

CHAPTER V.

DOMESTIC PIGEONS.

ENUMERATION AND DESCRIPTION OF THE SEVERAL BREEDS—INDIVIDUAL VARIABILITY—VARIATIONS OF A REMARKABLE NATURE—OSTEOLOGICAL CHARACTERS: SKULL, LOWER JAW, NUMBER OF VERTEBRÆ—CORRELATION OF GROWTH: TONGUE WITH BEAK; EYELIDS AND NOSTRILS WITH WATTLED SKIN—NUMBER OF WING-FEATHERS, AND LENGTH OF WING—COLOUR AND DOWN—WEBBED AND FEATHERED FEET—ON THE EFFECTS OF DISUSE—LENGTH OF FEET IN CORRELATION WITH LENGTH OF BEAK—LENGTH OF STERNUM, SCAPULA, AND FURCULUM—LENGTH OF WINGS—SUMMARY ON THE POINTS OF DIFFERENCE IN THE SEVERAL BREEDS.

I HAVE been led to study domestic pigeons with particular care, because the evidence that all the domestic races are descended from one known source is far clearer than with any other anciently domesticated animal. Secondly, because many treatises in several languages, some of them old, have been written on the pigeon, so that we are enabled to trace the history of several breeds. And lastly, because, from causes which we can partly understand, the amount of variation has been extraordinarily great. The details will often be tediously minute; but no one who really wants to understand the progress of change in domestic animals, and especially no one who has kept pigeons and has marked the great difference between the breeds and the trueness with which most of them propagate their kind, will doubt that this minuteness is worth while. Notwithstanding the clear evidence that all the breeds are the descendants of a single species, I could not persuade myself until some years had passed that the whole amount of difference between them, had arisen since man first domesticated the wild rock-pigeon.

I have kept alive all the most distinct breeds, which I could procure in England or from the Continent; and have prepared skeletons of all. I have received skins from Persia, and a large number from India and other quarters of the

world.¹ Since my admission into two of the London pigeon-clubs, I have received the kindest assistance from many of the most eminent amateurs.²

The races of the Pigeon which can be distinguished, and which breed true, are very numerous. MM. Boitard and Corbié³ describe in detail 122 kinds; and I could add several European kinds not known to them. In India, judging from the skins sent me, there are many breeds unknown here; and Sir W. Elliot informs me that a collection imported by an Indian merchant into Madras from Cairo and Constantinople included several kinds unknown in India. I have no doubt that there exist considerably above 150 kinds which breed true and have been separately named. But of these the far greater number differ from each other only in unimportant characters. Such differences will be here entirely passed over, and I shall confine myself to the more important points of structure. That many important differences exist we shall presently see. I have looked through the magnificent

¹ The Hon. C. Murray has sent me some very valuable specimens from Persia; and H.M. Consul, Mr. Keith Abbott, has given me information on the pigeons of the same country. I am deeply indebted to Sir Walter Elliot for an immense collection of skins from Madras, with much information regarding them. Mr. Blyth has freely communicated to me his stores of knowledge on this and all other related subjects. The Rajah Sir James Brooke sent me specimens from Borneo, as has H.M. Consul, Mr. Swinhoe, from Amoy in China, and Dr. Daniell from the west coast of Africa.

² Mr. B. P. Brent, well known for his various contributions to poultry literature, has aided me in every way during several years: so has Mr. Tegetmeier, with unwearied kindness. This latter gentleman, who is well known for his works on poultry, and who has largely bred pigeons, has looked over this and the following chapters. Mr. Bult formerly showed me his unrivalled collection of Pouters,

and gave me specimens. I had access to Mr. Wicking's collection, which contained a greater assortment of kinds than could anywhere else be seen; and he has always aided me with specimens and information given in the freest manner. Mr. Haynes and Mr. Corker have given me specimens of their magnificent Carriers. To Mr. Harrison Weir I am likewise indebted. Nor must I by any means pass over the assistance received from Mr. J. M. Eaton, Mr. Baker, Mr. Evans, and Mr. J. Baily, jun., of Mountstreet—to the latter gentleman I have been indebted for some valuable specimens. To all these gentlemen I beg permission to return my sincere and cordial thanks.

³ 'Les Pigeons de Volière et de Colombier,' Paris, 1824. During forty-five years the sole occupation of M. Corbié was the care of the pigeons belonging to the Duchess of Berry. Bonizzi has described a large number of coloured varieties in Italy: 'Le variazioni dei colombi Domestici.' Padova, 1873.

collection of the Columbidae in the British Museum, and, with the exception of a few forms (such as the *Didunculus*, *Calenas*, *Goura*, &c.), I do not hesitate to affirm that some domestic races of the rock-pigeon differ fully as much from each other in external characters as do the most distinct natural genera. We may look in vain through the 288 known species⁴ for a beak so small and conical as that of the short-faced tumbler; for one so broad and short as that of the barb; for one so long, straight, and narrow, with its enormous wattles, as that of the English carrier; for an expanded upraised tail like that of the fantail; or for an œsophagus like that of the pouter. I do not for a moment pretend that the domestic races differ from each other in their whole organisation as much as the more distinct natural genera. I refer only to external characters, on which, however, it must be confessed that most genera of birds have been founded. When, in a future chapter, we discuss the principle of selection as followed by man, we shall clearly see why the differences between the domestic races are almost always confined to external, or at least to externally visible, characters.

Owing to the amount and gradations of difference between the several breeds, I have found it indispensable in the following classification to rank them under Groups, Races, and Sub-races; to which varieties and sub-varieties, all strictly inheriting their proper characters, must often be added. Even with the individuals of the same sub-variety, when long kept by different fanciers, different strains can sometimes be recognised. There can be no doubt that, if well-characterized forms of the several races had been found wild, all would have been ranked as distinct species, and several of them would certainly have been placed by ornithologists in distinct genera. A good classification of the various domestic breeds is extremely difficult, owing to the manner in which many of the forms graduate into each other; but it is curious how exactly the same difficulties are encountered, and the same rules have to be followed, as in the classification of any natural but difficult group of organic beings. An "artificial

⁴ 'Coup d'Œil sur l'Ordre des Pigeons,' par Prince C. L. Bonaparte, Paris, 1855. This author makes 288 species, ranked under 85 genera.

classification " might be followed which would present fewer difficulties than a " natural classification ;" but then it would interrupt many plain affinities. Extreme forms can readily be defined ; but intermediate and troublesome forms often destroy our definitions. Forms which may be called " aberrant " must sometimes be included within groups to which they do not accurately belong. Characters of all kinds must be used ; but as with birds in a state of nature, those afforded by the beak are the best and most readily appreciated. It is not possible to weigh the importance of all the characters which have to be used so as to make the groups and sub-groups of equal value. Lastly, a group may contain only one race, and another and less distinctly defined group may contain several races and sub-races, and in this case it is difficult, as in the classification of natural species, to avoid placing too high a value on the number of forms which a group may contain.

In my measurements I have never trusted to the eye ; and when speaking of a part being large or small, I always refer to the wild rock-pigeon (*Columba livia*) as the standard of comparison. The measurements are given in decimals of an inch.⁵

I will now give a brief description of all the principal breeds. The diagram on the following page may aid the reader in learning their names and seeing their affinities. The rock-pigeon, or *Columba livia* (including under this name

⁵ As I so often refer to the size of the *C. livia*, or rock-pigeon, it may be convenient to give the mean between the measurements of two wild birds, kindly sent me by Dr. Edmondstone from the Shetland Islands.

	Inches.
Length from feathered base of beak to end of tail	14·25
" " " " to oil-gland	9·5
" from tip of beak to end of tail	15·02
" of tail-feathers	4·62
" from tip to tip of wing	26·75
" of folded wing	9·25
Beak.—Length from tip of beak to feathered base	·77
" Thickness, measured vertically at distal end of nostrils	·23
" Breadth, measured at same place	·16
Feet.—Length from end of middle toe (without claw) to distal end of tibia	2·77
" Length from end of middle toe to end of hind toe (without claws)	2·02
Weight 14½ ounces.	

two or three closely-allied sub-species or geographical races,

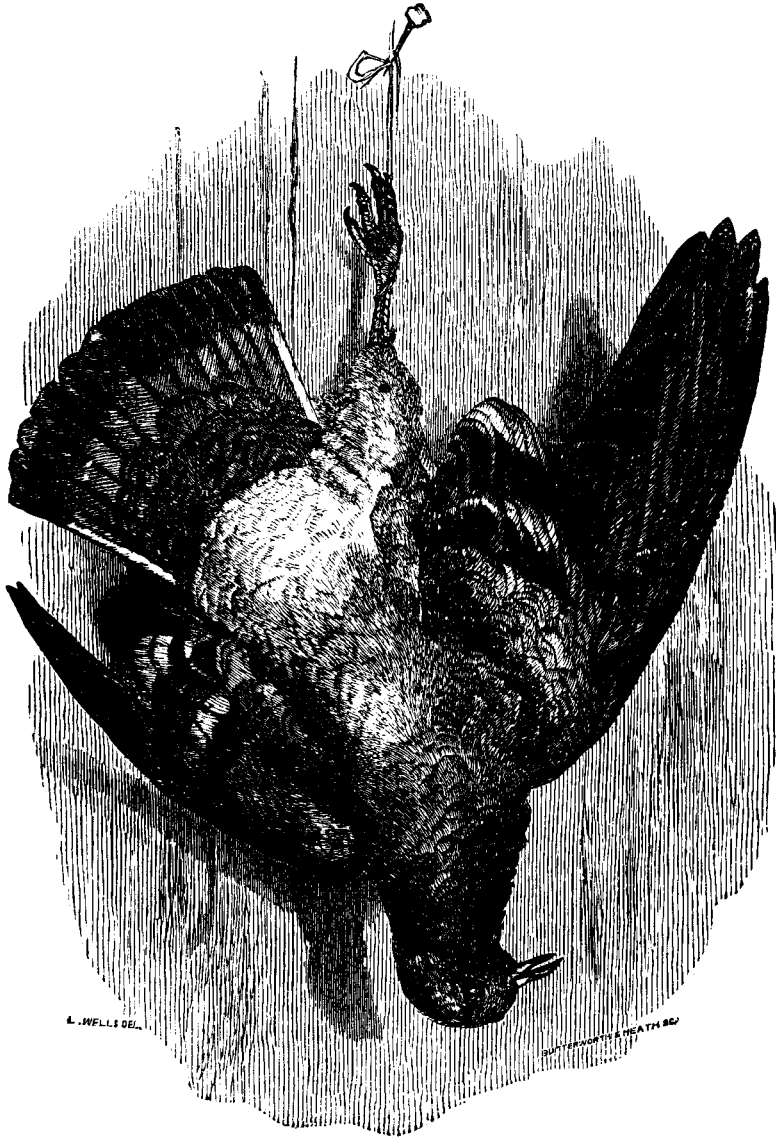
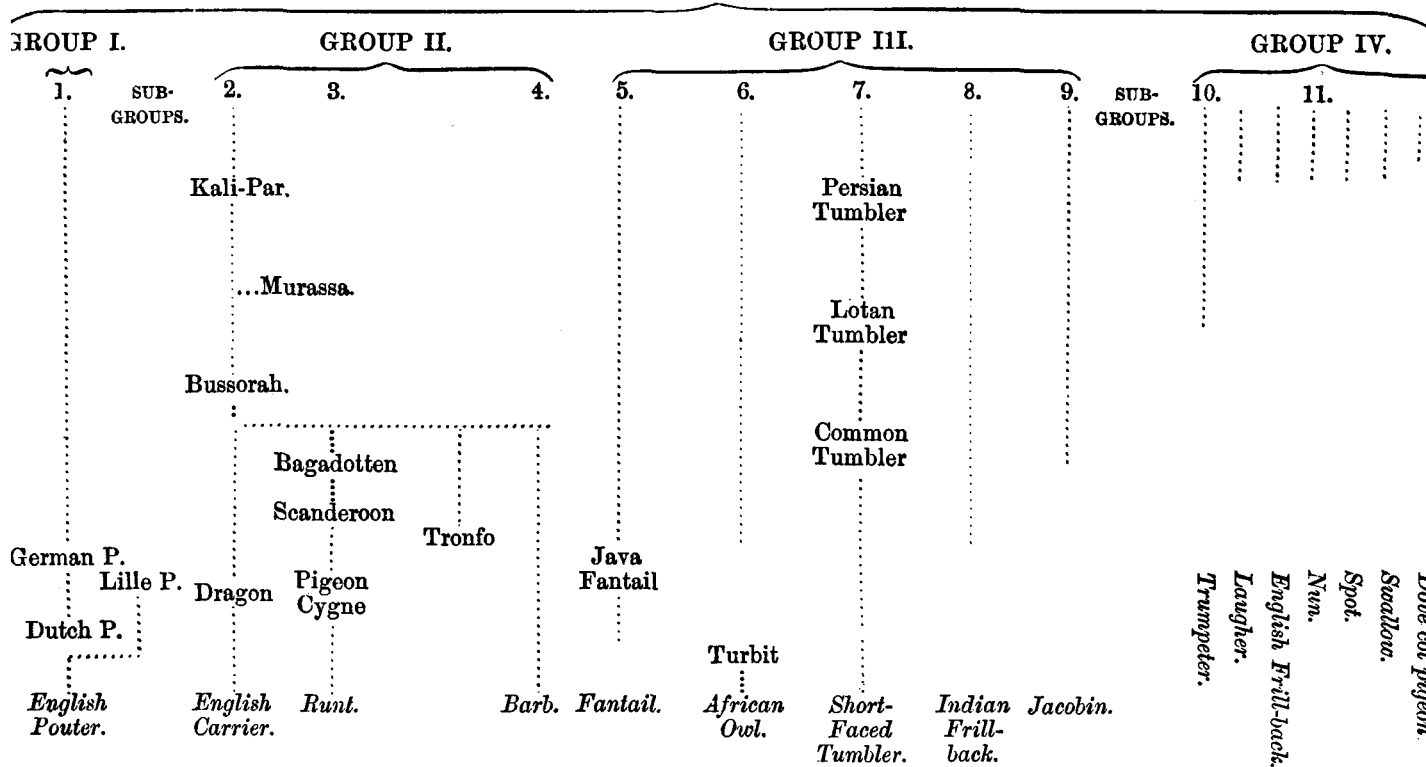


Fig. 17.—The Rock Pigeon, or *Columba livia*.⁶ The parent-form of all domesticated Pigeons.

⁶ This drawing was made from a dead bird. The six following figures were drawn with great care by Mr. Luke Wells from living birds selected

by Mr. Tegetmeier. It may be confidently asserted that the characters of the six breeds which have been figured are not in the least exaggerated.

COLUMBA LIVIA OR ROCK-PIGEON.



hereafter to be described), may be confidently viewed, as we shall see in the next chapter, as the common parent-form. The names in italics on the right-hand side of the page show us the most distinct breeds, or those which have undergone the greatest amount of modification. The lengths of the dotted lines rudely represent the degree of distinctness of each breed from the parent-stock, and the names placed under each other in the columns show the more or less closely connecting links. The distances of the dotted lines from each other approximately represent the amount of difference between the several breeds.

GROUP I.

This group includes a single race, that of the Pouters. If the most strongly marked sub-race be taken, namely, the Improved English Pouter, this is perhaps the most distinct of all domesticated pigeons.

