THE ROLE OF AVIAN RICTAL BRISTLES

ROGER J. LEDERER

IT has long been assumed by many workers that rictal bristles are characteristic of insectivorous birds and are employed as accessory food-capturing structures (Welty, 1962; Van Tyne and Berger, 1965). Others have said that the bristles serve a tactile function (Küster, 1905; Chandler, 1914; Stresemann, 1934; Wallace, 1955; Pettingill, 1970). No convincing evidence has been gathered to date to demonstrate the actual function of these bristles but it appears that their use as an insect scoop is negligible or non-existent.

Facial bristles are modified hairlike feathers which may run along the rictal region as rictal bristles in many diverse groups of birds such as the Apterygidae, Caprimulgidae, Aegothelidae, Mimidae, Accipitridae, and Tyrannidae. They may also encircle the eyes as eyelashes and lie over the top of the bill as loral bristles in numerous species. Facial bristles are fairly stiff, tapering to a point at the end and there may be barbs present on the rachis (Fig. 1). Filoplumes are hairlike also, but the shaft is weak and naked except for the tip which has a few barbs. The distribution, length, and number of bristles vary widely among species.

One function proposed for these structures is sensory, analogous to vibrissae in mammals. Küster (1905) reported finding avian lamellar corpuscles at the base of the rictal bristles in some owls. Küster suggested that the bristles may react to sound waves and that they are similar to mammalian tactile hairs. Schildmacher (1931) reported finding pressure-sensitive corpuscles at the base of many feather-types.

Chandler (1914) proposed that rictal, as well as other facial bristles, cover the face where ordinary feathers would be subject to excessive wear and tear.

Seemingly the most obvious application of rictal bristles is as an aid to in-flight feeding by facilitating prey capture. Theoretically, a bird which captures insects in flight would be benefited by stiff hairlike structures positioned about the bill in such a way as to form a funnel and thus giving the bird a larger effective gape, providing a more efficient capturing mechanism. It seems that the bird would only have to make some minor head movements to implement the device. However, this appears not to be the case.

A cursory examination of a number of bird families indicates that there is little or no relation between the presence, dimensions, or number of facial bristles and a tendency towards aerial feeding or insectivorous habits. The Tyrannidae, Parulidae, and Caprimulgidae, for example, capture flying insects and possess well developed rictal bristles. But the Mimidae, Turdidae,

FIG. 1. Cluster of rictal bristles of the Alder Flycatcher (*Empidonax traillii*). Seven millimeters in length.

Icteridae, Corvidae, and Apterygidae (Kiwi), which are somewhat insectivorous, yet rarely, if ever (the Kiwi, never), feeding in flight, also possess well developed bristles.

Figures 2 and 3 are examples of bristle arrangement in two species with

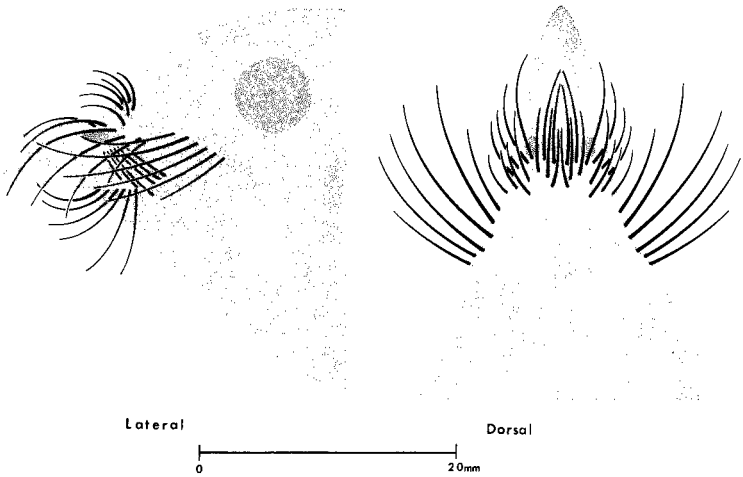

FIG. 2. Dorsal and lateral views of the head of *E. traillii*, showing the number and arrangements of facial bristles. Length of skull is 31 mm, width at widest point is 22 mm.

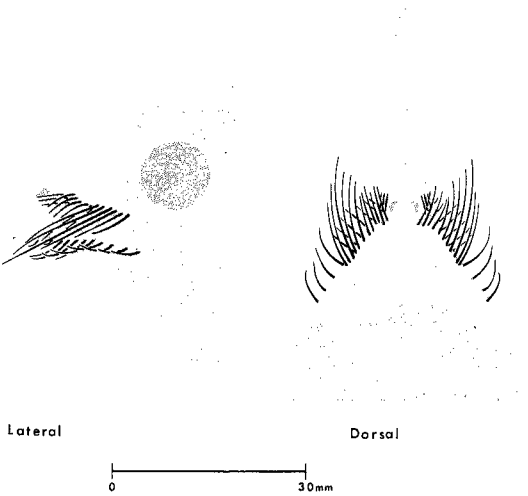

FIG. 3. Dorsal and lateral views of the head of the Brown Thrasher (*Toxostoma rufum*), showing the number and arrangement of facial bristles. Length of skull is 61 mm, width at widest point is 36 mm.

different feeding habits. The Alder Flycatcher (*Empidonax traillii*) forages by sitting erect on a low perch, watching for an insect to fly by, occasionally flying out to capture one, and returning to the same perch or one nearby (Bent, 1942; personal observation). The Brown Thrasher (*Toxostoma rufum*) forages in the ground litter by poking with its bill for insects, seeds, and berries; frequently the bill is thrust into the ground in search of prey (Engels, 1940). If there is any relation between the arrangement and/or number of rictal bristles and feeding behavior in these two species, it is not apparent.

