Gelochelidon anglica.

Sylochelidon caspia.

Both species are common in Lower Egypt; and occasionally the Gull-billed Tern was seen in Nubia.

Xema ridibundum.

Is very plentiful in Lower Egypt during the subsidence of the river in November, especially about the sluices, where the natives catch small fish. There it and the Black Kite may be seen in great numbers, darting on the banks where the refuse of the fish had been thrown.

Larus fuscus.

The Herring-Gull is common on the river below Beni Hassan. I saw a solitary individual near the Second Cataract; but it is not by any means so frequent in the upper country. I have seen *Larus canus* on wing near Cairo. A little Diver was occasionally noticed in the river, even as high as Thebes, and the same species is very common in the marshes about Alexandria.

II.—*Remarks on the Value of Osteological Characters in the Classification of Birds.* By Alfred R. Wallace.

May I beg for a few lines to correct a statement of M. E. Blanchard, and to show that it is not by osteology *only* that correct principles of classification are to be arrived at? In his 'Recherches sur les Caractères Ostéologiques des Oiseaux,' p. 75, M. Blanchard states that "one of the best-characterized and best-defined groups in the class of Birds has been misunderstood by all naturalists except one only (M. l'Herminier)." He then goes on to explain that this group consists of all Passeres except the families now generally classed as Fissirostres (including the Hummers, Swifts, Hoopoes, and Hornbills) and Scansores (including the Barbets and the *Musophagidæ*). M. l'Herminier, it seems, had founded this great group more than thirty years ago from an examination of the sternum, but his work had remained almost unknown to ornithologists; and M. Blanchard has now by his own more extensive researches established the same fact. Previous, however, to M. Blanchard's publication, and without having ever seen or heard of M. l'Herminier's work, I had

arrived at identical results from a consideration of the general external structure, habits, and affinities of the birds in question, and with but little or no knowledge of their osteology. In my paper on "A Natural Arrangement of Birds" in the 'Annals and Magazine of Natural History' for 1856 (vol. xviii. p. 214), I separate from the Passeres every family which M. Blanchard has separated, and of the rest I remark, "There remains an extensive series of species which we believe constitutes *one great group* of equal value with those we have already defined. This group may be called the normal or typical Passeres, and consists of above thirty-five families, containing between three and four thousand species, or at least half of the known birds. These, we believe, are too intimately connected with each other to allow of their being separated into a few great divisions without violating many of their natural relations. They have all normal or $\frac{3}{1}$-toed feet, which are never so short or weak as to be unadapted for progression. The bill is always moderate in size and form, and in the few cases where it is peculiarly modified (as in some species of *Dendrocolaptidæ*) other species in the same family possess the normal form. There is also a remarkable moderation in size; for though the species are so numerous, there are none either so large or so small as are to be found in the two abnormal groups. There is also a much greater uniformity in texture of plumage and in form, as well as in habits, which binds the whole into *one compact and natural group*. It is also a most important point to consider that there are no isolated families—none but have numerous points of connexion and transition with others; and to such an extent is this the case, that there is scarcely an extensive family group about the limits of which ornithologists can agree. The Thrushes, Warblers, Fly-catchers, Chatterers, Tanagers, Finches, Shrikes, Bush-Shrikes, and many others are in this condition, and offer a striking contrast to the families of the Fissirostres and Scansores, about the limits of every one of which there is scarcely any doubt or difficulty whatever. Here then we have three groups, one of which, though very much more extensive than the others, offers less variation in the form and size of the species and in the modifications of their principal organs. Correct principles of classifi-

cation would surely oblige us to consider the three groups of only equal rank." This extract, I think, proves that I both fully appreciated the *unity* of this group and accurately defined its limits some years before M. Blanchard's publication; for though it is (in its separate form) altogether without date, yet he quotes works in 1857—a year after the publication of my paper *.

No one can be more convinced than myself of the utility of osteology, and especially of the *sternum*, in the classification of birds, and I sincerely trust this great work may be brought to a conclusion. I cannot, however, allow that *osteological* characters are an all-sufficing guide. Like every other character taken singly, osteology is a very uncertain and irregular test of affinity, and is, moreover, in almost every case accompanied by parallel external characters. Sometimes one sometimes another part of the bird's organization has varied more rapidly, so that one group exhibits the most striking constancy of a part which in another group is subject to extreme modifications. The sternum is no exception to this rule, and by following it alone we should make the greatest errors in classification. For example, the sterna of the Finches and the Flycatchers are scarcely distinguishable, notwithstanding the great dissimilarity in almost every part of the structure of these birds—their bills, their feet, their plumage, their habits, food, and digestive organs. On the other hand, the sterna of the several genera of the *Caprimulgidæ* differ from each other more than do those of the most distinct families of the restricted Passeres. The Bee-eaters, the Barbets, and the Woodpeckers, again, are three very distinct families, which, in a classification founded upon all parts of a bird's organization, cannot be brought in close contact; and yet their sterna, according to M. Blanchard, much resemble each other. It is evident, therefore, that the whole structure of a bird and its corresponding habits may be profoundly modified, and yet the sternum may retain a very close resemblance to a common form; and, on the other hand, the sternum may undergo important changes, while the general organization and habits are but little altered.

* M. Blanchard's paper was published in the 'Annales d. Sc. Nat.' for 1859. See Ibis, 1860, p. 93.—Ed.

