

Jim White



# TIGER SALAMANDERS

## A Living Litmus Test

By Scott A. Smith

It was a cold, sunny February day in 1997 when Maryland Department of Natural Resources (DNR) Ecologist Kathy McCarthy and I broke through the skim ice covering a small Kent County pond.

Clumsy in our boots and chest waders and numb from the cold, we were nonetheless filled with a sense of anticipation.

After all, we were searching for tigers!

### Tigers? In Maryland?

No, not big cats escaped from the zoo. We were hunting something considerably smaller - but equally as rare; the elusive, endangered Eastern Tiger Salamander (*Ambystoma t. tigrinum*).

We each carried a 5-gallon bucket, the plastic bottom replaced with Plexiglas. We peered through the newly translucent undersides, searching for tigers in the icy water. Our chance of actually seeing an adult salamander was low; what we

really hoped to observe and count were their gelatinous egg masses attached to vegetation and woody debris near the pond bottom. This would give us some idea of annual reproductive effort and a rough idea of the number of females who bred that year.

On this particular day, we did not see any signs of adult salamanders or their eggs. We did, however, see evidence of fish in the pond. That was bad news, salamander-wise.

The ponds that tiger salamanders use for breeding are shallow wetlands known as vernal pools.

On the Eastern Shore, these seasonal ponds are called "Delmarva Bays." Most years, the ponds fill up during fall or winter rains and dry out by summer. This seasonal hydrology normally results in an absence of predatory fish, which eat larvae and adult salamanders. During excessively wet years when the ponds do not dry out, fish

can become temporarily established. That is what Kathy and I found on that cold day in 1997. Sometime later that winter, 2 egg masses were observed in the pond. That was the total output in this particular pond for the year. Where were the tigers?

### What's in a Name?

The Eastern tiger salamander is the largest terrestrial salamander in North America. It reaches a maximum length of 13 inches, with an average adult length of 7 to 8 inches. The amphibian's back, sides and tail are covered in irregular patches of alternating dark brown/black and olive-yellow, sometimes arranged like "tiger" stripes, hence its common name.

The tiger salamander is a member of the mole salamander family, so called because adults are primarily subterranean and live most of their lives in the underground burrows of moles and other small mammals. They also dig their own tunnels. Their above ground habitat is mature hardwood and mixed forest.

### A History of Scarcity

The tiger salamander is one of 21 salamander species known in Maryland. They were first discovered in Maryland in 1933 at Vienna in Dorchester County. Since then, they have been recorded in Caroline, Charles, Kent, Queen Anne's, Somerset and Worcester Counties. The only known Western Shore population, a site near LaPlata in Charles County, was discovered in 1953. It was destroyed in 1963 to make room for a golf course.

### The Dean

The dean of Maryland tiger salamander researchers, Dr. Charles Stine, began his lifelong passion in the early 1950s when he discovered a number of tiger salamander breeding ponds in Kent County. Additional field work by Dr. Stine and his students, most notably Robert Johnson, turned up a handful of sites. DNR funded much of Dr. Stine's research, including population assessments starting in 1977. Dr. Stine's work has greatly increased knowledge and understanding of this species in Maryland.



Massey Pond, late January 2009; Do tiger salamanders lurk under the ice? Only time and a thaw will tell!

By 1984, only seven ponds in two Eastern Shore counties (Caroline and Kent) held tiger salamanders, down from a total of 18 historic sites. This decline was attributed to wetland loss, deforestation, water pollution, and vegetative succession (pond basins becoming dominated by

Charles County in 1982. Both efforts were unsuccessful.

### Cold Weather Breeding

Though the tiger salamander is what is referred to as a cold-blooded creature, it is one of the earliest breeding animals in

on rainfall, humidity, air temperatures and the availability of water deep enough for egg laying.

Males leave their underground burrows after a few days of warm winter weather. In their quest to mate, they will often cross ice-encrusted ponds and slip into frigid waters where ice has melted. Females follow within a few days to two weeks. Reproduction may take place under the ice in some years.

