A SHORT DESCRIPTION OF THE SEQUENCE OF PLUMAGES IN SOME PALEARCTIC SURFACE-FEEDING DUCKS.

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The following remarks apply to the Teal (*Anas c. crecca*), Pintail (*A. acuta*), Garganey (*A. querquedula*), Gadwall (*A. strepera*), Shoveler (*Spatula clypeata*), Mallard (*A. p. platyrhyncha*) and Wigeon (*A. penelope*), the number of specimens of the remaining palearctic species seen being so small that nothing definite can be said about their moults.

The total number of specimens amounts to about 2,500, of which about 2,300 are in my own collection, the rest in the University Zoological Museum of Copenhagen. This series of ducks has been collected in the course of twenty years, about 1,700 have been sexed by myself and their skeletons preserved.

The study of the moults of the surface-feeding ducks is not an easy one, examination of dry skins alone very soon proving insufficient. It is true that the juvenile tail-feathers may be taken as a safe guide to distinguish young from so-called old birds, but as these feathers are often changed quite early in the young bird's first year, their evidence only goes a certain way. The oviduct and to some extent the ovary are in autumn and winter specimens more certain evidence, the narrow undeveloped oviduct of a young bird being easily distinguishable from the thickened prolapsed oviduct of an old or older bird that has laid eggs the preceding summer or before. In surface-feeding ducks the skeleton, *i.e.*, sternum and pelvis, may also be of some service in estimating age, as it is possible to follow the progress towards pneumaticity in these bones. This progress, however, does not take place according to the same rules in every species, and the time taken in attaining the maximum degree of pneumaticity for each species apparently differs to some extent, but this subject is too large to enter into more fully here. Used together these characters make it possible to trace the sequence of plumages in these interesting birds, and in doing away with guesswork they give the following results a tolerable degree of certainty.

THE TEAL (*Anas c. crecca*).

Female.—The downy duckling gets its first feathers on the shoulders and flanks; when about five or six weeks old it wears the first juvenile plumage, recognizable by the juvenile
tail-feathers with their blunt shaft-points from which the down has dropped.

By a moult including all the head, body and tail-feathers, but not the remiges, the young female assumes her second juvenile plumage; in most specimens this is complete by the end of November of the same year, but some birds assume it a month or more before. In the early spring of the next year a partial moult takes place by which some scapulars and flank feathers are renewed, later the innermost secondaries are moulted and in some specimens a tail-feather or two is renewed. Thus the young female ten to eleven months old has acquired its first breeding (nuptial) plumage, this being a mixture of second juvenile and full adult breeding plumage. Birds of northern origin seem ordinarily to acquire nuptial feathers to a smaller extent than breeding birds from more southern latitudes, e.g., Denmark, whence specimens may be seen having a first nuptial plumage almost or quite indistinguishable from that of a fully adult bird. During the summer, fading and abrasion of the light edges of the feathers give the bird a very dark appearance. In August generally (in Denmark) the remiges are shed all at once and the bird becomes for a time flightless, at the same time going into its first post-nuptial—the so-called eclipse—plumage, which is very much like the second juvenile plumage, in fact, so much so, that in many cases only dissection will prove whether the bird is an adult or a young bird in second juvenile plumage. This post-nuptial plumage lasts until the bird in the early spring of the following year moult into the first complete, or second nuptial plumage, which is as a rule browner, richer in colour than the first nuptial plumage (see above) and generally fully acquired when the bird is twenty to twenty-three months old. After this it has only two annual mouls, one complete in summer, and another in spring, which does not include the remiges, which are accordingly only moulted once.

**MALE.**—After the downy stage the young male gets the first juvenile plumage, from which it commences to moult into first nuptial plumage, showing however during this moult traces of a second juvenile plumage, the feathers of which only stay for a short time, and then they drop off. Some young males show even in their first juvenile plumage feathers that seem to belong to a more advanced plumage—somewhat similar to the nuptial, or better post-nuptial, being very coarsely vermiculated or rather barred; as, however, the ordinary juvenile feathers are always predominant, it seems reasonable to suppose that the second juvenile plumage of
the male has become almost suppressed. As early as September some young males have acquired a great deal of the nuptial plumage, while others, as late as November, show hardly a trace. The black and white scapulars seem to be the last feathers of the nuptial plumage to appear. The only change which this first nuptial plumage undergoes in spring is an abrasion of the tips of the feathers of the fore-neck and breast, whereby the roundish black spots of these parts become more visible than in autumn, when they are to some extent obscured by overlying feather-tips. In July the change into the post-nuptial plumage takes place, the flight-feathers being as a rule shed earlier in the male than in the female. After this the adult male, like the female, undergoes one incomplete and one complete annual moult. In many cases the tail-feathers of the post-nuptial (eclipse) plumage are changed, the central pair always. The post-nuptial or eclipse plumage of the Teal shows a great deal of variation, some specimens being greyish, others brownish of a lighter or deeper shade, some barred and others showing the common duck-like pattern on their feathers.


