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THE BREEDING HABITS OF *PROSTHERAPIS SUB-*  
*PUNCTATUS* COPE.

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The Bryant Walker Expedition to the Santa Marta Mountains, Colombia, in 1913, secured a series of specimens, and notes on the habits, of a small frog which corresponds so closely to the original descriptions of *Prostherapis subpunctatus* Cope<sup>1</sup> and *Prostherapis variabilis* Werner<sup>2</sup> as to leave little doubt that these species are identical, as held by Boulenger<sup>3</sup>. It should be recorded that the type specimen of *P. subpunctatus*, which was in the collection of The Commercial Museums, Philadelphia, has disintegrated, so that one must rely upon the published description, but the only apparent difference between our material and the original description is that the adults in

<sup>1</sup> Contributions to the Herpetology of New Grenada and Argentina. The Philadelphia Museums, Scient. Bull. No. 1 (1899), p. 5, Pl. 1, Fig. 2.

<sup>2</sup> Ueber Reptilien und Batrachier aus Colombien und Trinidad. Verh. Ges. Wien, xlix, pp. 474-475.

<sup>3</sup> Zool. Record, 1899, p. 27.

our series have a length (head and body) of from 19.5 mm. to 24 mm., whereas the length of the specimen measured by Cope is given as 43 mm. In this connection it may be noted that the specimen figured by Cope<sup>4</sup> was but 23 mm. long, if, as stated, the figures are natural size. In size, as well as in the other characters, the Santa Marta specimens conform closely to the description of *P. variabilis*.

Apparently the only notes on the habits of the species are those published by Werner<sup>5</sup>, who states that the specimens taken near Bogota which he examined were accompanied by the following field note, "Frosch, Larven im Laich auf dem Rücken tragend."

In the Santa Marta Mountains the species was found between altitudes of 2,200 feet and 5,000 feet, on the slope near the town of Santa Marta. It occurred in considerable numbers at the bottom of ravines, in the litter along the banks of the streams, where specimens could be studied and captured only with considerable difficulty, owing to their small size, secretiveness and agility, and the many places of concealment afforded by the debris on the forest floor in such situations. Fortunately the frogs may still exist in ravines which have been cleared and subsequently permitted to become grass-covered, and in such a ravine, at an altitude of 4,500 feet, the species was found in some numbers and was studied by the senior writer in as much detail as time and other work permitted, from July 2 to July 26, 1913.

The frogs were in song throughout the time spent in the region where they were found, and they were heard at all times of the day, but in largest numbers during the rains. The song consists of a piping note repeated rather regularly a varying number of times. No eggs could be discovered, but from

<sup>4</sup> Loc. cit., Pl. 1, Fig. 2.

<sup>5</sup> Loc. cit., p. 475.

July 3 to July 26 tadpoles were found in pools, and on July 3, 9, 11, and 14, single adults with tadpoles on their backs were observed hopping about on the land. The nurse frog was in each case a male, and the number of tadpoles carried was three, four, eleven and fifteen. The tadpoles were all very small (from 9 mm. to 12 mm. in length), apparently of about the same age, and were usually arranged on either side of the mid-dorsal line and at right angles to the axis of the body of the nurse frog. (Pl. I, Fig. 2). They apparently clung to the back of the nurse frog by means of the lips, and were rather active in that they were observed to wriggle about over the back and even over the other tadpoles. In the case of the nurse frog with fifteen tadpoles, there was room on the back and head for but fourteen young and one wriggled about over the others. When removed from the adult these tadpoles would cling to a wet finger or to the sides of a glass bottle.

When the nurse frog entered the water the tadpoles one by one dropped off the back and swam away. Possibly if the adult lingered in the water for a sufficient time the young would all escape at the first submersion, but the frogs are very active and the ones under observation entered and left the water several times before all of the young had released themselves. This may account, at least in part, for the observed differences in the number of tadpoles on the nurse frogs.

The tadpoles found in the pools varied in size from 12 mm. to 20 mm., and up to July 26 none had progressed so far as to show limb buds. The smallest ones would, when removed from the water, cling to the fingers and permit themselves to be carried about, only slipping off when the fingers were immersed, but the larger ones were apparently unable to cling to any surface when removed from the water.

This kind of nursing habit has been recorded for *Arthroleptis seychellensis* Böttger, *Phyllobates trinitatis* Garman,

*Dendrobates baccatus* Cope, and *Dendrobates trivittatus* Spix, but the observations are so incomplete that it is impossible to determine if the habit serves the same purpose, or is even the same in detail, in the different species. For none of the forms have we complete information as to place of egg deposition, sex of the nurse, number of tadpoles, stage at which the tadpoles are taken up by the nurse, method of attachment of tadpoles to nurse, and stage at which the tadpoles leave the nurse. The observations upon *P. subpunctatus* are also incomplete, but it is believed that from them may be drawn the conclusion that the eggs are laid on the land (possibly but not probably, in the opinion of the writers, placed upon the back of the male) and the male remains with them. At an early stage the tadpoles attach themselves to the male and are carried to the water, where they leave the nurse frog and complete their metamorphosis.

The following description of the tadpole has been prepared by the junior writer on the basis of thirty-one specimens from nurse frogs and six from pools.

Length of body of specimens from nurse frog 12 mm.; width 3 mm.; length of tail 8 mm.; depth 2 mm. Length of body of largest specimen from pool 20 mm.; width 5 mm.; length of tail 13 mm.; depth  $3\frac{1}{2}$  mm. Nostrils equidistant between end of muzzle and eye; distance between them slightly smaller than interocular space. Spiraculum half way between end of snout and anus.

Body distinct from tail, muzzle rounded. Eyes small, on upper surface of body. Spiraculum sinistral, small, in large specimens visible from above and below. Anal opening dextral, in muscular part of tail. Tail pointed. Crests scarcely visible near the body, posteriorly widening and becoming convex. Lines of crypts indistinct.

Lower lip and sides of mouth bordered by papillae. Beak

with margin of black. Teeth occupying whole width of inner surface of lip; formula 2/3. In smaller specimens (from nurse frogs and pools, Pl. I, Fig. 3), the upper row is interrupted in the middle, the first lower series is very feeble and the upper lip is strongly developed. With an increase in size the lower lip becomes relatively less prominent and the first lower row of teeth larger. (Pl. I, Fig. 1). In the largest specimens from the pools (20 mm.) the second upper row of teeth is not always interrupted.

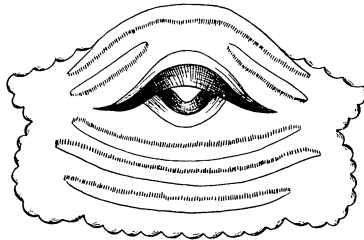
In alcohol the coloration is as follows: blackish above, snout semi-translucent with dark blotches on sides and above nostrils, sides lighter with dark spots, ventral surface uniform grey, tail crests immaculate, yellowish grey, muscular portion of tail colored with an occasional sprinkling of black dots. In life small tadpoles were uniform black, the heads of the older specimens conspicuously golden.

PLATE I.

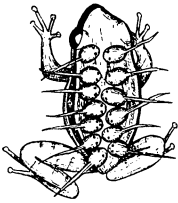
Figure 1. Mouth of large tadpole taken from a pool. Enlarged 16 times.

Figure 2. Adult male nurse frog with young. Natural size.

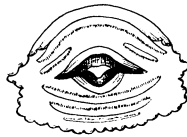
Figure 3. Mouth of tadpole taken from the back of a nurse frog. Enlarged 16 times.



I



2



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