RACE I.—POUTER PIGEONS. (Kropftauben, German. Grosses-gorges, or boulans, French.)

Oesophagus of great size, barely separated from the crop, often inflated. Body and legs elongated. Beak of moderate dimensions.

Sub-race I.—The improved English Pouter, when its crop is fully inflated, presents a truly astonishing appearance. The habit of slightly inflating the crop is common to all domestic pigeons, but is carried to an extreme in the Pouter. The crop does not differ, except in size, from that of other pigeons; but is less plainly separated by an oblique constriction from the oesophagus. The diameter of the upper part of the oesophagus is immense, even close up to the head. The beak in one bird which I possessed was almost completely buried when the oesophagus was fully expanded. The males, especially when excited, pout more than the females, and they glory in exercising this power. If a bird will not, to use the technical expression, “play,” the fancier, as I have witnessed, by taking the beak into his mouth, blows him up like a balloon; and the bird, then puffed up with wind and pride, struts about, retaining his magnificent size as long as he can. Pouters often take flight with their crops inflated. After one of my birds had swallowed a good meal of peas and water, as he flew up in order to disgorge them and feed his nearly fledged young, I heard the peas rattling in his inflated crop as if in a bladder. When flying, they

often strike the backs of their wings together, and thus make a clapping noise.

Pouters stand remarkably upright, and their bodies are thin and elongated. In connexion with this form of body, the ribs are

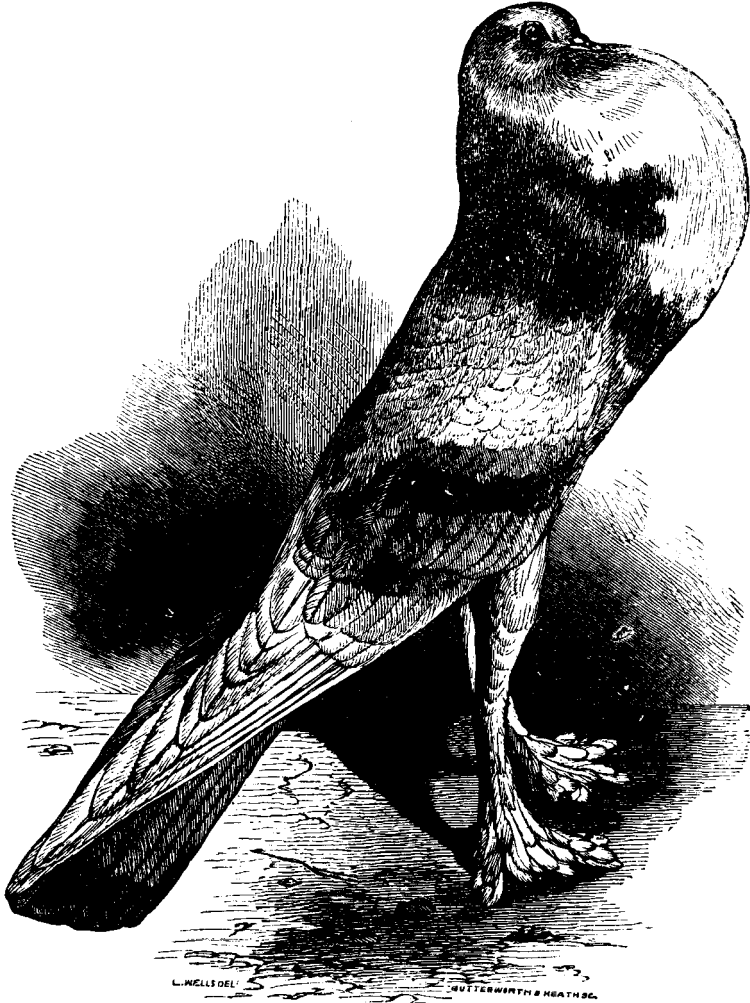


Fig. 18.—English Pouter.

generally broader and the vertebræ more numerous than in other breeds. From their manner of standing their legs appear longer than they really are, though, in proportion with those of *C. livia*, the legs and feet are actually longer. The wings appear much elongated, but by measurement, in relation to the length of body,

this is not the case. The beak likewise appears longer, but it is in fact a little shorter (about $\cdot 03$ of an inch), proportionally with the size of the body, and relatively to the beak of the rock-pigeon. The Pouter, though not bulky, is a large bird; I measured one which was $34\frac{1}{2}$ inches from tip to tip of wing, and 19 inches from tip of beak to end of tail. In a wild rock-pigeon from the Shetland Islands the same measurements gave only $28\frac{1}{4}$ and $14\frac{3}{4}$. There are many sub-varieties of the Pouter of different colours, but these I pass over.

Sub-race II. Dutch Pouter.—This seems to be the parent-form of our improved English Pouters. I kept a pair, but I suspect that they were not pure birds. They are smaller than English pouters, and less well developed in all their characters. Neumeister⁷ says that the wings are crossed over the tail, and do not reach to its extremity.

Sub-race III. The Lille Pouter.—I know this breed only from description.⁸ It approaches in general form the Dutch Pouter, but the inflated œsophagus assumes a spherical form, as if the pigeon had swallowed a large orange, which had stuck close under the beak. This inflated ball is represented as rising to a level with the crown of the head. The middle toe alone is feathered. A variety of this sub-race, called the claquant, is described by MM. Boitard and Corbié; it pouts but little, and is characterised by the habit of violently hitting its wings together over its back,—a habit which the English Pouter has in a slight degree.

Sub-race IV. Common German Pouter.—I know this bird only from the figures and description given by the accurate Neumeister, one of the few writers on pigeons who, as I have found, may always be trusted. This sub-race seems considerably different. The upper part of the œsophagus is much less distended. The bird stands less upright. The feet are not feathered, and the legs and beak are shorter. In these respects there is an approach in form to the common rock-pigeon. The tail-feathers are very long, yet the tips of the closed wings extend beyond the end of the tail; and the length of the wings, from tip to tip, and of the body, is greater than in the English Pouter.

GROUP II.

This group includes three Races, namely, Carriers, Runts, and Barbs, which are manifestly allied to each other. Indeed, certain carriers and runts pass into each other by such insensible gradations that an arbitrary line has to be drawn between them. Carriers also graduate through foreign breeds into the rock-pigeon. Yet, if well-characterised Carriers and

⁷ 'Das Ganze der Tanbenzucht:' Weimar, 1837, pl. 11 and 12.

⁸ Boitard and Corbié, 'Les Pigeons,' &c., p. 177, pl. 6.

Barbs (see figs. 19 and 20) had existed as wild species, no ornithologist would have placed them in the same genus with each other or with the rock-pigeon. This group may, as a general rule, be recognised by the beak being long, with the skin over the nostrils swollen and often carunculated or wattled, and with that round the eyes bare and likewise carunculated. The mouth is very wide, and the feet are large. Nevertheless the Barb, which must be classed in this same group, has a very short beak, and some runts have very little bare skin round their eyes.

RACE II.—CARRIERS. (*Türkische Tauben*; *pigeons tures*, dragons.)

Beak elongated, narrow, pointed; eyes surrounded by much naked, generally carunculated, skin; neck and body elongated.

Sub-race I. The English Carrier.—This is a fine bird, of large size, close feathered, generally dark-coloured, with an elongated neck. The beak is attenuated and of wonderful length: in one specimen it was 1·4 inch in length from the feathered base to the tip; therefore nearly twice as long as that of the rock-pigeon, which measured only ·77. Whenever I compare proportionally any part in the carrier and rock-pigeon, I take the length of the body from the base of the beak to the end of the tail as the standard of comparison; and according to this standard, the beak in one Carrier was nearly half an inch longer than in the rock-pigeon. The upper mandible is often slightly arched. The tongue is very long. The development of the carunculated skin or wattle round the eyes, over the nostrils, and on the lower mandible, is prodigious. The eyelids, measured longitudinally, were in some specimens exactly twice as long as in the rock-pigeon. The external orifice or furrow of the nostrils was also twice as long. The open mouth in its widest part was in one case ·75 of an inch in width, whereas in the rock-pigeon it is only about ·4 of an inch. This great width of mouth is shown in the skeleton by the reflexed edges of the ramus of the lower jaw. The head is flat on the summit and narrow between the orbits. The feet are large and coarse; the length, as measured from end of hind toe to end of middle toe (without the claws), was in two specimens 2·6 inches; and this, proportionally with the rock-pigeon, is an excess of nearly a quarter of an inch. One very fine Carrier measured 31½ inches from tip to tip of wing. Birds of this sub-race are too valuable to be flown as carriers.

Sub-race II. Dragons; Persian Carriers.—The English Dragon differs from the improved English Carrier in being smaller in all its dimensions, and in having less wattle round the eyes and over

the nostrils, and none on the lower mandible. Sir W. Elliot sent me from Madras a Bagdad Carrier (sometimes called khandési), the name of which shows its Persian origin: it would be considered

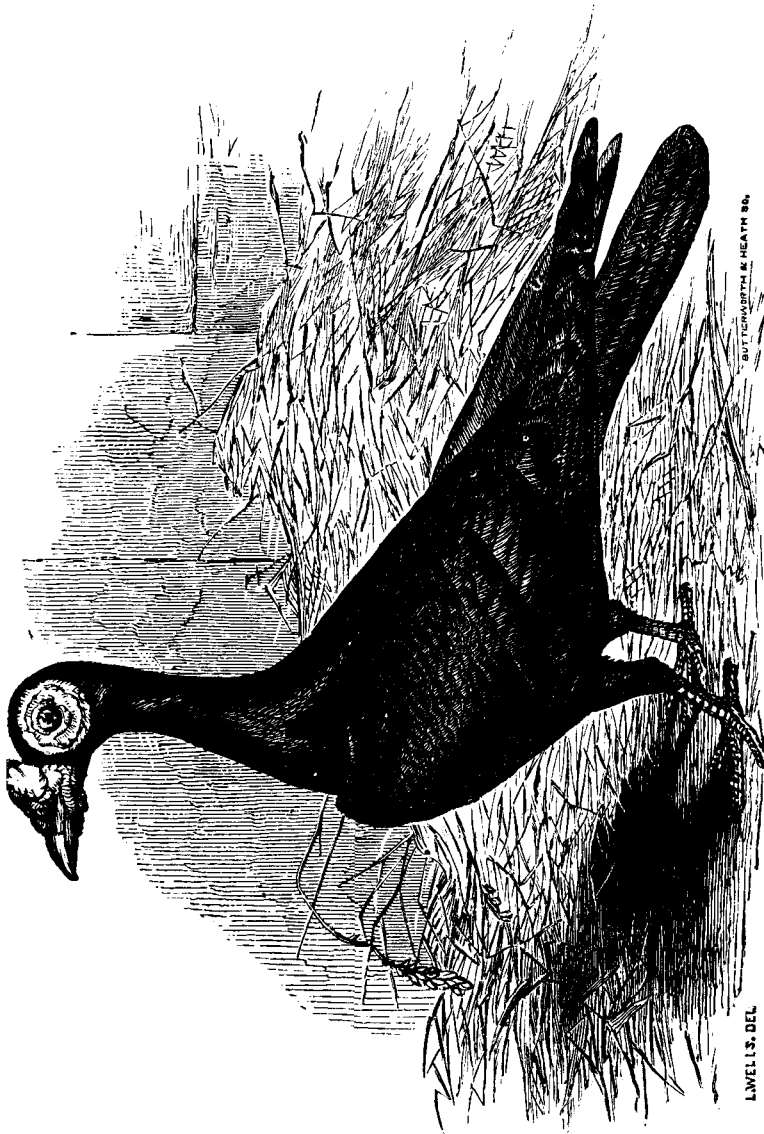


Fig. 19.—English Carrier.

here a very poor Dragon; the body was of the size of the rock-pigeon, with the beak a little longer, namely, 1 inch from the tip to the feathered base. The skin round the eyes was only slightly

wattled, whilst that over the nostrils was fairly wattled. The Hon. C. Murray, also, sent me two Carriers direct from Persia; these had nearly the same character as the Madras bird, being about as large as the rock-pigeon, but the beak in one specimen was as much as 1.15 in length; the skin over the nostrils was only moderately, and that round the eyes scarcely at all wattled.

Sub-race III. Bagadotten-Tauben of Neumeister (Pavdotten- or Hocker-Tauben).—I owe to the kindness of Mr. Baily, jun., a dead specimen of this singular breed imported from Germany. It is certainly allied to the Runts; nevertheless, from its close affinity with Carriers, it will be convenient here to describe it. The beak is long, and is hooked or bowed downwards in a highly remarkable manner, as will be seen in the woodcut to be hereafter given when I treat of the skeleton. The eyes are surrounded by a wide space of bright red skin, which, as well as that over the nostrils, is moderately wattled. The breast-bone is remarkably protuberant, being abruptly bowed outwards. The feet and tarsi are of great length, larger than in first-rate English Carriers. The whole bird is of large size, but in proportion to the size of the body the feathers of the wing and tail are short; a wild rock-pigeon, of considerably less size, had tail-feathers 4.6 inches in length, whereas in the large Bagadotten these feathers were scarcely over 4.1 inches in length. Riedel⁹ remarks that it is a very silent bird.

Sub-race IV. Bussorah Carrier.—Two specimens were sent me by Sir W. Elliot from Madras, one in spirits and the other skinned. The name shows its Persian origin. It is much valued in India, and is considered as a distinct breed from the Bagdad Carrier, which forms my second sub-race. At first I suspected that these two sub-races might have been recently formed by crosses with other breeds, though the estimation in which they are held renders this improbable; but in a Persian treatise,¹⁰ believed to have been written about 100 years ago, the Bagdad and Bussorah breeds are described as distinct. The Bussorah Carrier is of about the same size as the wild rock-pigeon. The shape of the beak, with some little carunculated skin over the nostrils,—the much elongated eyelids,—the broad mouth measured internally,—the narrow head,—the feet proportionally a little longer than in the rock-pigeon,—and the general appearance, all show that this bird is an undoubted Carrier; yet in one specimen the beak was of exactly the same length as in the rock-pigeon. In the other specimen the beak (as well as the opening of the nostrils) was only a very little longer, viz., by .08 of an inch. Although there was a considerable space of bare and slightly carunculated skin round the eyes, that over the nostrils was only in a slight degree rugose. Sir W. Elliot

⁹ 'Die Taubenzucht,' Ulm, 1824, s. 42.

¹⁰ This treatise was written by Sayzid Mohammed Musari, who died

in 1770: I owe to the great kindness of Sir W. Elliot a translation of this curious treatise.

informs me that in the living bird the eye seems remarkably large and prominent, and the same fact is noticed in the Persian treatise; but the bony orbit is barely larger than that in the rock-pigeon.

Amongst the several breeds sent to me from Madras by Sir W. Elliot there is a pair of the *Kali Par*, black birds with the beak slightly elongated, with the skin over the nostrils rather full, and with a little naked skin round the eyes. This breed seems more closely allied to the Carrier than to any other breed, being nearly intermediate between the Bussorah Carrier and the rock-pigeon.

The names applied in different parts of Europe and in India to the several kinds of Carriers all point to Persia or the surrounding countries as the source of this Race. And it deserves especial notice that, even if we neglect the *Kali Par* as of doubtful origin, we get a series broken by very small steps, from the rock-pigeon, through the Bussorah, which sometimes has a beak not at all longer than that of the rock-pigeon and with the naked skin round the eyes and over the nostrils very slightly swollen and carunculated, through the Bagdad sub-race and Dragons, to our improved English Carriers, which present so marvellous a difference from the rock-pigeon or *Columba livia*.

