American Museum Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N. Y. 10024

NUMBER 2375 MAY 12, 1969

The Hemipenis of *Philodryas* Günther: a Correction (Serpentes, Colubridae)

By Herndon G. Dowling[1]

Cope's greatest contribution to the classification of snakes may have been his introduction of hemipenial characters as taxonomic characters. It may also be that the apparent lack of consistency in hemipenial features which developed later was one of his greatest disappointments. The difference in tone between his early announcement, "I have made an examination of the hemipenis and have obtained valuable indications of relationship which have been hitherto unknown" (Cope, 1893, p. 478), and the later statements, "I have ceased to regard the more important penial structures observed as definitive of families, but rather of subfamilies. . . . Several very distinct types are distinguishable, but they are continuous at some point through intermediate forms. This is, however, the history of all characters which distinguish organic beings, especially of those which have been relied on as characters . . . of the Ophidia" (Cope, 1895, pp. 193, 194), suggests a diminishing confidence in these characters.

Many herpetologists still share a measure of distrust of hemipenial characters for taxonomic decisions, but, now that much more evidence has accumulated, probably Cope's early confidence was not misplaced. Rather, it appears that his loss of confidence resulted from a series of unfortunate and erroneous observations and from the immature taxonomy of the time.

[1] Research Associate, Department of Herpetology, the American Museum of Natural History.

Additional study is making more understandable those disturbing observations of what appeared to be closely related snakes having widely different kinds of hemipenes. Some incongruities have been shown to have been due to poor specimen preparation (*vide* Bogert, 1940, pp. 44, 47), mistaken identification of structure (Dowling, 1959, p. 3), or even poor art work (Bogert, 1940, p. 63). Later taxonomists have rearranged various species, placing some of the anomalous ones in other genera and grouping some previously separated species under one generic name.

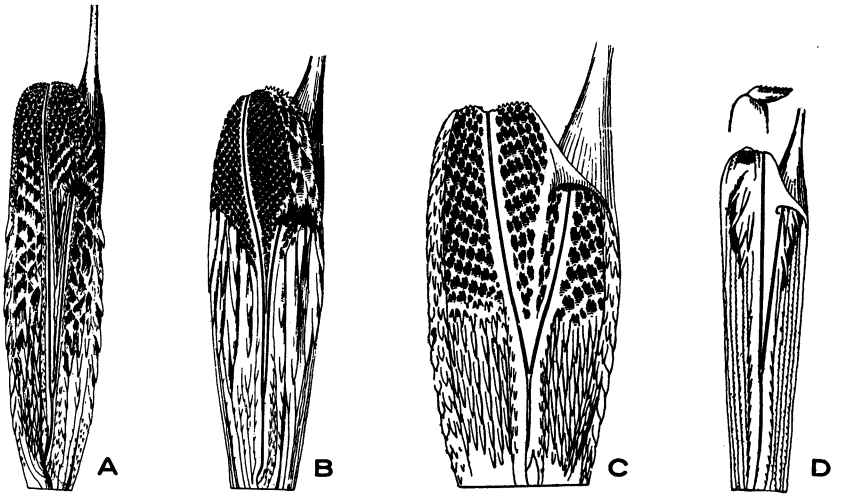

FIG. 1. Inverted and longitudinally split hemipenes of four species of the genus *Philodryas* (all from Cope, 1895). A. *P. nattererii* (pl. 28, fig. 6). B. *P. schottii* (pl. 28, fig. 7). C. *P. viridissimus* (pl. 27, fig. 8). D. "*Lygophis*" [=*Philodryas*] *elegans* (pl. 29, fig. 12).

Much of this taxonomic work has grouped species with similar hemipenes and separated those with different organs—often without reference by the author to the hemipenis. Cases of apparently anomalous hemipenial structure, however, remain unresolved. The present case involving several species of the genus *Philodryas* appears to have at its base the faulty observation of hemipenial structure in some species and the omission or misinterpretation of certain structures in others. When the primitive magnifying lenses available to nineteenth-century workers are considered, however, it seems remarkable that they were able to achieve the degree of accuracy that they display.

Cope's major and last comprehensive work on snake classification (1895) illustrated the hemipenes of more than 200 species of snakes (these quarto plates were reduced and reprinted, given plate numbers two

fewer than the originals in Cope, 1900). The erratic grouping of the figures, however, apparently based more on the size and shape of the drawing than on the taxonomy of the snake, tends to obscure the similarity of the hemipenes of taxonomically close species. Further, Cope's use of obsolete rules of nomenclature and his own generic names, many of which were not recognized by subsequent workers, makes the use of the plates an unusually taxing exercise in the history of zoological nomenclature.