I have direct evidence that, at least in several tyrant flycatchers, rictal bristles perform no function associated with prey capture. With the use of a high-speed motion picture camera, I photographed mid-air captures of flesh flies (*Sarcophaga bullata*) by the Crested Flycatcher (*Myiarchus crinitus*), Eastern Phoebe (*Sayornis phoebe*), Eastern Wood Pewee (*Contopus virens*), and some *Empidonax* species which could not be identified in the film. The films were taken while the birds were confined in a large glass-fronted cage into which the flies were introduced. Photographs were taken at the rate of 375 frames per second and analyzed on a stop-action projector. Over 30 sequences of prey capture were recorded and in every instance in which a capture or near-capture was made, the insect was caught between the tips of the mandibles.

The prey are captured in the bill tips, rather than farther back in the mouth

as would be the case if rictal bristles were utilized. Observation indicates that flycatchers normally seize their prey with a rapid closure of the bill, frequently resulting in an audible "snap." The upper mandible of these birds also forms a distinct downward hook at its anterior end (Fig. 2). It appears that this hook is an aid to seizing and holding prey. My observations in the field and laboratory both indicate that mid-air captures of insects by flycatchers occur as follows: a) The bird approaches the insect with jaws agape; b) when the tips of the mandibles are in close proximity to the prey, the jaws begin to close; c) the jaws close rapidly, trapping the prey in the bill tips.

I suggest that flycatchers and probably other birds with similarly shaped bills that catch insects in flight, do not use their rictal bristles in the process. Non-aerial feeders probably do not use their bristles in feeding, at least not for prey capture. Some birds which are aerial feeders but have very different bills, such as goatsuckers, swallows, and swifts, have a large gape. They probably do not use bristles in prey capture, although I would not exclude this possibility.

It appears as if the use of rictal bristles as an aid to aerial prey capture by arthropod-eating birds has been casually accepted without definitive evidence.

The most logical explanation for the presence of rictal bristles is that they perform some sort of sensory function. Further investigation is obviously warranted.

SUMMARY

Proposed explanations for rictal bristles are that they perform tactile functions, serve as an insect scoop, or protect other facial feathers. In the Tyrannidae, at least, motion pictures indicate that they do not play a part in prey capture.

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LITERATURE CITED

BENT, A. C. 1942. Life histories of North American flycatchers, larks, swallows, and their allies. U. S. Natl. Mus. Bull., 179.

CHANDLER, A. 1914. Modifications and adaptations to function in feathers of *Circus hudsonius*. Univ. California Publ. Zool., 11:329–396.

ENGELS, W. L. 1940. Structural adaptations in the thrashers with comments on interspecific relationships. Univ. California Publ. Zool., 42:341–400.

KÜSTER, E. 1905. Die Innervation und Entwicklung der Tastfeder. Morphol. Jahrb., 34:126–148.

PETTINGILL, O. S., JR. 1970. Ornithology in laboratory and field. Fourth ed. Burgess Publishing Co., Minneapolis.

SCHILDMACHER, H. 1931. Untersuchungen über die Funktion der Herbstschen Körperchen. J. Ornithol., 79:374–415.

STRESEMANN, E. 1927–1934. Aves. *In* Kükenthal u. Krumbach, Handbuch der Zoologie. Volume 7, Part 2. Walter de Gruyter, Berlin.

VAN TYNE, J., AND A. J. BERGER. 1959. Fundamentals of ornithology. John Wiley and Sons, Inc. New York.

WALLACE, G. J. 1955. An introduction to ornithology. Macmillan Co., New York.

WELTY, J. C. 1962. The life of birds. W. B. Saunders Co., Philadelphia.

DEPARTMENT OF ZOOLOGY, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS 61801,
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FAMILIES OF BIRDS. By Oliver L. Austin, Jr. Illustrated by Arthur Singer. Golden Press, New York City, 1971: 4 × 6 in., 200 pp. Many illustrations in color. Paper cover $1.95, hard cover $5.95.

An attractive reference book that provides thumbnail sketches of all known orders and families of birds, both living and fossil. A surprising amount of information is contained in a small space. The illustrations, generous in supply, depict species that are typical of their families; they are nicely executed and well printed, and are real aids in characterizing the families. This guide "is designed for those who have familiarity with birds and who would like to known more about their relationships to one another." Distribution, characteristics, and habits are adequately summarized within the limits of the book, but very little is said about relationships. Nevertheless this guide can serve well as a handy reference tool for ornithologists.—P.S.

NATIVE BIRDS OF MT. DESERT ISLAND AND ACADIA NATIONAL PARK. By James Bond. The Academy of Natural Sciences of Philadelphia, 1971: 5 × 7 in., paper covered, v + 28 pp. $1.50.

This is the second revised edition of an annotated list of the 138 species of birds that are known to breed or to have bred on Mt. Desert Island and adjacent islands, Maine, during the past 40 years. It is primarily a guide to bird finding in this ornithologically well known area but also gives remarks on the historical status of species.—P.S.

NATIVE AND WINTER RESIDENT BIRDS OF TOBAGO. By James Bond. The Academy of Natural Sciences of Philadelphia, 1970: 4 × 7 in., paper covered, v + 30 pp. $1.50.

An annotated list of the nearly 200 species of birds reported from Tobago. This island on the continental shelf of South America has a much richer avifauna than any of the other Antilles of comparable size. Six excursions for finding birds are suggested. The booklet gives aid for identification of indigenous and South American species but it is intended to be used with a field guide.—P.S.