RACE III.—RUNTS. (Scanderoon: die Florentiner Tauben and Hinkeltauben of Neumeister; pigeon bagadais, pigeon romain.)

Beak long, massive; body of great size.

Inextricable confusion reigns in the classification, affinities, and naming of Runts. Several characters which are generally pretty constant in other pigeons, such as the length of the wings, tail, legs, and neck, and the amount of naked skin round the eyes, are excessively variable in Runts. When the naked skin over the nostrils and round the eyes is considerably developed and wattled, and when the size of body is not very great, Runts graduate in so insensible a manner into Carriers, that the distinction is quite arbitrary. This fact is likewise shown by the names given to them in different parts of Europe. Nevertheless, taking the most distinct forms, at least five sub-races (some of them including well-marked varieties) can be distinguished, which differ in such important points of structure, that they would be considered as good species in a state of nature.

Sub-race I. Scanderoon of English Writers (die Florentiner and Hinkeltauben of Neumeister).—Birds of this sub-race, of which I kept one alive and have since seen two others, differ from the Bagadotten of Neumeister only in not having the beak nearly so much curved downwards, and in the naked skin round the eyes and over the nostrils being hardly at all wattled. Nevertheless I have felt myself compelled to place the Bagadotten in Race II., or that of the Carriers, and the present bird in Race III., or that of

the Runts. The Scanderoon has a very short, narrow, and elevated tail; wings extremely short, so that the first primary feathers were not longer than those of a small tumbler pigeon! Neck long, much bowed; breast-bone prominent. Beak long, being 1.15 inch from tip to feathered base; vertically thick; slightly curved downwards. The skin over the nostrils swollen, not wattled; naked skin round the eyes, broad, slightly carunculated. Legs long; feet very large. Skin of neck bright red, often showing a naked medial line, with a naked red patch at the distal end of the radius of the wing. My bird, as measured from the base of the beak to the root of the tail, was fully 2 inches longer than the rock-pigeon; yet the tail itself was only 4 inches in length, whereas in the rock-pigeon, which is a much smaller bird, the tail is $4\frac{5}{8}$ inches in length.

The Hinkel- or Florentiner Taube of Neumeister (Table XIII., fig. 1) agrees with the above description in all the specified characters (for the beak is not mentioned), except that Neumeister expressly says that the neck is short, whereas in my Scanderoon it was remarkably long and bowed; so that the Hinkel forms a well-marked variety.

Sub-race II. Pigeon cygne and Pigeon bagadais of Boitard and Corbié (Scanderoon of French writers).—I kept two of these birds alive, imported from France. They differed from the first sub-race or true Scanderoon in the much greater length of the wing and tail, in the beak not being so long, and in the skin about the head being more carunculated. The skin of the neck is red; but the naked patches on the wings are absent. One of my birds measured $38\frac{1}{2}$ inches from tip to tip of wing. By taking the length of the body as the standard of comparison, the two wings were no less than 5 inches longer than those of the rock-pigeon! The tail was $6\frac{1}{4}$ inches in length, and therefore $2\frac{1}{4}$ inches longer than that of the Scanderoon,—a bird of nearly the same size. The beak is longer, thicker, and broader than in the rock-pigeon, proportionally with the size of body. The eyelids, nostrils, and internal gape of mouth are all proportionally very large, as in Carriers. The foot, from the end of the middle to end of hind toe, was actually 2.85 inches in length, which is an excess of .32 of an inch over the foot of the rock-pigeon, proportionally to the relative size of the two birds.

Sub-race III. Spanish and Roman Runts.—I am not sure that I am right in placing these Runts in a distinct sub-race; yet, if we take well-characterized birds, there can be no doubt of the propriety of the separation. They are heavy, massive birds, with shorter necks, legs, and beaks than in the foregoing races. The skin over the nostrils is swollen, but not carunculated; the naked skin round the eyes is not very wide, and only slightly carunculated; and I have seen a fine so-called Spanish Runt with hardly any naked skin round the eyes. Of the two varieties to be seen in England, one, which is the rarer, has very long wings and tail, and agrees pretty closely with the last sub-race; the other, with shorter wings and tail, is apparently the *Pigeon romain ordinaire* of Boitard and Corbié.

These Runts are apt to tremble like Fantails. They are bad flyers. A few years ago Mr. Gulliver¹¹ exhibited a Runt which weighed 1 lb. 14 oz. ; and, as I am informed by Mr. Tegetmeier, two Runts from the south of France were lately exhibited at the Crystal Palace, each of which weighed 2 lbs. 2½ oz. A very fine rock-pigeon from the Shetland Islands weighed only 14½ oz.

Sub-race IV. Tronfo of Aldrovandi (Leghorn Runt ?).—In Aldrovandi's work published in 1600 there is a coarse woodcut of a great Italian pigeon, with an elevated tail, short legs, massive body, and with the beak short and thick. I had imagined that this latter character so abnormal in the group, was merely a false representation from bad drawing ; but Moore, in his work published in 1735, says that he possessed a Leghorn Runt of which "the beak was very short for so large a bird." In other respects Moore's bird resembled the first sub-race or Scanderoon, for it had a long bowed neck, long legs, short beak, and elevated tail, and not much wattle about the head. So that Aldrovandi's and Moore's birds must have formed distinct varieties, both of which seem to be now extinct in Europe. Sir W. Elliot, however, informs me that he has seen in Madras a short-beaked Runt imported from Cairo.

Sub-race V. Murassa (adorned Pigeon) of Madras.—Skins of these handsome chequered birds were sent me from Madras by Sir W. Elliot. They are rather larger than the largest rock-pigeon, with longer and more massive beaks. The skin over the nostrils is rather full and very slightly carunculated, and they have some naked skin round the eyes ; feet large. This breed is intermediate between the rock-pigeon and a very poor variety of Runt or Carrier.

From these several descriptions we see that with Runts, as with Carriers, we have a fine gradation from the rock-pigeon (with the Tronfo diverging as a distinct branch) to our largest and most massive Runts. But the chain of affinities, and many points of resemblance, between Runts and carriers, make me believe that these two races have not descended by independent lines from the rock-pigeon, but from some common parent, as represented in the Table, which had already acquired a moderately long beak with slightly swollen skin over the nostrils, and with some slightly carunculated naked skin round the eyes.

RACE IV.—BARBS. (Indische Tauben ; pigeons polonais.)

Beak short, broad, deep ; naked skin round the eyes, broad and carunculated ; skin over nostrils slightly swollen.

Misled by the extraordinary shortness and form of the beak, I did not at first perceive the near affinity of this Race to that of Carriers until the fact was pointed out to me by Mr. Brent. Subsequently, after examining the Bussorah Carrier, I saw that no very great amount

¹¹ 'Poultry Chronicle,' vol. ii. p. 573.

of modification would be requisite to convert it into a Barb. This view of the affinity of Barbs to Carriers is supported by the analogical difference between the short and long-beaked Runts; and



Fig. 20.—English Barb.

still more strongly by the fact, that young Barbs and Dragons, within 24 hours after being hatched, resemble each other much more closely than do young pigeons of other and equally distinct breeds.

At this early age, the length of beak, the swollen skin over the rather open nostrils, the gape of the mouth, and the size of the feet, are the same in both; although these parts afterwards become widely different. We thus see that embryology (as the comparison of very young animals may perhaps be called) comes into play in the classification of domestic varieties, as with species in a state of nature.

Fanciers, with some truth, compare the head and beak of the Barb to that of a bullfinch. The Barb, if found in a state of nature would certainly have been placed in a new genus formed for its reception. The body is a little larger than that of the rock-pigeon, but the beak is more than $\frac{1}{2}$ of an inch shorter; although shorter, it is both vertically and horizontally thicker. From the outward flexure of the rami of the lower jaw, the mouth internally is very broad, in the proportion of $\frac{1}{6}$ to $\frac{1}{4}$ to that of the rock-pigeon. The whole head is broad. The skin over the nostril is swollen, but not carunculated, except slightly in first-rate birds when old; whilst the naked skin round the eye is broad and much carunculated. It is sometimes so much developed, that a bird belonging to Mr. Harrison Weir could hardly see to pick up food from the ground. The eyelids in one specimen were nearly twice as long as those of the rock-pigeon. The feet are coarse and strong, but proportionally rather shorter than in the rock-pigeon. The plumage is generally dark and uniform. Barbs, in short, may be called short-beaked Carriers, bearing the same relation to Carriers that the Tronfo of Aldrovandi does to the common Runt.

GROUP III.

This group is artificial, and includes a heterogeneous collection of distinct forms. It may be defined by the beak, in well-characterized specimens of the several races, being shorter than in the rock-pigeon, and by the skin round the eyes not being much developed.

RACE V.—FANTAILS.

Sub-race I. European Fantails (Pfauentauben; trembleurs). Tail expanded, directed upwards, formed of many feathers; oil-gland aborted; body and beak rather short.

The normal number of tail-feathers in the genus *Columba* is 12; but Fantails have from only 12 (as has been asserted) up to, according to MM. Boitard and Corbié, 42. I have counted in one of my own birds 33, and at Calcutta Mr. Blyth¹² has counted in an imperfect tail 34 feathers. In Madras, as I am informed by Sir W.

¹² 'Annals and Mag. of Nat. History,' vol. xix., 1847, p. 105.

Elliot, 32 is the standard number ; but in England number is much

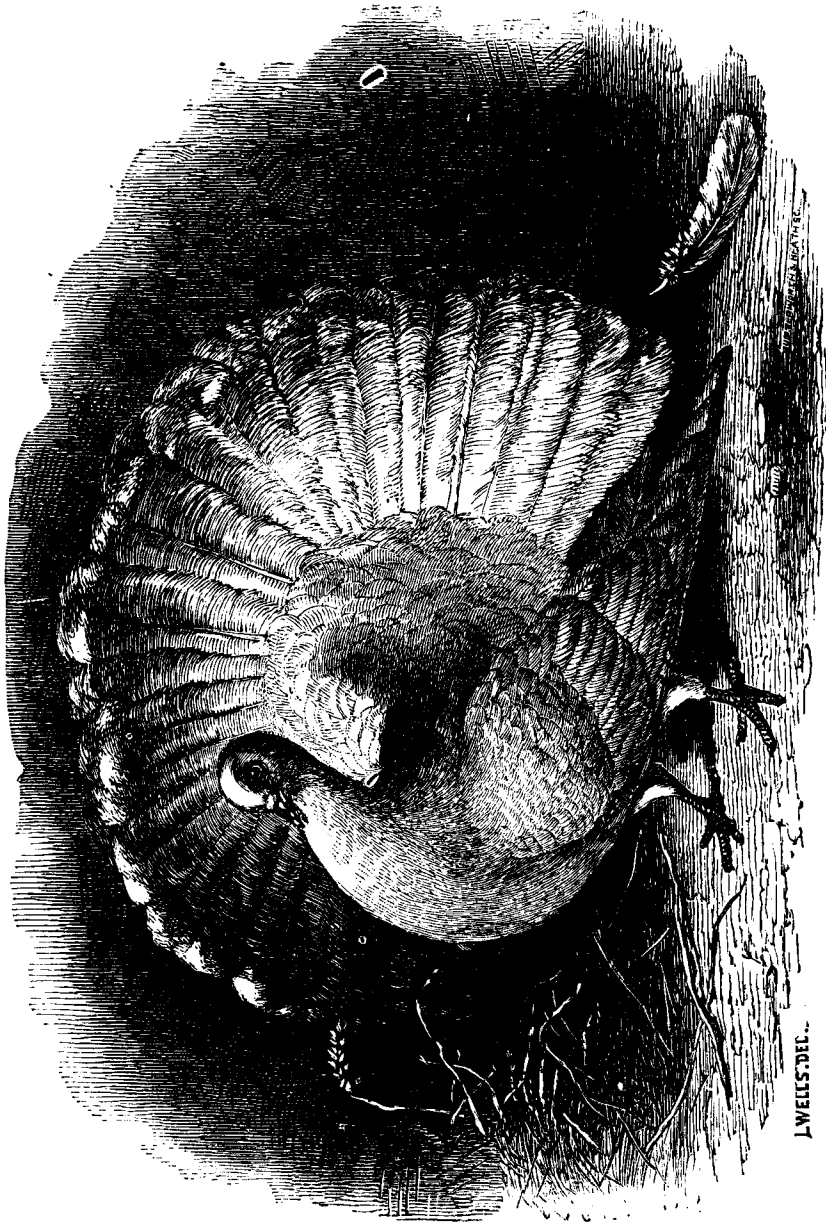


Fig. 21.—English Fantail.

less valued than the position and expansion of the tail. The feathers are arranged in an irregular double row ; their permanent fanlike

expansion and their upward direction are more remarkable characters than their increased number. The tail is capable of the same movements as in other pigeons, and can be depressed so as to sweep the ground. It arises from a more expanded basis than in other pigeons; and in three skeletons there were one or two extra coccygeal vertebrae. I have examined many specimens of various colours from different countries, and there was no trace of the oil-gland; this is a curious case of abortion.¹³ The neck is thin and bowed backwards. The breast is broad and protuberant. The feet are small. The carriage of the bird is very different from that of other pigeons; in good birds the head touches the tail-feathers, which consequently often become crumpled. They habitually tremble much: and their necks have an extraordinary, apparently convulsive, backward and forward movement. Good birds walk in a singular manner, as if their small feet were stiff. Owing to their large tails, they fly badly on a windy day. The dark-coloured varieties are generally larger than white Fantails.

Although between the best and common Fantails, now existing in England, there is a vast difference in the position and size of the tail, in the carriage of the head and neck, in the convulsive movements of the neck, in the manner of walking, and in the breadth of the breast, the differences so graduate away, that it is impossible to make more than one sub-race. Moore, however, an excellent old authority,¹⁴ says, that in 1735 there were two sorts of broad-tailed shakers (*i. e.* fantails), "one having a neck much longer and more slender than the other;" and I am informed by Mr. B. P. Brent, that there is an existing German Fantail with a thicker and shorter beak.

Sub-race II. Java Fantail.—Mr. Swinhoe sent me from Amoy, in China, the skin of a Fantail belonging to a breed known to have been imported from Java. It was coloured in a peculiar manner, unlike any European Fantail; and, for a Fantail, had a remarkably short beak. Although a good bird of the kind, it had only 14 tail-feathers; but Mr. Swinhoe has counted in other birds of this breed from 18 to 24 tail-feathers. From a rough sketch sent to me, it is evident that the tail is not so much expanded or so much upraised as in even second-rate European Fantails. The bird shakes its neck like our Fantails. It had a well-developed oil-gland. Fantails were known in India, as we shall hereafter see, before the year 1600; and we may suspect that in the Java Fantail we see the breed in its earlier and less improved condition.

¹³ This gland occurs in most birds; but Nitzsch (in his 'Pterylographie,' 1840, p. 55) states that it is absent in two species of *Columba*, in several species of *Psittacus*, in some species of *Otis*, and in most or all birds of the Ostrich family. It can hardly be an accidental coincidence that the two

species of *Columba*, which are destitute of an oil-gland, have an unusual number of tail-feathers, namely 16, and in this respect resemble Fantails.