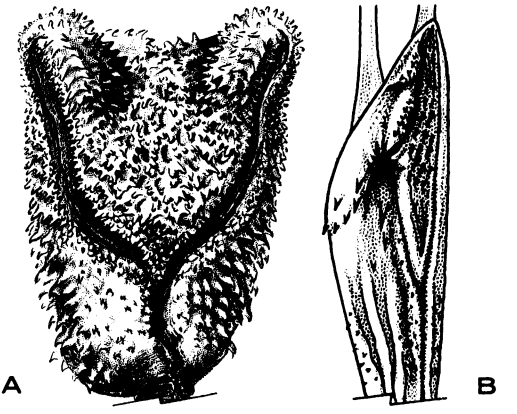

FIG. 2. Hemipenes of two species of the genus *Philodryas*. A. *P. olfersi* (U.M.M.Z. No. 108998, partly everted when preserved; apices everted after preservation). B. *P. elegans* (A.N.S.P. No. 11347, inverted and longitudinally split; a syntype of *Lygophis poecilostomus* Cope, 1876, apparently the specimen figured by Cope, 1895; cf. fig. 1D). The flaps near the apex in the inverted hemipenis become the bulges on the asulcate side of the everted hemipenis. Cope misinterpreted one of these flaps as an apical disc. Original drawings by Frances W. Gibson.

When the figures are grouped into units that reflect current taxonomic usage, however, the similarities and incongruities become evident (fig. 1). These figures, gathered from three different plates and here reduced to similar dimensions, illustrate the inverted hemipenes of four species of the South American colubrid genus *Philodryas,* as currently recognized. Three species, *P. nattererii, P. schottii,* and *P. viridissimus,* are illustrated as having very similar hemipenes; all may be described as bilobed with bifurcate sulcus, and having a proximal spiny region with calyculate distal lobes. The hemipenis shown for *"Lygophis"* (= *Philodryas*) *elegans* is quite different: bilobed with a furcate sulcus, but without calyces and with an unusual apical auriculate awn.

This latter hemipenis is illustrated in such a different fashion from

the others that I was at first convinced that there had been an error of misidentification; the drawing closely resembles the hemipenis of *Madagascarophis colubrinus* (Schlegel). I was dissuaded from this view, however, by Edmond Malnate, who pointed out (*in litt.*) that one of the syntypes of *Lygophis poecilostomus* Cope, 1876 (a synonym of *L. elegans* Tschudi, 1846), apparently was the specimen upon which the drawing was based. Further, he said that the hemipenis of the syntype was much like the drawing, except that there was a "finely calyculate area" near the distal end which was omitted from Cope's illustration.

This information led me to broaden my examination to include specimens of several species of *Philodryas* which were gathered from other museums. The abbreviations of various institutions from which specimens were examined are:

A.M.N.H., the American Museum of Natural History
A.N.S.P., Academy of Natural Sciences of Philadelphia
F.M.N.H., Field Museum of Natural History, Chicago
U.M.M.Z., University of Michigan Museum of Zoology, Ann Arbor

In most of the specimens available, including the syntypes of *Lygophis poecilostomus* (A.N.S.P. Nos. 11347–11349), the hemipenes are inverted into the base of the tail and must be dissected out and split longitudinally for examination. In some of the more recently collected specimens the hemipenes are partly everted, but in none is it completely so. Thus, the observations are still less than ideal, and the proportions of the apical structures are open to question. Nevertheless, one important point is clarified: all the species of *Philodryas* observed (including *P. olfersii* Lichtenstein, the type species) have basically the same kind of hemipenis. It is bilobed and non-capitate, spinose proximally and calyculate distally, and has a centrifugal bifurcate sulcus. The size and number of the spines differ in the different species, as do perhaps the proportions of the apical lobes (fig. 2). It is not known whether the "rabbit-ear" appearance shown by some specimens would be retained in fully everted hemipenes.

Thus, Cope's figures for *P. nattererii, P. schottii,* and *P. viridissimus,* although they appear to overemphasize the width of the lobes or omit their apices, give the correct over-all structure of the organ. In the figure for *"Lygophis" elegans,* however, the misinterpreted apical structures and omitted calyculate areas make it highly misleading.

Cope's misrepresentation of this specimen, together with his adoption of a nomenclatural procedure considered invalid under current rules ("A generic name of a species must be accompanied by a separate definition of the genus intended. . . ." [Cope, 1875, p. 5]), has resulted

in a number of erroneous statements in the literature. Thus, on the basis of his invalid rule, he attributed the name *Lygophis* to Tschudi ("1845" [1846]), with *elegans* as the type species, rather than to Fitzinger (1843, p. 26), with "*Herpetodryas lineatus* Schleg." (=*Coluber lineatus* Linnaeus) as the type (Cope, 1894, p. 842). His misrepresentation of the hemipenis of the presumed type species in turn led him to place *Lygophis* in a group of genera ("Levi") with acalyculate hemipenis (Cope, 1894, p. 842), and later to place it in a separate section of the "Erythrolamprinae" with "disc papillose" (Cope, 1895, p. 207; 1900, p. 1091). It probably also led to Dunn's (1928, p. 21) misallocation of *Philodryas* to a "Disked, double" category. If accurately described, *Philodryas elegans* (Tschudi, 1845) would have been placed, along with other species of its genus, in Cope's group "Calyculati" (1894, p. 842) of the Dipsadidae, Scytalinae (1895, p. 207; 1900, p. 1091), and in Dunn's Colubridae, Ophiinae, "Normal, double" group (1928, p. 21).

