

a toad. Evidently she knew that flight was useless and, as a place of concealment was not at hand at that late moment, her safety lay in protective coloration and in resembling a toad as little as possible.

April 20th I placed a male of the same species in the aquarium, thinking she would lay her eggs, but she would have absolutely nothing to do with him. As there seemed to be no likelihood of further development I changed them to a small park which I had prepared in a sunny part of the yard. It was mainly composed of sod, but in one corner was an area of soft earth, while in the center was a large pan of water. Here they mated at once and spent the greater part of two days hopping about, resting part of the time in the water. May 12th they buried themselves completely in the soft dirt to await the passing of a cold wave. When the cold wave had passed they emerged and the mating ceased without the deposition of eggs.

Among the things the toad was observed to eat during her captivity were ants, flies, grasshoppers, bees, wasps and many other insects which found their way within her reach. The eating of bees and wasps was followed by no ill effects except a momentary twisting or wincing. By far the greater part of her food consisted of flies and ants. These are household pests, and since the toad will average 40 or more each day it is needless to say that it is a very useful animal and one that should be protected.

THE METHODS AND EXTENT OF THE ILLINOIS ICHTHYOLOGICAL SURVEY.

BY THOMAS LARGE.

At the present time the Natural History Survey of the Illinois State Laboratory of Natural History is working on an extensive report on the Fishes of Illinois. This is a continuation of the work begun in 1878 and carried on with many interruptions since that time by Prof. S. A. Forbes and his collaborators. It is the purpose to have every fish known to occur within the State accurately described, with complete statement of all that is known concerning food, habits and breeding, and to have the geographical distribution indicated on maps. In addition to this it is the purpose to illustrate each species with colored plates reproduced from water-color

drawings of living fish. The number of species occurring is in the neighborhood of two hundred.

At present several lines of work are in progress: At the Biological Station on the Illinois River, located in the past two summers at Meredosia, aquaria were fitted in the floating laboratory and a gasoline engine and pump on the shore made to furnish clear water in which colors of living fish were studied for color descriptions and were painted by the laboratory artists. The field work for the geographical distribution has been pushed forward by means of wagon and launch expeditions and by volunteer collectors. The launch has not been used sufficiently for extended excursions to make the experience of value to others. With the wagon two men were in the field for six weeks in the fall of 1899, making collections in the Big Vermillion and Kaskaskia rivers and their tributaries. In 1900, with the advantage of the experience of the previous year, an expedition was fitted out to make collections in eastern Illinois, with Golconda on the Ohio River as the objective point, and returning to Urbana, the starting place, through the western and central portion of the State. The equipment consisted of an ordinary covered grocer's delivery wagon and two horses, a 9x9 miner's pyramid tent, woolen blankets, a blue-flame oil stove, an aluminum cooking outfit, a supply of groceries and canned meats, five large milk cans for shipping collections home, "hand-cans" for killing specimens as soon as taken, a ten-foot minnow seine hung to fish three feet, a thirty-foot minnow seine hung to fish five feet, and a forty-yard minnow seine hung to fish six feet. The Baird nets are not serviceable in the muddy streams of Illinois, as the bag collects too much mud. The party, consisting of two men who had had experience in such work, made no attempt to secure accommodations from farmers more than horse feed and water, experience of the previous year proving it to be very expensive in time and temper. Occasionally stops were made at hotels. The entire distance covered was about six hundred miles, in six weeks' time. The cost of subsistence in field, including some repairs, was about ten dollars per week.

In preserving fish the laboratory uses 10 per cent. formalin solution for killing, in which the fish is put as soon as taken from the water. In this the fish die with fins expanded. After remaining a few hours in this solution they are wrapped in cheese-cloth and transferred to a weaker solution (about 1 per cent. to 5 per cent.), for shipment. After being brought into the laboratory they are bottled in a solution consisting of 70 parts

95 per cent. alcohol, four parts glycerine, one part of formalin, and twenty parts of water. In this solution preservation is secured without the brittleness resulting from high per cent. alcohol.

The method of this institution in caring for collections may prove valuable to those interested in museum methods. Each catch is kept separate and given an accessions number referring to all data concerning it, which is entered in an accessions catalogue. The species are then separated and bottled, with tags (similar to those attached) on the outside and inside of the bottles.

Ac. No.
Sp. No.
Jor. & Ev. No.

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Those on the inside are made of ledger paper and written with lead-pencil; those for the outside are written with India ink. The tags bear accessions number, a number referring to the species list of the laboratory, and a number referring to the species number in Jordan & Evermann's "Fishes of North and Middle America." All bottles containing a particular species are racked together in series according to accessions number and placed in shelves. The racks used are wooden trays of two sizes, the larger $4\frac{1}{2} \times 15$ inches and meant to be wide enough to hold a two-quart fruit jar. The smaller are for vials and small bottles, and are 2×13 inches. This arrangement is exceedingly convenient for ready reference to any particular fish desired.

The plan of securing collections from volunteers in localities from which materials were needed for study of geographical distribution, was put in operation in April, 1900. It commends itself because of excellent results secured and the comparatively light cost. Letters inviting cooperation were sent to high school teachers and others, in localities that had not already been covered by field work. To those responding were sent two pairs of hip boots, a twenty-five foot minnow seine, a five-gallon milk can and a quantity of formalin, with directions for catching, labeling and preserving. In return for the service each collector receives a named set of the fishes from his locality. As a result of the volunteer work of the spring and summer a large triangular area lying between the Illinois and Mississippi rivers as far north as a line from Peoria to Rock Island was quite thoroughly worked, besides several other localities. Some collectors made collections representing entire counties.