

with insects, constitute the principal fare during early life. But as the birds grow, rats assume a more important role, and in or near two different nests I found remains, picked clean, of practically full-grown American Bitterns (*Botaurus lentiginosus*). Now the young American Bittern is no mean antagonist, and the fact that such large birds are actually killed and carried to the nest indicates the calibre of the Harrier as a hunter. I recall, once before in the later fall, flushing a Harrier from the half-consumed remains of an adult Green Heron. This bird had possibly acquired a taste for *Ardeidae* in earlier life.

During the fourth week of the young Harrier's life pellets of fur and feathers, containing some bone, begin to appear about the nest. These pellets are often as large, as compact and as well formed as those of the Short-eared Owls, constituting an interesting similarity between the two species. It is probable that the failure to find pellets about the nests earlier in the young brood's growth is due to the thorough removal of waste by the adults, rather than any change in feeding habits.

613 Cleveland Ave., Elizabeth, N. J.

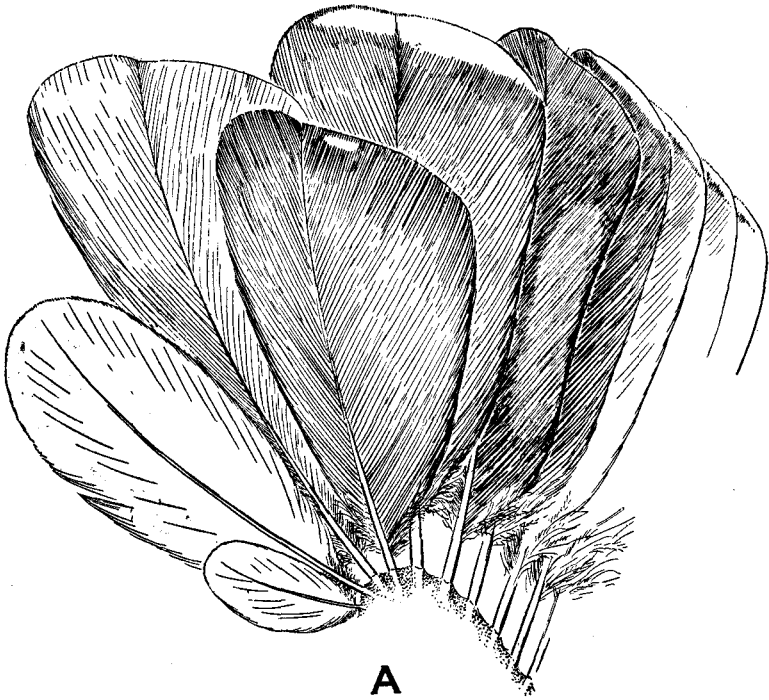
---

## THE SECONDARY REMIGES AND COVERTS IN THE MANDARIN AND WOOD DUCKS.

BY W. DE W. MILLER.

THE most striking peculiarity of the male Mandarin Duck is the remarkable sail- or fan-like expansion of the twelfth secondary, an ornament unique among birds. Correlated with this are other equally unusual features, evident only on close inspection. The thirteenth secondary is reduced to a mere hidden vestige much shorter than its greater coverts, and the fourteenth, though twice as long, is of far less than normal size.

Comparison of the wing with that of the Wood Duck (*Aix sponsa*) proves of great interest. In the latter there are several remarkable features, notably the abbreviation of the twelfth secondary which is only four-fifths as long as the remex on each side of it. The peculiarities in the remiges of this species were pointed out by Mr.



A



B

Proximal Secondaries of left wing from above, the coverts removed: A, of Wood Duck (*Aix sponsa*), adult male; B, of Mandarin Duck (*Dendroessa galericulata*), adult male. In each case the abbreviated secondary (fourth from inner edge) has been raised.

Ridgway many years ago (*Water Birds of North America*, II, p. 12, 1884), but I can find no mention of the reduced secondaries in the Mandarin nor any comparison of the remiges of the two species, and it therefore seems worth while to figure and describe them. Furthermore, the female Wood Duck has a peculiarity of its own in the greater secondary coverts.

In order to correctly compare the abnormal remiges of the two species it is essential that their homologies be determined. For this purpose we may first examine the undifferentiated wings of the females. We find in the Mandarin eleven typical secondary remiges and five inner secondaries or "tertials," which differ in size, shape and color from the others. In the Wood Duck these remiges number ten and five respectively, i. e., there is one less typical secondary than in the allied species. The tertials are plain bronzy-olive, the first one longer and broader than the adjacent secondary, the four others graduated.