After a nuptial dance by the males, which includes snout rubbing the female's body and grasping her side, the male deposits a pyramidal-shaped gelatinous spermatophore (a capsule or mass containing spermatozoa created by males of various animal species) on the pond bottom. If the female is receptive, she will lower herself over the spermatophore and insert it into her cloaca (the common cavity into which the intestinal, genital, and urinary tracts open in vertebrates), fertilizing her eggs.

Within 36 hours the female attaches a number of egg masses from 20 to 125 eggs each onto the stems of herbaceous or woody vegetation. The eggs expand as they fill with water, usually to 2 by 4-inch oblong gelatinous masses.

It is believed females leave the pond soon after they deposit their eggs. Males stay in the pond for weeks, attempting to mate with every female that presents herself,



External gills identify this larvae as a salamander (frog gills are internal). Eastern Tiger Salamanders have a long larval period of from 75 to 205 days. Survival is low due to diverse predators and the drying out of seasonal ponds.

woody species).

DNR attempted to establish new tiger salamander populations by relocating egg masses and/or larvae at Aberdeen Proving Ground in Harford County in 1977 and 1978, and at Myrtle Grove Wildlife Management Area (WMA) in

Maryland. Egg-laying has been recorded on the Eastern Shore as early as late November and as late as mid-March. Peak breeding usually takes place during the January thaw. Breeding may last only a few nights a year. It is more common for it to continue for some weeks, depending

and depositing many spermatophores on the pond bottom in the course of one breeding season.

Tiger salamander eggs normally hatch in about 30 days. The incubation period depends on water temperature, turbidity and the amount of shading. The larval period is highly variable — anywhere from 75 to 205 days depending on



DNR Biologist Jenny McClune surveys Massey Pond in Kent County for tiger salamander egg masses. This March 2008 day was a success with 23 egg masses counted.

temperatures, water levels and food availability. Survival rates of larval tiger salamanders are extremely low due to predation by other salamander larvae, diving beetles, other amphibians, reptiles and wading birds. Ponds may also dry out before larvae fully develop.

Tiger salamanders compensate for low survival of larvae by having amazing adult longevity. They have been recorded to live as long as 25 years, with the average lifespan believed to be about 18 years.

### A Maryland Tiger Safari

In an attempt to monitor tiger salamander populations and find new breeding ponds,



Recently laid tiger salamander egg masses viewed through thin ice in January 2008.

DNR visited 74 historic or potential breeding ponds on the Eastern Shore from 1997 to 1999. During that period, breeding could only be confirmed at three historic sites, but three new breeding ponds were discovered. All of the sites were in Caroline and Kent Counties.

A population crash we discovered at Massey Pond in Kent County was extremely troubling; the pond had historically been the mainstay of Maryland's tiger salamander population. The forest around the site had been logged in 1996 by the landowner, one year before it was purchased by The Nature Conservancy for DNR. In the breeding season prior to the timber harvest, 178 egg masses were counted. The year after the harvest, only 2 egg masses were found. The count had only risen to 8 by 2002. Following woody and herbaceous vegetation management in the pond basin from 2004 to 2007 by DNR Restoration Ecologist Dr. Wayne Tyndall and his assistant Pat Groller, 25 and 23 egg masses were logged in 2007 and 2008, respectively — an encouraging sign.

Tiger salamanders also colonized 2 new sites in Caroline and Kent Counties immediately following similar restoration efforts.

From 2000 to 2006, most of DNR's work on this species was limited to monitoring known tiger salamander breeding ponds or piggy-backing tiger surveys with other amphibian studies.

In 2007 and 2008, another intensive tiger survey was mounted by DNR. Sixty historic or potential breeding ponds were visited at the same time that Towson University graduate student Duncan Simpson was monitoring 55 ponds in Caroline, Kent, and Queen Anne's Counties as part of DNR-funded research on amphibian assemblages in Delmarva Bays. Tiger salamanders were confirmed as breeding at 9 ponds, including 2 new ponds in Caroline County. Tiger egg masses were also found for the first time since 1990 at historic Golts Pond in Kent County.