¹⁴ See the two excellent editions published by Mr. J. M. Eaton in 1852 and 1858, entitled 'A Treatise on Fancy Pigeons.'

RACE VI.—TURBIT AND OWL. (Möventauben ; pigeons à cravate.)

Feathers divergent along the front of the neck and breast ; beak very short, vertically rather thick ; œsophagus somewhat enlarged.

Turbits and Owls differ from each other slightly in the shape of the head ; the former have a crest, and the beak is differently curved ; but they may be here conveniently grouped together. These pretty birds, some of which are very small, can be recognised at once by the feathers irregularly diverging, like a frill, along the front of the neck, in the same manner, but in a less degree, as along the back of the neck in the Jacobin. They have the remarkable habit of continually and momentarily inflating the upper part of the œsophagus, which causes a movement in the frill. When the œsophagus of a dead bird is inflated, it is seen to be larger than in other breeds, and not so distinctly separated from the crop. The Pouter inflates both its true crop and œsophagus ; the Turbit inflates in a much less degree the œsophagus alone. The beak of the rock-pigeon, proportionally with the size of their bodies ; and in some owls brought by Mr. E. Vernon Harcourt from Tunis, it was even shorter. The beak is vertically thicker, and perhaps a little broader, in proportion to that of the rock-pigeon.

RACE VII.—TUMBLERS. (Tümmeler, or Burzeltauben ; culbutants.)

During flight, tumble backwards ; body generally small ; beak generally short, sometimes excessively short and conical.

This race may be divided into four sub-races, namely, Persian, Lotan, Common, and short-faced Tumblers. These sub-races include many varieties which breed true. I have examined eight skeletons of various kinds of Tumblers : excepting in one imperfect and doubtful specimen, the ribs are only seven in number, whereas the rock-pigeon has eight ribs.

Sub-race I. Persian Tumblers.—I received a pair direct from Persia, from the Hon. C. Murray. They are rather smaller birds than the wild rock-pigeon, about the size of the common dovecot pigeon, white and mottled, slightly feathered on the feet, with the beak just perceptibly shorter than in the rock-pigeon. H.M. Consul, Mr. Keith Abbott, informs me that the difference in the length of beak is so slight, that only practised Persian fanciers can distinguish these Tumblers from the common pigeon of the country. He informs me that they fly in flocks high up in the air and tumble well. Some of

them occasionally appear to become giddy and tumble to the ground, in which respect they resemble some of our Tumblers.

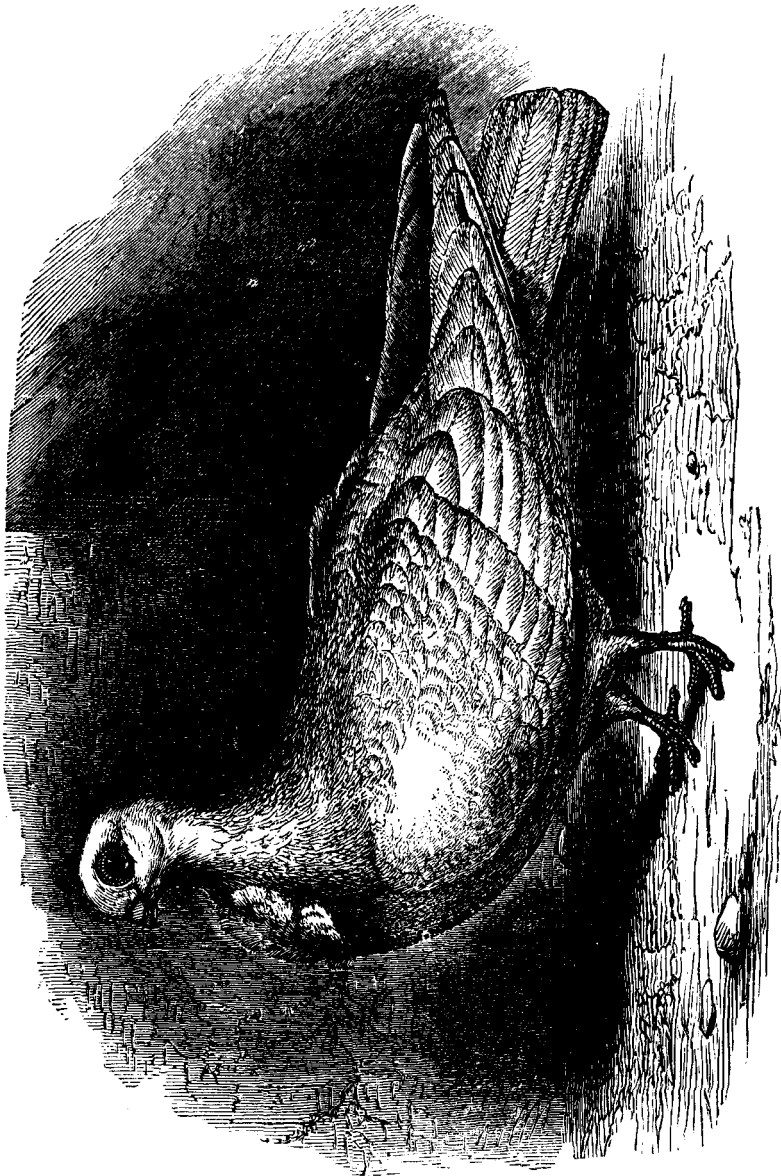


Fig. 22.—African Owl.

Sub-race II. Lotan, or Loutun: Indian Ground Tumblers.—These birds present one of the most remarkable inherited habits or instincts ever recorded. The specimens sent to me from Madras by Sir W.

Elliot are white, slightly feathered on the feet, with the feathers on the head reversed; and they are rather smaller than the rock or dove-cot pigeon. The beak is proportionally only slightly shorter and rather thinner than in the rock-pigeon. These birds when gently shaken and placed on the ground immediately begin tumbling head over heels, and they continue thus to tumble until taken up and soothed,—the ceremony being generally to blow in their faces, as in recovering a person from a state of hypnotism or mesmerism. It is asserted that they will continue to roll over till they die, if not taken up. There is abundant evidence with respect to these remarkable peculiarities; but what makes the case the more worthy of attention is, that the habit has been inherited since before the year 1600, for the breed is distinctly described in the ‘Ayeen Akbery.’¹⁵ Mr. Evans kept a pair in London, imported by Captain Vigne; and he assures me that he has seen them tumble in the air, as well as in the manner above described on the ground. Sir W. Elliot, however, writes to me from Madras, that he is informed that they tumble exclusively on the ground, or at a very small height above it. He also mentions birds of another sub-variety, called the Kalmi Lotan, which begin to roll over if only touched on the neck with a rod or wand.

Sub-rare III. Common English Tumblers.—These birds have exactly the same habits as the Persian Tumbler, but tumble better. The English bird is rather smaller than the Persian, and the beak is plainly shorter. Compared with the rock-pigeon, and proportionally with the size of body, the beak is from $\cdot 15$ to nearly $\cdot 2$ of an inch shorter, but it is not thinner. There are several varieties of the common Tumbler, namely, Baldheads, Beards, and Dutch Rollers. I have kept the latter alive; they have differently shaped heads, longer necks, and are feather-footed. They tumble to an extraordinary degree; as Mr. Brent remarks,¹⁶ “Every few seconds “over they go; one, two, or three summersaults at a time. Here “and there a bird gives a very quick and rapid spin, revolving like “a wheel, though they sometimes lose their balance, and make a “rather ungraceful fall, in which they occasionally hurt themselves “by striking some object.” From Madras I have received several specimens of the common Tumbler of India, differing slightly from each other in the length of their beaks. Mr. Brent sent me a dead specimen of a “House-tumbler,”¹⁷ which is a Scotch variety, not

¹⁵ English translation, by F. Gladwin, 4th edition, vol. i. The habit of the Lotan is also described in the Persian treatise before alluded to, published about 100 years ago: at this date the Lotans were generally white and crested as at present. Mr. Blyth describes these birds in ‘Annals and Mag. of Nat. Hist.,’ vol. xiv., 1847, p. 104; he says that they “may be

seen at any of the Calcutta bird-dealers.”

¹⁶ ‘Journal of Horticulture,’ Oct. 22, 1861, p. 76.

¹⁷ See the account of the House-tumblers kept at Glasgow, in the ‘Cottage Gardener,’ 1858, p. 285. Also Mr. Brent’s paper, ‘Journal of Horticulture,’ 1861, p. 76.

differing in general appearance and form of beak from the common Tumbler. Mr. Brent states that these birds generally begin to tumble "almost as soon as they can well fly; at three months old they tumble well, but still fly strong; at five or six months they tumble excessively; and in the second year they mostly give up flying, on account of their tumbling so much and so close to the ground. Some fly round with the flock, throwing a clean summersault every few yards, till they are obliged to settle from giddiness and exhaustion. These are called Air Tumblers, and they commonly throw from twenty to thirty summersaults in a minute, each clear and clean. I have one red cock that I have on two or three occasions timed by my watch, and counted forty summersaults in the minute. Others tumble differently. At first they throw a single summersault, then it is double, till it becomes a continuous roll, which puts an end to flying, for if they fly a few yards over they go, and roll till they reach the ground. Thus I had one kill herself, and another broke his leg. Many of them turn over only a few inches from the ground, and will tumble two or three times in flying across their loft. These are called House-tumblers, from tumbling in the house. The act of tumbling seems to be one over which they have no control, an involuntary movement which they seem to try to prevent. I have seen a bird sometimes in his struggles fly a yard or two straight upwards, the impulse forcing him backwards while he struggles to go forwards. If suddenly startled, or in a strange place, they seem less able to fly than if quiet in their accustomed loft." These House-tumblers differ from the Lotan or Ground Tumbler of India, in not requiring to be shaken in order to begin tumbling. The breed has probably been formed merely by selecting the best common Tumblers, though it is possible that they may have been crossed at some former period with Lotans.

Sub-race IV. Short-faced Tumblers.—These are marvellous birds, and are the glory and pride of many fanciers. In their extremely short, sharp, and conical beaks, with the skin over the nostrils but little developed, they almost depart from the type of the Columbidae. Their heads are nearly globular and upright in front, so that some fanciers say¹⁸ "the head should resemble a cherry with a barley-corn stuck in it." These are the smallest kind of pigeons. Mr. Esquilant possessed a blue Baldhead, two years old, which when alive weighed, before feeding-time, only 6 oz. 5 drs.; two others, each weighed 7 oz. We have seen that a wild rock-pigeon weighed 14 oz. 2 drs., and a Runt 34 oz. 4 drs. Short-faced Tumblers have a remarkably erect carriage, with prominent breasts, drooping wings, and very small feet. The length of the beak from the tip to the feathered base was in one good bird only $\frac{1}{4}$ of an inch; in a wild rock-pigeon it was exactly double this length. As these Tumblers have shorter bodies than the wild rock-pigeon, they ought of course

¹⁸ J. M. Eaton's 'Treatise on Pigeons,' 1852, p. 9.

to have shorter beaks; but proportionally with the size of the body,

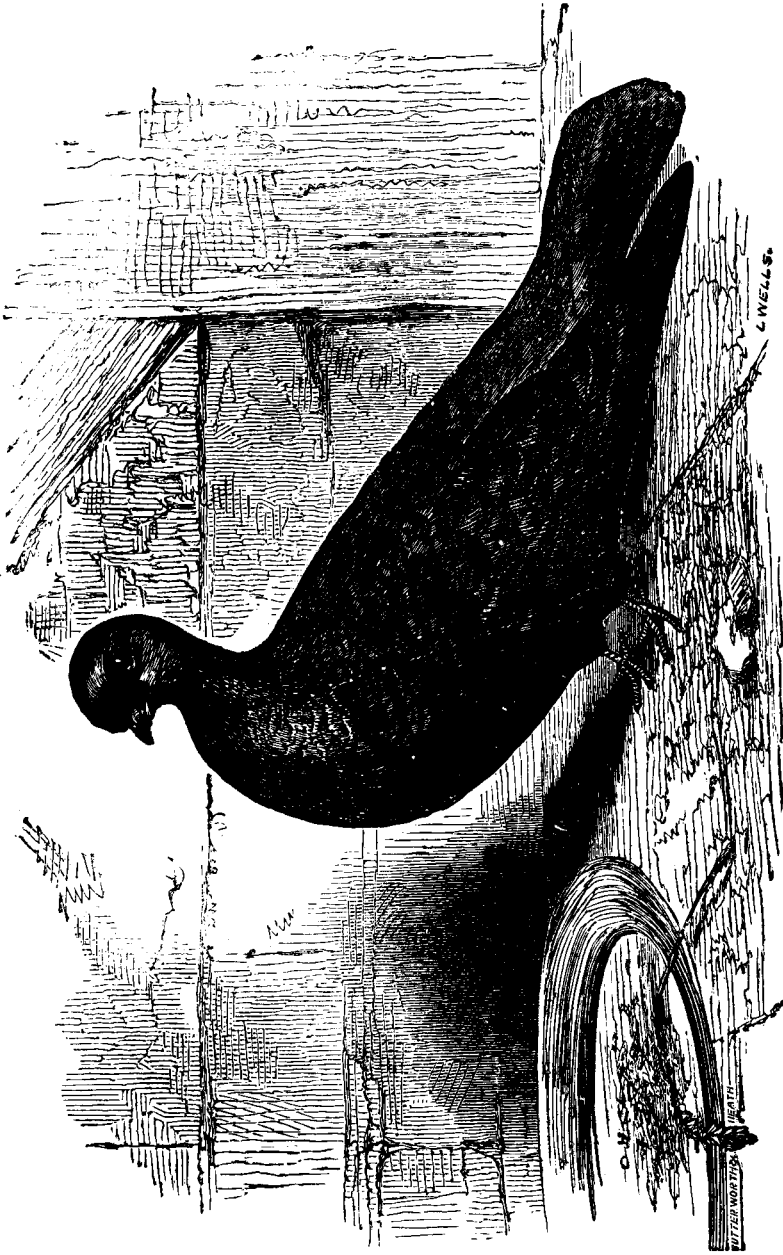


Fig. 23.—Short-necked English Tumbler.

the beak is $\cdot 28$ of an inch too short. So, again, the feet of this bird

were actually '45 shorter, and proportionally '21 of an inch shorter, than the feet of the rock-pigeon. The middle toe has only twelve or thirteen, instead of fourteen or fifteen scutellæ. The primary wing-feathers are not rarely nine instead of ten in number. The improved short-faced Tumblers have almost lost the power of tumbling; but there are several authentic accounts of their occasionally tumbling. There are several sub-varieties, such as Bald-heads, Beards, Mottles, and Almonds; the latter are remarkable from not acquiring their perfectly-coloured plumage until they have moulted three or four times. There is good reason to believe that most of these sub-varieties, some of which breed truly, have arisen since the publication of Moore's treatise in 1735.¹⁹

Finally, in regard to the whole group of Tumblers, it is impossible to conceive a more perfect gradation than I have now lying before me, from the rock-pigeon, through Persian, Lotan, and common Tumblers, up to the marvellous short-faced birds; which latter, no ornithologist, judging from mere external structure, would place in the same genus with the rock-pigeon. The differences between the successive steps in this series are not greater than those which may be observed between common dovecot-pigeons (*C. livia*) brought from different countries.

RACE VIII.—INDIAN FRILL-BACK.

Beak very short; feathers reversed.

