



Natural Heritage & Endangered Species Program

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Description: The four-toed salamander is the smallest salamander found in Massachusetts and is easily identified by three distinctive characteristics: (1) As its name implies, this salamander has only four digits on the front and hind feet, which is unlike most of the other terrestrial salamanders which have four digits on the front and five digits on the hind feet. (2) There is a very distinct constriction at the base of the tail posterior to the hind legs, which is an anti-predator strategy (this salamander can voluntarily shed its tail which then continues to wiggle in an attempt to distract the predator while the salamander escapes). (3) Its belly resembles bright white enamel that is speckled with small black spots.

The body of the four-toed salamander is slender with 13 or 14 costal (ribbed) grooves that meet along the spine in a herringbone pattern and a tail that is greater than 50% of the total body length. The dorsum is reddish brown, fading to gray or almost black in color along the sides; and, as mentioned, the belly is white and covered with black speckles, the size and shape of coarse ground pepper. The males range from 2-3 inches (5.0 -7.6 cm) in total length; females are slightly larger, ranging from 2.8-3.5 inches (6.2-8.9 cm). Mature males are distinguished from females by their smaller size, more slender form, relatively longer tail, and somewhat by color (dorsal surface of the male is slightly darker). Another difference is the shape of the male's snout, which is square-ish and truncated in front with a swollen region of the nasio-labial grooves; additionally, the upper lip overhangs the lower lip. In contrast, the female's snout is rounded and the upper lip does not overhang the lower lip.

The larvae are somewhat non-descript with a mottled yellow-brown dorsum, a slender build, prominent eyes, and a dorsal fin that extends forward to the head. Juveniles generally resemble adults, but have proportionally shorter tails than the adults.

Four-toed Salamander *Hemidactylium scutatum*

State Status: **Delisted**
Federal Status: None



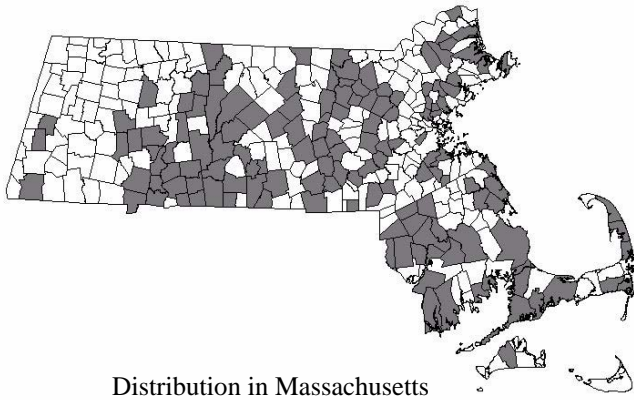
Photo by Bill Byrne

Etymology: The specific name *Hemidactylium* means "partial digits of partial toes". The name *scutatum* signified "covered with shield-like plates", from Latin *scutatus*, "armed with a shield". The salamander's costal grooves produce a superficial resemblance to overlapping plates on the dorsum and sides of the body.

Similar species: Like the four-toed salamander, the river-dwelling Mudpuppy (*Necturus m. maculosus*) has only four hind digits; however, the mudpuppy is much larger in size, 8-13 inches (20-33 cm), has external gills, and does not have either the white and black speckled belly pattern nor the constricted tail of the four-toed salamander. Redback salamanders (*Plethodon cinereus*) may be similar in size and general color; however, they have five toes on their hind feet, and also lack the tail constriction and belly pattern of the four-toed salamander.

Range: Four-toed salamanders occur from southern Maine, Quebec, Ontario, and northern Wisconsin southward to North Carolina, South Carolina, Georgia, Alabama, and Tennessee. Disjunct populations occur in Nova Scotia, Missouri, Arkansas, Louisiana, and Florida.

In Massachusetts, four-toed salamanders have been observed in all counties, except on Nantucket Island.



Distribution in Massachusetts
1980-2006

Based on records in Natural Heritage Database

Habitat: Four-toed salamanders live in forested habitats surrounding swamps, bogs, marshes, vernal pools, and other fish-free aquatic sites that are used as breeding sites. Adults are infrequently encountered outside of the spring nesting period. They are associated with mature hardwood or coniferous forests and when encountered can be found under cover objects such as logs, bark and boards on the forest floor. Juvenile and adult male salamanders are primarily terrestrial. Four-toed Salamanders overwinter in forested habitat in holes, channels and other crevices in the ground.

Four-toed salamanders are also associated with aquatic habitats for breeding a few weeks to months in the early spring and summer. Appropriate breeding habitat is in the form of wetlands with hummocks of grasses, sedges or wet moss (usually sphagnum moss) adjacent to slow moving streams or pools of standing water, is an important factor limiting the occurrence of four-toed salamanders throughout their range.

In Massachusetts, this species breeds in bogs, swamps, marshes, vernal pools or other perennial wetlands with sphagnum or other moss species. As a result of their preference for wetlands dominated by sphagnum, they are quite tolerant of acidic conditions. Larvae are typically found in small pools and slow moving streams associated with appropriate nesting areas. Four-toed salamanders will take refuge in wet moss, under fallen logs and other objects, in rotting wood, under stones or in the leaf litter. Distribution is limited to areas that provide both breeding and upland habitats in close proximity.