As of the end of the 2008 season, tiger salamanders were breeding in 11 ponds in Maryland. However, historic population levels

# MARYLAND'S SALAMANDERS

## Giant Salamanders

Common Mudpuppy	<i>Necturus maculosus maculosus</i> ( <b>Endangered-Extirpated</b> )
Eastern Hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i> ( <b>Endangered</b> )

## Mole Salamanders

Marbled Salamander	<i>Ambystoma opacum</i>
Jefferson Salamander	<i>Ambystoma jeffersonianum</i> ( <b>Watchlist</b> )
Spotted Salamander	<i>Ambystoma maculatum</i>
Eastern Tiger Salamander	<i>Ambystoma tigrinum tigrinum</i> ( <b>Endangered</b> )

## Newts

Red-spotted Newt	<i>Notophthalmus viridescens viridescens</i>
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## Lungless Salamanders

Eastern Red-backed Salamander	<i>Plethodon cinereus</i>
Wehrle's Salamander	<i>Plethodon wehrlei</i> ( <b>In need of conservation</b> )
Northern Slimy Salamander	<i>Plethodon glutinosus</i>
Valley and Ridge Salamander	<i>Plethodon hoffmani</i>
Seal Salamander	<i>Desmognathus monticola monticola</i>
Northern Dusky Salamander	<i>Desmognathus fuscus</i>
Allegheny Mountain Dusky Salamander	<i>Desmognathus ochrophaeus</i>
Northern Red Salamander	<i>Pseudotriton ruber ruber</i>
Eastern Mud Salamander	<i>Pseudotriton montanus montanus</i>
Northern Spring Salamander	<i>Gyrinophilus porphyriticus porphyriticus</i>
Northern Two-lined Salamander	<i>Eurycea bislineata</i>
Long-tailed Salamander	<i>Eurycea longicauda longicauda</i>
Four-toed Salamander	<i>Hemidactylium scutatum</i>
Green Salamander	<i>Aneides aeneus</i> ( <b>Endangered</b> )

David Mosner

at all but one site in Kent County are severely reduced. All of the known occupied ponds are in Caroline and Kent Counties. There are also signs that breeding sites could be found in Dorchester and Queen Anne's Counties in the next few years. Tiger salamanders are completely missing from the Western Shore.

## The Bottom Line

A key, and often overlooked, conservation issue for pond-breeding salamanders is

the protection of the upland areas where they spend the majority of their lives. We all have heard of wetland buffers; for amphibians like the tiger salamander these buffers are "life zones" which themselves need to be buffered.

Current wetland regulations in Maryland provide only a 25-foot buffer for most wetlands, while the buffers for Wetlands of Special State Concern are only 100 feet. A total of 12 current or formerly occupied

tiger salamander ponds are designated as Wetlands of Special State Concern.

In an oft-cited 2003 paper, Raymond Semlitsch and Russell Bodie from the University of Missouri summarized the results of 40 papers describing "biologically relevant" core habitats surrounding amphibian breeding sites. They determined conservation of core upland amphibian habitats required a radius of 521 to 951 feet from the wetland, which should then have a 150 foot buffer.

While the buffer widths recommended by Semlitsch and Bodie are politically unattainable, they illustrate the disparity between current Maryland regulations and ecological realities. Expanding current regulated buffers to 300 feet at known tiger salamander breeding ponds, where no commercial timber harvesting would be allowed, would be a step in the right direction. The main hope for maintaining tiger salamanders in Maryland is by protecting large interconnected complexes of seasonal wetlands and forests.

## A Living Litmus Test

Tiger salamanders are hanging on in Maryland, but just barely. They are still critically endangered, but the population responses to restoration efforts are very encouraging. Lessons learned from these projects will aid in speeding the recovery of this enigmatic creature. A Tiger Salamander Working Group, made up of experts and citizen scientists, has also been formed. The group is currently helping DNR develop a statewide conservation strategy. Amphibians like salamanders act as a living litmus test of the health of our environment. Their double lives – born in the water, living on land – expose them to the challenges that both environments have to offer. ■

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