My wife Marian helped with the field work. Financial aid was supplied by the Frank M. Chapman Memorial Fund and by the Peabody Museum of Yale University. NSF funds administered by the University of Michigan covered my fees while I was at the biological station.

LITERATURE CITED

ALLEN, A. A. 1930. Cherry bird—the Cedar Waxwing. Bird-Lore 32:298–307.

BENT, A. C. 1950. Life histories of North American wagtails, shrikes, vireos, and their allies. U.S. Natl. Mus., Bull. 197.

LACK, D. 1968. Ecological adaptations for breeding in birds. Methuen and Co., London.

LEA, R. B. 1942. A study of the nesting habits of the Cedar Waxwing. Wilson Bull. 54:225–237.

MESSERSMITH, D. H. 1963. Birds in a red pine plantation. Wilson Bull. 75:235–243.

PUTNAM, L. S. 1949. The life history of the Cedar Waxwing. Wilson Bull. 61:141–182.

SAUNDERS, A. A. 1911. A study of the nesting of the Cedar Waxwing. Auk 28:323–329.

YOUNG, H. 1949. A comparative study of nesting birds in a five-acre park. Wilson Bull. 61:36–47.

Accepted for publication 25 January 1971.

TONGUE STRUCTURE OF THE SUNBIRD *HYPOGRAMMA HYPOGRAMMICA*

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Hypogramma hypogrammica is an aberrantly-plumaged Malaysian sunbird usually allied to *Anthreptes* "on account of the straight keel of the lower mandible" (Shelley 1878) or *Nectarinia* on account of "its general coloration and apparently primitive nature" (Delacour 1944). In the most recent revision of the Nectariniidae, Rand (1967a) considered *Hypogramma* a monotypic genus which he placed between *Anthreptes* and *Nectarinia*.

Hypogramma hypogrammica is dull olive green in color, somewhat yellower below with bold streaking on most of the underparts, resembling in this respect certain *Arachnothera* (*A. juliae* for example) and certain female *Nectarinia* such as *N. johannae*. Iridescent coloration is restricted to males, which have a purple crescent on the nape and similar purple coloration on the lower back and upper tail coverts. Often concealed on study skins and rarely remarked upon are (in the male only) elongated tufts of white feathers at the base of the lower back. The pattern of metallic coloration, especially the nuchal patch, is unlike any other sunbird, although several species of *Anthreptes* have similar purple lower backs.

Because *Aethopyga-Arachnothera* sunbirds are easily distinguished from *Nectarinia* and *Anthreptes* by their tongue tip structure (Scharnke 1932; Delacour 1944), I wanted to examine the tongue of *Hypogramma* to establish its affinities with *Anthreptes-Nectarinia*. W. E. Lanyon kindly gave me permission to remove for examination the tongue from a skin of *Hypogramma hypogrammica intensior* (AMNH 685539) in the collections of the American Museum of Natural History.

The tongue of most sunbird species is for the major part of its length a closed tube formed by inward rolling and meeting of the edges (see cross sections in Skead 1967:28). The tongue tip is split and bitubular, but it lacks elaborate fimbriation. Virtually all species of sunbirds that have been examined have similar tongues; I have personally examined the tongues of 12 sunbird species in addition to those 23 species listed by Gardner (1925), Scharnke (1932), and Skead (1967). *Aethopyga* and *Arachnothera* differ from other sunbirds in having lateral splits at the tongue tip instead of a single median one; this separates a single, flat center piece from two lateral grooved structures (Scharnke 1932). The one important exception, *Anthreptes singalensis* (= *Chalcoparia phoenicotis*), has a flat tongue with a slight brush tip (Gardner 1925; pers. observ.); this was considered a significant enough departure from typical sunbirds to cause the species' removal from the family at one time (Scharnke 1932), but not permanently. The South African sugarbirds, *Promerops*, have semitubular, quadrifid, brush-tipped tongues which resemble honeyeater tongues in some aspects and those of sunbirds in others (Rand 1967b; Skead 1967).

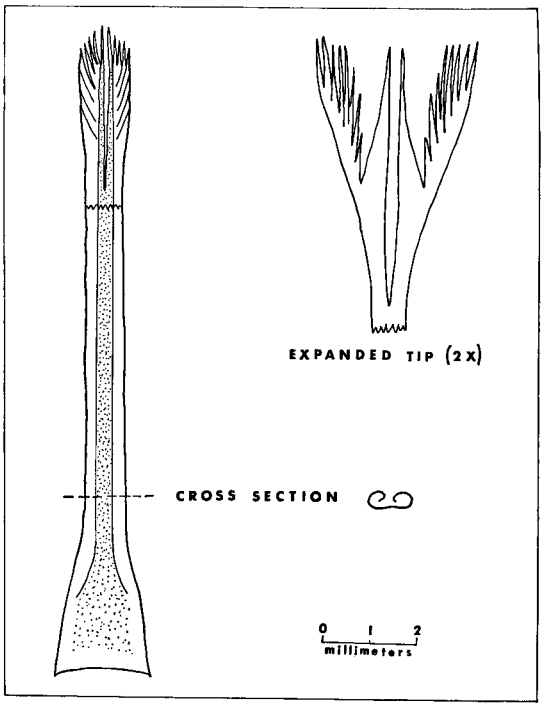

FIGURE 1. Tongue structure of *Hypogramma hypogrammica*.