A specimen of this bird, in spirits, was sent to me from Madras by Sir W. Elliot. It is wholly different from the Frill-back often exhibited in England. It is a smallish bird, about the size of the common Tumbler, but has a beak in all its proportions like our short-faced Tumblers. The beak, measured from the tip to the feathered base, was only '46 of an inch in length. The feathers over the whole body are reversed or curl backwards. Had this bird occurred in Europe, I should have thought it only a monstrous variety of our improved Tumbler: but as short-faced Tumblers are not known in India, I think it must rank as a distinct breed. Probably this is the breed seen by Hasselquist in 1757 at Cairo, and said to have been imported from India.

RACE IX.—JACOBIN. (Zopf- or Perrückentaube; nonnain.)

Feathers of the neck forming a hood; wings and tail long; beak moderately short.

This pigeon can at once be recognised by its hood, almost enclosing the head and meeting in front of the neck. The hood seems to be merely an exaggeration of the crest of reversed feathers on the back of the head, which is common to many sub-varieties, and

¹⁹ J. M. Eaton's Treatise, edit. 1858, p. 76.

which in the Latztaube²⁰ is in a nearly intermediate state between a hood and a crest. The feathers of the hood are elongated. Both the wings and tail are likewise much elongated; thus the folded wing of the Jacobin, though a somewhat smaller bird, is fully 1½ inch longer than in the rock-pigeon. Taking the length of the body without the tail as the standard of comparison, the folded wing, proportionally with the wings of the rock-pigeon, is 2½ inches too long, and the two wings, from tip to tip, 5½ inches too long. In disposition this bird is singularly quiet, seldom flying or moving about, as Bechstein and Riedel have likewise remarked in Germany.²¹ The latter author also notices the length of the wings and tail. The beak is nearly ½ of an inch shorter in proportion to the size of the body than in the rock-pigeon; but the internal gape of the mouth is considerably wider.

GROUP IV.

The birds of this group may be characterised by their resemblance in all important points of structure, especially in the beak, to the rock-pigeon. The Trumpeter forms the only well-marked race. Of the numerous other sub-races and varieties I shall specify only a few of the most distinct, which I have myself seen and kept alive.

RACE X.—TRUMPETER. (Trommeltaube; pigeon tambour, glouglou.)

A tuft of feathers at the base of the beak curling forward; feet much feathered; voice very peculiar; size exceeding that of the rock-pigeon.

This is a well-marked breed, with a peculiar voice, wholly unlike that of any other pigeon. The coo is rapidly repeated, and is continued for several minutes; hence their name of Trumpeters. They are also characterised by a tuft of elongated feathers, which curls forward over the base of the beak, and which is possessed by no other breed. Their feet are so heavily feathered, that they almost appear like little wings. They are larger birds than the rock-pigeon, but their beak is of very nearly the same proportional size. Their feet are rather small. This breed was perfectly characterised in Moore's time, in 1735. Mr. Brent says that two varieties exist, which differ in size.

²⁰ Neumeister, 'Taubenzucht,' Tab. 4. fig. i.

²¹ Riedel, 'Die Taubenzucht,' 1824,

s. 26. Bechstein, 'Naturgeschichte Deutschlands,' Band iv. s. 36, 1795.

RACE XI.—*Scarcely differing in structure from the wild
Columbia livia.*

Sub-race I. Laughers. Size less than the Rock-pigeon; voice very peculiar.—As this bird agrees in nearly all its proportions with the rock-pigeon, though of smaller size, I should not have thought it worthy of mention, had it not been for its peculiar voice—a character supposed seldom to vary with birds. Although the voice of the Laugher is very different from that of the Trumpeter, yet one of my Trumpeters used to utter a single note like that of the Laugher. I have kept two varieties of Laughers, which differed only in one variety, being turn-crowned; the smooth-headed kind, for which I am indebted to the kindness of Mr. Brent, besides its peculiar note, used to coo in a singular and pleasing manner, which, independently, struck both Mr. Brent and myself as resembling that of the turtle-dove. Both varieties come from Arabia. This breed was known by Moore in 1735. A pigeon which seems to say Yak-roo is mentioned in 1600 in the 'Ayeen Akbery,' and is probably the same breed. Sir W. Elliot has also sent me from Madras a pigeon called Yahui, said to have come from Mecca, which does not differ in appearance from the Laugher; it has "a deep melancholy voice, like Yahu, often repeated." Yahu, yahu, means Oh God, oh God; and Sayzid Mohammed Musari, in the treatise written about 100 years ago, says that these birds "are not flown, because they repeat the name of the most high God." Mr. Keith Abbott, however, informs me that the common pigeon is called Yahoo in Persia.

Sub-race II. Common Frill-back (die Strupptaube) Beak rather longer than in the rock-pigeon; feathers reversed.—This is a considerably larger bird than the rock-pigeon, and with the beak, proportionally with the size of body, a little (*viz.* by $\cdot 04$ of an inch) longer. The feathers, especially on the wing-coverts, have their points curled upwards or back-wards.

Sub-race III. Nuns (Pigeons coquilles). These elegant birds are smaller than the rock-pigeon. The beak is actually $1\cdot 7$, and proportionally with the size of the body $\cdot 1$ of an inch shorter than in the rock-pigeons, although of the same thickness. In young birds the scutellæ on the tarsi and toes are generally of a leaden-black colour; and this is a remarkable character (though observed in a lesser degree in some other breeds), as the colour of the legs in the adult state is subject to very little variation in any breed. I have on two or three occasions counted thirteen or fourteen feathers in the tail; this likewise occurs in the barely distinct breed called Helmets. Nuns are symmetrically coloured, with the head, primary wing-feathers, tail, and tail-coverts of the same colour, namely, black or red, and with the rest of the body white. This breed has retained the same character since Aldrovandi wrote in 1600. I have received from Madras almost similarly coloured birds.

Sub-race IV. Spots (die Blasstauben; pigeons heurtés).—These

birds are a very little larger than the rock-pigeon, with the beak a trace smaller in all its dimensions, and with the feet decidedly smaller. They are symmetrically coloured, with a spot on the forehead, with the tail and tail-coverts of the same colour, the rest of the body being white. This breed existed in 1676;²² and in 1735 Moore remarks that they breed truly, as is the case at the present day.

Sub-race V. Swallows.—These birds, as measured from tip to tip of wing, or from the end of the beak to the end of the tail, exceed in size the rock-pigeon; but their bodies are much less bulky; their feet and legs are likewise smaller. The beak is of about the same length, but rather slighter. Altogether their general appearance is considerably different from that of the rock-pigeon. Their heads and wings are of the same colour, the rest of the body being white. Their flight is said to be peculiar. This seems to be a modern breed, which, however, originated before the year 1795 in Germany, for it is described by Bechstein.

Besides the several breeds now described, three or four other very distinct kinds existed lately, or perhaps still exist, in Germany and France. Firstly, the Karmeliten, or carme pigeon, which I have not seen; it is described as of small size, with very short legs, and with an extremely short beak. Secondly, the Finnikin, which is now extinct in England. It had, according to Moore's²³ treatise, published in 1735, a tuft of feathers on the hinder part of the head, which ran down its back not unlike a horse's mane. "When it is salacious it rises over the hen and turns round three or four times, flapping its wings, then reverses and turns as many times the other way." The Turner, on the other hand, when it "plays to the female, turns only one way." Whether these extraordinary statements may be trusted I know not; but the inheritance of any habit may be believed, after what we have seen with respect to the Ground-tumbler of India. MM. Boitard and Corbié describe a pigeon²⁴ which has the singular habit of sailing for a considerable time through the air, without flapping its wings, like a bird of prey. The confusion is inextricable, from the time of Aldrovandi in 1600 to the present day, in the accounts published of the Draijers, Smiters, Finnikins, Turners, Claquers, &c., which are all remarkable from their manner of flight. Mr. Brent informs me that he has seen one of these breeds in Germany with its wing-feathers injured from having been so often struck together but he did not see it flying. An old stuffed specimen of a Finnikin in the British Museum presents no well-marked character. Thirdly, a singular pigeon with a forked tail is mentioned in some treatises; and as Bechstein²⁵ briefly describes and figures this bird, with a tail "having

²² Willughby's 'Ornithology,' edited by Ray.

²³ J. M. Eaton's edition, (1858) of Moore, p. 98.

²⁴ Pigeon pattu plongeur. 'Les Pigeons,' &c., p. 165.

²⁵ 'Naturgeschichte Deutschlands,' Band iv. s. 47.

completely the structure of that of the house-swallow," it must once have existed, for Bechstein was far too good a naturalist to have confounded any distinct species with the domestic pigeon. Lastly, an extraordinary pigeon imported from Belgium has lately been exhibited at the Philoperisteron Society in London,²⁶ which "conjoins the colour of an archangel with the head of an owl or barb, its most striking peculiarity being the extraordinary length of the tail and wing-feathers, the latter crossing beyond the tail, and giving to the bird the appearance of a gigantic swift (*Cypselus*), or long-winged hawk." Mr. Tegetmeier informs me that this bird weighed only 10 ounces, but in length was $15\frac{1}{2}$ inches from tip to beak to end of tail, and $32\frac{1}{2}$ inches from tip to tip of wing; now the wild rock-pigeon weighs $14\frac{1}{2}$ ounces, and measures from tip to beak to end of tail 15 inches, and from tip to tip of wing only $26\frac{1}{2}$ inches.

I have now described all the domestic pigeons known to me, and have added a few others on reliable authority. I have classed them under four Groups, in order to mark their affinities and degrees of difference; but the third group is artificial. The kinds examined by me form eleven races, which include several sub-races; and even these latter present differences that would certainly have been thought of specific value if observed in a state of nature. The sub-races likewise include many strictly inherited varieties; so that altogether there must exist, as previously remarked, above 150 kinds which can be distinguished, though generally by characters of extremely slight importance. Many of the genera of the *Columbidæ*, admitted by ornithologists, do not differ in any great degree from each other; taking this into consideration, there can be no doubt that several of the most strongly characterised domestic forms, if found wild, would have been placed in at least five new genera. Thus a new genus would have been formed for the reception of the improved English Pouter: a second genus for Carriers and Runts; and this would have been a wide or comprehensive genus, for it would have admitted common Spanish Runts without any wattle, short-beaked Runts like the Tronfo, and the improved English Carrier: a third genus would have been formed for the Barb: a fourth for the Fantail: and lastly, a fifth for the short beaked, not-wattled pigeons, such

²⁶ Mr. W. B. Tegetmeier, 'Journal of Horticulture,' Jan. 20th, 1863, p. 58.

as Turbits and short-faced Tumblers. The remaining domestic forms might have been included, in the same genus with the wild rock-pigeon.

Individual Variability; variations of a remarkable nature.

The differences which we have as yet considered are characteristic of distinct breeds; but there are other differences, either confined to individual birds, or often observed in certain breeds but not characteristic of them. These individual differences are of importance, as they might in most cases be secured and accumulated by man's power of selection and thus an existing breed might be greatly modified or a new one formed. Fanciers notice and select only those slight differences which are externally visible; but the whole organisation is so tied together by correlation of growth, that a change in one part is frequently accompanied by other changes. For our purpose, modifications of all kinds are equally important, and if affecting a part which does not commonly vary, are of more importance than a modification in some conspicuous part. At the present day any visible deviation of character in a well-established breed is rejected as a blemish; but it by no means follows that at an early period, before well-marked breeds had been formed, such deviations would have been rejected; on the contrary, they would have been eagerly preserved as presenting a novelty, and would then have been slowly augmented, as we shall hereafter more clearly see, by the process of unconscious selection.

I have made numerous measurements of the various parts of the body in the several breeds, and have hardly ever found them quite the same in birds of the same breed,—the differences being greater than we commonly meet with in wild species within the same district. To begin with the primary feathers of the wing and tail; but I must first mention, as some readers may not be aware of the fact, that the number of the primary wing and tail-feathers in wild birds is generally constant, and characterises, not only whole genera, but even whole families. When the tail-feathers are unusually numerous, as for instance in the swan, they are apt to be variable in number; but this does not apply to the several species and genera of the Columbidae, which never (as far as I can hear) have less than twelve or more than sixteen tail-feathers; and these numbers cha-

racterise, with rare exception, whole sub-families.²⁷ The wild rock-pigeon has twelve tail-feathers. With Fantails, as we have seen, the number varies from fourteen to forty-two. In two young birds in the same nest I counted twenty-two and twenty-seven feathers. Pouters are very liable to have additional tail-feathers, and I have seen on several occasions fourteen or fifteen in my own birds. Mr. Bult had a specimen, examined by Mr. Yarrell, with seventeen tail-feathers. I had a Nun with thirteen, and another with fourteen tail-feathers; and in a Helmet, a breed barely distinguishable from the Nun, I have counted fifteen, and have heard of other such instances. On the other hand, Mr. Brent possessed a Dragon, which during its whole life never had more than ten tail-feathers; and one of my Dragons, descended from Mr. Brent's, had only eleven. I have seen a Bald-head Tumbler with only ten; and Mr. Brent had an Air-Tumbler with the same number, but another with fourteen tail-feathers. Two of these latter Tumblers, bred by Mr. Brent, were remarkable,—one from having the two central tail-feathers a little divergent, and the other from having the two outer feathers longer by three-eighths of an inch than the others; so that in both cases the tail exhibited a tendency, but in different ways, to become forked. And this shows us how a swallow-tailed breed, like that described by Bechstein, might have been formed by careful selection.

With respect to the primary wing-feathers, the number in the Columbidae, as far as I can find out, is always nine or ten. In the rock-pigeon it is ten; but I have seen no less than eight short-faced Tumblers with only nine primaries, and the occurrence of this number has been noticed by fanciers, owing to ten primaries of a white colour being one of the points in Short-faced Baldhead-Tumblers. Mr. Brent, however, had an Air-Tumbler (not short-faced) which had in both wings eleven primaries. Mr. Corker, the eminent breeder of prize Carriers, assures me that some of his birds had eleven primaries in both wings. I have seen eleven in one wing in two Pouters. I have been assured by three fanciers that they have seen twelve in Scanderoon; but as Neumeister asserts that in the allied Florence Runt the middle flight-feather is often double, the number twelve may have been caused by two of the ten primaries having each two shafts to a single feather. The secondary wing-feathers are difficult to count, but the number seems to vary from twelve to fifteen. The length of the wing and tail relatively to the body, and of the wings to the tail, certainly varies; I have especially noticed this in Jacobins. In Mr. Bult's magnificent col-

²⁷ 'Coup-d'œil sur l'Ordre des Pigeons,' par C. L. Bonaparte ('Comptes Rendus'), 1854-55. Mr. Blyth, in 'Annals of Nat. Hist.,' vol. xix., 1847, p. 41, mentions, as a very singular fact, "that of the two species of

Ectopistes, which are nearly allied to each other, one should have fourteen tail-feathers, while the other, the passenger pigeon of North America, should possess but the usual number—twelve."

lection of Pouters, the wings and tail varied greatly in length; and were sometimes so much elongated that the birds could hardly play upright. In the relative length of the few first primaries I have observed only a slight degree of variability. Mr. Brent informs me that he has observed the shape of the first feather to vary very slightly. But the variation in these latter points is extremely slight compared with the differences which may be observed in the natural species of the Columbidae.

