

Keeping and Breeding the Barred Tiger Salamander

Ambystoma mavortium

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The barred tiger salamander, *Ambystoma mavortium*, belongs to the family Ambystomatidae, the mole salamanders, of which it is certainly the most imposing species. With some specimens reaching more than 35 centimeters in total length, it is the largest terrestrial salamander of any family — most barred tiger salamanders measure 25–30 centimeters.

Ambystoma mavortium usually has an aquatic larval stage that metamorphoses into a terrestrial adult, but some populations are neotenic, meaning that the larval aquatic form reaches sexual maturity without ever metamorphosing. Mature neotenic specimens often grow larger than their terrestrial counterparts. Among neotenic populations, two groups have been distinguished: the “normal” form, which feeds on aquatic insects; and a cannibalistic form that is specialized in feeding on its own kind, and readily

Female *Ambystoma mavortium diaboli*. Photo: T. Blanck



identifiable by a larger, broader head and more pronounced jaw. Cannibalism is not known in terrestrial populations, but most subspecies seem to have larger and smaller forms.

Barred tiger salamanders can live to 25 years of age, making them the longest lived of all salamanders.

This species has one of the largest distribution ranges of any salamander, extending from southwestern Canada through the western and central United States and into northern Mexico. With such a large distribution there are a number of clearly distinguishable forms that vary in morphology and coloration — some have been recognized as subspecies, others have been described but not widely accepted.

All of the subspecies of *Ambystoma mavortium* have a robust and quite plump build with an elongate body and a long tail. The head is large with a blunt snout and relatively small eyes, and broadens distinctly toward the neck.

The species is highly adaptable, and inhabits light woodland, marshes, meadows, shrubland, grassy steppe, rocky areas, semidesert, and even the edges of deserts. It is found in flatland and in the mountains at elevations up to 3,300 meters above sea level. One of the few requisites is that the habitat include suitable breeding waters such as ponds or small streams that are free of fish, including manmade ponds for irrigation or watering livestock.

Outside the breeding season, barred tiger salamanders in the wild are crepuscular and nocturnal, spending most of the daytime hours hiding in burrows that they may dig themselves (up to several meters long and deep), or under stones, in crevices in rocks or tree bark. Depending on climate conditions corresponding with geographic location, salamanders of this species may spend dry or cold seasons deep underground.

Despite habitat destruction, draining of ponds or the introduction of predacious fish, and to a lesser degree collection of salamanders for the pet trade, the species is still quite abundant in many places.



Male *Ambystoma mavortium mavortium*. Photo: T. Blanck

Until recently the barred tiger salamander was considered a subspecies of *Ambystoma tigrinum*, the eastern tiger salamander. However, morphological and genetic studies have shown significant differences, based on which *Ambystoma mavortium* has been given full species status. But taxonomic changes are slow in becoming established, and there are still many recent authors who refer to the barred tiger salamander as a subspecies of *Ambystoma tigrinum*.

This salamander is a popular terrarium pet, especially in the United States. On the other hand, the larvae are commonly sold under the name "waterdogs" to be used as bait for fishing — a practice that contributes to the mixing of different subspecies and forms, creating havoc for taxonomists.

This species is also regularly imported to Europe. Unfortunately these animals are usually infested with parasites or half starved when they arrive at the pet shop, and the majority do not survive long.

Successful captive breeding is rare in Europe, which makes it difficult to find robust captive-bred specimens. Another problem with imported specimens is their unknown origin. The salamanders usually arrive in a mixed group from diverse origins, which helps explain captive-breeding failures.

Ambystoma mavortium is often marketed as a good species for beginners, but this is not at all the case. Nonetheless, if certain aspects of captive care are taken into account, the barred tiger salamander can be a long-lived and robust animal.

Captive housing

With the exception of *Ambystoma mavortium stebbinsi* and *Ambystoma mavortium utahense*, we house all subspecies of *Ambystoma mavortium* in separate groups. We have been fortunate to know the origins of our specimens, which is a foundation for successful breeding and preservation of pure forms. All of our specimens were imported as



The salamanders quickly learn to take food from the keeper's hand. Photo: T. Blanck

juveniles from 2004 to 2006. The sexes could be identified at the time we acquired them, but they had not been given a cold winter, and our first breeding attempts were not successful.

