

## GENERAL NOTES

**Bower Ornamentation versus Plumage Characters in Bower-birds.—**

Bower-birds and birds of paradise are believed to be related though they are often placed in different families. The courtship behavior, while elaborate in both groups, is very different. All but the most primitive of the birds of paradise display their spectacular plumes. The bower-birds, on the other hand, have little in the way of morphological ornamentation, though a few species are brightly colored and some have a crest. Their courtship behavior is unique, at least among birds, in that it is conducted in or near a "bower" constructed by the male bird (except in two primitive species). These bowers are often very elaborate stick structures which fall into four categories: 1) the maypole type (a column of sticks up to nine feet in height supported by a forest sapling and sometimes capped with a hut or tepee-like roof); 2) the avenue type (an elongated mat of sticks with usually two and sometimes four vertical stick walls between which the bird displays); 3) the mat type (a simple platform of ferns and sticks); and 4) the stage type (a cleared area of earth). These structures are decorated in specific ways by the various species. The ornaments, which sometimes number nearly a thousand, take the form of colorful flowers, berries, leaves, snails, insects, and the like.

On several trips to New Guinea, I have given much attention to the study of bower-birds. During this work, the detailed results of which will be published elsewhere, I noticed that the species with the most elaborate bowers are often those with the least elaborate plumage. It occurred to me that there might be a correlation between the degree of ornamentation of the bower and that of the bird. This condition proved most pronounced in the "maypole builders." Indeed, the bower in some maypole builders (and perhaps in certain of the avenue builders) may be of such transcendent importance in the behavioral pattern of the species that it nearly or completely replaces the visual morphological signals of the builder and, through a transfer of the forces of sexual selection to inanimate objects, renders morphological ornamentation superfluous. The aptly named *Amblyornis inornatus*—a tepee builder—is the primary example of this hypothetical phenomenon. The male of this species, which constructs the most complicated and highly ornamented bower known, is crestless and virtually indistinguishable from the female; yet the males of all of its close relatives wear elongated golden-orange crests and differ strongly from the females.

A second case in point is *A. subalaris*, which builds a somewhat less complicated tepee-type bower. This species has the golden-orange crest darker and shorter than any of the other dimorphic species and heavily edged with dark brown as in the crestless female. Furthermore, the distribution and extent of brown in the orange crest of *A. subalaris* are extremely variable, giving the impression of recent release from the controls imposed by sexual selection. On the other hand, *A. macgregoriae*, which builds the simplest bower (a short cone of sticks around a pole on a mossy saucer with no suggestion of the tepee-like roof) and does not use colorful ornaments or, in fact, any but the simplest, most inconspicuous of paraphernalia (a few bits of charcoal, sometimes a lichen-decorated stick or some animal silk), has by far the longest, most brilliant crest found in the genus (with the exception of *A. flavifrons* whose bower is unknown).

These facts lead me to believe that the evolution of bower form and ornamentation from simple to complex reflects the degree of transfer of the forces of sexual selection from morphological characters to external objects, namely, the bower. The adoption of inanimate objects as primary sexual releasers apparently has no parallel

among vertebrates, except perhaps among humans. (Possible parallelisms may be: 1, building of false or play nests in male marsh wrens, weaver birds, etc.; 2, the clearing of display courts in manakins, ruffs, lyre birds, etc.; and 3, some aspects of courtship feeding. In insects the bubble ritual of certain of the Empididae seems to embody a similar dependence on external objects for the primary sexual stimulus.) In my opinion, it is this symbolism, which we may call the transferral effect, that has permitted the evolution of the extraordinary structures built by bower-birds. In essence, the bowers are bundles of secondary sexual characters.

Psychologically but no longer physically linked to the bird, such "secondary sexual characters" are open to a much greater variety of expression. Sticks, paint, insects, fungus, seeds, stones, clay balls, charcoal, animal and plant silk, grasses, flowers, fruits, shells, moss, and all manner of shiny, odd, and colorful objects are incorporated in the patterns of bower-bird behavior. The results are the unique and exaggerated bowers (sexual objects) we know in many bower-birds.

A second and taxonomically important effect appears to be closely linked to the transfer of sex stimuli to objects. Following the substitution, important changes may occur in the no longer important morphological stimuli, and one of these seems to be for the male to revert to the appearance of the female. In short, when the conspicuous plumage of the male is no longer needed and hence a detriment, the forces of selection tend to favor protective coloration, and the male will resemble more and more the protectively colored female. Such changes may occur relatively quickly once the threshold of transfer has been passed, and it may be because of this condition that we find the females of certain closely related species (in *Amblyornis* and *Archboldia*) to be nearly indistinguishable from each other; yet the males may be either highly dimorphic or virtually indistinguishable from the females.—E. THOMAS GILLIARD, *American Museum of Natural History, Central Park West at 79th Street, New York 24.*

**Winter Feeding on Sap by Sapsucker.**—The extent to which the Yellow-bellied Sapsucker (*Sphyrapicus varius*) may feed on sap from leafless trees in mid-winter in the northern part of its winter range depends somewhat on weather conditions as indicated by the following observations made in Seneca, Maryland, on January 31, 1954. After a night of freezing temperatures, the official readings (Washington, D. C.) were 29° F. at 11 A.M., 31° F. at noon, 32° F. at 1 P.M., and 34° F. at 2 P.M. At 11:30 A.M. a sapsucker was drilling holes in a 50-foot Black Walnut (*Juglans nigra*) at the edge of a swamp. The holes were in horizontal rows every few feet up the trunk. For the first half-hour the bird drilled new holes on the sunny side of the tree. After noon, less time was spent on drilling as the sapsucker visited holes in many of which sap sparkled in the sun. On withdrawal, the sapsucker's bill gleamed with moisture. A trip from bottom to top of drilled areas took 5 minutes or less, after which the bird would drop through the air or hitch backwards to begin over again. The volume of excreta indicated considerable fluid intake. Thus in 10 minutes the sapsucker voided 4 times and in a 25-minute period 11 times. Voided matter, as it shot down and backward, sparkled like water. After 1 P.M. trickles of sap ran from many holes. Observations were discontinued at 1:30 P.M. Sapsuckers were not found feeding on this tree on 3 successive week-ends of warm weather.

In summer feeding on nesting grounds, as observed in Tamworth, N. H., in July, 1953, a family of 5 sapsuckers fed almost constantly on a Yellow Birch (*Betula lenta*). Horizontal rows of holes close together formed a band around the tree. Below a limb, holes had coalesced through heavier use to form a well  $\frac{3}{4}$  by one inch, denuded