Life Cycle / Behavior: The four-toed salamander is inconspicuous, because of its small size and retiring habitats. When one is uncovered, it may slip quickly beneath the humus with lizard-like speed, or lie motionless, relying on cryptic coloration. If threatened, it will curl and raise its lighter-colored tail above its back, offering a piece of tail in exchange for its life. The tail is fragile and easily detached at the constriction near its base. The salamander can even cause the loss of its own tail by pushing against an object. The detached part of the tail wriggles violently for several minutes, a temporary distraction to a potential predator that enables the salamander escape. A new tail is soon regenerated.

The four-toed salamander reaches sexual maturity during its third year. The breeding season for this species lasts from late summer (early August) through fall (October). Mating and courtship take place on land and consist of the male rubbing his snout, lips, or the side of his body against the female's snout. Sperm are then transferred to the female by means of spermatophores (small packages of sperm approximately 2 mm high) which are deposited on the substrate and then picked up by the female and held in her cloaca until the following spring.

The four-toed salamander hibernates in and under rotting wood and leaves as well as in the channels of decaying tree roots. They have a tendency to clump together in small to rather large groups to hibernate, often in association with spring peepers, wood frogs, newts, and other species of salamanders. The four-toed salamander is one of the earliest to emerge from hibernation in the spring appearing from late March to early May. At this time, the females begin to migrate to suitable nesting sites which are generally simple little cavities in the sphagnum moss, but the undersides of stumps, rotten logs, leaf litter, and grass hummocks may also be used. They are invariably placed in the vicinity of water; usually 2-6 inches immediately above it, enabling the larvae to fall directly into the water after hatching. The nest cavity often has the appearance of being formed by turning movements of the female, but in some instances it is evident the female merely takes advantage of a natural opening in the moss or some hollow between the roots of a bog plant.

Eggs are laid from mid-April into June, depending on local climatic conditions. The female turns upside down, grasping rootlets and bits of moss with her feet while slowly forcing the eggs out into the nest cavity which can require several hours to complete. The eggs are laid singly, but adhere in a cluster. The number of eggs per clutch varies from 19 to 50; each egg being 5-6 mm in diameter. Communal nesting may occur with

up to 800 eggs laid in a single nest. Females remain with their eggs protecting them from predators throughout the incubation stage, generally 38 to 60 days, and desert the nests prior to hatching. If the nest is communal one, only a few females will attend the eggs. The larvae are about 1.2 cm long when they hatch and wriggle until they free themselves from the nest and drop into the water. The larvae grow to 0.75-1.0 inch (1.8-2.5 cm) over a period of 6 weeks; although the larval period may last up to 18 weeks depending on pond conditions. At that time, the larvae metamorphose and leave the water.

The diet of adult four-toed salamanders consists of ticks, spiders, springtails, midges, ground beetles, rove beetles, fly larvae, parasitic wasps, ants, earthworms, and snails. Larval four-toed salamanders feed on small zooplankton and other small invertebrates in their aquatic environment.

Population status in Massachusetts: The four-toed salamander was removed from the MESA list in 2006. This species is rare, but rather widespread in the state. As of 2006, there were 144 towns in Massachusetts where four-toed salamanders have been observed. Two-hundred and twenty-eight occurrences were documented between 1981 and 2006, as well as 43 historic occurrences that were documented prior to 1981. Some of these historic localities no longer support populations due to urbanization and development. Due to its nocturnal habits and reclusive behavior, this species is difficult to observe and, though rare, additional “populations” may occur in locations not yet recorded.

Management Recommendations: The greatest threat to the four-toed salamander is habitat destruction resulting from road construction, development, and timber harvesting in and around boggy wetlands, peatlands, and forest wetlands. Given the four-toed salamanders preference for nesting sites in bogs with sphagnum moss, every effort must be made to protect the natural state of bog areas throughout Massachusetts. Additional efforts should be made to determine the status of historic “populations” and to look for new occurrences of this species. Protection of both the breeding and adjacent non-breeding habitat is necessary to ensure the survival of the species. In particular, suitable nesting substrate – sphagnum hummocks abutting pools of water deep enough for larval survival – may be limited, even within relatively large wetlands. Every effort should be

made to identify areas that could potentially serve as nesting habitat and locate work away from these areas. Besides habitat loss, threats to populations are unknown but may include acid precipitation and flooding. Unlike other salamanders whose reproduction has been adversely affected by acid precipitation, the four-toed salamander may have some tolerance in this area. With its preference for an acidic environment, acid precipitation is less likely to affect significantly the four-toed salamander’s reproductive capabilities, but there are limits to its tolerance.

Citizens must be encouraged to recognize and report four-toed salamanders and the locations of their breeding wetlands. Due to the rarity of this species, its ephemeral terrestrial occurrence, and its very specific habitat requirements, some populations undoubtedly remain undiscovered and therefore under protected.

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