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THE GENERIC AND GENETIC RELATIONS OF *PSEUDACRIS*, THE SWAMP TREE FROGS

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For some time it has been recognized that the Swamp Tree Frogs, *Pseudacris*, are badly in need of revision. Many of the species differ but slightly from others, while certain of the so-called diagnostic characters seem dependent on fixation.

In preparation for a revision of the genus, I found it necessary to re-examine the characters upon which the genus is based, for several of the species differ but slightly from *Hyla*. The work led to some interesting conclusions and, as this revision is now indefinitely delayed, it seems advisable to place these conclusions on record.

Although only seven species of *Pseudacris* were recognized in the Check List of Stejneger and Barbour (1917, pp. 30-31), at least two more seem valid from the material I have examined. These are *P. copii* and *P. verrucosus*. Of these nine species, by far the most distinct is the minute *P. ocularis* (Holbrook). I have examined no less than 390 specimens of this species and have been impressed by the fact that it exhibits externally no character to distinguish it generically from the diminutive neotropical hylas, possessing reduced webs, as for example *H. chica* Noble (1918, p. 335) described from Nicaragua. If the reduced webbing is characteristic of some species of *Hyla*, what characters distinguish the species of *Pseudacris* and prevent our referring them also to the genus *Hyla*?

The characters utilized by Boulenger (1882, p. 332) to define that genus are certainly not diagnostic. *Pseudacris occidentalis* has as well-developed disks as many species of *Hyla*. Some semiterrestrial hylas of the neotropics do not possess any more expanded dilations than *P. feriarum*, and the digital disks of that species are scarcely larger than those of *P. nigrita*, the type of the genus.

The extent of the dilation of the sacral diapophyses does not distinguish *Pseudacris* from *Hyla*. One may convince oneself of this fact by comparing the sacrum of *H. crucifer* with those of a series of *Pseudacris*. Thus, I find that the sacral diapophyses of one specimen (A. M. N. H. No. 5743) of *P. septentrionalis* are a trifle more dilated than those of two

specimens of *H. crucifer* before me, while those of another specimen (A. M. N. H. No. 3004) of the same species are a trifle less so. The sacral diapophyses of a specimen of *P. ocularis* are about as extensive as those of *H. crucifer*. The sacrum of *H. chica* is not as dilated as any of the species of *Pseudacris* examined. I have (*loc. cit.*) discussed this species in the paper referred to above. The narrow sacral diapophyses are not always correlated with small size.

Cope (1889, p. 332) states that *Pseudacris* may be distinguished from the typical forms of *Hyla* by "the elongate terminal phalanges with small basal globe, supporting minute dilations, and the nearly webless digits. . . . Species of *Hyla* less representative are similar in cranial structure and have a diminished amount of palmation, but the series appears with our present knowledge distinct in the structure of the feet."

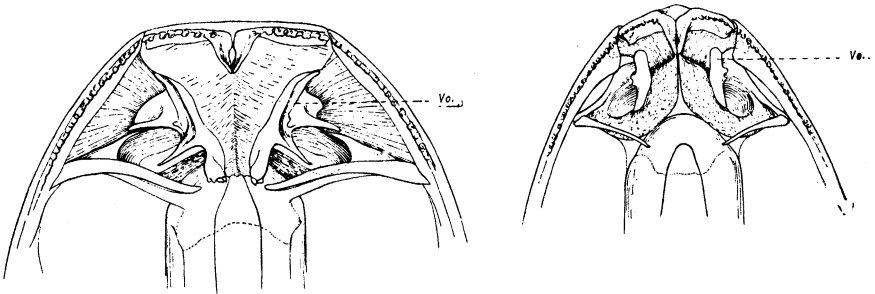


Fig. 1. Vomerine region with surrounding cranial elements in *Hyla crucifer* (left) and *Hyla ocularis* (right).

After a critical examination of the terminal phalanges of *P. septentrionalis* and *P. ocularis*, and comparisons of them with those of *H. crucifer*, *H. versicolor*, etc., I have convinced myself that there is no constant difference in the structure of these elements, although they all vary somewhat in size. (Fig. 3.) The intercalary cartilage differs somewhat in size in the various species, but, as this also differs in the digits of a single limb (Fig. 3), its size cannot be considered of great importance. The intercalary disk of *Acris* is proportionately longer than in any species of hyloid which I have examined.

