the spring and autumn, Copperheads hunt mainly by day as night temperatures are too low for normal activity. As the weather warms in the early summer, the Copperhead changes its diurnal hunting to nocturnal activity. This change has several advantages: the snake avoids the intense heat of the day, and the possibility of capturing prey is considerably better because rodents and amphibians are more active at night.

The typical hunting behavior of the Copperhead consists of long periods of lying motionless waiting to ambush prey with intervals of prowling. Copperheads waiting in ambush coil their bodies next to a fallen log and rest their heads or chin on the edge. The prey is detected by sight, scent, and the sensory pit which can detect the heat radiating from a warm-blooded animal. Thus guided, the snake strikes out at its prey and sinks its venom-conducting fangs into the prey. Usually it then recoils and waits for the venom to overcome the victim. After a strike, the Copperhead uses its sense of smell to track the

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victim. The length of time before the prey dies depends largely on the size and kind of prey and the amount of venom injected. The venom serves two important functions. In addition to being the killing agent, it contains enzymes that break down the victim's body tissue and aid in digestion.

The use of the venom as a defensive weapon is secondary. Copperheads' defensive actions are largely determined by the degree of intrusion and the accessibility of a refuge. A snake will resort to striking and biting only as a last resort—generally only when it has been cut off from retreat or when actually seized. Even when pushed to the limit, venomous snakes rarely use their poison to the fullest extent. The Copperhead is not boldly aggressive. In the field, this species usually lies motionless and rarely attempts to escape by rapid movement.

POPULATION STATUS IN MASSACHUSETTS:

The Copperhead is listed as an Endangered species in Massachusetts under the Massachusetts Endangered Species Act (MESA), because of its rarity and declining population, and is protected by law. Copperheads have been documented in Massachusetts only in the Connecticut River Valley and the Boston area in the past 25 years. Destruction of rocky, wooded habitat and summer feeding grounds, excessive removal by collectors, and mortality at the hands of snake hunters and the general public imperil the Copperhead. Its dependence on traditional den sites (used for many years, perhaps indefinitely) makes this species particularly vulnerable to exploitation by humans.

MANAGEMENT RECOMMENDATIONS: If it were not for the existence of public conservation lands (national and state parks, national forests, state forest preserves) and of privately owned nature preserves, much of the remaining habitat of the Copperhead would have been destroyed. Thus, taking steps to increase public land holdings in prime Copperhead habitats through a variety of purchase or conservation easement mechanisms is an important conservation strategy for this species. In addition to land protection, management recommendations to safeguard known populations would include the following:

- Protecting Copperheads at their known denning colonies through vigilance;
- Maintaining a level of secrecy regarding the localities of den sites;

- Avoiding behavioral disturbance of the snakes by restricting access to den and birthing rookery areas;
- Patrolling the area during vulnerable times, particularly (a) the spring emergence period and (b) the summer gestating and birthing periods;
- Limiting logging within Copperhead habitat to the winter months;
- Educating the public with biologically accurate information and working with local residents to promote understanding of the Copperhead as a beneficial native species of the deciduous forest community.

Due to the location of preferred habitat, the denning sites are rarely affected by construction-type development, but the Copperhead is put at risk by construction and development nearby. Roads, even in state forests and parks, also place this species at risk due to mortality in crossing.

The Copperhead is one of two snake species (the other being the Timber Rattlesnake) that is significantly affected by direct intentional persecution; they are killed out of a deep-rooted sociological fear. Too frequently, a Copperhead coiled quietly in its natural habitat is a target of wanton killing. This species is currently listed as an Endangered species in Massachusetts and is protected under law. Educating the public about the Copperhead and the laws protecting it is critical to the long-term survival of the species.

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