GENERAL NOTES

Variation in the outermost greater primary covert as related to method of flight.—While engaged in a study of molts and plumages in the Galliformes, it was observed that, as compared with neighboring greater primary-coverts, the dimensions and strength of the outermost covert varied within the order so as to fall into four major types. In most grouse (Tetraonidae) and quails (Perdicidae), the outermost covert was found to be so greatly reduced as to be barely evident (type-1 covert). The larger pheasants (such as *Phasianus, Syrmaticus* and *Argusianus*), and the curassows, guans and chachalacas (Cracidae) possessed outer coverts of a small but easily visible size (type 2) while most guinea fowls (Numididae, except *Phasidus*) had outer coverts reduced in width only, being as long as adjoining coverts but quite slender and somewhat stiffened (type 3). The Peacock (*Pavo*), unique among the Phasianidae, the Hoatzin (*Opisthocomus*), and some megapodes (*Leipoa, Alectura* and *Aepypodius*) possessed full-sized (type 4) outer coverts. Of these types, numbers 2 and 3 were subject to some variation, as would be expected of intermediate classifications, and might possibly be broken down into several sub-types.

It seemed apparent that the size of the species was, if anything, only a secondary factor determining the outer-covert type. The larger grouse possessed relatively larger type-1 coverts, but the Hoatzin and the megapodes had type-4 coverts despite their medium size. A general inverse correlation between the size of the outer covert and the rapidity of wing beat seemed reasonable, however, and a cursory investigation of this phenomenon was attempted for other groups of birds.

The hawks (Falconiformes), hummingbirds (Trochilidae), and swifts (Micropodidae) were first examined in the expectation that these rapid flyers would possess small outer coverts. Most of the hawk species seen, however, possessed type-2 coverts and although the outer coverts of the soaring vultures (*Vultur, Gymnogyps, Cathartes*) were of the large, type-4 size, those of the Duck Hawk (*Falco*) were little reduced below those of other non-soaring members of the order. Turning to the hummingbirds where wing movement occurs at maximum speeds, it was determined that the outer primary-coverts were rudimentary (type 1) in several small genera (*Heliothrix, Anthoscenus, Calypte, Selasphorus*) and some large ones (*Topaza, Campylopterus*) but were somewhat larger (type 2) in a few of the bigger forms (*Eugenia, Bourcieria, Ensifera*). In contrast, several swifts (*Aëronautes, Chaetura, Cypsilurus*) possessed outer coverts of full length and only slightly diminished width. They were much stiffened, however, and were sharp-pointed and curved inward. They were assigned to type 3.

With some evidence to indicate that reduction in size or stiffening of the outermost covert was correlated with rapid wing motion in flight, it was thought that examination of the rails (Rallidae) as examples of birds of weak flight, would reveal their possession of type-4 coverts. Contrary to expectation, however, the outer coverts of *Rallus, Gallinula* and *Porphyrio* all proved to be of the rudimentary type-1 size. Whether the presence of this type of covert in the Rallidae can be interpreted as a vestige indicating more powerful flight at some remote time in the group's history is not certain. The cranes (*Grus*), also of the Gruiformes, had large type-4 coverts as did the Flamingo (*Phoenicopterus*) of the Ciconiiformes.

Among the Anseriformes, *Anas, Nyroca, Anser* and *Cygnus* possessed type-2 coverts as did such Passeriformes as the Cardinal (*Richmondena*), Catbird (*Dumetella*),

Brown Creeper (*Certhia*), Yellow-billed Cuckoo (*Coccyzus*), Kingbird (*Tyrannus*) and Red-breasted Nuthatch (*Sitta*). Some of the smaller sparrows (*Pooecetes, Spizella*), warblers (*Dendroica*) and vireos (*Vireo*) had outer coverts that approached astonishingly close to type-1 size, though probably still in the type-2 category.

In species whose outer primaries were abortive, as in some tinamous (Tinamidae), woodpeckers (Picidae), kinglets (Sylviidae), and thrushes (Turdidae), the outermost primary-coverts were not evident and the coverts of the second outer primaries showed some of the modifications usually expressed by the outermost feather.

From these data, it was concluded that (1) although some evidence exists indicating that reduction in size or stiffening of the outermost covert is correlated with rapid wing motion in flight, at the present time it is not sufficient to permit a statement of general application; (2) most birds have type-2 outer coverts; (3) large birds of sedentary, sluggish or soaring habits and with slow wing motions characteristically possess large, full-sized type-4 outer coverts; and (4) variation in the size of the outermost covert may be of taxonomic significance.

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Outer primaries as age determiners in gallinaceous birds (Plate 7, upper figure).—Bent ('Life Histories of North American Gallinaceous Birds,' U. S. Nat. Mus., Bull. 146: 108, 125, 152, etc., 1932) points out that juvenile grouse do not shed the outer two pairs of primaries during the postjuvenal molt. Since these juvenal feathers are narrower and more pointed than those of the adult, it is possible to use this criterion in determining the age of grouse taken during the fall and winter months. Wight (Field and Laboratory Technic in Wildlife Management, Univ. of Mich. Press: 50, 1939), on the other hand, states that it is the adult bird which retains the outer primaries through the postnuptial molt rather than the juvenile.

Upon checking this character in Sharp-tailed, Ruffed, Franklin's and Richardson's Grouse in Montana against the presence or absence of the bursa of Fabricius, the writers find that Wight is in error while Bent is correct in stating that it is the juvenile birds which retain the outer primaries. Moreover, we have found that these grouse when taken in the latter part of September are completing the molt of the remiges. The accompanying figures illustrating the wings of adult and juvenile Sharp-tailed Grouse (*Pedioecetes phasianellus campestris*) taken on September 22, 1942, indicate that in the adult bird (Plate 7, upper left figure) the two outer primaries were growing in. The sheaths surrounding the bases of the growing feathers are clearly seen in the photograph. The juvenile bird (Plate 7, upper right figure), on the other hand, has the outer two remiges complete. The third primary from the outside was growing in, the sheath surrounding the base indicative. If the outer two primaries were to undergo a molt, they would have been shed earlier if the usual sequence of shedding of primaries was followed. Our experience with the above-mentioned species has indicated that when taken late in September, their age may usually be determined without difficulty by merely observing the state of growth of the outer primaries.

Wight states further that this character holds for all gallinaceous birds, and Bent (tom. cit.: 316) states that juvenile pheasants retain the outer primaries during the postjuvenal molt similar to grouse. That juvenile pheasants as well as adults