



Salamander Blues

—The Blue-spotted Salamander

by Rob Criswell

They say beauty is in the eye of the beholder, but who could argue the elegance of a sinuous, shimmering piece of onyx encrusted with fine flecks of turquoise. The fact that this gem is not a precious stone but an amphibian should make little difference.

The jewel that is the subject of this description is none other than the blue-spotted salamander, and the status of this diminutive forest dweller is a cause for concern in Pennsylvania. It was not known to occur in the Keystone State until 2000 when it was discovered in McKean County during a rangewide survey of the mole salamander species in the northeast. Since then, it has been found at only two other locations in Northampton and Warren counties. Its dire situation has resulted in it being listed by the Pennsylvania Fish & Boat Commission (PFBC) as an endangered species.

The blue-spotted salamander is a slender salamander reaching a length of 4 to 5½ inches, but nearly half of that is tail. Its namesake spots and flecks adorn its sides, legs, cheeks, tail and its back to a lesser extent. The blue-spotted salamander's spots resemble the patterns of pots and pans known as graniteware. Its belly is paler than the dark grey or ebony background color that highlights its brilliant markings.

Although attractive, these amphibians rarely show themselves, preferring to lead a reclusive, subterranean existence. They favor moist, shady deciduous and mixed forests where they spend most of their time hunting insects, spiders and worms under leaf litter or resting in vacant, small burrows up to 3 feet below the surface.

Blue-spotted salamanders, like many other reptiles and amphibians, lead double lives and require aquatic environs in addition to upland habitat for breeding and the development of their offspring. In Pennsylvania, this requirement is satisfied by a variety of waterways, and blue-spotted salamanders may occur in upland forests where ponds, swamps and seasonal pools exist or in forested floodplains along larger streams and rivers.

When things begin to thaw in March and April, these amphibians crawl to the surface and head for the pool, males first with reproduction in mind. Their treks may take them as far as 4/10 of a mile from their terrestrial territory, but they usually migrate less than 100 yards. When the females join them, they engage in elaborate rituals. A male courts a single female by engaging her in a nudging, chin rubbing and tail fanning courtship ceremony. The male then deposits a small sac, called a spermatophore, on the bottom of the pool, and his amour picks it up to fertilize her eggs.

It is here where the blue-spotted salamander and the Jefferson salamander, another species of the same genus (*Ambystoma*, the mole salamanders) that occurs in

Pennsylvania, become unwitting pawns in one of the most bizarre reproductive scandals in nature. For there also exists, within the distributional ranges of these two salamanders, populations of hybrid-like unisexual salamanders consisting almost entirely of females. Recently, uncovered DNA evidence has led to the theory that these unisexuals likely arose from a hybridization event 3 to 4 million years ago but are not true hybrids. Even though the hybrids were once thought to be a separate species, they are now considered just part of the group known as the “Jefferson complex,” which includes the Jefferson salamanders and related hybrids, or the “blue-spotted group,” which includes the blue-spotted salamander and related hybrids.

If this isn't complicated enough, it gets worse. The unisexual female's eggs develop without fertilization, but she still needs sperm to stimulate their development. So, the unisexual female “steals” sperm sacs dropped by the non-hybrid mating males. In this process, known as kleptogenesis, which may occur nowhere else in the animal kingdom, these reproductive thieves can incorporate some genes from the “donor” male but still maintain most of their original genetic blueprint and defy our normal concept of what a species is.

To make matters worse, the unisexuals usually far outnumber the non-hybridized species that occur in the same area, they may be very similar in appearance to the donor male, may possess one or more additional sets of chromosomes, and can be difficult to positively identify to the untrained eye.

What is even more mysterious about these species is that Jefferson salamanders and blue-spotted salamanders appear to utilize different breeding habitats in Pennsylvania. According to Branden Ruhe of the Mid-Atlantic Center for Herpetology and Conservation, who worked extensively with both species on the rangewide study that discovered the blue-spotted salamanders in Pennsylvania, “Throughout North America, the two closely-related species have never been found in the same breeding habitat. Jefferson salamanders tend to prefer fishless seasonal pools (vernal pools) and perched swamps within upland landscapes, while blue-spotted salamanders generally live in large lowland swamps and pool systems.”

After courtship, the female blue-spotted salamander attaches her approximately 200 eggs singly or in masses of 2 to 15 to submerged vegetation, where they will hatch in 3 to 4 weeks. These salamanders feed on tiny crustaceans, fly larvae and occasionally small tadpoles. Then, they develop into adults in 2 to 3 months.

