ART. 7. OCCURRENCE OF THE EASTERN TIGER SALAMANDER, AMBYSTOMA TIGRINUM TIGRINUM (GREEN) IN MARYLAND, WITH NOTES ON ITS LIFE HISTORY

BY

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The eastern tiger salamander, Ambystoma tigrinum tigrinum (Green), was first recorded in Maryland by Dr. E. E. Lamkin in February, 1933. This specimen (United States National Museum, 89904) was from Vienna, Dorchester County. A second specimen (United States National Museum, 104405) was collected by Dr. Robert H. McCauley, Jr., in September, 1937 in Denton, Caroline County.

Since these two records, efforts have been made to obtain additional specimens to define more fully the distribution of this salamander in the state of Maryland.

Eggs of this species were obtained by James A. Fowler in a pond at Federalsburg, Caroline County, on March 17, 1946. Eggs were also collected on March 31, 1941, at Hollingsworth Crossroads, Caroline County. In both instances the eggs were hatching.

On a joint field trip on February 22, 1952, the authors found approximately thirty clusters of eggs in a field pond at Golts, Kent County, and a single cluster at Carson's Corner, Queen Annes County. These eggs were also hatching.

With the knowledge that the incubation period for the eggs of this species is about thirty days, it was assumed that the eggs collected in February had been deposited near the middle of January. With this in mind, Stine and Simmons visited a pond two miles east of Massey, Kent County, on the evening of January 15, 1953, following a week of rain, and obtained four male specimens. The air temperature was 49 deg. F. and the water temperature 46 deg. F. The relative humidity was 89%. On five subsequent night trips, a total of eight males and one female was captured.

Of the eight males obtained, the two largest specimens measured 9 and 9½ inches, respectively, in total length. The single female was 8½ inches

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Issued March 8, 1954
long. The vent was slightly longer in the males than in the female, and the cloacal glands bordering the vent in the male were greatly swollen. No significant color differences between the two sexes were noted. The tail fin of each specimen captured was exceptionally wide but, when the specimens were removed from the water, degenerated to its normal width within 24 hours.

Three unsegmented egg masses with unswollen envelopes were also found on the night of January 15, at the Massey pond. Eleven masses were counted in the same pond on January 18. These egg masses were attached to weeds in water 1 to 2½ feet deep, most of them about one foot from the surface.

It is noteworthy that a careful examination of the Golts pond on seven visits from January 15 through February 24, 1953, revealed only three egg masses, a difference of approximately 27 from the previous year. This indicates a marked yearly fluctuation in the number of eggs deposited.

The single female collected was brought back to the laboratory where it deposited 344 eggs, distributed in 12 clusters. Five separate clusters from the Massey pond totaled 296 eggs with extremes of 17 to 92 eggs. It is possible, therefore, that one or two females may be responsible for all of the eggs observed in a given pond. This fact also suggests that the number of salamanders which breed in a single pond is not as great as the abundance of egg masses was previously thought to indicate. Moreover, the importance of the younger females to the survival of the species is obvious.

A visit to the Massey pond on February 24, 1953, revealed only one remaining egg mass, and it was partially hatched. This indicates an incubation period of about thirty-six days in the field when the weather is mild. On the other hand, eggs kept in an aquarium at 65-70 deg. F. hatched in seventeen days.

Field observations have also established that tigrinum larvae reach maturity in Maryland about the last week of May, and transform during the last half of June, depending upon the food supply available.

In the area under study, Ambystoma t. tigrinum appears to prefer transient field ponds situated close to woods. Although A. maculatum occurs in this region, it apparently does not breed in those ponds utilized by tigrinum, nor has tigrinum been found to breed in ponds preferred by maculatum.

The tiger salamander does, however, share its breeding grounds with A. opacum. Since this latter species breeds in the fall, its larvae are about half grown when the tigrinum eggs hatch. As a consequence, the opacum larvae devour some of the smaller tigrinum larvae. This situation is soon reversed, however, for within 90 days the surviving tigrinum are larger than the opacum larvae.
Other amphibians associated with *A. t. tigrinum* in the Massey and Golts ponds were *Triturus v. viridescens*, *Acris crepitans*, *Pseudacris nigrita ferox*, *Hyla c. crucifer*, *H. v. versicolor*, *Rana catesbeiana*, *R. clamitans*, *R. palustris*, and *R. pipiens*. *Scaphiopus h. holbrookii* and *Rana s. sylvatica* were collected in the immediate vicinity of the ponds in which the *tigrinum* were found.