We must decide whether there has been an abrupt loss or gain (according to the species) of one of the typical secondaries, or whether there has been a change at the proximal end of the series and the transformation of a tertial into a typical secondary or vice versa.

The longest tertial is so unlike the adjacent typical secondary that I believe any modification of one into the other within the limits of the genus is most unlikely. Moreover, I have examined one female Wood Duck in which there are eleven typical secondaries as in the Mandarin, and in a male of the latter there are eleven in one wing and twelve in the other!

It is fairly safe to assume that the first eleven secondaries of the female Mandarin correspond to the first ten of the Wood Duck and that while the long bronzy-olive outer tertial is the twelfth quill in the former and the eleventh in the latter, yet the two are strictly homologous.

The number of secondaries in the males is the same as in the females and on this assumption it is evident that the remarkable sail-like twelfth remex of the Mandarin corresponds to the eleventh quill of the Wood Duck and in each case it is the first tertial. While these feathers are merely modified inner secondaries, it will be more convenient in the present paper to refer to them as

tertials. To Mr. James P. Chapin I am greatly indebted for the two accompanying figures.

#### COMPARISON OF THE SECONDARIES IN THE MALES.

The first (distal) nine secondaries are normal in size and shape and virtually alike in the two species though broader in the Wood Duck. In the Mandarin they are bronzy-olive, the last one or two being steel-blue on the outer web, while in the Wood Duck all are steel-blue. In both species each feather is narrowly tipped with white. The next two feathers in the Mandarin are blue like the ninth but lack the white tip, or the tenth may have a very narrow tip. In the Wood Duck the tenth feather, which probably corresponds to the eleventh of the Mandarin and like it always lacks the white tip, differs in having the outer web, which is largely bright coppery red, widening terminally, and the end of the feather angular.

The twelfth quill or sail-feather of the Mandarin is, as already stated, the first tertial, and homologous with the eleventh of the Wood Duck.

In both birds, but particularly in the Mandarin, this remex is much larger than the preceding feather and widens towards the end, but while in the Mandarin only the inner web is expanded, the outer being even narrower than usual, in the Wood Duck the outer web is considerably wider than the inner. In the Oriental bird the outer web of this sail-like feather is violet-blue nearly to the tip, the rest of the feather tawny-rufous with black and white terminal edges. In the American bird the inner web is fuscous, the outer velvety black, showing rich bluish green reflections in certain lights, the tip of the feather pure white.

The second tertial of the Mandarin is a miniature of the first, but the shaft is straight and the tawny inner web degenerate in character. It is a mere vestige ranging from fourteen to thirty millimeters in length (usually about 17) in the few birds examined. The outer web is violet or this color may be more or less replaced by white or fuscous. It is crowded in between the neighboring quills and hidden by these and by its upper covert which is two or three times as long.

Except that the corresponding feather of the Wood Duck is

considerably shorter than the immediately adjacent tertials there is no resemblance between it and the Mandarin's vestigial remex. It resembles its preceding tertial in color and form but lacks the white tip.

The third tertial of the Mandarin, while strikingly abbreviated, is about twice as long as the second. It is obliquely cut off on the inner web, the outer web tapering to an obtuse point; light violet blue, the inner web sometimes with a narrow white terminal edge. In the American species this feather is wholly different and closely resembles the first and second tertials, being of the same length as the first but, like the second, with no white tip.

The last two tertials of the Mandarin are plain bronzy-olive feathers, the fourth a little shorter than the third, the fifth only half as long as the fourth. In the Wood Duck the fourth tertial is about three-fourths to four-fifths as long as the large third one. It resembles the latter in color but is usually duller and is much narrower and does not widen terminally. The last tertial is a small plain feather, sometimes degenerate and shorter than its covert, or twice as long, (considerably exceeding its covert) and firm webbed.

The anomalous relations of the second and third tertials of the male Wood Duck is reflected in the female in which the third feather is often scarcely shorter than the second. In the female Mandarin there is no such approach to the characters of the male but the first tertial is much longer and broader than the others.

To sum up, the first three tertials are conspicuously modified in the males of both species, the first two at least are broad and truncate, and the second one shorter than the first and third. All three of these feathers, however, are much more modified and peculiar in the Mandarin than in the Wood Duck and the difference in size between them is far more marked. Thus while the first tertial of the former is more expanded than in any other Duck, the next one is unique in its vestigial condition. Furthermore, in the Mandarin the inner web of each feather is far wider than the outer, whereas in the Wood Duck the outer is the wider. The remiges immediately adjoining these tertials also differ conspicuously in the two species.

In the male Wood Duck the first and third tertials are equal

and longest, only the last two being graduated, while in all other members of the family at least three are shortened. In the Mandarin, on the other hand, the third is disproportionately abbreviated and actually much shorter than in any other Anserine bird.