In the beak I have seen very considerable differences in birds of the same breed, as in carefully bred Jacobins and Trumpeters. In Carriers there is often a conspicuous difference in the degree of attenuation and curvature of the beak. So it is indeed in many breeds: thus I had two strains of black Barbs, which evidently differed in the curvature of the upper mandible. In width of mouth I have found a great difference in two Swallows. In Fantails of first-rate merit I have seen some birds with much longer and thinner necks than in others. Other analogous facts could be given. We have seen that the oil-gland is aborted in all Fantails (with the exception of the sub-race from Java), and, I may add, so hereditary is this tendency to abortion, that some, although not all, of the mongrels which I reared from the Faintail and Pouter had no oil-gland; in one Swallow out of many which I have examined, and in two Nuns, there was no oil-gland.

The number of the scutellæ on the toes often varies in the same breed, and sometimes even differs on the two feet of the same individual; the Shetland rock-pigeon has fifteen on the middle, and six on the hinder toe; whereas I have seen a Runt with sixteen on the middle and eight on the hind toe; and a short-faced Tumbler with only twelve and five on these same toes. The rock-pigeon has no sensible amount of skin between its toes; but I possessed a Spot and a Nun with the skin extending for a space of a quarter of an inch from the fork, between the two *inner* toes. On the other hand, as will hereafter be more fully shown, pigeons with feathered feet very generally have the bases of their *outer* toes connected by skin. I had a red Tumbler, which had a coo unlike that of its fellows, approaching in tone to that of the Laugher: this bird had the habit, to a degree which I never saw equalled in any other pigeon, of often walking with its wings raised and arched in an elegant manner. I need say nothing on the great variability, in almost every breed, in size of body, in colour, in the feathering of the feet, and in the feathers on the back of the head being reversed. But I may mention a remarkable Tumbler²⁸ exhibited at the Crystal Palace, which had an irregular crest of feathers on its head, somewhat like the tuft on the head of the Polish fowl. Mr. Bult reared a hen Jacobin with the feathers on the thigh so long as to reach the ground, and a cock having, but in a lesser degree, the same peculiarity: from these two birds he bred others similarly characterised, which were exhibited

²⁸ Described and figured in the 'Poultry Chronicle,' vol. iii., 1855, p. 82.

at the Philoperisteron Soc. I bred a mongrel pigeon which had fibrous feathers, and the wing and tail-feathers so short and imperfect that the bird could not fly even a foot in height.

There are many singular and inherited peculiarities in the plumage of pigeons: thus Almond-Tumblers do not acquire their perfect mottled feathers until they have moulted three or four times: the Kite Tumbler is at first brindled black and red with a barred appearance, but when "it throws its nest feathers it becomes almost black, generally with a bluish tail, and a reddish colour on the inner webs of the primary wing-feathers."²⁹ Neumeister describes a breed of a black colour with white bars on the wing and a white crescent-shaped mark on the breast; these marks are generally rusty-red before the first moult, but after the third or fourth moult they undergo a change; the wing-feathers and the crown of the head likewise then become white or grey.³⁰

It is an important fact, and I believe there is hardly an exception to the rule, that the especial characters for which each breed is valued are eminently variable: thus, in the Fantail, the number and direction of the tail-feathers, the carriage of the body, and the degree of trembling are all highly variable points; in Pouters, the degree to which they pout, and the shape of their inflated crops; in the Carrier, the length, narrowness, and curvature of the beak, and the amount of wattle; in Short-faced Tumblers, the shortness of the beak, the prominence of the forehead, and general carriage,³¹ and in the Almond-Tumbler the colour of the plumage; in common Tumblers, the manner of tumbling; in the Barb, the breadth and shortness of the beak and the amount of eye-wattle; in Runts, the size of body; in Turbits the frill; and lastly in Trumpeters, the cooing, as well as the size of the tuft of feathers over the nostrils. These, which are the distinctive and selected characters of the several breeds, are all eminently variable.

There is another interesting fact with respect to the

²⁹ 'The Pigeon Book,' by Mr. B. P. Brent, 1859, p. 41.

³⁰ 'Die staarhalsige Taube. Das Ganze, &c.' s. 21, tab. i. fig. 4.

³¹ 'A Treatise on the Almond-Tumbler, by J. M. Eaton, 1852, p. 8, et passim.

characters of the several breeds, namely, that they are often most strongly displayed in the male bird. In Carriers, when the males and females are exhibited in separate pens, the wattle is plainly seen to be much more developed in the males, though I have seen a hen Carrier belonging to Mr. Haynes heavily wattled. Mr. Tegetmeier informs me that, in twenty Barbs in Mr. P. H. Jones's possession, the males had generally the largest eye-wattles; Mr. Esquilant also believes in this rule, but Mr. H. Weir, a first-rate judge, entertains some doubt on the subject. Male Pouters distend their crops to a much greater size than do the females; I have, however, seen a hen in the possession of Mr. Evans which pouted excellently; but this is an unusual circumstance. Mr. Harrison Weir, a successful breeder of prize Fantails, informs me that his male birds often have a greater number of tail-feathers than the females. Mr. Eaton asserts³² that if a cock and hen Tumbler were of equal merit, the hen would be worth double the money; and as pigeons always pair, so that an equal number of both sexes is necessary for reproduction, this seems to show that high merit is rarer in the female than in the male. In the development of the frill in Turbits, of the hood in Jacobins, of the tuft in Trumpeters, of tumbling in Tumblers, there is no difference between the males and females. I may here add a rather different case, namely, the existence in France³³ of a wine-coloured variety of the Pouter, in which the male is generally chequered with black, whilst the female is never so chequered. Dr. Chapuis also remarks³⁴ that in certain light-coloured pigeons the males have their feathers striated with black, and these striæ increase in size at each moult, so that the male ultimately becomes spotted with black. With Carriers, the wattle, both

³² A Treatise, &c., p. 10.

³³ Boitard and Corbié, 'Les Pigeons,' &c., 1824, p. 173.

³⁴ 'Le Pigeon Voyageur Belge,' 1865, p. 87. I have given in my 'Descent of Man' (6th edit. p. 466) some curious cases, on the authority of Mr. Tegetmeier, of silver-coloured (*i. e.* very pale blue) birds being

generally females, and of the ease with which a race thus characterised could be produced. Bonizzi (see 'Variazioni dei Columbi domestici:' Padova, 1873) states that certain coloured spots are often different in the two sexes, and the certain tints are commoner in females than in male pigeons.

on the beak and round the eyes, and with Barbs that round the eyes, goes on increasing with age. This augmentation of character with advancing age, and more especially the difference between the males and females in the above-mentioned several respects, are remarkable facts, for there is no sensible difference at any age between the two sexes in the aboriginal rock-pigeon; and not often any strongly marked difference throughout the family of the Columbidae.³⁵

Osteological Characters.

In the skeletons of the various breeds there is much variability; and though certain differences occur frequently, and others rarely, in certain breeds, yet none can be said to be absolutely characteristic of any breed. Considering that strongly-marked domestic races have been formed chiefly by man's selection, we ought not to expect to find great and constant differences in the skeleton; for fanciers neither see, nor do they care for, modifications of structure in the internal framework. Nor ought we to expect changes in the skeletons from changed habits of life; as every facility is given to the most distinct breeds to follow the same habits, and the much modified races are never allowed to wander abroad and procure their own food in various ways. Moreover, I find, on comparing the skeletons of *Columba livia*, *oenas*, *palumbus*, and *turtur*, which are ranked by all systematists in two or three distinct though allied genera, that the differences are extremely slight, certainly less than between the skeletons of some of the most distinct domestic breeds. How far the skeleton of the wild rock-pigeon is constant I have had no means of judging, as I have examined only two.

Skull.—The individual bones, especially those at the base, do not differ in shape. But the whole skull, in its proportions, outline, and relative direction of the bones, differs greatly in some of the breeds, as may be seen by comparing the figures of (A) the wild

³⁵ Prof. A. Newton ('Proc. Zoolog. Soc.,' 1865, p. 716) remarks that he knows no species which present any remarkable sexual distinction; but Mr. Wallace informs me, that in the sub-

family of the Treronidae the sexes often differ considerably in colour. See also on sexual differences in the Columbidae, Gould, 'Handbook to the Birds of Australia,' vol. ii. pp. 109-149.

rock-pigeon, (B) the Short-faced Tumbler, (C) the English Carrier, and (D) the Bagadotten Carrier (of Neumeister), all drawn of the natural size and viewed laterally. In the Carrier, besides the elon-

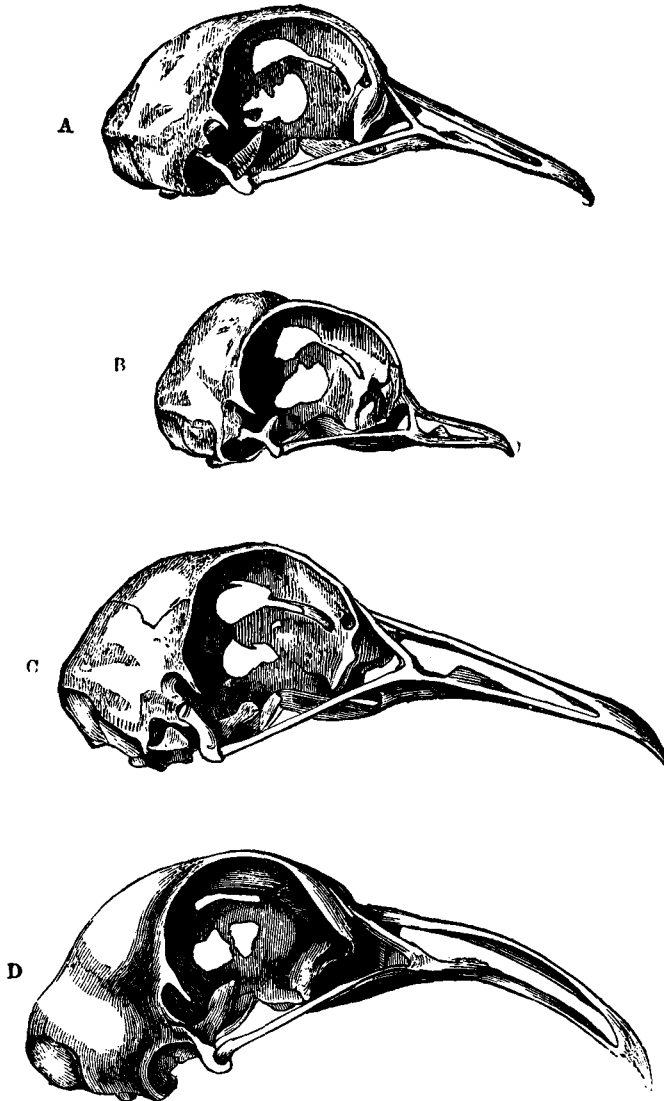


Fig. 24.—Skulls of Pigeons viewed laterally, of natural size. A. Wild Rock-pigeon, *Columba livia*. B. Short-faced Tumbler. C. English Carrier. D. Bagadotten Carrier.

gation of the bones of the face, the space between the orbits is proportionally a little narrower than in the rock-pigeon. In the Bagadotten the upper mandible is remarkably arched, and the premaxillary bones are proportionally broader. In the Short-faced Tumbler

the skull is more globular: all the bones of the face are much shortened, and the front of the skull and descending nasal bones are *almost perpendicular*: the *maxillo-jugal arch and premaxillary bones* form an almost straight line; the space between the prominent edges of the eye-orbits is depressed. In the Barb the premaxillary bones are much shortened, and their anterior portion is thicker than in the rock-pigeon, as is the lower part of the nasal bone. In two Nuns the ascending branches of the premaxillaries, near their tips, were somewhat attenuated, and in these birds, as well as in some others, for instance in the Spot, the occipital crest over the foramen was considerably more prominent than in the rock-pigeon.

In the lower jaw, the articular surface is proportionably smaller in many breeds than in the rock-pigeon; and the vertical diameter,

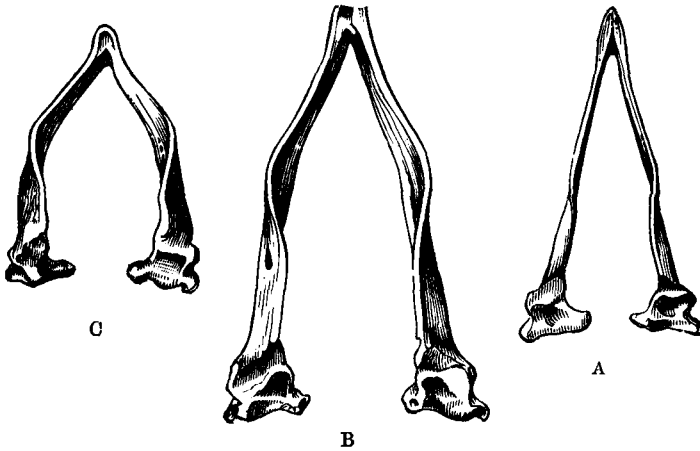


Fig. 25.—Lower jaws, seen from above, of natural size. A. Rock-pigeon. B. Runt. C. Barb.

more especially of the outer part of the articular surface, is considerably shorter. May not this be accounted for by the lessened use of the jaws, owing to nutritious food having been given during a long period to all highly improved pigeons? In Runts, Carriers, and Barbs (and in a lesser degree in several breeds), the whole side of the jaw near the articular end is bent inwards in a highly remarkable manner; and the superior margin of the ramus, beyond the middle, is reflexed in an equally remarkable manner, as may be seen in the accompanying figures, in comparison with the jaw of the rock-pigeon. This reflexion of the upper margin of the lower jaw is plainly connected with the singularly wide gape of the mouth, as has been described in Runts, Carriers, and Barbs. The reflexion is well shown in fig. 26. of the head of a Runt seen from above; here a wide open space may be observed on each side, between the edges of the lower jaw and of the premaxillary bones.

In the rock-pigeon, and in several domestic breeds, the edges of the lower jaw on each side come close up to the premaxillary bones, so

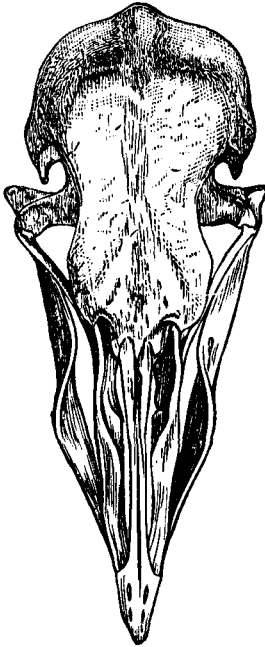


Fig. 26.—Skull of Runt, seen from above, of natural size, showing the reflexed margin of the distal portion of the lower jaw.

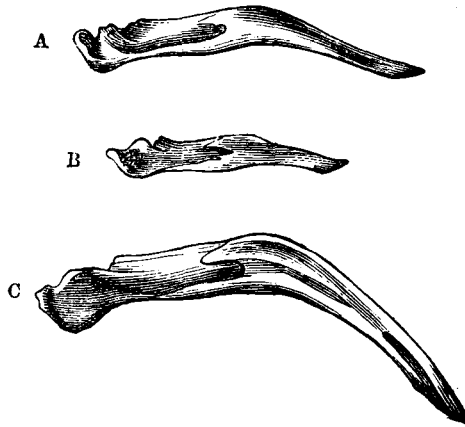


Fig. 27.—Lateral view of jaws, of natural size. A. Rock-pigeon. B. Short-faced Tumbler. C. Bagadotten Carrier.

that no open space is left. The degree of downward curvature of the distal half of the lower jaw also differs to an extraordinary degree in some breeds, as may be seen in the drawings (fig. A) of the rock-pigeon, (B) of the Short-faced Tumbler, and (C) of the Bagadotten Carrier of Neumeister. In some Runts the symphysis of the lower jaw is remarkably solid. No one

would readily have believed that jaws differing in the several above-specified points so greatly could have belonged to the same species.

