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Received 18 December 1978, accepted 28 July 1979.

### Club-tipped Feathers in Some South American Tanagers

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The presence of patches of feathers, "fused into deep orange, club-shaped structures," behind the ear openings in males of the South American tanagers *Chlorochrysa* has been noted by Storer (1969, *Living Bird* 8: 127). These structures result from the enlargement of several of the barbs near the tip of each feather and the absence of barbules on these barbs. Three basic types of enlargement can be discerned: uniform widening of the entire length of the barb, gradual widening from the base to the tip of the barb, and a sudden widening very near the tip of the barb. These types tend to intergrade somewhat so that no single description of these club tips is possible. In *Chlorochrysa calliparaea fulgentissima* (a subtropical species that occurs east of the Andes in Peru and Bolivia), which exhibits the character most clearly, the enlargement may be 3-4 times the normal diameter of a barb near the tip. The tips appear to be a glossy orange from all angles, and the widened part may start as much as  $\frac{3}{16}$  of an inch from the tip of the barb. Each feather in the patch grows duller from tip to base, graduating from orange through yellow to gray, as the barbs get closer to the base of the rachis; these inner barbs are not normally visible and

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are all of normal width. The widening of some feathers takes place unevenly such that there is a thick and a thin dimension to the club tip, but only a few are so flattened as to be translucent.

The club-tipped feature is found in a less-developed form in the orange-brown earpatches of the other two subspecies of *Chlorochrysa calliparaea*, as well as in the much smaller orange earpatch of *Chlorochrysa phoenicotis* (which occurs west of the Andes in southern Colombia and northwestern Ecuador). In the earpatch of *Chlorochrysa nitidissima* (found west of the Andes in Colombia), the feature is weakly present in the portion that is brown and is not present in the portion that is black. I have also found well-developed club-tip feathers in the genus *Tangara*. For example, they occur in the earpatch and across the back of the neck in *Tangara cyanocephala* (a tropical species, which occurs in eastern Brazil, eastern Paraguay, and parts of Argentina) and, in a less developed form, under the eye of *Tangara parzudakii* (found in the subtropical zone from Venezuela to Ecuador). In addition, club-tipped feathers are found in the orange-brown cap of *Tangara ruficervix fulvicervix* and in a less-developed form in other subspecies of *Tangara ruficervix* (the species is found in the upper tropical and subtropical zones from Colombia to Bolivia). Poorly developed examples of what appear to be the same structure occur in the orange-yellow rump of *Tangara fastuosa* (a tropical species of eastern Brazil), the orange portion of the rump patch of *Tangara chilensis* (widely distributed throughout Amazonia), some orange feathers on the crown of *Tangara arthus pulchra*, and some orange-yellow feathers on the crown of *Tangara xanthocephala*.

Similar structures have been described in the Gouldian Finch (*Poephila gouldiae*) by Brush and Siefried (1968, Auk 85: 416), in *Rupicola rupicola*, *Pyroderus scutatus*, *Pipreola whiteleyi*, and others by Olson (1970, Condor 72: 424), and can be found in a few birds-of-paradise, most notably *Paradisaea apoda salvadorii*.

It is significant that the club-tip structure is found primarily in small patches of intense coloration, almost always orange. Presumably the widening of the barbs and elimination of barbules accompanies heavy deposition of carotenoid pigments for display purposes. Olson found that in *Pyroderus scutatus* and *Rupicola rupicola* the medulla, a part of the feather normally very important to structural coloration, may be lost entirely in carotenoid-bearing portions of barbs. The pigments are deposited directly in the cells of the cortex. Brush and Siefried noted that "this modification consists of the reduction of potentially interfering pigments, especially melanin, the elimination of barbules, and the flattening of the barb to increase the exposed surface area". They also note that the production of carotenoids probably involves greater metabolic expense than the production of melanins, which could explain the evolution of such an efficient, localized, and highly specialized means of displaying pigments as the club-tipped feather. Melanins may in fact inhibit the formation of the structure, judging by its less distinct form in orange-brown feathers and absence in black feathers of the earpatch within *Chlorochrysa*.

Despite the occurrence of club-tipped feathers in quite divergent families, the pattern of occurrence within the *Tangara-Chlorochrysa* group suggests a close taxonomic relationship, and the character may be of use in analyzing this unwieldy (50 species) group. *Tangara* and *Chlorochrysa* have long been considered to be closely related (Miller 1919, Auk 36: 576). In view of this shared character and others, such as the waxy feathers mentioned by Storer, the three species of *Chlorochrysa* should be added to *Tangara*. Otherwise, considering the variety of characters exhibited by the 47 species currently lumped in *Tangara*, consistency demands that the genus should be split into several logically defined genera.

Received 3 January 1979, accepted 5 July 1979.

### A Field Study of the Effect of Crude Oil on Herring Gull (*Larus argentatus*) Chick Growth

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The immediate, lethal impact of oil pollution (e.g. oil spills) on seabird populations is well documented and has been reviewed by Bourne (1976). Sub-lethal or delayed effects of oil contamination, however, may have an impact on seabird populations as significant as mortality due to heavy external oiling. Hartung (1963) demonstrated that Mallards (*Anas platyrhynchos*) contaminated externally with as little

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