very conspicuous white of the upper mandible, which he does not even hint at, is discernible a gun-shot away.

I might also point to a modern work in which the bill of the *deglandi* female is painted blue; that of female *perspicillata*, sea-green; the eyes of both, yellow; and where in the text the eyes of the *deglandi* female are still "yellow," and those of female *perspicillata* "yellowish-white." How much prettier and more appropriate for the sex, this blue, green, and yellowish, than the dusky hues used by nature.

It is a pity, perhaps, ever to call attention in print to these mistakes, for if in some far off future the theory of evolution is as fascinating as it is today, what interesting changes might be shown among the Scoters.

HYBRIDISM, AND A DESCRIPTION OF A HYBRID BETWEEN *ANAS BOSCHAS* AND *ANAS AMERICANA*.

BY D. G. ELLIOT.

THE OCCURRENCE of hybridism among birds in a state of nature in certain groups is not infrequent, but it is generally believed that the individual hybrids are infertile, if not in the first certainly in the second generation. If this were not so, the evidences of the existence of these crosses would be exhibited in specimens killed, more often than has been the case up to the present time. Of course it will be readily understood that the probability of the continuance of the peculiarities shown by these hybrids under the most favorable circumstances, and allowing that they were fertile beyond the second generation, is not great, for they would be extinguished by interbreeding with pure-blooded birds in a comparatively brief period of time; otherwise in those families whose members migrate on the same lines of travel, and associate more or less together, there would exist the possibility of a mongrel race supplanting a pure species, and our scientific classification would be thrown into considerable

confusion thereby. By many persons, who have not appreciated the fact of this existence of hybridism, crosses arising from the interbreeding of distinct species have been described from time to time as new species, although to those more familiar with the subject the evidence of their descent, shown in their style of coloration, and often in the outline and structure of the bill, is manifested almost at a glance.

Among ornithologists, as a rule, there seems to have existed a strange reluctance to acknowledge this condition of hybridism, the reason for which would be very difficult to explain, save where in some instances it might conflict with preconceived opinions or theories entertained by various authors. One of the most, if not *the* most, remarkable conditions of hybridism known to us, is that produced by the crossing of *Colaptes cafer* and *C. auratus*, the offspring of which has been known in our literature as *C. hybridus*, and the evidence of which has been witnessed over a vast extent of North America; but even in this case it has not been ascertained that the hybrids have been fertile to any very great degree, although the information gathered would seem to foretell the gradual curtailment of the range of *C. cafer* as the dominant form, *C. auratus*, intrudes itself farther and farther upon its domain.

Perhaps the most numerous examples of intercrossing have been obtained from the families of the Phasianidæ and Anatidæ, and species of both of these are known to interbreed more or less readily under the conditions pertaining to domestication. But even under such circumstances, when the physical conditions of the birds have attained a most perfect development, and their passions have been excited by stimulating food to the highest degree, fertility rarely extends beyond the second generation among the hybrids breeding *inter se*. Prof. Newton (P. Z. S. 1860, p. 338) instances a case that came under his own observation, where a pair of hybrids, the result of a cross between *Anas boschas* and *Dafila acuta*, interbred, as he believed, near a pond in his park, and produced four young, two males and two females. During the next breeding season these birds were closely watched. His observations led him to regard them as infertile, and his belief was shown to be well founded, when he dissected them after death, proving that in this case ability to reproduce their kind did not extend to the second generation.

Among the species, so-called, described from hybrids I may mention *Fuligula ferinoides* Bartlett (P. Z. S. 1847, p. 48) and *F. homeyeri* Bädeker (Naumannia, 1851, pp. 12–15). These were afterwards shown to be hybrids between *Fuligula ferina* and *F. nyroca*. An analogous example is now before me of a cross between *Aythya valisneria* and *Aythya collaris*. I exhibited this specimen with others at a meeting of the Zoölogical Society of London, and a poor figure is given of it in the P. Z. S. 1860, pl. clxvii. It is there erroneously called a cross between *A. americana* and *A. collaris*. Its great length of bill and extent and depth of coloring of the neck show the Canvasback derivation and not the Redhead. *Anas breweri* (Audubon, B. of Am. Vol. VI, p. 252) is, again, an instance of crossing between *A. boschas* and *A. strepera*, and interbreeding has occurred so frequently in this family that M. de Sélys-Longchamps in 1856 (Bull. Acad. Roy. de Bruxelles, Tom. XXIII, No. 7) was able to record no less than forty-four different crosses among its members.

