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DISCOVERY OF THE EGGS OF THE FOUR-TOED
SALAMANDER IN MICHIGAN

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Even before the publication of Mr. S. C. Bishop's excellent paper on the habits and development of *Hemidactylum scutatatum* (Schlegel),¹ it had been the present author's hope to find the eggs of this "rare" salamander in Michigan. Adults and immature individuals had been found in several localities, chiefly in the autumn, however, on account of lack of time and facilities for spring collecting and because the salamanders are easier to find at the former season in the situations most hunted, *i. e.*, beneath old logs and wood in terrestrial habitats adjacent to swampy areas.

In one such place, in Lima Township, Washtenaw County, adults and half-grown individuals had been taken under logs on several occasions in the autumn. Here a small piece of oak woods occupies an uneven ground adjacent to a wet grass-

¹ *New York State Mus. Bull.*, Nos. 219, 220, 15th Rep. of the Director for 1918, 1920, pp. 251-282.

land that borders a moderate-sized stream. Partly in and partly outside of the woods lies a small, irregular pond, roughly 300 feet by 30 feet, with low grasses, sedges, and mosses at its edges, and numerous grassy and shrubby clumps forming little islets out from shore. Duckweed, crossed by numerous muskrat swimways, almost entirely covers its surface, beneath which may be seen a plentiful aquatic vegetation with sphagnum in places abundant. At the first step from shore one sinks knee-deep or more in a vile-smelling muck of decayed leaves and aquatic vegetation. Good-sized oaks nearby admit only an intermittent light during most of the day. Here wood frogs, green frogs, cricket frogs, and newts are abundant. And here in the rhizoids and roots of moss and grass the eggs of *Hemidactylium scutatum* were first found this spring on May 13. About eight bunches of eggs were discovered on this date with larvae bearing gills and fore limbs as buds or only slightly developed, representing Bishop's figures 2 and 3, plate 7. Subsequent visits to the same place revealed about thirty more masses of eggs. In every case the eggs were found within from three to six and a half inches of the water's surface, either just under the moss covering of an old stump or root or entangled in moss rhizoids and grass roots, not in the earth below the roots nor in the moss and grass above the roots. In the great majority of instances the eggs were almost or quite directly above the water, but occasional masses were located as much as three inches from the water horizontally. Although most of the clusters were confined to the shore line, a few were discovered in the grassy islets several feet from shore.

The process of hatching was observed in three egg masses in the field on May 27, and numerous larvae were taken from the water with a dip net. The larvae in all the other egg masses examined on this date were in an advanced state of

development. On June 4 no eggs were to be found, but about eighteen larvae were taken near shore with a dip net. These had fully developed gills, and the hind limbs showed from two to four toes. Although somewhat less advanced than examples reared in the laboratory, they were plumper and lacked the frequent mutilations of gills and limbs observed in the indoor specimens.

Eggs were found also in two similar localities in Iosco Township, Livingston County, on May 21, and in Whiteoak Township, Ingham County, May 28. At the latter place fifty-two masses of eggs were found in one section of a single small pond in a shady, wet woods of ash, linden, oak, maples, and elms. Not only was advantage taken of the mossy situations, but very many masses of eggs were attached to the sides of crevices and hollows in the soft, rotted wood of a large water-soaked log that projected thirty feet or so out into the pond, and in one instance eggs were found under the loose bark of an old stump that stood at the edge of the water. In one egg cluster the larvae were hatching; in the others they were well advanced and those brought to the laboratory nearly all hatched in a day or two. Here, as in previous instances, with nearly every egg mass an adult salamander was found, which proved in every one of about forty dissections to be a female. Varied as were the places for deposit of the eggs, every cluster fulfilled the essential conditions of proximity to water, both horizontal and vertical, that were found in the Lima pond, and that Bishop observed in New York state. Doubtless it will be found that the eggs occur in this state, too, in sphagnum at the bases of shrubby clumps in bogs or swamps, as Bishop reported, but at any rate "feather-bed" swamps do not present the only acceptable conditions for the breeding of the four-toed salamander.

