The Salamanders of Connecticut with Comments on Conservation

Gregory J. Watkins-Colwell and Twan Leenders

The 22 amphibian and 23 reptile species (not including sea turtles) living wild in Connecticut represent a diversity of habitat needs in addition to diversity of species. Although Connecticut is a small state, the available habitat is diverse. Amphibian and reptile species in Connecticut include species dependant on vernal pools and fragile trap-rock habitat. Some species live in tidal salt marshes, while others require cool, clean mountain streams. Some migrate each fall to ancestral hibernation dens, while others burrow deep into mud in the bottom of a pond to survive the cold New England winters. Connecticut's amphibians and reptiles can be found high in trees and deep underground.

Sadly, because some of these species require very specific habitats, they are subject to extinction through habitat loss. Many species have been given some protection, with a few being classified as endangered or threatened by the State of Connecticut. Hopefully, through public education and continued research and understanding, conservation efforts will succeed and those few species truly in danger of extinction will continue to be valued members of the herpetofaunal diversity of Connecticut.

Amphibia

Amphibians include three major groups of vertebrates including frogs (Anura), salamanders (Caudata) and caecilians (Apoda). These groups include more than 5700 species and are found world-wide in temperate and tropical climates. Amphibians typically have smooth skin and usually live in moist habitats. Reproduction occurs via both external and internal fertilization with many species having aquatic larval stages such as tadpoles. The development of larva is a process called metamorphosis and it follows specific patterns that are often slightly different for each group of amphibians. However, most amphibians in the world lack this life stage and hatch from eggs as miniature versions of the adults or at least late-staged larvae. Many species do not lay eggs in water, but instead lay them on land or in trees. Some amphibians are viviparous or ovoviviparous, and do not lay eggs.

Ten of the twelve salamander species and all of the ten species of frog that occurs within Connecticut have aquatic larval stages. The remaining two salamander species lay eggs on land and have direct development into small versions of the adults.

Salamanders (Amphibia: Caudata)

Salamanders are often very secretive in the wild. Many of the more than 120 species of this group of amphibians in the United States are only seen during the breeding season. Salamanders have a wider array of life history traits than do frogs. While most salamanders spawn in the water and have a larval stage that metamorphoses into a terrestrial adult, some develop directly from eggs into small salamanders, thus bypassing the aquatic larval stage entirely (genus *Plethodon*). Some species are viviparous, giving birth to young lacking an aquatic life stage. Still others have a larval stage that lasts for the entire life of the animal, with aquatic adults with gills (genus *Necturus*). While none of the twelve species of Connecticut salamanders is live-bearing, each of the other life history strategies can be seen.

Blue-spotted Salamander (*Ambystoma laterale*)

Description: A medium-sized salamander (8 inches; 20.3 cm) that is generally stocky in overall body shape. The background color is black with blue or metallic blue flecking. The degree of flecking varies widely. This, coupled with the amount of hybridization that occurs between this and other species throughout its range, can make it difficult to identify readily in the field.
Reproduction: Lays 10 to 20 egg masses of 15 eggs each in vernal pools in the spring. Eggs hatch 30 to 45 days later and larvae usually complete metamorphosis by September.
Eggs and Young:
Habitat: Spends most of its life underground, but surfaces to breed. During the breeding season it can be found under logs and rocks in woodland habitat, or at woodland edges near vernal pools.
Food: Feeds on a variety of invertebrates, including earthworms and insects.
Range: A band ranging from Indiana east to central Massachusetts; from the southern coast of Lake Erie south to Virginia. In Connecticut the range is spotty and complicated by the fact that this species hybridizes with others in its range.
Conservation Status: Diploid populations are threatened in Connecticut, while hybrid "complex" populations, and pure populations of Jefferson Salamander, are of special concern. Recognizing diploid from hybrid animals, however, is nearly impossible without the aid of laboratory techniques. Some differences in body size and coloration can help provide clues that a particular individual might be a hybrid as opposed to a pure form of either Jefferson Salamander or Blue-spotted Salamander. However, distinguishing pure forms from hybrids is difficult for even the most seasoned salamander biologist.

