

ARTICLE XIV.—*Notes on the Hermit Spadefoot (Scaphiopus holbrookii Harlan ; S. solitarius Holbr.).* — By Colonel NICHOLAS PIKE.

THE study of the habits of the *Spadefoot* (so called from the animal using its hind feet in digging) has always been one of great interest to me. The harmless little creature is still not uncommon, *if you only know where to find it*. There lies the difficulty—so few do know—and, excepting some naturalists, very few would distinguish it from a common toad. It must of course be hunted for in secluded places, and woody hill-sides, but I will venture to say that even the most knowing, in nine cases out of ten, will only find a Spadefoot by accident.

Many years ago I had several in my garden which became quite tame, and would allow me to take them in my hands. They made circular holes in the ground about six inches deep, somewhat turnip shaped. A few minutes sufficed for them to burrow out of sight. The long feet, with the horny excrescence serving as an additional toe, and the strong curved fingers enable the Spadefoot to make the excavation rapidly. This is not by any means the completion of its home. The inside has to be worked smoothly, and the earth prevented from falling in.

This is done by the animal working its body with a circular motion, and the operation would go on for an hour or more, and the liquid exuding from its pores worked into the earth made it smooth, and formed a curious little dwelling when completed. Round the top was a layer of viscous matter, and woe betide any unwary insect that alighted on it. Closely concealed lay Spadefoot, only the bright eyes visible, ever on the watch, and unerring in its aim when any luckless fly intruded on the threshold. They appeared to be greedy feeders, and I often amused myself by giving them insects, which they seized with avidity as long as I supplied them.

This I find is the usual summer residence of the Spadefoot, and when once domiciled, it rarely leaves home in the day-time. No two ever inhabit the same hole, hence the name Hermit Spadefoot, or *solitarius*.

When sharp summer rains fell they would quit their houses and seek shelter under plants, but would not return to the holes they
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had left. As soon as it was fine, about sunset or in the night, new homes were constructed with great rapidity. In the fall, very heavy rains set in and one by one my pets disappeared, generally in the night, and though I searched diligently for them I could not find their hibernaculum, and presume they burrowed away under the fence.

Thirty-five years ago I exhibited one of these habitations, which was made in a box sunk in my garden, with the animal in it, and read notes on it which were published in the proceedings of the Brooklyn Natural History Society.

The *Scaphiopus* changes much in color at various seasons. I have taken this animal late in the fall when it might easily have been passed by as only a dingy young toad, but for the curious eyes which will always identify the Spadefoot, no matter what its dress. The irides are mottled gold and brown, and are divided into four parts by a notch at each quarter, giving a lozenge shape to the large black pupil.

Quite late in November, 1883, I dug one up from about a foot below the surface of the earth, which was covered with decayed leaves. The head was smooth dark brown, and the whole body a dingy dark olive, with faint lines running from the eyes along the back, converging to a point at the rump. Every part of the animal was tubercled, even to the eyelids, and the parotid glands were greatly swollen. When first taken there was an orange tint over the thighs and hands, but this soon faded in confinement.

The little fellow took kindly to its imprisonment, grew very tame, and looked quite comfortable in its large glass jar half filled with damp moss. Sometimes when the moss seemed too wet I put in a lot quite dry. The cunning animal would look at it, toad like, with its head on one side, and take in the situation at once. It set to work and in a few minutes made a pretty little arbor, quite thick behind but so thin in front that it could see through the moss. It never appeared quite torpid, but only sound asleep at times, and would wake up quickly if disturbed. A favorite position of my Spadefoot was to crouch down flat with the hands turned in under the chin, the feet turned up, and the long toes resting on the elbows.

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In April I took it out and found it as fat as when its winter rest began, although it had not tasted any kind of food for over six months.* During this long quiescence its coat had changed. The centre of the back was a bright sandy color with a large dark irregular star edged with black. The whole back and legs were heavily tubercled with a vivid red, chin white, abdomen and inside of thighs a reddish purple.

When the cold nights of fall begin, the Spadefoot leaves its summer home and looks out for one more suitable for the winter season. It generally chooses the warm southerly side of a hill, and excavates deeply for its new quarters. It was only after many years' studying of this animal that I was able to verify this fact.

About four years ago I found one by accident in winter, over three feet below the surface. On December 27, 1884, I was in Cypress Hills Cemetery when a laborer who was digging a grave called my attention to a toad snugly imbedded in the side of an opening he had just made. His spade had slightly grazed the body of the animal, which I saw at once was a Spadefoot. I asked him not to disturb it till I had made a careful examination of the burrow. The man had dug down nearly four feet, but the distance the creature had burrowed was by exact measurement three feet two inches.