This correction of Cope's representation of the hemipenis of *Philodryas elegans,* together with minor corrections of that of other species, removes one more of the species of American snakes with "anomalous" hemipenial structure and provides a truer view of the relations of the South American genus *Philodryas* Wagler, 1830. On the basis of hemipenial structure, most South American colubrids appear to fall into one of four undefined groups: (1) those with a single, non-capitate, spinose, and calyculate hemipenis with a simple sulcus ("colubrine" snakes); (2) those with a single, capitate, spinose, and calyculate hemipenis with a simple or apically bifurcate sulcus ("dipsadines"); (3) those with a bilobed, non-capitate or semi-capitate, spinose, and calyculate hemipenis with a bifurcate sulcus ("dromicines"), or (4) those with a bilobed, non-capitate, spinose, acalyculate hemipenis with a bifurcate sulcus and an apical disk ("xenodontines"). The observations on *Philodryas* help to place it solidly in the "dromicine" group.

ACKNOWLEDGMENTS

Dr. Charles M. Bogert kindly allowed me to examine the specimens under his care in the American Museum of Natural History. Mr. Edmond V. Malnate, Academy of Natural Sciences of Philadelphia, fortunately rescued me from a complete misinterpretation of Cope's figure of the hemipenis of "*Lygophis*" *elegans* by finding the specimen apparently used by Cope and making it available to me. Dr. James A. Peters, United States National Museum of the Smithsonian Institution, also searched for the specimen in question. Dr. Robert F. Inger, Field Museum of Natural History, and Dr. Charles F. Walker, University of Michigan

Museum of Zoology, lent important specimens from their respective institutions. The original manuscript was reviewed by Dr. Bogert, Dr. Richard G. Zweifel, and Mr. Itzchak Gilboa.

The information presented in this paper was obtained while I was consolidating information on the genera of reptiles. It is contribution number 9 of the Genera of Reptiles project, which is partly supported by the National Science Foundation (Grant GN-707).

I am very grateful to all these persons and institutions for their aid.

LITERATURE CITED

BOGERT, CHARLES M.

1940. Herpetological results of the Vernay Angola expedition, with notes on African reptiles in other collections. Part I. Snakes, including an arrangement of African Colubridae. Bull. Amer. Mus. Nat. Hist., vol. 77, pp. 1–107, figs. 1–18, pl. 1.

COPE, EDWARD D.

1875. Check-list of North American Batrachia and Reptilia; with a systematic list of the higher groups and an essay on geographical distribution. Based on the specimens contained in the U. S. National Museum. Bull. U. S. Natl. Mus., 1875, no. 1, pp. 1–104.

1893. Prodromus of a new system of the non-venomous snakes. Amer. Nat., vol. 27, pp. 477–483.

1894. The classification of snakes. *Ibid.,* vol. 28, pp. 831–844, pls. 27, 28.

1895. The classification of the Ophidia. Trans. Amer. Phil. Soc., new ser., vol. 18, pt. 2, art. 3, pp. 186–219, pls. 14–33.

1900. The crocodilians, lizards and snakes of North America. Rept. U. S. Natl. Mus., for 1898, pp. 153–1294, pls. 1–36.

DOWLING, HERNDON G.

1959. Apical papillae on the hemipenes of two colubrid snakes. Amer. Mus. Novitates, no. 1948, pp. 1–7, figs. 1, 2.

DUNN, EMMETT R.

1928. A tentative key and arrangement of the American genera of Colubridae. Bull. Antivenin Inst. Amer., vol. 2, no. 1, pp. 18–24.

FITZINGER, LEOPOLDO

1843. Systema reptilium. Fasciculus primus. Amblyglossae. Vienna, Braumüller and Seidel, 106+vi+[3] pp.

TSCHUDI, JOHANN J. DE

1845. Reptilium conspectus quae in Republica Peruana reperiunter et pleraque observata . . . [etc.]. Arch. Naturgesch., vol. 11, no. 1, pp. 150–170.

"1845" [1846]. Untersuchungen über die Fauna Peruana. Herpetologie. Vienna, St. Gallen, 80 pp., 12 pls.