Jefferson's Salamander (*Ambystoma jeffersonianum*)

Description: This is a moderately sized (5.8 inches, 14.9 cm; see Klemens 1993) salamander that is usually gray or silvery gray, or sometimes brown. Some individuals have some light blue speckling or foxing (Klemens 1993). It is typically more slender than many other Ambystoma, with a wide head. This species is known to hybridize with other Ambystoma and produce offspring with multiple sets of chromosomes. Recognizing pure A. jeffersonianum is often difficult and frequently requires genetic testing for certainty.
Reproduction: This species breeds in vernal pools, frequently in ledge areas (Klemens 1993), typically in March through April. Eggs hatch in 30 to 45 days (Bishop 1941) and metamorphosis is usually complete in late summer.
Habitat: In Connecticut typically found in undisturbed deciduous forest with rocky slopes. Elsewhere in its range it may be more tolerant of disturbance. The author has found this species in woodland pockets surrounded on all sides by agriculture in Ohio, though the status of those populations is unknown.
Eggs and Young:
Food: Feeds on a variety of invertebrates. Larvae feed on aquatic insects, worms and other invertebrates.
Range: Southern Indiana through Ohio and Pennsylvania and into New York and the western edge of New England. In Connecticut it is known from only a few counties. Many of the known populations could be hybrids

Marbled Salamander (*Ambystoma opacum*)

Description: A medium-sized salamander with a length of 5 inches (12.7 cm) (see Klemens 1993). The body is generally stocky with a tail usually barely the length of the body. Coloration is black with a white marbling pattern on adults. The pattern color contrast is greater in males than females. Contrast also increases with age.
Reproduction: From 50 to 200 eggs are laid one at a time in the fall. Eggs are scattered around the bottom of vernal pools, or in depressions in the ground that later fill with water Metamorphosis is generally completed in 4 to 6 months. Juveniles tend to have less contrasting coloration than adults. Larval specimens are dark with some greenish or grayish mottling.
Eggs and Young:
Habitat: Generally found under rocks or logs in woodlands. It is often found in habitat that includes oaks. Most of the year it is buried underground, emerging in the late summer and fall to breed in vernal pools.
Food: Feeds primarily on insects and other invertebrates.
Range: Widespread throughout the eastern United States.
Conservation Status: Neither threatened nor endangered. However, there is a possession limit for the species in Connecticut. Destruction of vernal pools may be a primary threat.

Spotted Salamander (*Ambystoma maculatum*)

Description: The largest terrestrial salamander in Connecticut, the spotted salamander measures 6 to 9 inches (15.2 to 22.8 cm). Adults are typically black with yellow spots. The belly is gray to a silvery gray. Occasionally, some animals are entirely black with a grayish belly, lacking any spots on the back. In some parts of the animal's range, the spots, especially those near the head, are orange or red, not yellow.

Reproduction: This species depends on vernal pools to spawn. Adults arrive at the ponds in early spring, often before the last of the ice has thawed. Sperm capsules are deposited by males on submerged leaves. The females collect the sperm capsules and then lay clusters of eggs, each containing about 100 individual eggs. The egg masses typically start clear, but many will become cloudy. In fact, in any vernal pool usually both types of egg masses can be seen. The cloudy coloration may help protect the embryos from ultraviolet (UV) radiation. Additionally, some egg masses will have algae growing within the jelly of the egg mass. This species of algae is found only in the jelly of amphibian egg masses. Newly metamorphosed individuals closely resemble adults, although the spots may not appear immediately on metamorphosis, or at least not as bright as in adults.

Eggs and Young:

Habitat: Found in woodland habitats with mixed hardwoods and vernal pools. In Connecticut they are frequently found in woodland habitats with large rocks. They spend most of their lives underground, typically only appearing above ground during breeding season.

Food: Adults eat a wide variety of invertebrate food and occasionally smaller salamanders. Larvae eat aquatic invertebrates, including mosquito larvae.

Range: Southcentral Ontario to Nova Scotia south to Georgia and central Texas (Behler and King 1979). In Connecticut it is known from every county, but not every township (see Klemens 1993).