The most careful search round the hibernaculum failed to discover any outlet. It had left no trace of burrowing behind it, having evidently covered up all tracks to its lair. The soil was packed closely about it, and the round hole was perfectly smooth, just large enough to contain the body in the crouching posture I mention its assuming in confinement. I have since been told that the Spadefoot has been found at a depth of six feet, but this I cannot vouch for.

When the weather is not too severe, even while the last snow is still on the ground, the *Scaphiopus* often makes its appearance, but then it only roams aimlessly round, hiding under dead leaves and taking little food. The usual time of awakening to renewed spring-life is the end of April or beginning of May, and if the weather is unfavorable, not till June or even July.

* In autumn the *Scaphiopus* feed voraciously and become very fat, and this seems to keep them in good condition till spring again brings forth their insect food.

This animal has as great a repugnance to water as the common *Bufo*, but like it is impelled towards this element in spring for the propagation of its species. In the "Synopsis of Batrachians of Arizona," by Dr. Elliott Coues, he states that the *Spea hammondi*, or *Scaph. hammondi*, was taken *in coïtu* in June, 1864, near Fort Wingate, New Mexico, at a considerable distance from water, but I know our Long Island *S. holbrookii* never mates otherwise than in the water.

Though I have had an intimate acquaintance with the Spadefoot, and studied its habits so long, and had it often in confinement, yet not till this year have I succeeded in breeding it. In 1884, when in correspondence with Dr. Charles C. Abbott, he sent me a paper he had published on this animal, in which he states that on April 10, 1874, a colony of Spadefoots suddenly appeared in a sink-hole in a dry upland field and remained till the 15th and then disappeared. Ten years later, May, 1884, they came again to the same locality, and left in a few days, yet nothing had been seen of them in the intervening years. On June 25 and 26 a violent storm filled the sink-hole, and in the afternoon of the later date the place was alive with them, every one uttering its ear-piercing notes. By the morning of the 28th not one was to be seen or heard. During this brief interval they spawned, attaching the eggs to blades of grass, etc. They hatched by the 2d of July, and by the 9th had their hind legs developed. On the 16th the front legs were out, tail diminished, and on the 25th they burrowed an inch below the surface of the earth he had placed in his aquarium for them.

This was very rapid development, but Dr. Abbott says they perfected three days earlier in the sink-hole.

In the account of the *Scaphiopus* in the "Essex County Journal of Natural History," by Andrew Nichols, M. M. S. S., President of the Society, this gentleman states that in Danvers, Mass., about the years 1812 and 1825, after a great rain in summer, and on August 12, 1834, and again on June 16, 1842, the Spadefoots appeared for breeding purposes, never being noticed in the intervening years—a most remarkable fact.

This animal is a most difficult subject to work upon to gain its life history, from the extreme uncertainty as to its whereabouts at

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all ages. In all the years I have known the Spadefoot, and in all my rambles every month in the year, it was not until August 8, 1884, that I was fortunate enough to see an exodus of these animals from the water.

I was strolling leisurely homewards with my wife after a long, enjoyable tramp in the woods, when on skirting the side of a hill rising from a pond we saw some little toads hopping across our path. They looked such mites we thought we would take a few as specimens of toads at that age for my cabinet series. My wife stooped for some, but on handling them she cried out, "Oh, come here, they are all pretty little Spadefoots."

Down went our baskets, fatigue and sunset were forgotten, and we gathered them in till the growing darkness compelled us to desist. Thousands of the little creatures were leisurely trudging up the steep hill, and the exodus must have been going on for hours, for many had reached the summit and were scattering in all directions, whilst others were still leaving the ponds. We carried our little treasures home in bags filled with grass, and so tired were we after our hunt we left them imprisoned all night. Some of them objected to being bagged, and made a faint squeaking noise when handled.

Next morning I placed them in a large glass jar with earth, and in less time than it takes to write the fact most were buried, all but their noses. I fed them on flies and insects, and once I put in half a nest of young spiders. As soon as their little bright eyes caught sight of the moving game, a most animated scene took place. Every one was out jumping and capering about till not a spider was left, when back they all hastened to hide till new victims were provided. I turned many into the garden in the hope that I might see some come out this spring. I was, however, disappointed, and it was not until August 24 that by accident I discovered any were alive. On the night of the 22d, and all next day, heavy rain fell, which washed the poor little fellows out of their homes and revealed their presence to me.

