

lacked the white tips to the primary coverts and white and yellow tips to the primaries that are such a conspicuous feature of the Bohemian Waxwing.

The occurrence of the Cedar Waxwing in central Alaska well over 700 miles north of its recorded range in the state is quite extraordinary. The likely explanation is that the two Cedar Waxwings joined a flock of migrating Bohemian Waxwings and accompanied them north to the Hess Creek area. From the recorded range of the two species, it seems that there is some degree of overlap in winter and un-

doubtedly also at certain times during migration.

It is unlikely that this record represents a northward extension of the range of the Cedar Waxwing in Alaska, but that possibility exists. A similar problem occurs with the Rufous Hummingbird (*Selasphorus rufus*), whose range is given by Gabrielson and Lincoln (op. cit.) as southeastern Alaska north to Prince William Sound. It is now known to occur as far north as the upper Yukon River area (White and Haugh, Can. Field Nat. 83:257, 1969).

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OBSERVATIONS ON THE URBAN FEEDING HABITS OF THE ROADRUNNER (*GEOCOCCYX CALIFORNIANUS*)

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During the years 1970 and 1971, extensive observations were made of a pair of Roadrunners (*Geococcyx californianus*) and their young. The birds were frequent, almost daily visitors in the backyard of a home in Woodland Hills, Los Angeles County, California. The home is located on the northern slope of the Santa Monica Mountains at an elevation of about 1200 ft, and the backyard is contiguous with the chaparral growth native to this region. The yard, planted to dichondra with a border of shrubs and annuals, has a population of introduced European snails (*Helix pomata*).

Roadrunners were first noticed in March 1970 (sometimes alone, sometimes as a pair) feeding on the snails, and they have been observed many times during the following months. The bird forages under the shrubbery and flowers in the garden for snails which it carries in its beak to the nearest large rock (sometimes several meters away). With a sideways, snapping motion of its head, it hammers the snail against the rock until the shell is broken into fragments. The soft body is then eaten. After feeding, mucous from the snails is carefully cleaned from the beak by rubbing against the soil. In both 1970 and 1971 parent birds were seen feeding snails to their

half-grown young. This previously unreported feeding behavior may indicate an unsuspected ability of these primarily chaparral- and desert-adapted birds to find acceptable food even after man has altered their normal habitat. A somewhat similar behavior has been reported for the Blackbird (*Turdus merula*) which uses rocks as anvils.

The Roadrunners were also observed capturing small birds. A cement block wall separates the yard from a steep slope which is covered with dense chaparral in the upper portion and cleared of brush in the lower portion. Just beyond the wall a bird feeder, kept supplied with chicken scratch, is utilized by many passerine birds, Mourning Doves (*Zenaidura macroura*), and California Quail (*Lophortyx californicus*). A Roadrunner, attracted by this bountiful prey, takes a position a few feet from the feeder and waits until a group of birds is within about 6 ft of its position, at which time it makes a sudden rush, head down, wings slightly extended. If the attack is successful, the Roadrunner kills its prey with a few stabbing motions of its beak and carries it to the dense chaparral above. On three occasions when prey could be identified, a House Finch (*Carpodacus mexicanus*) and two young quail were captured. Zimmerman (Condor 72:475, 1970) has also described predation on passerine birds by the Roadrunner.

Although many new homes have been built in the immediate area in the last few months, the Roadrunners are still present. Hopefully they may be able to supplement their customary diet with the snails and adapt to the man-made changes in their environment.

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TONGUE STRUCTURE OF THE PLUMED WHISTLING DUCK (*DENDROCYGNA EYTONI*)

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The eight species of whistling or tree ducks (*Dendrocygna* spp.) form a closely related group whose phylogenetic status is unchallenged (cf. Delacour

1954:26; Johnsgard 1968:6; and others). Despite their taxonomic similarity, however, a significant degree of ecological and behavioral diversity exists among these forms as shown in the functional anatomy of the North American species discussed by Rylander and Bolen (1970).

Our observations of the feeding apparatus of this group indicate a general uniformity with regard to the tongue structure consistent with a basic similarity in their diets (i.e., seeds from either aquatic or terrestrial sources). We were thus surprised to note the presence of a remarkably developed fimbriated lateral margin on an anterior process of the tongue of the Plumed Whistling Duck (*D. eytoni*). This condition, not previously reported elsewhere, was discovered on specimens kindly sent to us from Australia by H. J. Frith. A fimbriated tongue margin in this position has not been reported for anatids, and