Status: Although not specifically protected in Connecticut, there are possession limits on the species. Given its dependence on specific habitat types and vernal pools, this species is among those that suffer from human development in wetland areas.

Conservation Status: This species is vulnerable to habitat fragmentation and loss of vernal pool habitat to development. Though it is presently not specifically protected in the state it is probable that in the relatively near future this situation will change as new studies reveal more about the population ecology of the species and the affect of areas of suitable habitat being increasingly isolated from one another.

Four-toed Salamander (*Hemidactylum scutatum*)

Description: A small salamander 2 to 4 inches (5 to 10 cm) in length. The hind feet have only 4 toes, unlike other species of salamander in Connecticut, which have 5. The base of the tail has a constriction separating the body from the tail. Coloration of the belly is whitish gray with black speckles. The dorsal coloration is reddish brown.
Reproduction: As many as 3 dozen eggs are laid individually on sphagnum near water in the early spring. The female guards them until the larvae hatch. The larvae are aquatic and complete metamorphosis within a couple of months.
Eggs and Young:
Habitat: Sphagnum bogs, red maple swamps and associated upland habitats.
Food: Eats a variety of small invertebrates.
Range: Found in most states east of the Mississippi River. In Connecticut its distribution is more sporadic; this species is mostly found in low-lying areas. Though known from all counties in the state, it is not known from every township (see Klemens 1993).
Conservation Status: Not protected in Connecticut.

Northern Dusky Salamander (*Desmognathus fuscus*)

Description: This is a medium-sized salamander among those found in Connecticut. It reaches an adult size of 3 to 5 inches (7.6 to 12.7 cm). Dorsal coloration of adults is usually brown or tan with darker brown markings usually forming a stripe down the middle of the back. Most diagnostic is the dark line extending from the eye to the corner of the mouth. The head is somewhat flattened and rounded with the jaws appearing to be muscular. The tail is "teardrop-shaped" in cross section, with a dorsal fin. The hind legs are more muscular than the front legs enabling this species to jump well, which it will do in attempts to escape.
Reproduction: Eggs are laid in clusters beneath rocks near water in middle to late summer. The larvae look essentially like the adults, although the pattern may not develop immediately. Larval development occurs in streams and some individuals will remain in larval form for many years. Paedomorphic individuals are known.
Eggs and Young:
Habitat: Usually found in or near clear streams or shallow rivers. It can be found under flat rocks at the edges of such streams. Larvae are often in deeper water.
Food: Eats a wide variety of invertebrates.
Range: South New Brunswick and Quebec southwest to Louisiana (Behler and King 1979). In Connecticut it is found in every county, but it is not known from every town (Klemens 1993).
Status: Has no protected status in Connecticut.

Northern Spring Salamander (*Gyrinophilus poryphoriticus*)

Description: A large (8 inches; 20 cm), stout salamander with a blunt snout. The tail is compressed laterally and thick at the base. Coloration of adults is reddish orange or rusty brown, occasionally with a purple hue and usually with some darker brown marbling. Belly is white. A dark line extends from the eye to the nostril.
Reproduction: Eggs are laid in early spring. Larvae may take several years to complete metamorphosis. Aquatic larvae, which are less stocky than adults and often pale in color. The dorsal pattern is more marbled than adults (see Klemens 1993). The larvae have well-developed gills.
Eggs and Young:
Habitat: As the common name implies, this is a species of freshwater springs and streams. Flowing water that is clean and cold is preferred. Klemens (1992) indicates that they are often found in forested hemlock ravines.
Food: Various invertebrates and smaller amphibians.
Range: The general range of the species is rather large, extending from Canada to northern Georgia. However, its specific habitat requirements mean that the actual distribution is spotty throughout its range. In Connecticut it is limited to a handful of sites in Litchfield, Hartford and Tolland counties (Klemens 1993).
Conservation Status: Because it requires pristine water conditions, the Northern Spring Salamander is easily threatened by land use, including water and thermal pollution. It is listed as threatened in Connecticut.

