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**Some putative Mandarin Duck hybrids**

by PAUL A. JOHNSGARD

Received 16th May, 1968

A few years ago Prestwich (1960) compiled a useful summary of alleged cases of hybridisation by Mandarin Ducks (*Aix galericulata*), in which he discussed four reputed interspecific combinations, collectively involving Wood Duck (*Aix sponsa*), Mallard (*Anas platyrhynchos*), Gadwall (*Anas strepera*) and Redhead (*Aythya americana*). He indicated that Mandarin Ducks have reportedly produced reciprocal crosses with both of the first two species, and that the Gadwall was regarded the male parent in an alleged cross involving that species. Evidence for the supposed cross involving the Redhead is very weak, and its details are unknown. Prestwich concluded that, considering the absence of museum specimens or the production of hybrids under controlled conditions, the occurrence of any hybridisation by Mandarin Ducks must be regarded as unproven. Gray (1958) also reviewed the literature concerning Mandarin hybrids and, although including a few references not mentioned by Prestwich, likewise provides no clear-cut evidence substantiating such hybrids. The conclusion of Prestwich thus mirrored the views of Delacour and Mayr (1945) and of Seth-Smith (1922), all of whom believed that the Mandarin Duck is unable to hybridize even with its nearest living relative, the Wood Duck. The explanation usually advanced for this seemingly unique situation is a reportedly aberrant chromosomal condition of the Mandarin Duck (Yamashina, 1952). After similarly reviewing the literature, however, I listed (1960) the Mandarin Duck as having probably hybridized with the Wood Duck, and also mentioned the possibility of hybridization with one or more species of *Anas*. Since then I have been hopeful that actual specimens of Mandarin Duck hybrids might be located to substantiate this vulnerable position, and it is now possible to report on some probable hybrids.

The first of these came to my attention on 16th June, 1965, during a visit to the waterfowl collection of Mr. William Lemburg, of Cairo, Nebraska. He mentioned to me that two unusual ducklings had just hatched from eggs laid by a female Mandarin in a pen lacking males of this species. The only male ducks present in the pen were Red-crested Pochards (*Netta rufina*) and Laysan Teal (*Anas platyrhynchos laysanensis*). Mr. Lemburg believed that the latter represented the male parent; since he had earlier observed attempted matings by a male Laysan Teal. Only two eggs out of a fairly large clutch had hatched, and both ducklings shared the remarkable feature of totally lacking eyes. The birds were only about a day old at the time of my visit, and I compared (and photographed) them with Mandarin ducklings of about the same age. The absence of eyes had affected the ducklings' head patterning, but otherwise the hybrids' plumage coloration was very similar to that of newly hatched Mandarins. However, their bills were slightly more flattened and wider than those of Mandarins. In spite of the ducklings' blindness I convinced Mr. Lemburg that he should attempt to rear them so that their parentage could be more certainly determined. Unfortunately, within a few days one of them died, but the other soon learned to find its food and water without special attention.

Thereafter it grew and developed at a nearly normal rate. However, at the age of about two months it got out of its small pen, and apparently was unable to find its way back. Some days later its body was found in a somewhat deteriorated condition, but Mr. Lemburg preserved it and later gave it to me. The bird was still in juvenile plumage and the internal organs were too badly decayed to determine its sex, but a study skin (U. of N. no. ZM-10950) was made and most of its body skeleton was separately preserved.

Considering the drabness of the hybrid's plumage (Fig. 1), my first impression was that a Red-crested Pochard was the probable parent. However, comparison of the specimen's measurements and the absence of any paleness along the secondary and inner primary vanes soon convinced me otherwise. Measurements of the hybrid and its probable parental species are presented in Table 1, and support Mr. Lemburg's view that a Laysan Teal was the male parent.