As already stated, the Wood Duck has but fifteen secondaries, one fewer than the Mandarin. This is the minimum number in the Anatidae, for of the thirty-six genera examined by me none has fewer than sixteen secondaries, and all but six have more than sixteen.

In certain groups of birds, as the Tyrannidae and Cotingidae, the primaries are not infrequently irregular in length, and this is carried to an extreme in *Tityra* in which the ninth primary is reduced to a vestige between two quills of normal length.

So far as I am aware no such reduction in the length of a secondary has heretofore been recorded in any bird, for which reason the state of these quills in the Mandarin and Wood Ducks is especially notable.

In Mr. Ridgway's note on the male Wood Duck, above cited, he describes the broader, black scapulars as alternating with narrower, more pointed, bronzy ones, which are mostly concealed between the broader feathers. In the fresh specimen now before me I find that the black feathers are the *outer* ones, the bronzy feathers the inner ones. There is no alternation as regards their insertion in the skin but in the normal contracted condition of the humeral tract the feathers naturally overlap in this alternate fashion.

A difference in the greater upper coverts may also be mentioned. In the Mandarin these coverts are of the same bronzy-olive as the other upper coverts and the innermost two are graduated. In the Wood Duck the outer coverts are olive but as they approach the elbow the coverts gradually become green and then violet, with a narrow black tip, and at the same time become actually shorter and broader. The penultimate one, however, is green with no black tip and is slightly longer and narrower than the one distad of it. Thus only the final covert is shortened.

In the female Wood Duck there is a very interesting peculiarity in the upper greater secondary coverts. The four of these coverts belonging to the tenth to thirteenth secondaries are largely bright

red-purple contrasting conspicuously with the adjacent steel-blue and olive-brown. Their chief distinction, however, is that they are much larger than the preceding coverts, particularly that of the eleventh quill, which is considerably longer as well as broader than the more distal coverts. The two coverts proximad of this one are graduated and the one distad of it is also shortened. There is no such modification either in size or color in the male Wood Duck nor in either sex of the Mandarin. In these the covert of the eleventh remex is smaller than the distal coverts instead of larger.

#### OTHER DIFFERENCES BETWEEN THE SPECIES.

The Mandarin is a slightly smaller bird with a decidedly smaller bill, but the tarsi are actually longer than in the Wood Duck and the wings are fully as long.

There is no backward extension of the bill in a point on each side of the forehead as is so conspicuously the case in the Wood Duck, and the teeth of the maxillary tomia are much less developed and usually invisible from the side.

The very long, narrowly linear-lanceolate "hackles" which spring abundantly from the posterior part of the head and anterior part of the neck in the Mandarin (shorter ones even crossing the fore-neck) are entirely different from the short velvety plumage of the Wood Duck.

In the Mandarin there is a graduated outer series of falcate, pointed scapular feathers, pure white with a broad deep black outer edge (much like those of *Nettion crecca*). In the allied species these scapulars are very broad, rounded terminally, somewhat arched or convex and velvety black with violet reflections.

The central one or two pairs of rectrices in the Wood Duck are broader, rounder at the end, and laterally arched or vaulted instead of flat as in the Mandarin. The upper tail-coverts too, in the latter, are flatter and narrower and there is no special development of the outer ones. In the Wood Duck the several outer coverts are arched downward laterally over the base of the tail, the very broad, loose webs with a tawny shaft stripe. In the Mandarin the upper tail-coverts are usually slightly longer than the lower, instead of the reverse as in the other species.

I cannot confirm the marked differences in the length and graduation of the tail and in the length of the lower coverts described by Ridgway (l. c.) and suspect that an imperfect or molting specimen of the Mandarin was examined.

In the Wood Duck the plumage of the chest is harsh to the touch and under a magnifying glass the barbs are seen to be somewhat thickened subterminally and devoid of barbules. In the allied species the plumage is soft and normal.

The plumage of the upper parts in general is richer, softer and more lustrous in the Wood Duck, violet, red-purple and velvety black predominating, and the bronzy-olive is richer than in the Mandarin. The feathers are larger, broader, and more obtuse, and tend to be convex or arched rather than flat.

The color and pattern of the head (except the crown) and of the bill, the scapulars and the under wing- and tail-coverts, are all very different in the two birds.

In their coloration the females of the two species differ chiefly as follows. In the Mandarin the upper part of the head is grayer, the grayish olive back and scapulars have no red-purple shade, the upper wing-coverts are entirely bronzy-olive with none of the steel-blue or copper-red of *A. sponsa*. On the outer web of the ninth secondary, and often of the eighth also, is an oblique white bar (lacking in one of eight specimens); the outer web of the tenth quill is edged with white (in all but one of the eight birds). The under-wing coverts differ as they do in the males and the crissum also to a certain degree.