Northern Two-lined Salamander (*Eurycea bislineata*)

Description: A small (4 inches; 10 cm), slender salamander with a long tail. The body coloration is usually yellow or yellowish orange with 2 distinct dark lateral lines extending from eye to tail. The mid-dorsal region is often peppered with small black dots. Color variants occur in nature and include specimens that are more yellow than normal or have reduced black lines.
Reproduction: Eggs are attached to the underside of rocks on stream bottoms. Larvae may take several years to complete metamorphosis. Multiple females often deposit eggs under the same rock so that many eggs may be found in one place, representing different developmental stages. Aquatic larvae are dark brown with a series of light dots extending down the side beginning just behind the shoulder. The back may also have lighter coloration than the sides. The tail fin is reddish tan with black peppering. A dark line extends from the eye to the gills, which are well developed.
Eggs and Young:
Habitat: Streams and brooks with rocky bottoms may be preferred. However, the species can be found in a variety of habitats. The author has found adults under flat stones near swampy habitat without running water, and in river flood plains. Running water does not seem to be a necessity.
Food: A variety of invertebrates.
Range: A wide range throughout the eastern United States. The distribution of this species in Connecticut is quite extensive, with many known populations in every county. Only the Red-backed Salamander has a wider distribution in the state.
Conservation Status: Not protected by Connecticut.

Red-backed Salamander (*Plethodon cinereus*)

Description: A small, slender salamander with a maximum length of 5 inches (12.7 cm) (see Klemens 1993). The body is slender and the legs are small to the point that, at first glance, the species can be confused with an earthworm. Coloration varies widely, but 2 distinct color morphs are known: the red-back and the lead-back phase. The 2 phases are not geographically isolated from each other and can, in fact, be found under the same log.
Reproduction: Clutches of 4 to 12 soft eggs are laid under logs or rocks. The female often guards the eggs until hatching; there is direct development of the embryos. There is no aquatic larval stage. Juveniles are very small.
Eggs and Young:
Habitat: Generally found under rocks or logs in woodland habitat, often on hillsides, but also frequently found under debris in disturbed areas or in urban or suburban yards.
Food: Feeds mainly on termites, ants and other small invertebrates.
Range: Widespread throughout the northeastern United States.
Conservation Status: Not specifically protected. The most common amphibian species in Connecticut.

Slimy Salamander (*Plethodon glutinosus*)

Description: A large (7 inches; 17.8 cm) and stocky salamander. Black in color and speckled with white or yellowish white spots. When disturbed it secretes a wonderful glue that promptly sticks to anything that touches the animal, including your fingers, or the mouth of a garter snake. While the predator is attempting to remove the glue (and sticks and leaves stuck in the glue) the salamander escapes.
Reproduction: Direct development occurs in this species. Females deposit eggs under a log or rock in late spring. It can take at least 5 years for juveniles to mature and females may only breed every second year (see Klemens 1992). Similar are to adults, but with fewer spots.
Eggs and Young:
Habitat: Occurs in forested habitat with much ground cover in the form of rotting logs and flat rocks. It is usually found on hillsides. The author has found this species in Ohio under rocks on steep hillsides along mountain streams where Northern Spring Salamanders occur.
Food: Various invertebrates.
Range: Though it has a wide range in the eastern United States, Connecticut appears to be at the edge of that range. In Connecticut its distribution is restricted to northwestern Fairfield County.
Conservation Status: This species is threatened in Connecticut.

Mudpuppy (*Necturus maculosus*)

Description: At a maximum adult size of 19 inches (48.3 cm), this is the largest salamander in Connecticut. The species is completely aquatic. Adults have large feather gills elevated on stalks just behind the eyes. Coloration is gray with darker gray to black dorsal spots and a black stripe passing from the nose, through the small eyes, to the gill stalks.
Reproduction: Mates in the fall, but eggs are not laid until the following spring. Eggs are deposited under submerged rocks or logs. As many as 100 eggs are laid in one clutch and may hatch in just over one month. Larvae do not become sexually mature until their sixth year (see Klemens 1992). Larvae look much like the adults, but generally with lighter coloration and a black stripe along the side.
Eggs and Young:
Habitat: Occurs in a wide range of water conditions, including rivers and drainage ditches.
Food: Eats invertebrates, smaller salamanders, and fish.
Range: The species can be found from Canada to Tennessee and as far west as Kansas. In Connecticut it is thought to be an introduced species, found only in the Connecticut and Housatonic River.
Conservation Status: Not protected in Connecticut.