Two days after the exodus we visited the same hillside, but with the exception of two or three belated in the pond, not one was visible. We hunted diligently for them, dug in all sorts of places, turned over heaps of stones, but all in vain; yet I do not doubt
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there were hundreds buried all around us had we only known where. It is evident they go far from their first watery home, for they were marching steadily on, the column spreading out about fifty feet wide with none beyond it. Nor do I think they feed during the exodus. I saw an immense number of very small crickets in amongst them, but though I looked carefully I could not see any of the little Spadefoots eating them. When they leave the water they are smaller than the common toad, but if the season is favorable they grow rapidly in width more than in length. I have some two years old one-quarter of an inch in length, and nearly as wide as long.

This year I calculated about the time it would have taken the little Spadefoot of last year's catch to perfect, and I haunted the same spot for days in vain. Men who had been working near by the whole month told me there had been no sound of them, and it is quite certain they must have heard them had the ear-piercing screams been going on, which Dr. Abbott says can be heard half a mile away. Not a vestige of egg, tadpole or young have I seen in the spot where thousands were hatched in 1884. I shall watch curiously to see how long it will be before they re-appear in that locality.

As I said before, the Spadefoot has a great dislike to water, and when forced to it for breeding purposes does not remain in it long, from three to five days at most. The embrace often takes place on land, as it does occasionally in toads, so that they only enter the water for the act of spawning. Their wonderful screaming chorus is kept up the whole time the animals are *in coitu*, and is the love song of the males, the females having only a low guttural grunt. As soon as possible the sexes separate and seek their summer homes, where they lead solitary lives till they have to seek their winter's retreat.

On the ridge extending from East New York to Jamaica, one of the most elevated parts of Long Island, there are ten or twelve ponds, some fed by springs and constant, others only filled by winter's snows and rains. This spring I worked them all over with my net, and though I heard no screeching, yet as the *Scaphiopus* is far from rare on the hills near by, I felt sure they must breed in some of these ponds. Toads, I know, also swarm in the

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vicinity, and on the 17th of July I fished up what I took to be toad spawn, although not in chaplets, and only slightly attached to some weeds floating about in the water. The eggs were evidently laid only a few days before, and I brought them carefully home.

The first week I had them was warm and sunny, and in about seven days the first tadpoles appeared, but a gloomy cold spell following, the rest did not hatch out under twelve and even fifteen days. At this stage they look black in the water, but are really brown. In about ten days the color broke out into blotches, with little white scattered dots. Certain signs at this time led me to suspect I had found a treasure, and the metamorphosis was watched with renewed interest. Having bred toads, and my cabinet containing a series of these tadpoles of different ages, I soon found a difference between them and my new acquisitions.

The toad tadpoles are oval, of a dusky black, with a clear white fin on the tail. The Spadefoots are brown and chubby, the tail narrow and blotched all over. Then they swim differently; the latter with the body depressed, and they skim around the aquarium with the greatest rapidity. The tadpole is of good size before the hind legs develop, and the back and abdomen gleam with gold; the latter is dark gray, the former brown, with dark marks on it showing the outline of the star of the adult starting from a broad dark disk between the eyes.

As soon as the hind legs are out, both body and tail diminish, and they are as ravenous as other tadpoles, devouring both meat and fish greedily. As soon as the thread-like front legs show, they must have cork or chips to sit on, as their perfection is close at hand. I neglected this at first, and some that were ready to leave the water August 18, actually atrophied till they were barely an inch long from snout to hind toe, the smallest live reptiles I ever saw, and died evidently from inability to remain in their watery home. It was only by giving them resting places, and a way out into a dry house, that I succeeded in bringing out strong young ones; and the first act of their terrestrial life seems to be to provide a home by burrowing.

When the front legs are well out in the toad, the whole under part assumes a yellowish-white hue, the thighs are finely granulated, and on the insides of the hands and feet the joints are thick and

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white. From between the eyes and all over the back are the outlines of the future warts, increasing in size daily. When the Spadefoot is at the same stage of growth the whole underneath is dusky gray; feet and hands are slighter and smoother; the body more drawn in behind the arms, and the tail is narrower.

When perfect, the little Spadefoots linger a little while on the long grass and weeds at the margin of the ponds to gain strength for their exodus. By this time, small as it is, it has all the makings of the adult, and crouches on the ground in the same way.

I do not quite agree with Mr. Nichols that "as they are southern reptiles chilled by our northern climate they want a more genial season to celebrate their nuptials, and thus with a suitable pond to receive their spawn, year after year transpires until a summer freshet has filled their native habitat sufficiently for spawning to take place."

In the pond where I found them in 1884 there was abundant water in 1885, fed by springs, and to my eye the same conditions obtained this year. It is evident Spadefoot thought differently, and resorted to a pool a quarter of a mile away, for some reasons unknown to me. I believe they breed every year, but change their locality, as the winters, though often severe on Long Island, certainly do not diminish the numbers of the *Scaphiopus*.