To prove that true affinities indicated by the sternum are also in most cases exhibited in external characters, it is only necessary to refer to the paper above quoted, in which the relation of the Hummers to the Swifts, and the separation of the Hornbills, the Rollers, the *Musophagidæ*, and the Parrots from the Passeres, were pointed out from the consideration of such characters alone. In that paper, however, I made two important errors, namely, putting the Todies with the Passeres (from the descriptions given of their habits), and including the Swallows among the Swifts. The character of the sternum is undoubtedly of great importance in finally settling such points as these.

I also at that time included the *Psittaci* among the Scansores; but I am now quite convinced that they deserve to rank as a primary division of the class of Birds, a rank to which the great peculiarity of the sternum, the large brain-cavity, and highly organized cranium fully entitle them.

With regard to M. Blanchard's determination of affinities from the body of the *sternum* only, without its appendages, I must remark that it often leads to erroneous results. For example, he says that the *sterna* of *Merops* and *Tamatia* do not differ enough to deserve a separate description; and he includes *Megalæma* with *Tamatia* in one section, as having the same form of sternum. He notices some differences in the *Picidæ*, but remarks on their resemblance to *Megalæma* and to the Toucans. Now in all these points an examination of the entire sternum, with the *furcula*, coracoids, and clavicles attached, leads me to very different results. The sterna of *Merops* and *Nyctiornis*, compared with those of two species of *Megalæma*, seem to me to show no resemblance whatever: in almost every part they present important differences of form, surface-texture, and proportions, while the *furcula* and coracoids are so different in the two, that I should unhesitatingly place them far apart, in at least different tribes or primary divisions of the Passeres. On the other hand, the sternum of the Toucans (*Pteroglossus*) resembles that of *Megalæma* most closely in every particular, and especially in the extreme weakness and complete separation of the two arms of the *furcula*—a character which I am not aware exists in any other families of birds. The sternum of the *Picidæ*

presents many important differences from those of all these families, and fully bears out the isolation which their external characters exhibit. It differs much from *Megalæma* and *Pteroglossus* in its general form, as well as in details of structure, and still more from *Merops*. It seems to approach the typical Passeres more than either of the other groups to which M. Blanchard compares it; but its peculiar pyramidal shape, so remarkably narrowed at the anterior extremity, and its very short clavicles distinctly separate it as a characteristic and isolated form. It will, therefore, I think, be admitted that the affinities indicated by the complete sternum and appendages are much more in accordance with those derived from external form and structure, and from habits and economy, than those which M. Blanchard deduces from the body of the sternum alone.

These remarks are made in no spirit of depreciation of this very interesting and valuable work, but for the purpose of showing that isolated characters may lead to erroneous conclusions from whatever part of the organism they are chosen, and that in this respect osteological have no positive superiority over external characters. M. Blanchard tells us, in the introduction to this first instalment of his work, that he proposes to examine successively each separate part of the bird's skeleton. His future researches may therefore seriously modify the conclusions he has hitherto arrived at. I cannot but think, however, that he would have produced a more satisfactory work, if he had based it upon the comparison of the entire sternum, with its appendages attached, and also on the cranium, these two parts being of the greatest importance in classification.

It has been well observed by Professor Owen that those parts of an animal which have the least immediate connexion with its habits and economy are exactly those which best exhibit deep-seated and obscure affinities. The wings, the feet, and the beak in birds may undergo the most extraordinary modifications in the same group in accordance with differences of habits and of external conditions, while at the same time such apparently insignificant characters as the general colouring, the texture of the plumage, the scaling of the tarsi, or the colour and texture of the eggs remain constant, and reveal the true relations of

the species. Thus it is that the form of the sternum is of such importance, since it has no immediate dependence on external form and habits. The Sparrow, the Flycatcher, the Wren, and the Sunbird, all have one characteristic form of sternum; while between those of the Swallow and the Swift there is the greatest diversity.

It is evident also that the modifications of form immediately dependent on habits and external conditions are generally to be seen in the skin even better than in the skeleton of a bird. These are principally changes of form, size, and proportion in the bill, the feet, and the wings, which are excellent characters for distinguishing genera and even families; while for determining the true affinities of isolated groups we must have recourse to those characters which, having no direct dependence on habits, &c., are often persistent in a remarkable degree. Of these, no doubt, the sternum is of the highest value; but there are many others of almost equal importance. Such are the texture of the plumage; the form of the feathers and their arrangement over the surface of the body; the form of the nostrils; the scutellation of the tarsi; the mode of nidification, with the form, texture, and colour of the eggs; the covering of the young bird, and its changes of plumage; peculiarities of food, characteristic habits, and peculiar attitudes and actions.

As an instance of the value of such apparently trifling characters as the last, I may mention that the first time I saw a Roller (*Coracias temmincki*) alive, I was at once satisfied it was a Fissirostral bird, from a peculiar jerking motion of the head and tail when it alighted, which is common to Kingfishers, Trogons, Bee-eaters, and Motmots, but never seen in the typical Passeres. In like manner the motions of the *Eurylæmi* convinced me that they were not Fissirostres, but typical Passeres, as mentioned in my paper quoted at the beginning of these remarks (Ann. Nat. Hist. 1856, p. 199).

Now that true principles of classification are becoming so much better understood, we may, I think, hope that the chaos which has so long existed in ornithology will soon give way to a truly natural system which must obtain general acceptance.