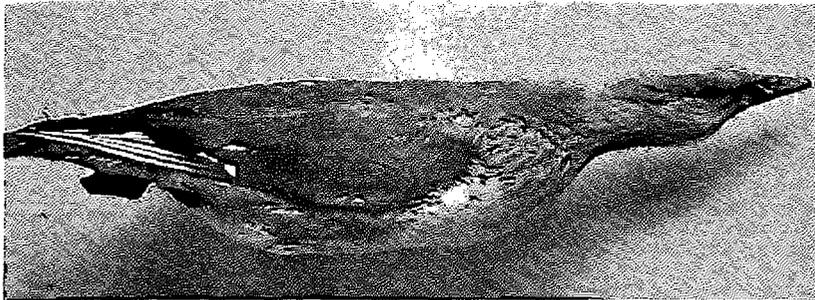


FIG. 1. Skin of probable Laysan Teal x Mandarin Duck hybrid. The flattened appearance of the head is the result of removal of the skull for separate preservation.

The head pattern of the hybrid is mostly mouse-grey, but it lacks the white eye-ring and post-ocular stripe typical of immature or female Mandarins. The breast and flanks are more brownish than are those of Mandarins, and some of the longer flank feathers have a brown and buff pattern that approaches the disruptive patterns found among females of most *Anas* species. The outer vanes of the primaries are silvery grey as in Mandarins, but their tips are only faintly iridescent with a greenish sheen. The only other wing iridescence occurs on the secondaries; their coverts and the other upper wing feathers are an olive-brown. The outer seven secondaries are brownish and their outer webs are only faintly iridescent green, with white or black and white tips. The eighth and ninth secondaries' outer vanes are iridescent blue-green, with black and white tips and a diagonal white stripe projecting anteriorly. The tenth and eleventh secondaries have bluish to blackish outer vanes with little or no white at their tips, but instead have narrow white stripes along their anterior edges. Neither Mandarin Ducks nor Laysan Teal have white anterior markings on their secondaries, but this white anterior border to the speculum has a visual effect remarkably similar to the narrow white border pattern of the secondary coverts in Laysan Teal and the other mallard-like ducks.

Collectively, the available criteria have convinced me that the specimen is indeed a Laysan Teal  $\times$  Mandarin Duck hybrid.

More recently, some possible hybrids came to my attention through an advertisement in the April, 1967 issue of the *Game Bird Breeders, Aviculturalists and Conservationists' Gazette*, where two Wood Duck  $\times$  Mandarin Duck hybrids were listed for sale by Norma J. Safford, of Swanzev, New Hampshire. According to her, the birds were among a total of four (the other two being apparently pure Wood Duck) that hatched from a large clutch of eggs laid in 1966 by a female Wood Duck mated to a male Mandarin. Three past years' attempts by this pair to produce offspring had never resulted in any young. I obtained these birds in November, 1967,



FIG. 2. Specimen L-1 of probable Mandarin Duck  $\times$  Wood Duck parentage. The photo was taken in March, 1968, after maximum development of the "sail" feather (see text).

when they were over a year old and were moulting into a brighter, generally male-like, plumage (Fig. 2). Upon receiving these I contacted the American Museum of Natural History to inquire about the authenticity of an alleged Mandarin  $\times$  Oldsquaw (*Clangula hyemalis*) that I had earlier noted as in their collection (Johnsgard, 1960). Dr. Lester Short, Jr. examined this specimen carefully and assured me that *Aix* was not involved in its parentage. However, he located a mounted specimen (no. 448985) of an apparent male hybrid between the Wood Duck and Mandarin Duck that had been received without data by the Museum in June of 1932. This