The structural differences between the two species, then, lie in the form of the bill and in the very different development or shape of the feathers of various parts, as the neck, scapulars, secondaries, upper tail-coverts and central rectrices. The females show these differences (except in the scapulars) to a certain degree, and, furthermore, in this sex of the Wood Duck there is an unusual development of some of the secondary coverts which are normal in the other species.

The Mandarin is not only unique in the neck ruff or cape and in the form of the tertials, but the wings are of maximum relative length while the bill is probably smaller than in any other freshwater Duck.



The number of rectrices in this group is sometimes given as sixteen. Of the thirteen Wood Ducks examined, eleven have fourteen rectrices, one fifteen and one sixteen. Of the ten Mandarins, eight have fourteen, and two have fifteen. The variation is irrespective of sex.

There has long been a difference of opinion as to whether the Wood Duck and the Mandarin Duck are congeneric or not. They are obviously much more like each other than either is to any other member of the family. Indeed, so distinct are they from any other group that their exact affinities are somewhat uncertain. The natural and usual course therefore has been to keep them together in the genus *Aix*.

In this comprehensive sense *Aix* differs from all other Ducks in the silvery white edging of the primaries, the elegant black and white terminal banding of the vermiculated flank feathers and the very broad, truncate tertials, the second of which is smaller than the third. The lustrous green-and-white crest, the long wings and the relatively long, broad-feathered tail, with long coverts, are also characteristic. Some of these features are present in the male only, others in both sexes.

Ridgway (op. cit. p. 9) has remarked that the Mandarin differs from the Wood Duck "in so many points of external anatomy as to render it extremely doubtful whether the two species should be kept together in the same genus."

They are perhaps as distinct as are the monotypic genera *Charitonetta*,<sup>1</sup> *Arctonetta*, *Nomonyx* and *Lophodytes* which have long been recognized by American ornithologists. Hartert considers the two species generically separable, although there are a number of current genera of Ducks and Geese, including *Charitonetta* and *Lophodytes* that he refuses to recognize.

The Wood Duck, *Anas sponsa* Linnaeus, is the type of the genus *Aix* Boie (cf. Allen, Bull. Amer. Mus. Nat. Hist., XXIII, p. 305, and A. O. U. Check List of N. Am. Bds., 3d Ed., 1910, p. 73).

---

<sup>1</sup> In this connection it may be well to call attention to a character of *Charitonetta* that is often overlooked. According to MacGillivray (and I can confirm his statement) the trachea has "scarcely any appearance of dilatation at the part which is so excessively enlarged in the Golden-eyed Duck." This refers to the bony labyrinth at the lower end of the trachea.

Swainson's name *Dendronessa* is available for the Mandarin Duck which, if considered generically distinct, will be known as *Dendronessa galericulata* (Linnaeus).<sup>1</sup>

*American Museum of Natural History,  
New York City.*

---

## NOTES ON THE BIRD LIFE OF NORTH DAKOTA WITH PARTICULAR REFERENCE TO THE SUMMER WATERFOWL.

BY FREDERICK C. LINCOLN.

### ITINERARY.

THE following notes were taken by the writer while engaged in official work for the Biological Survey, United States Department of Agriculture, during the period July 2 to August 1, 1921. The trip was made possible through the cooperation of Dr. John C. Phillips, and had as its objective experimental work to determine satisfactory methods for trapping waterfowl for banding purposes.

I arrived at Napoleon, North Dakota, on July 5, and from that date until July 12 made observations and conducted trapping experiments at lakes in the vicinity. On July 12, I went to the town of Turtle Lake, via Bismarck and Underwood, remaining there two days. Leaving that point, my next field of operations was Devils Lake, reached by way of Minot. After examining some of the smaller lakes in the neighborhood, I selected for further operations what is known as Mission Bay, on the south side of Devils Lake, where I camped from July 20 to 27, when I returned to the town of Devils Lake and concluded my activities at Hankinson on the 30th.

The following list of lakes of the Napoleon, Hankinson, Turtle Lake, and Devils Lake regions will simplify future reference to the lakes and sloughs studied:

---

<sup>1</sup> Most of the older authorities and even Hartert as late as 1915 give *galericulata* as the type of *Aiz.* Dr. Richmond informs me that these writers probably follow Gray who, in 1841, gave that species as the type, but that Eyton in 1838 had already designated *sponsa* as the type of *Aiz.*