The Pintail (*Anas acuta*).

**Female.**—Down. First juvenile plumage. Second juvenile plumage, acquired during the autumn and first winter. In spring a partial moult, including the inner secondaries, gives the female (now about ten months old) an incomplete first nuptial plumage consisting, as in the Teal, of a mixture of second juvenile and adult breeding plumage. The same remarks about northern and southern specimens of the Teal apply also to the Pintail. This plumage being worn and abraded during summer, is in early autumn or late summer replaced by a first post-nuptial plumage, which is of a more greyish shade than the buffy-brown breeding plumage of the adult bird acquired in the following spring when the female is about twenty-two months old. After this the female has an annual complete and an annual incomplete moult, the latter not including the wings.

**Male.**—Down. First juvenile plumage. From this the bird in the course of the autumn and the early winter months goes into first nuptial plumage, showing, however, during this moult a growth of feathers that belong neither to the juvenile nor to the nuptial plumage; they are soon shed again, and no doubt represent a lost second juvenile plumage.
Young males seldom get the full plumage before the end of November or December and the elongated central tail-feathers seem to be the last of the nuptial plumage to appear. In spring the dark brown colour of the head and the yellowish tinge of the feathers of the sides of the anal region fade, giving the former a paler brown and the latter a more whitish colour. From the nuptial plumage the thirteen to fourteen months old bird goes into first post-nuptial (eclipse) plumage, which it commences to lose again in October to November, acquiring by an incomplete moult—of course not moulting the flight-feathers again as in summer—a second nuptial plumage. After this there is an annual complete and an annual incomplete moult.

The eclipse plumage of the male Pintail does not show so much variation as that of the male Teal. There is in this reversion plumage a type that is broadly barred, not at all unlike the first juvenile plumage of the male, while another coarsely and duskily vermiculated type seems to represent a more advanced stage, its feathers being reminiscent of those of the disappearing second juvenile plumage.

(Number of specimens examined: Coll. E.L.S., 270. Univ. Zool. Mus., Copenhagen, 51.)

THE GARGANEY (Anas querquedula).

FEMALE.—Down. First juvenile plumage. In this plumage most young Garganey leave their breeding places (in Denmark). I have not seen a second juvenile plumage, but young females in spring have a first nuptial plumage which is a mixture of a former—not first juvenile plumage—and first breeding plumage, easily distinguishable from the breeding plumage of two-year-old or older birds. This makes it probable that a second juvenile plumage exists as in Teal and others. From first nuptial plumage the bird by a complete moult goes into first post-nuptial (eclipse) plumage easily distinguishable from the breeding plumage by its much darker tone. As soon as the post-nuptial plumage is completed the female Garganey leaves Denmark and returns late in March or early in April, some a week or ten days later, in full breeding or second nuptial plumage. After this there are two annual moults as in the preceding species.

MALE.—The moult is probably very nearly the same as that of the female. I am unable to say whether traces of a second juvenile plumage are found, as I have not been able to examine specimens in transition plumage.

(Number of specimens examined: Coll. E.L.S., 91. Univ. Zool. Mus., Copenhagen, 13.)
THE GADWALL (*Anas strepera*).

**FEMALE.**—Down. First juvenile plumage. As in the Garganey I have been unable to examine specimens in second juvenile plumage, but specimens from breeding places show the same characters as Garganey and it does not seem difficult to distinguish between first and later nuptial plumages. The rest of the moults of the female Gadwall are the same as in the female Garganey or other surface-feeding ducks. Of this species comparatively few specimens have been examined.

**MALE.**—Down. First juvenile plumage. During the moult into first nuptial plumage, commencing in the bird's first autumn, many traces of a second juvenile plumage are visible in the few specimens examined (from Iceland and one from Greenland). After the nuptial plumage follows the post nuptial or eclipse and after this again a new nuptial plumage.