Red-spotted Newt (*Notopthalmus viridens*)

Description: Adults are 4 inches (10 cm) in total length and are generally greenish in color with small red spots on the dorsolateral surface of the body. The belly is yellow with black peppering. In breeding season, males have a pronounced dorsal crest on the tail. Adults are aquatic.
Reproduction: Eggs are laid singly on submerged vegetation after an elaborate underwater courtship "dance" where the male holds his tail above his body and waves it in the water. During this dance the male will often hold the female's head with his hind legs and will even nuzzle her with his nose. Eggs hatch into aquatic larvae. After a larval state of generally a few months, metamorphosis occurs. The resultant stage is the "eft" stage, which resembles the adults in many ways but is orange or red in color. During this stage, which may last a year or more, the animal is often found walking in the open in early morning or after summer rains. The skin is warty.
Eggs and Young:
Habitat: Adults are found in a variety of bodies of water, usually those that are permanent or semi-permanent. The author has caught adults in large ponds, vernal pools, freshwater marshes and even in mud puddles in the middle of dirt roads. Active adults are sometimes seen under ice in the early spring and can dive quite deep.
Food: Eats a variety of invertebrates. Adults also eat small fish and tadpoles.
Range: Extensive range throughout the eastern United States with many subspecies, especially in the south. In Connecticut the species is known to occur throughout the state.
Conservation Status: Adults are not protected. However, juvenile life stages may not be possessed in the state.

Key to Connecticut's salamanders (non-larval)

1 a. external gills present in adult; large (8-12") and fully aquatic, with paddle shaped and muscular tail. Uniform gray with darker spots. Head flat with large feathery gills above the back of the jaws on each side. ……..…***Necturus maculosus*** **(Mudpuppy)**
b. no external gills in adult, not as above …… 2

2 a. costal grooves absent. Rough skinned with a series of dark circles along the sides. Body may be greenish above or bright red or orange (specimens that are orange or red have rougher skin). Belly speckled and either yellow or yellowish-orange……..….***Notopthalmus viridescens*** **(Red-spotted Newt)**
b. costal grooves present, not as above…… 3

3 a. Large (adults >2.5-3" in SVL) and robust. When limbs are pressed against side of the body, toes of front and back limbs overlap or (almost) touch……**Ambystomatidae (Mole Salamanders)**….4
b. generally small (usually <2" in SVL), slender and elongate. Toes widely separated when limbs are adpressed against side of body……**Plethodontidae (Lungless Salamanders)**……..7

4 a. Dark gray, brown or purplish in color with 2 parallel rows of light (yellow, cream) spots on the dorsal surface. Belly is grayish to grayish white……***Ambystoma maculatum*** **(Spotted Salamander)**
b. Lacks parallel rows of spots or is otherwise marked……..5

5 a. Black with a pattern of squarish or ladder-like dorsal blotches. Blotches white, silvery gray or light blue. Belly dark……***Ambystoma opacum*** **(Marbled Salamander)**
b. Not as above……..6

6 a. Salamander uniform gray, grayish-blue or silvery gray, generally with a purplish-blue wash but without distinct blue blotches. Toes appear long and slender relative to body size. ……***Ambystoma jeffersonianum*** **(Jefferson's Salamander)**
b. A relatively small black salamander with discreet blue blotches. Toes not distinctly elongate and slender …….. ***Ambystoma laterale*** **(Blue-spotted Salamander)**

7 a. With 4 toes on each hind foot. Belly white or silvery in color with many dark spots ……..…… ……***Hemidactylium scutatum*** **(Four-toed Salamander)**
b. With 5 toes on each hind foot. Belly typically uniform in color or dark with light mottling ……..….8

8 a. Robust. Hind leg clearly larger than front leg. Tail wedge or tear drop-shaped in cross section. Head proportionally large, with bulging jaw muscles. Usually uniform dark grey to brown, with or without dorsal blotches; a light line extends from the eye to the posterior margin of the mouth. Generally found under rocks or logs along stream sides……***Desmognathus fuscus*** **(Dusky Salamander)**
b. Hind leg and front leg roughly the same size. Not as above ……..…….9