The blue-spotted salamander occupies the area from the Gulf of St. Lawrence in southern Canada, west to the Lake Superior region and south to northern Illinois, Indiana,



Photo: Andrew L. Shields

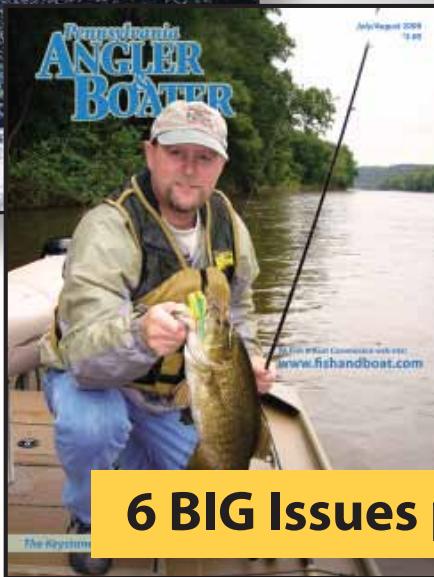
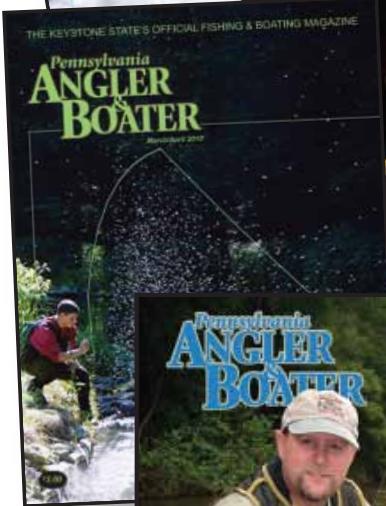
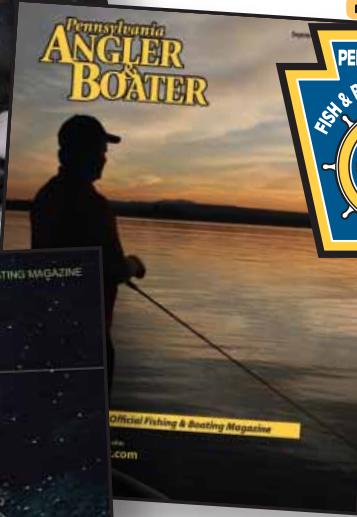
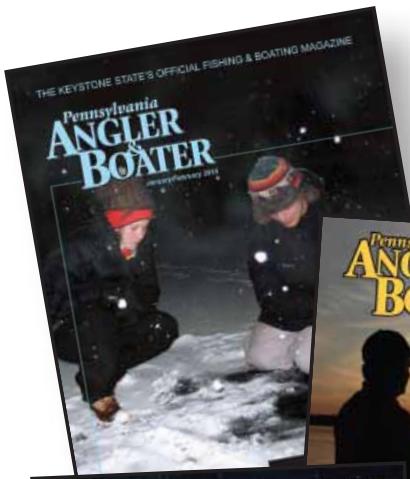
Ohio, Pennsylvania and New Jersey. Although the Keystone State is on the edge of its range and has only recently been discovered here, it has probably been a resident for millennia. Its secretive nature and superficial resemblance to the Jefferson salamander allowed it to avoid detection, even during the Pennsylvania Herpetological Atlas projects.

A number of threats confront this amphibian, but predators may be the least of their worries. Blue-spotted salamanders have several weapons in their arsenal to combat would-be attackers including curling their bodies and lashing at their attackers with their tails. If that ploy fails and the tail falls into the assailant's clutches, it simply tears away and a new one regenerates. Glands at the base of the tail also emit a noxious secretion during the confrontation.

Although there may be additional populations of blue-spotted salamanders waiting to be discovered in Pennsylvania, it is evident that they are very rare. Their conservation and long-term well-being are major concerns.

This species is known to inhabit less than three square miles in the state. Its dependence on forested, shallow-water breeding areas makes it vulnerable to land development and fragmentation, pollution and changes in hydrology. In addition, unisexual salamanders also occur and outnumber blue-spotted salamanders at all three known locations. How they interact and compete is unknown.

According to Chris Urban, Chief of Pennsylvania Fish & Boat Commission (PFBC) Natural Diversity Section, because the habitats these salamanders occupy do not often clearly fall under wetland and waterway categories, which require permits and consultation with state and federal agencies when earth disturbance is anticipated, protecting their habitats can be a challenging, up-hill battle. Urban believes that the blue-spotted salamander's future in Pennsylvania is dependent on protecting the sensitive seasonal pool habitats they breed in and the surrounding upland habitats where they forage and live most of their underground lives. Future conservation efforts for PFBC and their partners will be focused on discovering new populations and protecting this species' critical habitats for the long-term through land acquisition and easements. □



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