In summary, *Ambystoma t. tigrinum* is now known from Maryland on the basis of eggs and adults from the following counties, all of which are located in the Eastern Shore division of the Coastal Plain province: Caroline, Dorchester, Kent and Queen Annes. It has also been recorded from Sussex County, Del., in the Coastal Plain. It is probable that this salamander will eventually be recorded from other localities in both the Eastern and Western Shore divisions of the Coastal Plain in Maryland wherever suitable habitats and breeding ponds occur.* The most effective method of establishing additional locality records for this species in the state is to examine likely looking ponds for egg masses or larvae from the middle of January to the middle of June.

The illustrations are from photographs by Stine.

Fig. 1 shows a typical breeding pond of *Ambystoma tigrinum tigrinum*.

Fig. 2 shows an adult male, nine inches in length, from Massey, Kent County, Md.

In Fig. 3 two spermatophores of the male tiger salamander are shown resting on a leaf in the water. The spermatophore on the left is a front view; the one on the right is a lateral view. These opaque masses are about ½ inch in height, slightly exceeding in volume those of the spotted salamander (*Ambystoma maculatum*).

Fig. 4 shows a female tiger salamander depositing her eggs. This captive specimen laid 344 eggs distributed in 12 clusters at varying depths in the water.

Fig. 5 shows the egg mass of the tiger salamander. This mass is highly hygroscopic. The cluster of well advanced eggs has a volume almost five times that of the original mass because of rapid imbibition of water.

Fig. 6 shows eggs of the tiger salamander. At any stage of development it is virtually impossible to lift the mass of eggs out of the water in one piece, and this is an excellent method of identifying the eggs of this species.

Fig. 7 shows eggs of the spotted salamander (*Ambystoma maculatum*). It can be seen that these eggs are more gelatinous than those of *tigrinum*.

*On May 27, 1953, larval specimens of *A. tigrinum* were collected in a pond on the Western Shore near La Plata, Charles County, Md.*
Fig. 8 depicts a tiger salamander larva two weeks old. Note the rounded head, and the pointed and transparent tail fin indicating an early stage of larval development.

Fig. 9 shows a mature larva of the tiger salamander. It reveals the broad, dorsally compressed head and the wide tail fin which indicate a high degree of aquatic adaptation. The light lateral (golden) stripe between the two darker stripes is diagnostic of the larva of this species.

The larvae of the marbled salamander (*Ambystoma opacum*) are half grown when the larvae of *tigrinum* are hatchlings, and they frequently devour the smaller larvae of *tigrinum* as illustrated in Fig. 10.

As shown in Fig. 11, the earthworm is a common item on the menu of the tiger salamander.

Fig. 12 shows the tiger salamander (above) and the spotted salamander. Where the two species coexist, one may be mistaken for the other. Note that the spotted salamander (below) has two lateral rows of dots which do not extend onto the sides, while the tiger salamander (above) has many dots forming a diffuse pattern which extends well onto the sides.
Fig. 1. Typical Breeding Pond of Eastern Tiger Salamander.

Fig. 2. Adult Male Eastern Tiger Salamander.

Fig. 3. Two Spermatophores of Male Tiger Salamander.
Fig. 4. Female Tiger Salamander Depositing Eggs.

Fig. 5. Egg Mass of Tiger Salamander.

Fig. 6. Eggs of Tiger Salamander.
Fig. 7. Eggs of Spotted Salamander.

Fig. 8. Larva of Tiger Salamander, Two Weeks Old.

Fig. 9. Mature Larva of Tiger Salamander.
Fig. 10. Larva of Marbled Salamander swallowing smaller larva of Tiger Salamander.

Fig. 11. Tiger Salamander with Earthworm.

Fig. 12. Tiger Salamander (above) and Spotted Salamander.

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