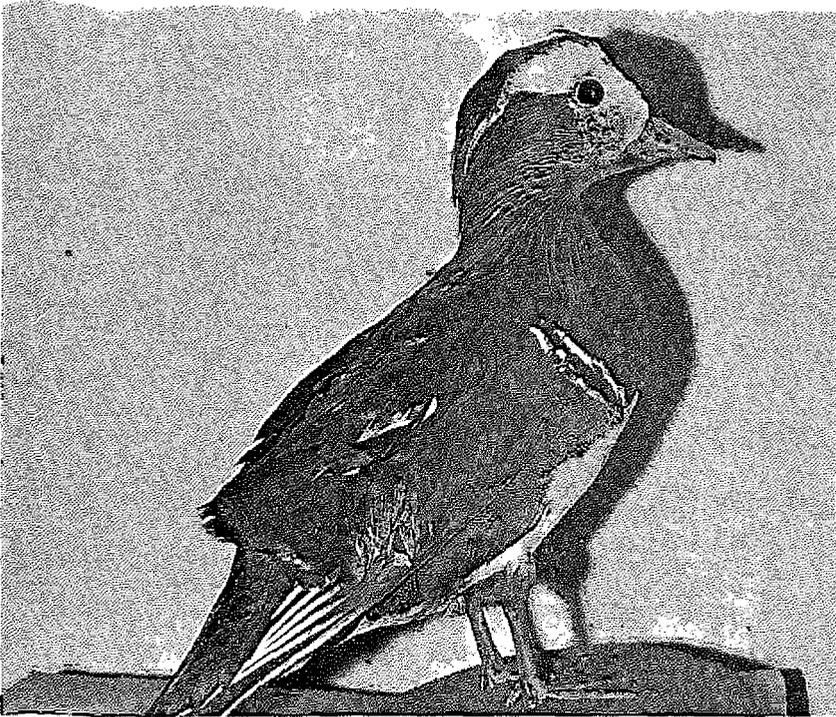


FIG. 3. Mounted specimen of possible Wood Duck x Mandarin Duck parentage. Compare shape and pattern of "sail" feather with Fig. 2.

specimen was sent to me for examination (Fig. 3); its measurements ("AMNH") and those of the two living specimens are presented in the Table. I have also since observed a bird that was reported to result from the pairing of a male Mandarin and a female Wood Duck, and was raised by Calvin Wilson, Tracy Aviary, Salt Lake City. I was not able to closely examine this bird, a presumed male, but did photograph it in April, 1968 (Fig. 4). Mr. Wilson informed me that he had obtained reciprocal crosses between the species, and that the resulting offspring have all resembled the male parent. No typically female-like hybrids have been observed, which suggests that perhaps the apparently male-like appearance of all these birds is actually a relatively neutral plumage condition, and is not indicative of actual sex. Adding substance to this possibility is the fact that the two captive birds have so far shown no interest in either female Mandarins or Wood Ducks.

These two sibling specimens at present differ only slightly in appearance from one another. Their legs and toes are yellow, and the eyes are a very dark brown. The bill varies from reddish to yellow, with a pale nail, and generally resembles that of a Mandarin Duck. The breast colour is maroon, with a very narrow lower fringe of lighter spotting as occurs in Wood Ducks. The vertical striping of the chest is somewhat imperfect, but includes two definite white stripes separated by a wider black stripe, as in Mandarins. The black edges bordering these white stripes are weakly developed and the

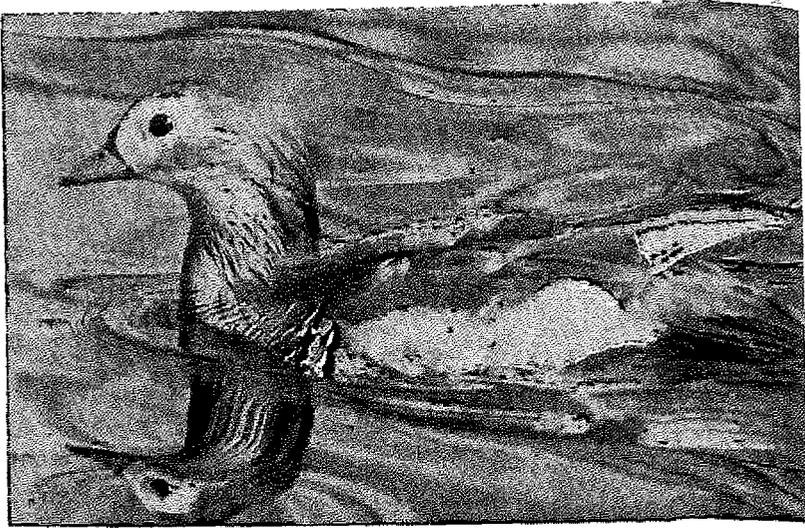


FIG. 4. Salt Lake City specimen (now owned by G. Allen, Jr.) of reputed Mandarin Duck x Wood Duck parentage. Compare head shape and pattern with those in Figs. 2 and 3. The "sail" feather is visible at the base of the primaries, and the longer scapulars are similarly coloured.