The bottom surface area of a tank for tiger salamanders is often given as 60–80 x 40 centimeters, but we consider this quite small for an adult pair. Our breeding groups of one adult male and two adult females are housed in tanks with a bottom surface area of 120–150 x 50 centimeters.

The substrate is composed as follows. On the bottom of the tank there is a 5-centimeter drainage layer of expanded clay pellets, to prevent mildew and at the same time help maintain ground moisture. Then there is a 20-centimeter layer of a soil mixture: 40 percent forest soil, 30 percent biohumus, 20 percent beech leaf litter, and 10 percent fine sand. This provides a good variable texture and a consistency suitable for the digging activity of the

Ambystoma mavortium diaboli eating. Photo: T. Blanck



salamanders. On top of the soil mix we add a layer of leaf litter and sporadic clumps of sphagnum moss.

All of our specimens dig very actively, usually in the soil substrate mixture, but sometimes even down into the clay pellets, which cause them no harm. Some keepers house these salamanders on a substrate of paper towels, but that method is not correct for the species in our opinion.

Live plants such as ferns and mosses can be used in the salamander enclosure with no problem as long as no fertilizers are used. Pieces of root and bark make good hiding places. Stone slabs can also be used, but be sure they cannot fall if the salamanders dig under them. These salamanders are gregarious animals and often hide together in the same spot even though there are plenty of separate hiding places available for all of them.

A pool of water measuring 30 x 30 x 20 centimeters (length x width x depth) is always available for the salamanders, and is used especially in the spring. In our observation the most aquatic subspecies is *Ambystoma mavortium melanostictum*. The pool is made with a piece of pond liner, allowing for a natural form with deeper and shallower areas. The salamanders dig around and under the pond, but this has not caused any problems. The important thing is that it is easy for the animals to get out of the water — with bark ramps, for example. Even salamanders can drown. The water should be changed at least once a week, as it will also be used as a toilet.

The substrate should be kept moist with an automatic spray system or with a hand mister. The enclosure should be well sprayed every morning and evening, leaving a few dry places such as under pieces of bark. A fog machine usually increases the daytime activity of the salamanders. In early summer we provided a 3-week dry period for our *Ambystoma mavortium mavortium*, simulating conditions the species often gets in its natural habitat. Our specimens dug down into the substrate almost to the bottom of the tank, and reappeared on the surface again only after spraying was resumed.

View of a terrarium for barred tiger salamanders. Photo: T. Blanck





Terrariums for barred tiger salamanders. Photo: T. Blanck

Lighting can be provided with weak fluorescent tubes (20 watt) or energy efficient lamps (7 watt). Tiger salamanders do not bask — they tend to shy away from light. They do not need UV radiation, which can be harmful for them. In the wild, tiger salamanders are mainly crepuscular and nocturnal, but their behavior is different in captivity. Unlike any other species of the genus we have observed, *Ambystoma mavortium* in captivity is often active all day and becomes quite tame.

The temperature in summer should be 18–22°C (64–72°F), maximum 24°C (75°F). Prolonged higher temperatures can be harmful.

Hibernation is recommended. The animals are kept in the basement in a terrarium filled with leaf litter at temperatures of 2–5°C (36–41°F) for 2 months. Substrate moisture should be monitored continually.

Breeding

In the wild, terrestrial adult salamanders migrate to their breeding ponds at night during rainy weather, usually immediately after snowmelt where that exists, and varying greatly with geographic location. The northern subspecies *Ambystoma mavortium diaboli* and *Ambystoma mavortium melanostictum* breed from mid February to the end of April. The central and highland subspecies such as *Ambystoma mavortium utahense* and *Ambystoma mavortium nebulosum* breed from May to August. The southern

subspecies and lowland populations such as *Ambystoma mavortium mavortium* breed from January to May, and *Ambystoma mavortium stebbinsi* breeds in March and April. This innate difference in mating seasons could be one of the main problems in captive breeding since most captives are of unknown and often kept in groups of mixed origins.