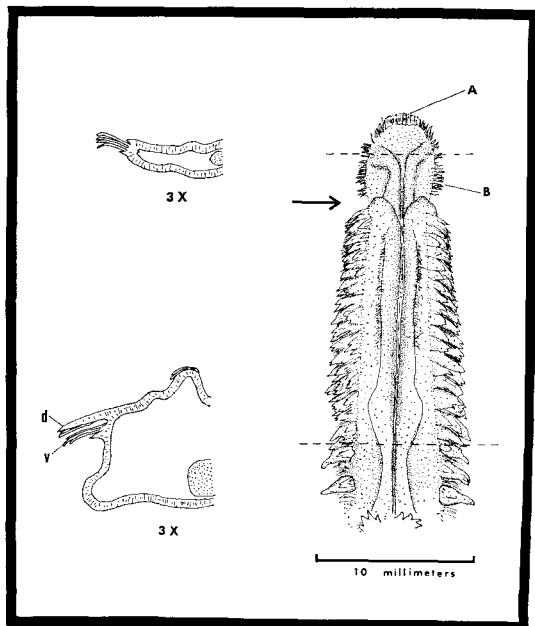


FIGURE 1. Dorsal view of the tongue of *Dendrocygna eytoni* (right) and cross sections of the anterior part (upper left) and posterior part (lower left) of the tongue. The musculature and internal loose connective tissue are not illustrated in the two figures at the left, leaving an outline of the integumentary shell. The arrow indicates the division between the anterior and posterior parts of the tongue. The flap at the anterior margin of the tongue (A) is more prominent in *D. eytoni* than in the other dendrocygnids examined. The fimbriated lateral margin (B) on the anterior part of the tongue, apparently not represented in other anatids, appears to be an anterior elaboration of the ventral row of trichia (v) rather than of the dorsal row of scales and trichia (d) that form the lateral margin of the posterior part of the tongue.

the few avian groups having any sort of fimbriated tongue at all are not closely related to waterfowl (cf. Gardner 1925; Gill 1971).

The posterior part of the tongue in *D. eytoni* (fig. 1: posterior to arrow) differs only in detail from that of the other dendrocygnids we examined (*D. autumnalis*, *D. arcuata*, and *D. bicolor*). In all four species (as well as most other anatids), the integumentary processes on the lateral margin of this part of the tongue are in two rows: (1) a dorsal row of scales and spines, most of which have hair-like processes (which we call trichia) sparsely distributed on their dorsal and ventral surfaces; and (2) a ventral row of dense trichia that give the lateral margin of the tongue a brush-like appearance when viewed under magnification.

The unique fimbriated margin on the anterior part of the tongue (fig. 1: anterior to arrow) in *D. eytoni* appears to be an anterior extension of the ventral row of dense trichia so prominent on the posterior part of the tongue. These trichia were equally as well developed in the three specimens available to us.

The function of the fimbriated lateral margin in *D. eytoni* is not obvious. We find nothing in the literature suggesting that such fimbriations would

be uniquely useful to *D. eytoni*. Our cursory observations of the feeding behavior of captive *D. eytoni* at The Wildfowl Trust, Slimbridge, England, did not indicate any adaptive role for the fimbriations. Considering the presumed usefulness of the fimbriations for straining and separating seeds in water, one might expect a priori that a fimbriated process would occur in those whistling ducks highly adapted to aquatic feeding habits. However, *D. eytoni* is instead a cursorial species and feeds extensively by grazing in grasslands both near and far from water (Frith 1967:88; Lavery 1967). Many of *D. eytoni*'s feeding habits, including grazing, are thus similar to those of the Black-bellied Tree (Whistling) Duck (*D. autumnalis*) (cf. Bolen and Forsyth 1967); yet the latter species, like the other whistling ducks, lacks the unique tongue structure of *D. eytoni*. In contrast, the tongues of waterfowl that feed heavily on grasses and weeds generally exhibit sharp spines instead of trichia; thus terrestrial feeders such as geese have a single lateral row of conical "teeth" on their tongues (Gardner 1927) whereas an insectivorous feeder such as the Blue Duck (*Hymenolaimus malacorhynchus*) altogether lacks apparent modifications in tongue structure (Kear and Burton 1971).

Although the fimbriated tongue of the Plumbed Whistling Duck appears to be unique among anatids, we do not suggest modifying the taxonomy of this species with its present congeners (see, however, Gardner 1925 and Gill 1971 for discussions of the taxonomic importance of tongue morphology in other avian groups). Yet, we do wish to emphasize that this feature remains an anomaly whose function, if any, cannot be correlated with the existing knowledge of the foods and feeding behavior of *D. eytoni*. Moreover, the question of how the presence of such a tongue structure in *D. eytoni* can be explained in light of the adaptive radiation experienced by the entire whistling duck group is equally perplexing and awaits fuller study.

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