anterior one is nearly lacking in one of the males. Both birds have crests that lack iridescence and are somewhat female-like in appearance. The mounted specimen is similar in general features, but has a more highly developed iridescent crest, longer "whiskers", and a more definite facial pattern than do the living birds. Its head colour is generally Mandarin-like except for a brown post-ocular stripe and a narrower supra-ocular white area than is typical of Mandarins, and this area is heavily tinged with rusty coloration in front of and below the eyes. The specimen raised by Mr. Wilson is more generally greyish to brownish on both its head and body, but has a brightly reddish bill, well developed crest and "whiskers" (both greyish), and imperfect vertical chest stripes. It is thus the most female-like of the four birds examined.

The outer scapulars of the two parental species differ in that the male Wood Duck lacks any white patterning in this region whereas the Mandarin Duck has a series of strongly contrasting black and white elongated feathers. One of the captive specimens (R-2) has scapulars that are uniformly iridescent blue-green or blackish. The other male has four small feathers on its right side that are entirely white, plus three larger black and white feathers. The largest of these is mostly iridescent black except for a small white oval patch. On the left side there is a single small white feather and three more that are black and white. The mounted specimen has two large iridescent black and mottled white feathers on its right side, and a similar pair on the left, plus some smaller anterior feathers with varying amounts of white. No white feathering was visible on the scapulars of the Salt Lake City specimen.

The flank patterns are similar in males of both species and all the apparent hybrids, but the latter lack the conspicuous black and white terminal barring of the longer flank feathers that occurs in Wood Ducks.

The under tail-coverts are white, as in Mandarins, and the upper tail-coverts are mostly brown and quite distinct from the ornamental black and tawny ornamental upper tail-coverts of male Wood Ducks. The under wing-coverts and axillaries are a nearly uniform brown, unlike the barred brown and white condition found in Wood Ducks. The tail is brown with almost no iridescence, and seems to be slightly shorter than that typical of males of either species. The wing length is slightly greater than that characteristic of male Mandarins, but considerably under the length typical of Wood Ducks (Table).

TABLE  
Comparative measurements (in mm.) of hybrids and parental species

	<i>Wing</i>	<i>Culmen</i>	<i>Tarsus</i>	<i>Tail</i>
Laysan Teal*				
females	190-196	38-39	35-38	90
Teal x Mandarin				
juvenile	215	31	34	82 (broken)
Mandarin Duck*				
females	217-230	26-30	32	107
males	220-235	27-31	33	110-115
Wood Duck x Mandarin				
L-1	233	27	32	106
R-2	238	29	32	106
AMNH	225	28	35	103
Wood Duck*				
females	208-230	30-33	32	103
males	250-285	33-35	34-35	125-127

\* Measurements cited for parental species are from Phillips (1924) and Delacour (1959).

It is in the inner remiges that these two species diverge most remarkably, a feature which has been discussed in detail by Miller (1925). He pointed out that the two species differ in the number of their typical secondaries (10 in Wood Ducks, 11 in Mandarins), and that their five proximal secondaries ("tertials") differ even more remarkably, particularly among males (see Fig. 5). These latter differences are clearly related to the development of the Mandarin's "sail" feather and to its significance during sexual display.

The outer webs of the first nine secondaries of male Mandarins are bronzy-olive to iridescent blue with narrow white tips, while in the Wood Duck they are all iridescent blue with narrow white tips. The corresponding feathers on the presumed hybrids have olive-brown or (in the inner four) iridescent blue-green outer vanes with somewhat wider white tips. The tenth secondary (ignoring the "missing" fifth secondary resulting from diastaxy) of male Mandarin Ducks is like the first nine, although its white tip is narrow or lacking, while that of Wood Ducks has an iridescent coppery red outer vane that is angular and lacks a white tip. In the presumed hybrids the outer vane of this feather is iridescent blue, with a very narrow white tip. The Mandarin has one more typical secondary, similar to the tenth in shape and pattern, but the Wood Duck's more proximal feather is a differentiated and larger "tertial" that Miller (1925) believed to be homologous with the Mandarin's "sail" feather. The apparent hybrids' corresponding feathers are not sail-like, but are somewhat enlarged and resemble the Wood Duck's first tertial. This intermediate shape suggests that the eleventh secondaries are probably homologous in

the two species, and that the reduction of remiges by one among Wood Ducks must have occurred among the more proximal "tertials." Brinckmann (1958) was led to the same conclusion in her study of the Mandarin wing feathers.