Pseudacris is stated in all textbooks to possess vomerine teeth, as in most species of the genus *Hyla*. Those species of *Hyla* which do not possess vomerine teeth are sometimes grouped together under the name *Hylella*. I have shown elsewhere (Noble, 1922) that genera based on the presence or absence of vomerine teeth are usually polyphyletic and artificial assemblages. Some specimens of *Hyla chica* lack the vomerine

teeth, while others possess them. It is therefore of no great phylogenetic consequence to find that, contrary to the statement of Holbrook (1842, p. 173) and Boulenger (1882, p. 333), *P. ocularis* normally lacks the vomerine teeth. I can find no evidence of them in the 390 specimens of this species before me. These specimens come from several localities in Lee Co., Florida (3 specimens); Arlington, Florida (49 specimens); near Jacksonville, Florida (336 specimens); Wilmington, South Carolina (1 specimen); and Hampton Co., South Carolina (1 specimen). Small specimens of *Hyla* often exhibit a reduction of the web between the toes and a loss of the vomerine teeth. *P. ocularis* exhibits both these features, as further evidence of its close relationship to *Hyla*.



Fig. 2. *Hyla ocularis* (Holbrook), typical color variation.

The reduction of the vomers has progressed farther in *P. ocularis* than in *H. chica*. It seems highly improbable that they could ever bear teeth. (Fig. 1.) I believe it will be shown that *P. ocularis* never exhibits vomerine teeth even as a variation.

P. ocularis has so many external characters in common with the small hylas that I have given a figure (Fig. 2) of a typical specimen. It will be noticed that the disks, although small, are as distinct as in many species of *Hyla*.

Many structural features of *P. ocularis* suggest that the species is more closely allied to *P. feriarum* and its close allies than to *Hyla*

squirella, *H. femoralis*, or any other of the small species of *Hyla*. The reduced web and the form of its pectoral girdle (Fig. 4) and hyoid apparatus suggest this, but, until the osteology of many more species of southern hylas is made known, the exact genetic relations of *P. ocularis* must remain uncertain. In external appearance *P. ocularis* is most hyla-like. Mr. Jay A. Weber, who observed the species in life and has presented his specimens to The American Museum of Natural History, remarks:

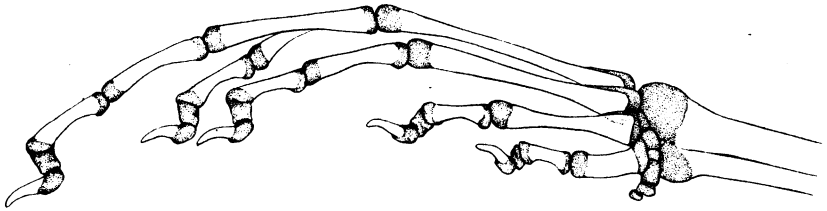


Fig. 3. Right foot of *H. ocularis* viewed laterally to show the form of the intercalary cartilages.

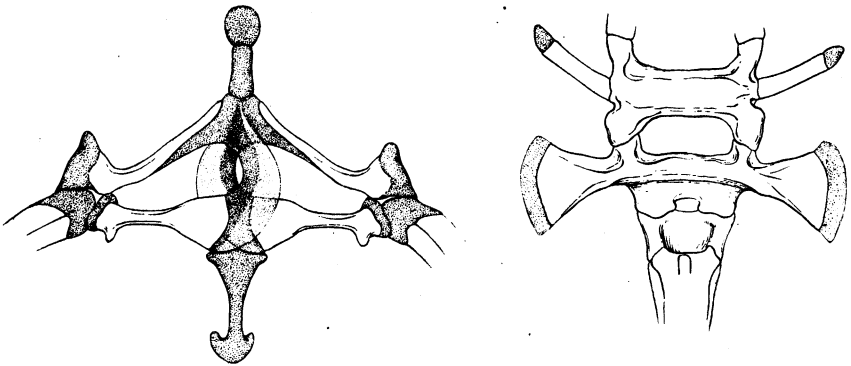


Fig. 4. Pectoral girdle of *H. ocularis*, ventral aspect (left) and sacrum of *H. ocularis*, dorsal aspect (right).

