The Philippine "Tamarao."

IN 1878 I reported in a letter to Dr. Sclater, the existence of a species of *Anoa* in the Island of Mindoro, on the strength of an example of the *Tamarao* labelled *Anoa depressicornis* in a Museum at Manilla. Having since seen living specimens of the Celebean *Anoa*, I have no hesitation in affirming that the latter animal has not even a superficial resemblance to the *Tamarao* which I saw at Manilla. I have now no doubt that the *Tamarao* of the Manilla Museum is a buffalo,—not, however, an immature example of the common buffalo, as has been suggested, but a distinct species, with short flattened horns sloping directly backwards.

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A Pheasant attacking a Gamekeeper.

As the keeper was walking home, a distance of half a mile, through the plantations near his cottage, a pheasant flew at him three times, attacking his legs in a most savage manner. The keeper got to his cottage with the pheasant after him, and called his wife out to witness the incident.

The keeper was able to secure the pheasant and return it to the cover. I should be glad to know if such conduct is exceptional on the part of game birds.

M. H. MAW.

Walk House, Barrow, Hull, November 30.

THE MORPHOLOGY OF BIRDS.¹

I.

THIS magnificent work, consisting of two folio volumes, with more than 1700 pages of closely printed text, and illustrated by more than thirty artistically executed plates, is the latest of the "Bijdragen tot de Dierkunde" ("Contributions to the Knowledge of Animals"), published by the Royal Zoological Society, *Natura Artis Magistra*, of Amsterdam, on its fiftieth anniversary. It is the parting gift to that Society of its grateful author, who, one of Prof. Gegenbaur's ablest pupils, now fills the Chair of Anatomy in the University of Jena; and it is needless to say that the publication of so monumental a work reflects the highest credit upon the Society of Amsterdam. It is monumental not merely from its bulk, but chiefly from the enormous amount of information it contains, much of it bearing upon some of the most deeply-rooted questions of importance to the general morphologist, and above all on the natural affinities—that is to say, the phylogeny—of birds both living and extinct.

In what follows I make no attempt at a critical review, but give as complete a summary as possible of Prof. Fuerbringer's work, which I trust will be acceptable to English readers, for few of them will have the opportunity of seeing these costly and weighty volumes, or the perseverance to master their contents, and yet it cannot be but that many would like to know the results at which the author's investigations have led him to arrive.

The whole work consists of two parts.

The *special part* comprises the first 837 pages, and is devoted to a minute and most comprehensive description of the bones, nerves, and muscles of the avian shoulder-girdle in the widest sense. The investigations extend over many hundreds of birds of all orders and families; frequently numerous specimens of the same species have been examined in order to ascertain the extent of individual variability.

The author justly asks himself if it is not too much to offer such a bewildering mass of mere detail to the public; but he considers it indispensable that the reader, who may not easily yield acceptance to the generalizations, should be offered the fullest opportunity to re-examine the facts in detail, and to follow step by step the road which has led the author to his conclusions.

¹ "Untersuchungen zur Morphologie und Systematik der Voegel, zugleich ein Beitrag zur Anatomie der Stuetz- und Bewegungsorgane." Von Max Fuerbringer, Professor der Anatomie, und Direktor des anatomischen Institutes und des Museum Vrolik der Universitaet zu Amsterdam. Mit 30 Tafeln. (Amsterdam: T. van Holkema, 1888.)

At the same time, it must be borne in mind that the first part of the work is not merely descriptive, but that it contains a series of complete essays on the morphology of the organs under consideration. The treatment of the structure, development, and modifications of the sternum, for instance, takes up not less than 78 pages. In the myological part particular attention has been bestowed upon the proper naming and homologizing of the muscles.

The descriptive detail deposited in the special part has been used in the *second or generalizing part* as the material for reflections. These lead (a) to morphological results, which are important chiefly for the phylogenesis of the skeletal, nervous, and muscular systems; (b) they form a basis for a new systematic arrangement of birds. Physiological questions are less dwelt upon, but there are numerous contemplations on the theory of flight, and a remarkable chapter on cold- and warm-bloodedness.

The author remarks that the study of the morphology of birds well repays the labour bestowed upon it, not so much because of the great or fundamental variety which this class of vertebrates exhibits, but rather because several organic systems have reached a height of development which they have not attained in any other class of animals. We often find a richness of organic differentiations within the limits of small groups of birds. It is therefore possible to form a judgment, approaching almost to certainty, as to the primary or secondary significance of these differences. It is interesting to follow the steps which lead to such astonishing heights of specialization.

Pp. 839-996 are devoted to results and reflections of general morphological importance. For instance, the changes in the configuration of the sternum which are brought about by the modifications of the muscles of the pectoral girdle. There is not unfrequently an apparent discord between the passive or skeletal and the active or muscular elements; of these the latter are by far the more progressive, so that the more conservative skeletal parts have not always kept step with the newly introduced changes of the muscles. An example of this is afforded by the wings. By the reduction of the wing, beginning at the distal end, those muscles are first affected which arise from the wing bones, next are affected the bones themselves, and lastly those muscles which are inserted on the same (p. 855).

Syndesmology receives much attention, chiefly by an extensive treatment of the shoulder-joint. Joints are certainly not formed by the action of the muscles during embryonic life, but they are phylogenetically preformed, and only during the post-embryonic stages can the finer configuration of the joints be modelled and influenced by the muscles.

P. 862.—Questions of the greatest importance are involved in the transformation of mere ligamentous connections into symphyses and joints, with the accompanying neoblastic appearance of cartilage. This new cartilage is either homoblastic or heteroblastic. It arises from latent cartilaginous cells, as is the case with the addition of new vertebrae at the end of the Ophidian tail, and probably with the multiplication of the Cetacean phalanges; or the cartilage is due to transformation of periosteal cells, like the patella ulnaris. In such cases the original ligament can be supplanted by bone. On the other hand, the clavicle is sometimes transformed into a ligamentum claviculare.

Fasciae are often strengthened into aponeuroses and into tendons; they are used as such, not only by their own muscle, but also by neighbouring ones, and this leads to the formation of paratenons or tendinous slips. Birds afford numerous instances in which muscles have gained extra support by "anchoring" themselves to neighbouring fasciae.

Pp. 877-82 treat of *sesamoid* bodies, of which the author recognizes three sorts. (1) Skeletogenous sesamoids, like the pisiform bone, are, strictly speaking, not