The essential features of *Hypogramma*'s tongue structure are as follows (see fig. 1). a) The tongue is nontubular. The edges are curled inwards, form-

ing an open semitubular structure, but this is probably an artifact of preservation as found by Moreau et al. (1969) in white-eye (Zosteropidae) tongues. The tongue of *Hypogramma* is definitely not the closed tubular structure of most sunbirds but resembles instead the tongues of *Promerops* and honeyeaters.

b) The tip is quadrifid. The primary division extends from the distal tip for about one sixth of the tongue's total length; the secondary division is about one-half the length of the primary division.

c) The tip is fimbriated, forming a rather simple brush tip. Fimbriation is confined to the inner edges of the outer tips which are extensively split, but the inner ones narrow into sharp, unfrayed tips.

d) It appears to be cuticular throughout most of its length, thus resembling sunbird and sugarbird tongues rather than the fleshy tongues of honeyeaters. However, fresh material is needed for detailed study of the cuticle and musculature as well as natural groove relationships.

Brush-tipped, quadrifid tongues are characteristic of Meliphagidae, certain Dicaeidae (Mayr and Amadon 1947; Rand 1961), Zosteropidae (Moreau et al. 1969), and the "Promeropidae" (Rand 1967b). However, the tongue of *Hypogramma* differs from other known quadrifid tongues in having the fimbriation restricted to the inner edges of the outer pair of tips. The simple unfrayed inner pair of tips of *Hypogramma*'s tongue resembles the simple central elements of *Promerops*' tongue. In overall structure the tongue of *Hypogramma* is closer to those of the Nectariniidae than to those of the Meliphagidae, but it especially resembles *Promerops*'.

Except for tongue structure, there is little reason to doubt that *Hypogramma* is a sunbird, despite examples of known convergence in such flower feeding birds (e.g., *Neodrepanis*, *Myzomela*, *Myzornis*, etc.). *Hypogramma*'s feeding behavior and nest structure (see Robinson 1927:305) support the traditional sunbird relationship, and its peculiar plumage pattern obscures only its subfamilial affinities. Its aberrant tongue structure, described here, supports its generic separation from other sunbirds but in no way allies *Hypogramma* to *Anthreptes-Nectarinia* as opposed to *Aethopyga-Arachnothera*.

The resolution of *Hypogramma*'s true affinities may ultimately bear on the question of the relationships of the sugarbird (*Promerops*) of South Africa. However, the superficial resemblance of the tongues of *Hypogramma* and *Promerops* needs to be supplemented by additional lines of evidence before speculation as to their possible relationship will be worthwhile. Certainly *Promerops*' quadrifid tongue structure is of even less value now than before as a taxonomic character indicating relationship with the Meliphagidae.

I am grateful to Walter J. Bock and Austin L. Rand for their comments on earlier drafts of this paper.

LITERATURE CITED

DELACOUR, J. 1944. A revision of the family Nectariniidae (sunbirds). Zoologica 29:17–38.

GARDNER, L. L. 1925. The adaptive modifications and the taxonomic value of the tongue in birds. Proc. U. S. Natl. Mus. 67:1–49.

MAYR, E., AND D. AMADON. 1947. A review of the Dicaeidae. Amer. Mus. Novitates, no. 1360.

MOREAU, R. E., M. PERRINS, AND J. T. HUGHES. 1969. Tongues of the Zosteropidae (white-eyes). Ardea 57:29–47.

RAND, A. L. 1961. The tongue and nest of certain flowerpeckers (Aves:Dicaeidae) Fieldiana—Zool. 39:581–587.

RAND, A. L. 1967a. Family Nectariniidae. p. 208–289. *In* R. A. Paynter, Jr. [ed.] Checklist of birds of the world. Vol. XII, Mus. Comp. Zool., Cambridge, Mass.

RAND, A. L. 1967b. The flower-adapted tongue of a Timaliinae bird and its implications. Fieldiana—Zool. 51:53–61.

ROBINSON, H. C. 1927. The birds of the Malay Peninsula. Vol. 1. The commoner birds. H. F. and G. Witherby, London.

SCHARNKE, H. 1932. Uber den Bau der Zunge der Nectariniidae, Promeropidae, und Drepanididae. J. Ornithol. 80:114–123.

SHELLEY, G. E. 1878. A monograph of the Nectariniidae, or family of sunbirds. Publ. by author, London.

SKEAD, C. J. 1967. The sunbirds of southern Africa. Cape and Transvaal Printers Ltd., Capetown.

Accepted for publication 7 January 1971.

HORNED GREBE SPECIMEN FROM ARIZONA

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On 23 November 1967, I collected a Horned Grebe (*Podiceps auritus*) on an irrigation pond about 7 mi. N of Tucson, Pima County, Arizona. It is a juvenile with dark patches of feathers below the eyes, on the front of the neck, and on the upper breast. Except for size, it was nearly indistinguishable from the approximately 15 Eared Grebes (*P. caspicus*) also present on the pond.

Although the AOU Check-list of North American Birds (Fifth ed., AOU, Baltimore, 1957) does not include Arizona within the range of the Horned Grebe, Phillips, Marshall, and Monson (The birds of Arizona, Univ. Arizona Press, Tucson, 1964) consider it a rare transient, noting several sight records and one specimen record from along the Colorado River. This previous specimen (presently in the United States National Museum Bird Collection, Washington, D. C.) was taken on 27 October 1952 on Lower Havasu Lake. My specimen is the first record of this species in Arizona, east of the California-Arizona border. Its plumage lends much support to the suggestion of Phillips et al. (op. cit., p. 2) that "the scarcity of records for the state may reflect only the extreme difficulty of distinguishing the Horned Grebe in its winter plumage."

My thanks to H. B. Tordoff (University of Michigan) for confirming my identification of the specimen. The bird has been deposited in the University of Arizona Bird Collection, Tucson, Arizona.

Accepted for publication 11 December 1970.

[1] Deceased.