(Number of specimens examined: Col. E.L.S., 23. Univ. Zool. Mus., Copenhagen, ii.)

THE SHOVELER (*Spatula clypeata*)

**FEMALE.**—Down. First juvenile plumage. This is followed by a second juvenile plumage acquired in autumn and the first winter months, this moult including all the head, body and tail-feathers but, of course, not the wings. In spring there is another moult, giving the bird, as in the Teal and others, new feathers on the crown, mantle, scapulars, innermost secondaries and some tail-feathers; the moult, however, seems to be more extensive than in the preceding species; consequently the difference between this first and later nuptial plumages is very slight, the more worn flight-feathers and duller blue fore-wing of the young bird being as a rule the only certain marks of distinction. Having reared its ducklings it goes into first post-nuptial (eclipse) plumage, which in the following spring, sometimes earlier, even in the winter months, is replaced by the second nuptial plumage, after which the female Shoveler, like other surface-feeding ducks, has two annual moults, one only including the flight-feathers.

**MALE.**—Down. First juvenile plumage. In early autumn this plumage is replaced by a perfectly distinct second juvenile plumage which has, however, hardly been completed before the feathers of the first nuptial plumage commence to appear. This moult lasts until spring, when the bird assumes its first nuptial plumage, showing in this as a rule, but not always, a less glossy green head and some
dark horseshoe-shaped markings on the white shield of the fore-neck and breast, the chestnut-brown feathers of the lower breast and belly being retained from the second juvenile plumage. The first nuptial plumage is followed by a first post-nuptial plumage (eclipse), this again by the second nuptial plumage and so on. It is a well-known fact that the enlargement of the bill is not noticeable in the newly hatched duckling, and that the growth of it commences just before the bird is acquiring its first feathers; this seems to indicate that the broad spoon-shaped bill with its highly developed lamellæ is a comparatively recently acquired character, and perhaps this may account for the fact that the male Shoveler exhibits a more primitive sequence of plumages than most other surface-feeding ducks, having retained a complete second juvenile plumage.

(Number of specimens examined: Coll. E.L.S., 183 Univ. Zool. Mus., Copenhagen, 14.)

THE MALLARD (Anas p. platyrhyncha).

FEMALE.—Down. First juvenile plumage, which is in early autumn followed by a first nuptial plumage; birds from Denmark especially early ones, show only a few traces of a second juvenile plumage and in spring apparently no other moult takes place than the changing of the uniform greyish secondaries for new ones marked with a buff pattern, and then, if not before, such feathers of a second juvenile plumage which may have been retained are also changed. There is, however, a second juvenile plumage, exhibited by birds coming here in September and later, and in such birds another moult takes place, giving them a more or less complete first nuptial plumage; some have this moult earlier, others later; specimens in February and March still show new feathers coming in, while others, young birds nine to ten months old with straight oviducts, are indistinguishable from adults with oviducts that have been in function the preceding year or before. I have seen specimens in March in almost full second juvenile plumage (for instance, No. 2159, 15/3/1917. Coll. E.L.S.)—as in other ducks it is very much like the post-nuptial of the adult female—and specimens from Iceland often show this state of plumage, one (No. 1728, 13/7/1909, North Iceland. Coll. E.L.S.) a July specimen in worn and faded plumage has not even changed the grey secondaries. Such visitors to this country are probably birds coming from north-eastern districts.

When the breeding-season is over, the worn and faded
first nuptial plumage, including the flight-feathers, is moulted and replaced by a quite distinct post-nuptial plumage, which, lasting only for a short time, is in its turn—in some as early as October—replaced by the second nuptial plumage, the flight-feathers and innermost (uniform grey) secondaries alone being retained until the next spring when the latter are replaced by new ones with a buff pattern. In northern birds this moult, as in young birds, takes place somewhat later.

**Male.**—Down. First juvenile plumage. From this the young male very soon commences to moult into his first nuptial plumage but the first signs of the moult are almost invariably chocolate-brown feathers which appear on the head, most frequently on the cheeks and chin, feathers which are undoubtedly traces of a lost second juvenile plumage. Other feathers of this lost plumage may be seen elsewhere on the body as, for instance, on the flanks, some feathers of which are more coarsely vermiculated than those of the coming nuptial plumage. In June the moult into first post-nuptial (eclipse) plumage takes place and early in September—in northern birds later—the second nuptial plumage commences to appear.