9 a. A large, robust (semi) aquatic salamander with muscular limbs, a powerful paddle-shaped tail and large head. Generally tan, pink or brown with distinct sharp ridge between eye and nostril, marked by a light line. ……***Gyrinophilus porphyriticus*** **(Northern Spring Salamander)**
b. Not as above ……..……10

10 a. A small streamside salamander with a yellowish belly. Back may be greenish, yellowish or tan generally with either 2 dark stripes lateral to midline or a series of dark dots or dashes that form a similar pair of lines. Slender body and tail. Tail not wedge-shaped. Dark line may be present from eye to corner of mouth……***Eurycea bislineata*** **(Two-lined Salamander)**
b. not as above ……11

11 a. A medium-sized, black woodland salamander with a dense pattern of silvery-white spots on the dorsum. Belly usually grayish. A small groove runs between the nostril and the front of the mouth. Excretes very sticky secretion when handled ……***Plethodon glutinosus*** **(Slimy Salamander)**
b. A small, slender woodland salamander. Grayish, reddish, or tan with dark sides and broad middorsal light band ("red-back" phase), or entirely dark gray with dusting of light specks ("lead-back" phase). Occasionally, sides and body are entirely red with tail-tip dark or black ("erythristic" phase). Belly grayish with lighter dusting of white or silvery gray……***Plethodon cinereus*** **(Red-backed Salamander)**

Gregory Watkins-Colwell
Museum Assistant, Vertebrate Zoology
Peabody Museum of Natural History, Yale University
170 Whitney Avenue
PO Box 208118
New Haven, CT 06520-8118
Email: Gregory.watkins-collwell@yale.edu
Tel. (203) 432-3791

Twan Leenders
Conservation Biologist
Connecticut Audubon Society
2325 Burr Street
Fairfield, CT 06824
Email: tleenders@ctaudubon.org
Tel. (203) 259 6305 ext. 114

Resources

AmphibiaWeb is an online system enabling anyone with a Web browser to quickly search and retrieve information relating to amphibian biology and conservation. http://www.amphibiaweb.org/aw/index.html

The Global Amphibian Assessment (GAA) is the first-ever comprehensive assessment of the conservation status of the world's 5,743 known species of frogs, toads, salamanders, and caecilians. http://www.globalamphibians.org/

The Connecticut Amphibian Monitoring Project (CAMP) is a 15-year study to assess amphibian populations throughout the State. http://www.scinax.com/camp/

The Herpetologists' League, established in 1936, is an international organization of people devoted to studying the biology of amphibians and reptiles. http://www.inhs.uiuc.edu/cbd/HL/HL.html

The Society for the Study of Amphibians and Reptiles, a not-for-profit organization established to advance research, conservation, and education concerning amphibians and reptiles, was founded in 1958. http://www.ssarherps.org

Important Terms

Amphibian: An ectothermic vertebrate animal lacking scales. Adults are often terrestrial. Many species have larval stages.
Chromosomes: Structures containing DNA within the nucleus of a cell.
Diploid: Having two sets of chromosomes.
Ectotherm: An animal whose body temperature depends upon the temperature of its surroundings.
Herpetology: The field of science devoted to the study of amphibians and/or reptiles.
Home range: The space an individual animal may occupy within its normal activities.
Hybrid: The result of a cross-breeding between two different species of plant or animal.
Indicator Species: A species whose presence or absence in an area may serve to indicate the condition or quality of the environment there.
Larva: Aquatic life stage of amphibians. The larval stage of frogs is often called “tadpole” or “pollywog”.
Metamorphosis: The transformation from larval to adult.
Oviparous: Reproductive method that involves laying eggs.
Terrestrial: Living on land.
Triploid: Having three sets of chromosomes.
Vernal Pool: A temporary body of water that holds water in spring months.
Vertebrate: An animal having a back-bone.
Viviparous: The reproductive method that involves giving birth to live young, rather than laying eggs.
Anura: The group of amphibians that includes frogs and toads.
Caudata: The group of amphibians that includes salamanders and newts.