In the Phasianidæ, as in other families of gallinaceous birds, hybridism is often met with, and especially among certain of its species. Thus *Euplocamus lineatus*, found in Tenasserim, Pegu, and Siam, interbreeds with *E. horsfieldi*, a resident of Assam and neighboring provinces, and the two species pass completely one into the other in the province of Arakan. In like manner *E. albocristatus*, ranging in the northwest Himalayas as far as Nepaul, interbreeds in the last province with *E. melanonotus*, which is found in Sikkim and Butan. In the domestic and semi-domestic state, as observed in England, the offspring of two or three introduced species are fertile, but these are mongrel races, not strictly hybrids, and are perpetuated by the infusion of fresh blood.

When speaking of hybrids, this term is meant to define those individuals which are the direct offspring of two distinct species, each possessing in equal degree the blood of both parents. It is such creatures, which may be termed *complete hybrids*, that it is believed are not fertile beyond the second generation. But it is not yet, I believe, conclusively proved that such a complete hybrid may not be fertile when mated with a pure-blooded bird of one or the other of the species from which it descended, and their progeny, being three quarters pure

blood, may also be fertile; and these incomplete hybrids may thus transmit the characters of the separate stocks to which they owe their existence, through numerous generations, and spread over a wide extent of country, but it is the constant infusion of fresh blood that makes this fact possible, and not the ability of complete hybrids to produce offspring indefinitely, breeding *inter se*. Without the accession of pure blood constantly introduced into the hybrid stock, there appears to be no recorded evidence of the continued fertility of complete hybrids. Under this hypothesis an explanation is obtained of the occurrence of *Colaptes hybridus*, already mentioned, over an extent of country about one thousand miles in length with a varying width of from three to five hundred miles. (See Allen, Bull. Amer. Mus. Nat. Hist. IV, pp. 29–33.) The two species dwelling on either side of this tract encroach probably upon it to a certain degree, breeding with the incomplete hybrids within the borders, thus introducing a constant stream of fresh blood, and these incomplete hybrids breeding again, if even only through their first generation, would easily produce the almost limitless diversity of characters pertaining originally to the pure-blooded *C. auratus* and *C. cafer* which are met with throughout the district in which these crosses are mainly dispersed.

It has been urged as a proof of the unlimited fertility of hybrids, at all events among mammals, that the wild bison (*Bison americanus*) can be crossed with domestic cattle, and that their progeny is fertile. This, however, cannot be considered a proper criterion for the reason that domestic cattle are artificial breeds that either have never been wild, or, if the present generations of any of them can be traced back to a wild ancestor, it is only through such a lapse of time that their descendants are practically, if not completely, domesticated animals, and therefore through artificial selection have acquired the power of fertility. Their offspring are mongrels, *i. e.* offspring of varieties, not hybrids, which are offspring of species. The influences of domestication have dominated and superseded those pertaining to the animals in a state of nature, and it is hazardous to argue that, because wild animals crossed with those in captivity can produce offspring that are fertile and which transmit their power of fertility to their descendants indefinitely, two wild animals in a state of nature would be able

to accomplish similar results in their offspring. It is, of course, next to impossible to prove this fact among wild animals, but the fact that a strain of hybrids occupying a district to the exclusion of their parent stock, save in one or two very exceptional instances, has not been observed in a state of nature, would seem to be the best possible proof that a cause does exist which prevents complete hybrids from continuing to exist, and that they either die out from inability to reproduce, or else are swallowed up and extinguished through the interbreeding of incomplete hybrids and pure-blooded races, the influences exerted by the latter proving too powerful for the mixed races to overcome. In this fact lies the possibility, and the only one where two pure-blooded races are liable to cross, of the continuity of distinct species.

In this connection it may be suggested by some believer in complete hybrid fertility, that these individuals are the progenitors of new species, evolving new characters out of the mixed ones derived from their original sources. I do not think that there is any recorded evidence permitting the belief that such a view is anywise tenable.

Sterility in hybrids is caused by the disturbance in the reproductive organs arising from the union of two distinct forms, thus rendering them inoperative; or the continuance of the race is prevented by the early death of the embryo. (See Darwin, Origin of Species, 3d ed. p. 286.)

