

Extra Limbs in the Small-Mouthed Salamander, *Ambystoma texanum*

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Introduction

As early as 1880 Kingsley reported the appearance of structural abnormalities in the genus *Ambystoma*. A specimen of *A. punctatum* (Baird) (now *A. maculatum*) was collected from Williamstown, Mass., in which the largest toe of the right hind foot, including the skeleton, was bifid at the tip.

Sealander (1944) reported a specimen of *A. tigrinum* from Minnesota in which the left forelimb was doubled. The extra limb could not be moved independently though the pectoral and hypaxial musculature were modified for its presence. Direct observation revealed that the extra limb aided little in locomotion.

From Muskee Lake, Colorado, Bishop, Bishop and Hamilton (1947) and Rosine (1955) reported multiple polydactylism and supernumerary limbs in a single population of *A. tigrinum*. In all cases the extra limbs and toes occurred only on the hind limbs. Previous collections by both groups had uncovered no aberrant individuals. Bishop and Hamilton (1947) concluded that a genetic mechanism had caused the production of extra limbs while Rosine (1955) questioned a genetic cause because he also found two *Rana pipiens* with multiple toes and one with an extra hind limb. He suggested environmental factors as the probable cause.

Worthington (1974) reported an 88% abnormality incidence in a population of *Ambystoma maculatum*. There were individuals with extra, fewer, fused or split toes as well as 35% with vertebral abnormalities. He suggested temperature changes as the cause.

In March, 1980, during a life history study of *Ambystoma texanum* in Vigo County, Indiana, four individuals each with five limbs were captured from a single population. This paper reports morphological and behavioral observations on these individuals.

Materials and Methods

The salamanders were taken in minnow traps set in a ditch next to a railroad embankment. The ditch was a known breeding area for the small-mouthed salamander. Extensive collecting was undertaken in 1976 and 1980 during the salamander's breeding period. The animals were taken into the lab and observed and finally were preserved in 10% formalin.

Results

During the spring of 1976, 483 animals were collected in the ditch but no aberrant individuals were taken. In 1980, 1099 *A. texanum* were collected at this site. Of those, four (0.36%) showed this extreme an abnormality, whereas many others were noted with extra toes, but data were not tabulated on this.

Description of Animals with Extra Limbs

All four animals involved were adult females, but details of the duplications varied. Three of the four animals were observed in the laboratory to assess the involvement of the fifth limb in movement. The fourth was preserved before observa-

tions could be made. A photograph (FIGURE 1) is presented for the first individual described below.

1. Right front limb doubled. Duplicate growing out of body directly behind the original. The duplicate possessed seven toes. When the animal moved, the extra limb was dragged behind, pressed against the body wall. The original limb did not come in contact with the duplicate and therefore did not appear hindered by it. The movement of the animal appeared normal.

2. Right front limb doubled. Duplicated limb growing out of body directly above normal limb. This animal was preserved before observations could be made. The fifth limb was very small, approximately one half the length of the normal limb. The toes had been damaged so that no description was possible.

3. Right front limb duplicated from elbow down, duplicate protruded straight up into the air. The abnormal limb possessed three toes whose arrangement formed a tripod. This limb, because of its positioning, was not involved in movement at all.

4. Left hind limb doubled, limb split after it left the body. The duplicate carried four toes. This animal used both limbs in movement. Both moved forward at the same time but the fifth was placed upside-down on the surface with only three toes making contact. As a result of this fifth appendage, the normal limb was placed down with only three toes in contact with the surface and the other two parallel to it. Neither limb was placed normally on the ground but rather on their sides.

Discussion

The occurrence of this kind of abnormality has been reported before in *Ambystoma*, but never in *A. texanum*. Since no other animals have been reported in Vigo County with this kind of abnormality, though populations in the area have been extensively studied, the cause of the duplications must have been introduced fairly recently. The low frequency of occurrence suggests a causative agent with limited range. Both physical and genetic factors have been suggested as the cause of supernumerary toes and legs in salamanders. It is not at this time apparent which was involved here. Future collections and environmental monitoring at the railroad ditch could help determine the cause of the abnormalities.



FIGURE 1. *Salamander with extra limb.*

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