(Number of specimens examined: Coll. E.L.S., 746 (and 200 from Greenland). Univ. Zool. Mus., Copenhagen, 110.)

**The Wigeon (Anas penelope).**

**Female.**—Down. First juvenile plumage, retained in most specimens until December or even later, when a moult into a second juvenile plumage takes place. In this second juvenile plumage feathers of the first juvenile plumage (e.g., tail-feathers) are not unfrequently retained, and just before breeding time a new moult commences into what may be called the first nuptial plumage, though not all females breed in their first year. This is a mixture of the grey-backed second juvenile, and (to a greater or lesser extent) of a darker nuptial plumage and in some cases even of some feathers of the first juvenile plumage; the innermost secondaries are apparently always replaced by new ones with a pattern. From this first nuptial plumage the one-year-old female—having bred or not—goes into first post-nuptial, eclipse or reversion plumage. This, as a rule, seems to be more like the first than the second juvenile plumage. In autumn it is replaced by the second nuptial plumage, which is somewhat variable, a brown and a greyish more or less barred type seeming to be predominant. After this the two annual mouls take place.
MALE.—Down. First juvenile plumage. This in the Wigeon is more variable than in other surface-feeding ducks, some specimens showing some barring on the back between the shoulders, others none, some having a glossy green, others a blackish speculum, some showing a uniform greyish-brown fore-wing, others having the lesser and median coverts broadly edged with white, and others again even showing a tendency towards a white fore-wing with darker edges to the feathers.

From the first juvenile plumage the bird passes by a slowly progressing moult, into its first nuptial plumage.

During this moult there is a growth of feathers which are mostly shed again and which are evidently representatives of a lost second juvenile plumage.

The first nuptial plumage is like the corresponding plumage of the old male, except that the yellowish feathers of the fore-head are as a rule paler, the vermiculation of the back and flank feathers seems slightly coarser and the juvenile fore-wing with the above named variations is retained. As it is uncertain whether males always pair in this plumage—those dissected have shown swelling of the sexual organs, although apparently not to the extent shown in old males—this plumage might even be called third (or existing second) juvenile plumage. It is followed in summer by a first post-nuptial eclipse or reversion plumage showing for the first time the white fore-wing, and this again is replaced by the nuptial plumage of the fully adult male, the white fore-wing being retained.

(Number of specimens examined: Coll. E.L.S., 373. Univ. Zool. Mus., Copenhagen, 85.)

It will be noticed that the females of all the above-named species have a post-nuptial or eclipse plumage as well as the males, but as it has only been my intention to give an account of the sequence of plumages no detailed description of these or other plumages has been attempted nor have such well-known changes as that of the colour of the feet, due to age, or the seasonal colour changes in the bills been mentioned. Besides, a full description of all these plumages with the necessary illustrations is under preparation and will appear in a not remote future.

Finally it may be mentioned that a few females in male-like plumage have been seen.

On the 13th and 20th of March, 1911, two ten-months-old Mallard females were killed. With a lot of others they had been reared by a hen, the eggs having been taken from the
nest of a wild duck the preceding spring, 1910. When the rest of the Mallards were all in normal plumage (pinioned) and paired these two birds kept by themselves and had singular voices different to the normal one of the female. Their bills and feet were of normal colour, but their plumage was very much like that of an old drake in eclipse; one, however, showed an imperfect white ring round the neck and upcurled middle tail-feathers, as well as uniform brown feathers on its chin and cheeks resembling those of the "lost" second juvenile plumage of the male. Dissection proved that both had normal but perfectly thin and straight oviducts and two little oval organs, that to the naked eye looked like testes but by microscopic examination were found to be ovaries in an embryonic state.

A female Pintail shot September 17th, 1911—judging from the skeleton about sixteen-and-a-half months old—has the plumage very much like the barred type of the old male in eclipse, the wing, however, like that of a young male. The colour of the bill was that of a normal female; the ovary (only one visible, but the bird somewhat damaged by the shot) very small and undeveloped, the distal part of the oviduct somewhat broad. All tail-feathers "adult," middle ones somewhat elongated.

A female Wigeon, bought on the market here, September 26th, 1918, looks like a young male going into first nuptial plumage. Oviduct normal, ovary undeveloped; apparently about fifteen months old.

In these cases the presence of a male-like plumage was evidently not due to old age, but rather to arrested development of the ovaries.

In the case of the Pintail it would seem that pairing had been attempted. No alteration in the tracheæ was seen.