The principle of reversion also acts as a check to the continuation of hybrid and mongrel strains. Thus domesticated pigeons constantly show a tendency to revert to their parent stock, *Columba livia*, and fowls in the same way, to their original source, *Gallus ferrugineus*. Darwin relates an instance ('Animals and Plants under Domestication', 1868, Vol. I, p. 242) where he crossed a black Spanish cock with a white silk hen, and one of the progeny, a cock, closely resembled the wild *G. ferrugineus*. This was the more extraordinary as the black Spanish has been long known to breed true, and the silk hen, being of most ancient extraction, having been known previous to the year 1600, also breeds true. If left entirely to themselves, without the possibility of receiving any fresh blood, it is presumable that in course of time these hybrid and mongrel strains would breed back to their original stock, by means of this inherited tendency to reversion.

Comparatively few hybrids among the wild ducks of North America have been observed, and of those met with the majority have had either *Anas boschas* or *Anas obscura* for one of their parents, which would seem to show that the infidelity of these birds is the chief cause for the appearance of crosses. Beside the examples already cited, hybrids have been obtained from the interbreeding of the Muscovy (*Cairina moschata*) and the Black Duck, producing offspring of enormous size, which have been called *Anas maxima*, and the Mallard and Black Duck also cross in the wild state. It may not be surprising that salacious creatures like Ducks should cross when the species are in the habit of associating commonly together and have similar habits; but it is surprising to find hybrids of species whose habits are different, and which, as a rule, keep apart. Therefore I was not prepared to meet with a cross between a Mallard and an American Widgeon, which was killed out of a small bunch of Mallards on the grounds of the Narrow's Island Club in Currituck Sound, North Carolina, in January, 1892. The only other instances that I know of the interbreeding of Mallard and Widgeon is that recorded by Prof. Newton (P. Z. S. 1861, p. 392), but this was between the European birds in captivity, a male *Anas penelope* having mated with a female which was a cross between *Anas boschas* and an ordinary farmyard duck, or a mongrel. I do not recall, however, any other instances when a cross between Mallard and Widgeon has been obtained in the wild state. This bird in question is about the size of an ordinary drake Mallard, and is a male. The first point about it that arrests attention is the bill, which is similar in shape to that of the Widgeon, but about one fourth larger, and light blue in color, with a black nail on the point of the maxilla. The head and neck are brilliant emerald-green like the Mallard, with white dots on the lores and fore part of the cheeks, and a conspicuous buffy white line, the feathers tipped with black, broadest in its upper portion, and running from the ears down the neck. Front, and a line on top of head, blackish, with rusty tips to the feathers on top of the head. Mantle and wings crossed with fine irregular lines of black and buff, this last hue becoming pale buff on the apical half of the tertiaries. Greater, median, and lesser coverts, pale brownish gray, with a narrow white bar, succeeded by a narrow black one on the tips of the last row of the greater coverts. Secondaries

pale gray, with half of the outer web black edged with white. A brilliant, metallic, emerald-green speculum. Two innermost secondaries silvery gray without any black. Primaries blackish brown with rufous shafts save at their tips which are blackish brown like the webs. The inner webs along the shafts are silvery gray. Back and rump brownish black, finely vermiculated with buff; on the rump a few black blotches, and feathers of lower part, extending over the tail, irregularly crossed with black and white.

Breast dark chestnut with numerous black spots in the centre forming a narrow line from base of the neck, and widening out in a fan shape towards the lower part of breast, where the chestnut color changes to a purplish shade and graduates into the buffy white of the lower parts. Feathers of flanks crossed irregularly with narrow black and white lines. Abdomen and vent whitish, indistinctly barred with fine blackish brown lines, and faintly blotched with buff. On each side of rump a conspicuous, large, white patch, some of the feathers faintly barred with black. Tail: median feathers velvety black, sharply graduated and extending beyond the other feathers about an inch. Lateral feathers grayish brown edged with white on outer webs and tips. Upper tail-coverts velvety black, edged on inner webs with buff. Under tail-coverts velvety black. Legs and feet dark yellow.

On comparing this hybrid with the parent species, the following resemblances are observed. It approaches the Widgeon in the shape and color of its bill, in the buff markings on the side of the head, in the vermiculation of the upper parts, and color of back and rump; also in the coloring of the secondaries, in the purplish hue of the lower breast, in the upper tail-coverts with their peculiar buff edging on the inner webs, and in the shape of the pointed, lengthened tail. It resembles the Mallard in the green head and neck, in the chestnut of the breast, in the slight tendency to curl of the tips of the median feathers, and in its large size. It resembles neither species in the coloration of the wing-coverts, the speculum, the flank feathers, the under part of the body, and the legs and feet.

The specimen is in the collection of the American Museum of Natural History, New York City.