Mating takes place in small ponds, pools, or watering holes, and sometimes in slow-moving streams — usually in waters where there are no fish. The male circles the female until she follows him. Then the male deposits a spermatophore on the bottom of the pond, and the female picks it up with her cloaca.

Two or three days after mating, the female deposits eggs. The record number of eggs laid by a salamander female is 7,631 — usually the clutch numbers about 1,000 eggs. The eggs are deposited singly, in short strands, or in small clumps on aquatic plants. Time to eclosion varies greatly depending on geographic location and water temperature, usually between 6 and 25 days.

The *Ambystoma mavortium* larva measures about 1–1.5 centimeters in length at the time of hatching, and then grows rapidly. In terrestrial populations, metamorphosis takes place after 2–5 months, when the larva has grown to 4–10 centimeters. Warmer water temperatures — 19–25°C (66–77°F) — speed growth.

Sexual maturity is reached in 1–4 years depending on origin and diet, usually when the salamander has reached 15 centimeters in total length. Males are generally slimmer than females, and have thinner longer tails, although these characteristics are difficult to evaluate without experience and several specimens for comparison. Especially during breeding season, the male has a noticeably thickened cloaca.

As already mentioned, captive breeding of *Ambystoma mavortium* has only seldom been successful. The species has been bred in a terrarium by a total of only 5–6 keepers, in Germany, Austria, France, and Japan. Captive breeding in the United

Ambystoma mavortium mavortium in a terrarium. Photo: T. Blanck





Female *Ambystoma mavortium mavortium*. Photo: T. Blanck

States has been successful only in year-round outdoor free-range conditions. Unfortunately, published reports on the reproduction of the species are limited to a short Internet news item by Paul Devienne at www.caudata.org.

Critical for reproduction are compatible mates — i.e., from the same origin — and triggering of mating behavior. The mating season varies greatly, as already mentioned, between different parts of the very large distribution range of the species, which can make captive breeding difficult if the origins of the specimens are not known. Outdoor maintenance seems to be the most successful method, exposing the salamanders to the weather and possible mating triggers.

But the most important factor for successful captive reproduction seems to be a cold hibernation period as reported by Devienne and others who have had breeding success with the species. A cold period of 1–2 months at 2–5°C (36–41°F) seems to be ideal.

In early spring the terrarium should then be slowly returned to warmer temperatures, and rains should be simulated with a sprinkler system or hand mister. An ample pool of water at about 10°C (50°F) with aquatic plants should be provided.

When eggs hatch, larvae should be transferred to an aquarium with a filter and a water depth of 20–30 centimeters. The water does not need to be heated — room temperature is fine. The tank should not be in a sunny place or it will overheat.

The salamander larvae are first fed water fleas, and then mosquito larvae, gammarus, and other small aquatic invertebrates. When the larvae have grown to about 5 centimeters they can also be fed guppies.

Food

In the wild, the barred tiger salamander eats practically anything it can overpower, including small

insects, tadpoles, worms, and even frogs, baby birds, young rodents, and small snakes. In captivity the salamanders are also easy to please. They take crickets, grasshoppers, earthworms, meadow sweepings, slugs, king mealworms, fish, pinky mice, and beef heart and other lean meat. Rich foods such as mealworms should be given infrequently. The salamanders are voracious eaters and easily become overweight. Especially dead food items should be fed with tongs to permit careful monitoring — we also offer live prey with tongs. All of our specimens take food readily from tongs. By the way, a bite does not hurt.

Feeding frequency should depend on the age and condition of the salamander. We feed healthy juveniles every other day. We feed healthy adults (15 centimeters and larger) once or twice a week, usually in the late afternoon. The animals remember feeding spots and times.

Tiger salamanders are fairly clumsy and slow lie-in-wait hunters. At feeding time live prey often gets away from them. On the other hand, when offered prey with tongs, the salamanders can become quite aggressive, jumping and snapping to get the food. They don't have very good aim however, and usually have to try several times before succeeding.

The salamander usually shakes the food and then swallows it whole. It is surprising what large pieces the salamander can gulp down. ■

Male *Ambystoma mavortium diaboli*. Photo: T. Blanck