The Mandarin's first tertial (twelfth secondary) is long and curved, with the inner vane greatly expanded into a rufous "sail," while the outer vane is normally shaped, with violet-blue iridescence. The Wood Duck's twelfth secondary is surprisingly short, and is normally hidden below the next, which it closely resembles in shape and colour. Both lack white tips and have metallic blue-black iridescence near their tips. The situation in the two sibling specimens is confusing. Both birds had present on one side only the remains of a long (shaft 11.3 cm.), straight, fuscous-brown feather, both vanes of which were badly worn and lacked iridescence. This feather was doubtless from an earlier feather generation, perhaps even that of the juvenal plumage. However, since male Mandarins moult their tertials twice a year and have a straight, unspecialised "eclipse" remix of about eleven centimetres located at this point (Brinckmann, 1958), the feather's identity is uncertain. At the corresponding location on the left wing of male L-1 a small (shaft 5.6 cm.), triangular feather was present, which closely resembled in shape and pattern those illustrated by Brinckmann (1958 : 576) as resulting from induced regeneration during late winter and spring. This feather and the two badly worn ones were plucked for examination in November. Evidently no new feathers resulted from removing the two worn ones, but on the left side of male L-1 a much larger and more nearly typical "sail" feather grew.

In the mounted specimen the first ten secondaries on the right side had been cut off near their bases, but those on the left side corresponded in shape and pattern to the other specimens. Likewise the eleventh secondary on both sides was as described above, but the inner vane was slightly wider and more iridescent. The adjacent "sail" feathers on both sides were almost as large as in Mandarins, but the inner vanes were less recurved and have a curious pattern of alternating "ripples" of iridescent green and purple, which fades to a buffy tip: the outer vanes were iridescent violet. The Salt Lake City specimen appeared to have an intermediate-shaped and rufous-coloured "sail" feather on its left side, which was not lifted above the other feathers. No corresponding feather was visible on the right (pinioned) side.

The remaining four inner tertials of the Mandarin Duck are all quite small, and vary somewhat in shape (Fig. 5). The Wood Duck has only two or three more proximal remiges, which are all similar in shape but are graduated in size. In all three of the specimens that were examined the thirteenth remix was slightly sail-like and of reduced size. Two or three more proximal feathers were also present and presumably represented the innermost tertials, but they could not be easily distinguished from the adjacent wing-coverts. It is thus clearly evident, if the birds are actually hybrids, that the homologies of the proximal wing feathers are as suggested by Brinckmann (1958) rather than as proposed by Miller (1925).

Although the condition of the remiges was thus of interest, it was surprising to find among the proximal greater coverts and adjacent scapulars of the sibling specimens a few feathers that exhibited character-