Vertebræ.—All the breeds have twelve cervical vertebræ.³⁶ But in a Bussorah Carrier from India the twelfth vertebra carried a small rib, a quarter of an inch in length, with a perfect double articulation.

The *dorsal vertebræ* are always eight. In the rock-pigeon all eight bear ribs; the eighth rib being very thin, and the seventh having no process. In Pouters all the ribs are extremely broad, eight bear ribs; the eighth rib being very thin and the seventh having no process. In Pouters all the ribs are extremely broad, and, in three out of four skeletons examined by me, the eighth rib was twice or even thrice as broad as in the rock-pigeon; and the

³⁶ I am not sure that I have designated the different kinds of vertebræ correctly: but I observe that different anatomists follow in this respect dif-

ferent rules, and, as I use the same terms in the comparison of all the skeletons, this, I hope, will not signify.

seventh pair had distinct processes. In many breeds there are only seven ribs, as in seven out of eight skeletons of various Tumblers, and in several skeletons of Fantails, Turbits and Nuns.

In all these breeds the seventh pair was very small, and was destitute of processes, in which respect it differed from the same rib in the rock-pigeon. In one Tumbler, and in the Bussorah Carrier, even the sixth pair had no process. The hypapophysis of the second dorsal vertebra varies much in development; being sometimes (as in several, but not all Tumblers) nearly as prominent as that of the third dorsal vertebra; and the two hypapophyses together tend to form an ossified arch. The development of the arch, formed by the hypapophyses of the third and fourth dorsal vertebrae, also varies considerably, as does the size of the hypapophysis of the fifth vertebra.

The rock-pigeon has twelve *sacral vertebrae*; but these vary in number, relative size, and distinctness, in the different breeds. In Pouters, with their elongated bodies, there are thirteen or even fourteen, and, as we shall immediately see, an additional number of caudal vertebrae. In Runts and Carriers there is generally the proper number, namely twelve; but in one Runt, and in the Bussorah Carrier, there were only eleven. In Tumblers there are either eleven, or twelve, or thirteen sacral vertebrae.

The *caudal vertebrae* are seven in number in the rock-pigeon. In Fantails, which have their tails so largely developed, there are eight or nine, and apparently in one case ten, and they are a little longer than in the rock-pigeon, and their shape varies considerably. Pouters, also, have eight or nine caudal vertebrae. I have seen eight in a Nun and Jacobin. Tumblers, though such small birds, always have the normal number seven; as have Carriers, with one exception, in which there were only six.

The following table will serve as a summary, and will show the most remarkable deviations in the number of the vertebrae and ribs which I have observed:—

	Rock Pigeon.	Pouter, from Mr. Buit.	Tumbler, Dutch Roller.	Bussorah Carrier.
Cervical Vertebrae	12	12	12	12 The 12th bore a small rib.
Dorsal Vertebrae	8	8	8	8
„ Ribs ..	8 The 6th Pair with processes, the 7th pair without a process.	8 The 6th and 7th pair with processes.	7 The 6th and 7th pair without processes.	7 The 6th and 7th pair without processes.
Sacral Vertebrae	12	14	11	11
Caudal Vertebrae	7	8 or 9	7	7
Total Vertebrae	39	42 or 43	38	38

The *pelvis* differs very little in any breed. The anterior margin of the ilium, however, is sometimes a little more equally rounded

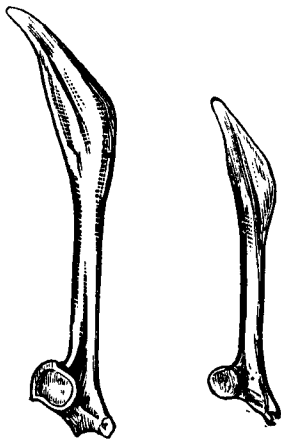


Fig. 28.—Scapulæ, of natural size. A. Rock-pigeon. B. Short-faced Tumbler.

on both sides than in the rock-pigeon. The ischium is also frequently rather more elongated. The obturator-notch is sometimes, as in many Tumblers, less developed than in the rock-pigeon. The ridges on the ilium are very prominent in most Runts.

In the bones of the extremities I could detect no difference, except in their proportional lengths; for instance, the metatarsus in a Pouter was 1.65 inch, and in a Short-faced Tumbler only .95 in length; and this is a greater difference than would naturally follow from their differently-sized bodies; but long legs in the Pouter, and small feet in the Tumbler, are selected points. In some Pouters the *scapula* is rather straighter, and in some Tumblers it is straighter, with the apex less elongated, than in the rock-pigeon: in the woodcut, fig. 28, the scapulæ of the rock-pigeon (A), and of a short-faced Tumbler (B), are given. The processes at the summit of the *coracoid*, which receive the extremities of the *furculum*, form a more perfect cavity in some Tumblers than in the rock-pigeon: in Pouters these processes are larger and differently shaped, and the exterior angle of the extremity of the *coracoid*, which is articulated to the sternum, is squarer.

The two arms of the *furculum* in Pouters diverge less, proportionally to their length, than in the rock-pigeon; and the symphysis is more solid and pointed. In Fantails the degree of divergence of the two arms varies in a remarkable manner. In fig. 29, B and C represent the *furcula* of two Fantails; and it will be seen that the divergence in B is rather less even than in the

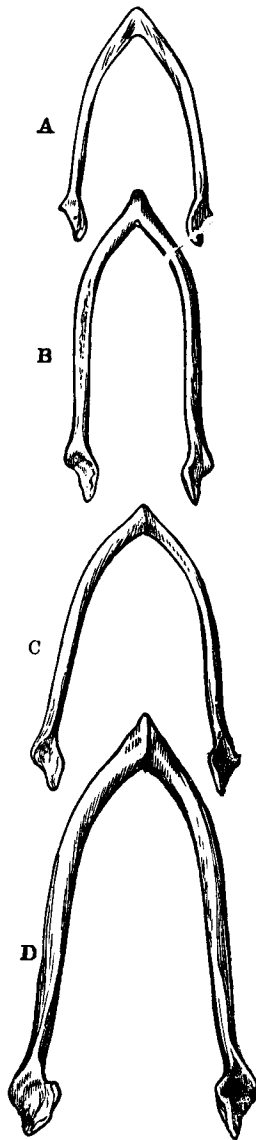


Fig. 29.—Furcula, of natural size. A. Short-faced Tumbler. B and C Fantail. D. Pouter.

furculum of the short-faced, small-sized Tumbler (A), whereas the divergence in c equals that in a rock-pigeon, or in the Pouter (D), though the latter is a much larger bird. The extremities of the furculum, where articulated to the coracoids, vary considerably in outline.

In the *sternum* the differences in form are slight, except in the size and outline of the perforations, which, both in the larger and lesser sized breeds, are sometimes small. These perforations, also, are sometimes either nearly circular, or elongated as is often the case with Carriers. The posterior perforations occasionally are not complete, being left open posteriorly. The marginal apophyses forming the anterior perforations vary greatly in development. The degree of convexity of the posterior part of the sternum differs much, being sometimes almost perfectly flat. The manubrium is rather more prominent in some individuals than in others, and the pore immediately under it varies greatly in size.

Correlation of Growth.—By this term I mean that the whole organisation is so connected, that when one part varies, other parts vary; but which of two correlated variations ought to be looked at as the cause and which as the effect, or whether both result from some common cause, we can seldom or never tell. The point of interest for us is that, when fanciers, by the continued selection of slight variations, have largely modified one part, they often unintentionally produce other modifications. For instance, the beak is readily acted on by selection, and, with its increased or diminished length, the tongue increases or diminishes, but not in due proportion; for, in a Barb and Short-faced Tumbler, both of which have very short beaks, the tongue, taking the rock-pigeon as the standard of comparison, was proportionally not shortened enough, whilst in two Carriers and in a Runt the tongue, proportionally with the beak, was not lengthened enough, thus, in a first-rate English Carrier, in which the beak from the tip to the feathered base was exactly thrice as long as in a first-rate Short-faced Tumbler, the tongue was only a little more than twice as long. But the tongue varies in length independently of the beak: thus in a Carrier with a beak 1·2 inch in length, the tongue was ·67 in length: whilst in a Runt which equalled the Carrier in length of body and in stretch of wings from tip to tip, the beak was ·92 whilst the tongue was ·73 of an inch in length, so that the tongue was actually longer than in the carrier with its long beak. The tongue of the Runt was also very broad at the root. Of two Runts, one had its

beak longer by $\cdot 23$ of an inch, whilst its tongue was shorter by $\cdot 14$ than in the other.

With the increased or diminished length of the beak the length of the slit forming the external orifice of the nostrils varies, but not in due proportion, for, taking the rock-pigeon as the standard, the orifice in a Short-faced Tumbler was not shortened in due proportion with its very short beak. On the other hand (and this could not have been anticipated), the orifice in three English Carriers, in the Bagadotten Carrier, and in a Runt (*pigeon cygne*), was longer by above the tenth of an inch than would follow from the length of the beak proportionally with that of the rock-pigeon. In one Carrier the orifice of the nostrils was thrice as long as in the rock-pigeon, though in body and length of beak this bird was not nearly double the size of the rock-pigeon. This greatly increased length of the orifice of the nostrils seems to stand partly in correlation with the enlargement of the wattled skin on the upper mandible and over the nostrils; and this is a character which is selected by fanciers. So again, the broad, naked, and wattled skin round the eyes of Carriers and Barbs is a selected character; and in obvious correlation with this, the eyelids, measured longitudinally, are proportionally more than double the length of those of the rock-pigeon.

The great difference (see woodcut No. 27) in the curvature of the lower jaw in the rock-pigeon, the Tumbler, and Bagadotten Carrier, stands in obvious relation to the curvature of the upper jaw, and more especially to the angle formed by the maxillo-jugal arch with the premaxillary bones. But in Carriers, Runts, and Barbs the singular reflexion of the upper margin of the middle part of the lower jaw (see woodcut No. 25) is not strictly correlated with the width or divergence (as may be clearly seen in woodcut No. 26) of the premaxillary bones, but with the breadth of the horny and soft parts of the upper mandible, which are always overlapped by the edges of the lower mandible.

In Pouters, the elongation of the body is a selected character, and the ribs, as we have seen, have generally become very broad, with the seventh pair furnished with processes; the

sacral and caudal vertebræ have been augmented in number; the sternum has likewise increased in length (but not in the depth of the crest) by $\cdot 4$ of an inch more than would follow from the greater bulk of the body in comparison with that of the rock-pigeon. In Fantails, the length and number of the caudal vertebræ have increased. Hence, during the gradual progress of variation and selection, the internal bony framework and the external shape of the body have been, to a certain extent, modified in a correlated manner.

Although the wings and tail often vary in length independently of each other, it is scarcely possible to doubt that they generally tend to become elongated or shortened in correlation. This is well seen in Jacobins, and still more plainly in Runts, some varieties of which have their wings and tail of great length, whilst others have both very short. With Jacobins, the remarkable length of the tail and wing-feathers is not a character which is intentionally selected by fanciers; but fanciers have been trying for centuries, at least since the year 1600, to increase the length of the reversed feathers on the neck, so that the hood may more completely enclose the head; and it may be suspected that the increased length of the wing and tail-feathers stand in correlation with the increased length of the neck-feathers. Short-faced Tumblers have short wings in nearly due proportion with the reduced size of their bodies; but it is remarkable, seeing that the number of the primary wing-feathers is a constant character in most birds, that these Tumblers generally have only nine instead of ten primaries. I have myself observed this in eight birds; and the Original Columbarian Society³⁷ reduced the standard for Bald-head Tumblers from ten to nine white flight-feathers, thinking it unfair that a bird which had only nine feathers should be disqualified for a prize because it had not ten *white* flight-feathers. On the other hand, in Carriers and Runts, which have large bodies and long wings, eleven primary feathers have occasionally been observed.

Mr. Tegetmeier has informed me of a curious and inexplicable case of correlation, namely, that young pigeons of all breeds which when mature become white, yellow, silver (*i.e.*, extremely pale blue), or dun-coloured, are born almost naked;

³⁷ J. M. Eaton's Treatise, edit. 1858, p. 78.

whereas pigeons of other colours are born well-clothed with down. Mr. Esquilant, however, has observed that young dun Carriers are not so bare as young dun Barbs and Tumblers. Mr. Tegetmeier has seen two young birds in the same nest, produced from differently coloured parents, which differed greatly in the degree to which they were at first clothed with down.

I have observed another case of correlation which at first sight appears quite inexplicable, but on which, as we shall see in a future chapter, some light can be thrown by the law of homologous parts varying in the same manner. The case is, that, when the feet are much feathered, the roots of the feathers are connected by a web of skin, and apparently in correlation with this the two outer toes become connected for a considerable space by skin. I have observed this in very many specimens of Pouters, Trumpeters, Swallows, Roller-tumblers (likewise observed in this breed by Mr. Brent), and in a lesser degree in other feather-footed pigeons.

The feet of the smaller and larger breeds are of course much smaller or larger than those of the rock-pigeon; but the scutellæ or scales covering the toes and tarsi have not only decreased or increased in size, but likewise in number. To give a single instance, I have counted eight scutellæ on the hind toe of a Runt, and only five on that of a Short-faced Tumbler. With birds in a state of nature the number of the scutellæ on the feet is usually a constant character. The length of the feet and the length of the beak apparently stand in correlation; but as disuse apparently has affected the size of the feet, this case may come under the following discussion.

On the Effects of Disuse.—In the following discussion on the relative proportions of the feet, sternum, furculum, scapulæ, and wings, I may premise, in order to give some confidence to the reader, that all my measurements were made in the same manner, and that they were made without the least intention of applying them to the following purpose.

I measured most of the birds which came into my possession, from the feathered *base* of the beak (the length of beak itself being so variable) to the end of the tail, and to the oil-gland, but unfortunately (except in a few cases) not to the root of the tail; I

measured each bird from the extreme tip to tip of wing; and the length of the terminal folded part of the wing, from the extremity of the primaries to the joint of the radius. I measured the feet without the claws, from the end of the middle toe to the end of the hind toe; and the tarsus and middle toe together. I have taken in every case the mean measurement of two wild rock-pigeons from the Shetland Islands, as the standard of comparison. The following table shows the actual length of the feet in each bird;

TABLE. I.

Pigeons with their beaks generally shorter than that of the Rock-pigeon, proportionally to the size of their bodies.