"The tiny frogs were a brilliant light green in life, similar to, but even brighter than *H. cinerea*. They were observed most abundantly at Rocky Lake. A narrow belt of reeds along the water's edge had been trampled down by cattle, and it was here the frogs, in association with *Acris*, were found. They were extremely agile and I found it impossible to get near enough to catch them by hand. As one approached them,

they would hop among the crushed, but still living, reeds, where their green coloration caused them to disappear immediately. Never did they seek a hiding place in the holes or shallow puddles in the manner of *Acris*. The deep water of the lake was full of fish and I noticed that neither *Acris* nor this species ever hopped into the deep water. At last, after constructing a club from the base of a cat-tail stalk, I succeeded in approaching close enough to secure some specimens. The species is the rarest of the riparian frogs in the region that I visited and its extreme agility and protective coloration make it the hardest, by far, to catch."

The huge series of 336 specimens of *P. ocularis*, all from the vicinity of Jacksonville and all taken within a few weeks' time, exhibits an extraordinary range of variation. In what may be called the "dark phase," preserved specimens possess three longitudinal stripes of dark brown on the back, very similar in form to *P. triseriata*. The ground tone, however, is flesh-color, and the black stripe on the side of the head readily distinguishes the species from other species of *Pseudacris*. The "light phase," that illustrated in Figure 2, is of more frequent occurrence, for the stripes in most specimens are indistinct.

Some species, at present referred to *Pseudacris*, are superficially more hyla-like than others. Perhaps the most hyla-like is *P. copii*. Future work may show that *P. septentrionalis*, *P. triseriata*, and *P. feriarum* are closely allied and possess characters in common, distinguishing them from the more hyla-like species of the genus. But it must be clearly recognized that neither the shape of the sacral diapophyses, the structure of the terminal phalanges, nor any other characters which have been suggested until this time are actually diagnostic of the genus. Until these characters have been pointed out, the genus *Pseudacris* must be disregarded and the species formerly referred to that genus must be referred to *Hyla*. In referring all the species of *Pseudacris* to *Hyla*, two changes in nomenclature are as necessary as they are unfortunate. The name *septentrionalis* is preoccupied by *Hyla septentrionalis* of Boulenger. As no other name seems available, I propose the name ***Hyla canadensis*** for that species. The name *H. copii* (Boulenger) is preoccupied by *H. copii* of Boulenger 1887, and I propose for it the name, ***Hyla weberi***.

It will be maintained by some who are concerned only with North American herpetology that the name *Pseudacris* should be retained, if only to distinguish the American diminutive hylas. These workers may still use the name *Pseudacris* as a section or a group name, just as one often speaks of the "*Hylella* group" of *Hyla*.

SUMMARY

(1) No characters exist to distinguish *Pseudacris* from the short-webbed neotropical species of *Hyla*.

(2) *Pseudacris* has undergone an evolution parallel to this group of hylas.

(3) The species of *Pseudacris* must be referred to *Hyla*, although all species are distinguished from American hylas on external characters.

(4) In referring these species to *Hyla*, certain names are found to be preoccupied, and the following names have been proposed: *H. canadensis* for *P. septentrionalis*; *H. weberi* for *P. copii*.

LITERATURE CITED

BOULENGER, G. A.

1882. 'Catalogue of the Batrachia Salientia . . . of the British Museum.' London.

COPE, E. D.

1889. 'The Batrachia of North America.' Bull. U. S. N. M., XXXIV.

HOLBROOK, J. E.

1842. 'North American Herpetology, IV.' Philadelphia, 2nd Ed.

NOBLE, G. K.

1918. 'The Amphibians Collected by the American Museum Expedition to Nicaragua in 1916.' Bull. Amer. Mus. Nat. Hist., XXXVIII, pp. 311-347, Pls. XIV-XIX.

1922. 'The Phylogeny of the Salientia I. The Osteology and the Thigh Musculature; Their Bearing on Classification and Phylogeny.' Bull. Amer. Mus. Nat. Hist., XLVI, pp. 1-87, Pls. I-XXIII.

STEJNEGER L. AND BARBOUR, T.

1917. 'A Check List of North American Amphibians and Reptiles.' Cambridge.