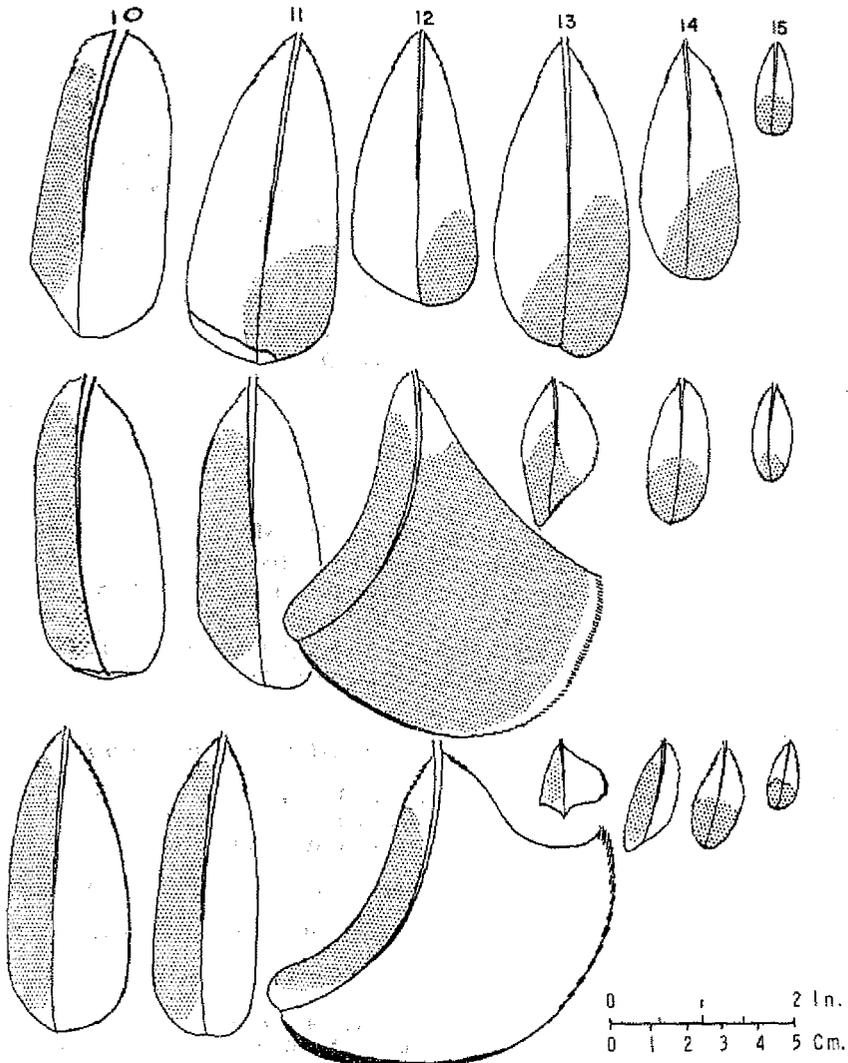


FIG. 5. Diagram of the proximal remiges of Wood Duck (above), Mandarin Duck (below) and probable hybrids (middle). Stippled areas are iridescent; numbering of feathers is from most distal secondary. The feathers shown are all from the left wing, as seen from above. Iridescence on the inner vane of the "sail" feather varied among the hybrids, as did the shape and size. That shown is the condition of the mounted specimen (Fig. 3).

istics of the Mandarin Duck's "sail". One of these coverts on the left wing of specimen R-2 was very similar to the reduced "sail" of specimen L-1, but was even more strongly rufous on the inner vane. One other scapular on the opposite side of R-2 was of elongated shape but rufous coloration, and three of the longer scapulars on the other bird had the same rufous or rufous and black pattern on one vane. A similar rufous

coloration was also visible in the scapulars of the Salt Lake City specimen (Fig. 2).

In summary, although the two sibling specimens and the Salt Lake City specimen were reported to hatch from eggs laid by a female Wood Duck, they show a predominance of Mandarin features, as well as a few inexplicable plumage characteristics. To consider them as aberrant Mandarins having intersex or sex mosaic features would not only require that the maternal parent was incorrectly identified, but also that they all suffered the same genetic "accident", the probability of which seems remote. The history of the museum specimen is unknown, but it corresponds to the two sibling specimens in its measurements and some of its plumage characteristics. If, as Mr. Wilson suggests, paternal characteristics tend to be expressed in the hybrids, the mounted specimen may represent the reciprocal cross involving a male Wood Duck. None of the living specimens have shown any indication of sexual activity, and it thus is unlikely that they will prove to be fertile.

#### *Acknowledgments*

I would like to thank Dr. Lester Short, Jr., Mr. Charles O'Brien, Mr. Calvin Wilson, Mr. William Lemburg, and Miss Norma Safford for their co-operation in helping me obtain these specimens, and for providing information about them. The University of Nebraska arranged purchase of the presumed sibling hybrids, and the Municipal Zoo of Lincoln has helpfully maintained them in a location where they may be readily studied.

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