Name of Breed.	Actual length of Feet	Difference between actual and calculated length of feet, in proportion to length of feet and size of body in the Rock-pigeon.	
		Too short by	Too long by
Wild rock-pigeon (mean measurement) ..	2.02		
Short-faced Tumbler, bald-head	1.57	0.11	..
" " almond	1.60	0.16	..
Tumbler, red magpie	1.75	0.19	..
" red common (by standard to end of tail)	1.85	0.07	..
" common bald-head	1.85	0.18	..
" roller	1.80	0.06	..
Turbit	1.75	0.17	..
" " " "	1.80	0.01	..
" " " "	1.84	0.15	..
Jacobin	1.90	0.02	..
Trumpeter, white	2.02	0.06	..
" mottled	1.95	0.18	..
Fantail (by standard to end of tail) ..	1.85	0.15	..
" " " "	1.95	0.15	..
" crested var. " "	1.95	0.0	0.0
Indian Frill-back	1.80	0.19	..
English Frill-back	2.10	0.03	..
Nun	1.82	0.02	..
Laugher	1.65	0.16	..
Barb	2.00	0.03	..
" " " "	2.00	..	0.03
Spot	1.90	0.02	..
" " " "	1.90	0.07	..
Swallow, red	1.85	0.18	..
" blue	2.00	..	0.03
Pouter	2.42	..	0.11
" German	2.30	..	0.09
Bussorah Carrier	2.17	..	0.09
Number of specimens	28	22	5

and the difference between the length which the feet ought to have had according to the size of body of each, in comparison with the size of body and length of feet of the rock-pigeon, calculated (with a few specified exceptions) by the standard of the length of the body from the base of the beak to the oil-gland. I have preferred this standard, owing to the variability of the length of tail. But I have made similar calculations, taking as the standard the length from tip to tip of wing, and likewise in most cases from the base of the beak to the end of the tail; and the result has always been closely similar. To give an example: the first bird in the table, being a Short-faced Tumbler, is much smaller than the rock-pigeon, and would naturally have shorter feet; but it is found on calculation to have feet too short by $\cdot 11$ of an inch, in comparison with the feet of the rock-pigeon, relatively to the size of the body in these two birds, as measured from the base of beak to the oil-gland. So again, when this same Tumbler and the rock-pigeon were compared by the length of their wings, or by the extreme length of their bodies, the feet of the Tumbler were likewise found to be too short in very nearly the same proportion. I am well aware that the measurements pretend to greater accuracy than is possible, but it was less trouble to write down the actual measurements given by the compasses in each case than an approximation.

TABLE II.

Pigeons with their beaks longer than that of the Rock-pigeon, proportionally to the size of their bodies.

Name of Breed.	Actual length of Feet	Difference between actual and calculated length of feet, in proportion to length of feet and size of body in the Rock-pigeon.	
		Too short by	Too long by
Wild rock-pigeon (mean measurement) ..	2·02		
Carrier	2·60	..	0·31
" " " " " " " " " "	2·60	..	0·25
" " " " " " " " " "	2·40	..	0·21
" Dragon	2·25	..	0·06
Bagadotten Carrier	2·80	..	0·56
Scanderoon, white	2·80	..	0·37
" Pigeon cygne	2·85	..	0·29
Runt	2·75	..	0·27
Number of specimens	8	..	8

In these two tables we see in the first column the actual length of the feet in thirty-six birds belonging to various breeds, and in the two other columns we see by how much the feet are too short or too long, according to the size of bird, in comparison with the rock-pigeon. In the first table twenty-two specimens have their

feet too short, on an average by a little above the tenth of an inch (viz. '107); and five specimens have their feet on an average a very little too long, namely, by '07 of an inch. But some of these latter cases can be explained; for instance, with Pouters the legs and feet are selected for length, and thus any natural tendency to a diminution in the length of the feet will have been counteracted. In the Swallow and Barb, when the calculation was made on any standard of comparison besides the one used (viz. length of body from base of beak to oil-gland), the feet were found to be too small.

In the second table we have eight birds, with their beaks much longer than in the rock-pigeon, both actually and proportionally with the size of body, and their feet are in an equally marked manner longer, namely, in proportion, on an average by '29 of an inch. I should here state that in Table I. there are a few partial exceptions to the beak being proportionally shorter than in the rock-pigeon: thus the beak of the English Frill-back is just perceptibly longer, and that of the Bussorah Carrier of the same length or slightly longer, than in the rock-pigeon. The beaks of Spots, Swallows, and Laughers are only a very little shorter, or of the same proportional length, but slenderer. Nevertheless, these two tables, taken conjointly, indicate pretty plainly some kind of correlation between the length of the beak and the size of the feet. Breeders of cattle and horses believe that there is an analogous connection between the length of the limbs and head; they assert that a race-horse with the head of a dray-horse, or a grey-hound with the head of a bulldog, would be a monstrous production. As fancy pigeons are generally kept in small aviaries, and are abundantly supplied with food, they must walk about much less than the wild rock-pigeon; and it may be admitted as highly probable that the reduction in the size of the feet in the twenty-two birds in the first table has been caused by disuse,³⁶ and that this reduction has acted by correlation on the beaks of the great majority of the birds in Table I. When, on the other hand, the beak has been much elongated by the continued selection of successive slight increments of length, the feet by correlation have likewise become much elongated in comparison with those of the wild rock-pigeon, notwithstanding their lessened use.

As I had taken measures from the end of the middle toe to the heel of the tarsus in the rock-pigeon and in the above thirty-six birds, I have made calculations analogous with those above given, and the result is the same—namely, that in the short-beaked breeds, with equally few exceptions as in the former case, the middle toe conjointly with the tarsus has decreased in length; whereas in the long-beaked breeds it has increased in length, though not quite so uniformly as in the former case, for the leg in some varieties of the Runt varies much in length.

³⁶ In an analogous, but converse, manner, certain natural groups of the Columbidae, from being more terrestrial in their habits than other

allied groups, have larger feet. See Prince Bonaparte's 'Coup-d'œil sur l'Order des Pigeons.'

As fancy pigeons are generally confined in aviaries of moderate size, and as even when not confined they do not search for their own food, they must during many generations have used their wings incomparably less than the wild rock-pigeon. Hence it seemed to me probable that all the parts of the skeleton subservient to flight would be found to be reduced in size. With respect to the sternum, I have carefully measured its extreme length in twelve birds of different breeds, and in two wild rock-pigeons from the Shetland Islands. For the proportional comparison I have tried three standards of measurement, with all twelve birds namely, the length from the base of the beak to the oil-gland, to the end of the tail, and from the extreme tip to tip of wings. The result has been in each case nearly the same, the sternum being invariably found to be shorter than in the wild rock-pigeon. I will give only a single table, as calculated by the standard from the base of the beak to the oil-gland; for the result in this case is nearly the mean between the results obtained by the two other standards.

Length of Sternum.

Name of Breed.	Actual Length. Inches.	Too Short by	Name of Breed.	Actual Length. Inches.	Too Short by
Wild Rock-pigeon	2·55	..	Barb	2·35	0·34
Pied Scanderoon ..	2·80	0·60	Nun	2·27	0·15
Bagadotten Carrier	2·80	0·17	German Pouter ..	2·36	0·54
Dragon	2·45	0·41	Jacobin	2·33	0·22
Carrier	2·75	0·35	English Frill-back	2·40	0·43
Short faced Tumbler	2·05	0·28	Swallow	2·45	0·17

This table shows that in these twelve breeds the sternum is of an average one-third of an inch (exactly $\cdot332$) shorter than in the rock-pigeon, proportionally with the size of their bodies; so that the sternum has been reduced by between one-seventh and one-eighth of its entire length; and this is a considerable reduction.

I have also measured in twenty-one birds, including the above dozen, the prominence of the crest of the sternum relatively to its length, independently of the size of the body. In two of the twenty-one birds the crest was prominent in the same relative degree as in the rock-pigeon; in seven it was more prominent; but in five out of these seven, namely, in a Fantail, two Scanderoons, and two English Carriers, this greater prominence may to a certain extent be explained, as a prominent breast is admired and selected by fanciers; in the remaining twelve birds the prominence was less. Hence it follows that the crest exhibits a slight, though uncertain, tendency to be reduced in prominence in a greater degree than does the length of the sternum relatively to the size of body, in comparison with the rock-pigeon.

I have measured the length of the scapula in nine different large

and small-sized breeds, and in all the scapula is proportionally shorter (taking the same standard as before) than in the wild rock-pigeon. The reduction in length on an average is very nearly one-fifth of an inch, or about one-ninth of the length of the scapula in the rock-pigeon.

The arms of the furcula in all the specimens which I compared, diverged less, proportionally with the size of body, than in the rock-pigeon; and the whole furculum was proportionally shorter. Thus in a Runt, which measured from tip to tip of wings $38\frac{1}{2}$ inches, the furculum was only a very little longer (with the arms hardly more divergent) than in a rock-pigeon which measured from tip to tip $26\frac{1}{2}$ inches. In a Barb, which in all its measurements was a little larger than the same rock-pigeon, the furculum was a quarter of an inch shorter. In a Pouter, the furculum had not been lengthened proportionally with the increased length of the body. In a Short-faced Tumbler, which measured from tip to tip of wings 24 inches, therefore only $2\frac{1}{2}$ inches less than the rock-pigeon, the furculum was barely two-thirds of the length of that of the rock-pigeon.

We thus clearly see that the sternum, scapulæ, and furculum are all reduced in proportional length; but when we turn to the wings we find what at first appears a wholly different and unexpected result. I may here remark that I have not picked out specimens, but have used every measurement made by me. Taking the length from the base of beak to the end of the tail as the standard of comparison, I find that, out of thirty-five birds of various breeds, twenty-five have wings of greater, and ten have them of less proportional length, than in the rock-pigeon. But from the frequently correlated length of the tail and wing-feathers, it is better to take as the standard of comparison the length from the base of the beak to the oil-gland; and by this standard, out of twenty-six of the same birds which had been thus measured, twenty-one had wings too long, and only five had them too short. In the twenty-one birds the wings exceeded in length those of the rock-pigeon, on an average, by $1\frac{1}{3}$ inch; whilst in the five birds they were less in length by only $\cdot 8$ of an inch. As I was much surprised that the wings of closely confined birds should thus so frequently have been increased in length, it occurred to me that it might be solely due to the greater length of the wing-feathers; for this certainly is the case with the Jacobin, which has wings of unusual length. As in almost every case I had measured the folded wings, I subtracted the length of

this terminal part from that of the expanded wings, and thus I obtained, with a moderate degree of accuracy, the length of the wings from the ends of the two radii, answering from wrist to wrist in our arms. The wings, thus measured in the same twenty-five birds, now gave a widely different result ; for they were proportionally with those of the rock-pigeon too short in seventeen birds, and in only eight too long. Of these eight birds, five were long-beaked,³⁹ and this fact perhaps indicates that there is some correlation of the length of the beak with the length of the bones of the wings, in the same manner as with that of the feet and tarsi. The shortening of the humerus and radius in the seventeen birds may probably be attributed to disuse, as in the case of the scapulæ and furculum to which the wing-bones are attached ;— the lengthening of the wing-feathers, and consequently the expansion of the wings from tip to tip, being, on the other hand, as completely independent of use and disuse as is the growth of the hair or wool on our long-haired dogs or long-wooled sheep.

To sum up : we may confidently admit that the length of the sternum, and frequently the prominence of its crest, the length of the scapulæ and furculum, have all been reduced in size in comparison with the same parts in the rock-pigeon. And I presume that this may be attributed to disuse or lessened exercise. The wings, as measured from the ends of the radii, have likewise been generally reduced in length ; but, owing to the increased growth of the wing-feathers, the wings, from tip to tip, are commonly longer than in the rock-pigeon. The feet, as well as the tarsi conjointly with the middle toe, have likewise in most cases become reduced ; and this it is probable has been caused by their lessened use ; but the existence of some sort of correlation between the feet and beak is shown more plainly than the effects of disuse. We

³⁹ It perhaps deserves notice that besides these five birds two of the eight were Barbs, which, as I have shown, must be classed in the same group with the long-beaked Carriers and Runts. Barbs may properly be called short-beaked Carriers. It

would, therefore, appear as if, during the reduction of their beaks, their wings had retained a little of that excess of length which is characteristic of their nearest relations and progenitors.

have also some faint indication of a similar correlation between the main bones of the wing and the beak.

Summary on the Points of Difference between the several Domestic Races, and between the individual Birds.—The beak, together with the bones of the face, differ remarkably in length, breadth, shape, and curvature. The skull differs in shape, and greatly in the angle formed by the union of the pre-maxillary, nasal, and maxillo-jugal bones. The curvature of the lower jaw and the reflection of its upper margin, as well as the gape of the mouth, differ in a highly remarkable manner. The tongue varies much in length, both independently and in correlation with the length of the beak. The development of the naked, wattled skin over the nostrils and round the eyes varies in an extreme degree. The eyelids and the external orifices of the nostrils vary in length, and are to a certain extent correlated with the degree of development of the wattle. The size and form of the œsophagus and crop, and their capacity for inflation, differ immensely. The length of the neck varies. With the varying shape of the body, the breadth and number of the ribs, the presence of processes, the number of the sacral vertebræ, and the length of the sternum, all vary. The number and size of the coccygeal vertebræ vary, apparently in correlation with the increased size of the tail. The size and shape of the perforations in the sternum, and the size and divergence of the arms of the furculum, differ. The oil-gland varies in development, and is sometimes quite aborted. The direction and length of certain feathers have been much modified, as in the hood of the Jacobin and the frill of the Turbit. The wing and tail-feathers generally vary in length together, but sometimes independently of each other and of the size of the body. The number and position of the tail-feather vary to an unparalleled degree. The primary and secondary wing-feathers occasionally vary in number, apparently in correlation with the length of the wing. The length of the leg and the size of the feet, and, in connection with the latter, the number of the scutellæ, all vary. A web of skin sometimes connects the bases of the two inner toes, and almost invariably the two outer toes when the feet are feathered.

The size of the body differs greatly: a Runt has been known

to weigh more than five times as much as a Short-faced Tumbler. The eggs differ in size and shape. According to Parmentier,⁴⁰ some races use much straw in building their nests, and others use little; but I cannot hear of any recent corroboration of this statement. The length of time required for hatching the eggs is uniform in all the breeds. The period at which the characteristic plumage of some breeds is acquired, and at which certain changes of colour supervene, differs. The degree to which the young birds are clothed with down when first hatched is different, and is correlated in a singular manner with the colour of the plumage. The manner of flight, and certain inherited movements, such as clapping the wings, tumbling either in the air or on the ground, and the manner of courting the female, present the most singular differences. In disposition the several races differ. Some races are very silent; others coo in a highly peculiar manner.

Although many different races have kept true in character during several centuries, as we shall hereafter more fully see, yet there is far more individual variability in the most constant breeds than in birds in a state of nature. There is hardly any exception to the rule that those characters vary most which are now most valued and attended to by fanciers, and which consequently are now being improved by continued selection. This is indirectly admitted by fanciers when they complain that it is much more difficult to breed high fancy pigeons up to the proper standard of excellence than the so-called toy pigeons, which differ from each other merely in colour; for particular colours when once acquired are not liable to continued improvement or augmentation. Some characters become attached, from quite unknown causes, more strongly to the male than to the female sex; so that we have in certain races, a tendency towards the appearance of secondary sexual characters,⁴¹ of which the aboriginal rock-pigeon displays not a trace.

⁴⁰ Temminck, 'Hist. Nat. Gén. des Pigeons et des Gallinacés,' tom. i., 1813, p. 170.

⁴¹ This term was used by John Hunter for such differences in structure

between the males and females, as are not directly connected with the act of reproduction, as the tail of the peacock, the horns of deer, &c.