

XV.—*On the Species of Manatees (Manatus), and on the Difficulty of distinguishing such Species by Osteological Characters.*

By Dr. J. E. GRAY, F.R.S.

THE species of Manatees (*Manatus*) appear to be in great confusion. The American and African animals have each had no less than five specific names. I believe this has chiefly arisen from skulls of different ages having been examined, and especially from the fewness of the specimens contained in museums compared with those now to be seen in London. The British Museum has specimens of the American and of the African kind, and there is a skeleton from each country and several skulls in the Museum of the College of Surgeons.

I will first give the history of the skulls which have been figured by preceding authors, on which the species have been founded, and then the result of the examination of the specimens in the British Museum and in the Museum of the College of Surgeons.

In the Paris Museum there is a skeleton of the American Manatee which M. Geoffroy carried off from the Museum of Aguda during the occupation of Portugal by the French (see Blainv. Ostéog., *Manatus*, p. 135). The special habitat of this specimen is not known; but it is most probably from the Brazils, that being a Portuguese possession. It is rather more than 6 feet long. This skeleton formed the material of Cuvier's description and figure of the American Manatee in the 'Ossements Fossiles' (v. t. 19. f. 1, 2, 3)\*, and of the figures of the skeleton, skull, and teeth of that animal in Blainville's 'Ostéographie' (Gravigrades), *Manatus*, t. 1, 3, 5.

The front of the skull of Cuvier's figure of this specimen is copied by Dr. Harlan, t. 13. f. 5; and the skeleton and skull are copied into F. Cuvier's 'Hist. Nat. Cetacés,' t. 2. f. 1, 2, and t. 3 (1836).

De Blainville's figure of the skull, separate from the skeleton, is much narrower and longer than Cuvier's figure of the same specimen in the Paris Museum, and far longer than any skull I have seen. Cuvier's figure is not a bad representation of our skull from America.

Cuvier (Oss. Foss. v. 243) describes a young specimen, sent from Cayenne, rather more than 3 feet long.

In the 'Philosophical Transactions' for 1821 Sir Everard Home described and figured the animal and skeleton of the Manatee of the West Indies, sent by the Duke of Manchester from Jamaica (the skeleton is in the Museum of the College of Surgeons), to show the differences between it and the skeleton

\* By mistake, at p. 255 the references to the figures are reversed.



of the Dugong of the East-Indian seas. The paper and plates are reproduced in his 'Lectures on Comparative Anatomy' (vol. iv. t. 55, 56). This is the best figure of the entire animal that I have seen. The next best is that of the Manatee of the Orinoco, figured in Wiegmann's 'Archiv' for 1838, where the form of the mouth of the living animal and the horny plate on the outside of the grinders in the lower jaw are shown.

In the 'Journal of the Academy of Natural Sciences of Philadelphia' for 1823 (vol. iii. t. 13) Dr. Harlan described and figured the skull of a young Manatee procured from the coast of Florida, which he regarded as a new species, under the name of *M. latirostris*. He copies the front part of the skull of *M. australis* and *M. senegalensis*, in Cuvier's 'Ossemens Fossiles,' for comparison with the skull he figures; and M. de Blainville, in the 'Ostéographie' (t. 3), copied his figure of the front part of the skull of *M. latirostris* for comparison with his figure of the skull of the young Manatee from Cayenne, which M. de Blainville considers the same as that figured by Dr. Harlan.

In the Paris Museum there is the skull of a young animal without teeth, which was sent from Cayenne by M. Plie, and is figured by M. de Blainville, in his 'Ostéographie,' t. 3, as *Manatus latirostris*.

In the Leyden Museum there is the skeleton of an American Manatee which was examined by M. de Blainville, and of which he figured the cervical vertebræ, the sternum, and ischium in his 'Ostéographie,' t. 3.

Prof. Schlegel, in his 'Abhandlungen' for 1841, figures the skulls of two specimens which had been received from the Pari-maribo River (t. 5. f. 4-6). The smaller is 12, and the larger 13½ inches long.

Prof. W. Vrolik describes and figures the skeleton of *Manatus americanus* in the 'Bijdr. tot de Dierkund' for 1851, which is probably the same as that examined by De Blainville and figured by Schlegel.

Dr. Ferdinand Kraus, in Müller's 'Arch. f. Anat.' for 1858, p. 390, describes the osteology of the Manatees from Surinam, chiefly from the Mariwyne River. In the paper he gives the measurements of seven skeletons and four skulls which had been supplied to different museums, viz. skeletons at Stuttgart, at St. Petersburg, Copenhagen, Tübingen, Würzburg (a female), Freiburg, and Berlin; and skulls at Stuttgart, Tübingen, and Freiburg. The cervical vertebræ in all are 6; the dorsal vertebræ vary from 16 to 17, the lumbar from 1 to 3; the caudal vary from 24 to 28 (p. 425).

Dr. Kraus observes that the length of the nasal cavity, as compared with its width, is subject to great variation, and con-



firm this observation by the measurements of several skulls. He does not believe that it affords a good specific difference. In young specimens the nose is wider, because the facial part of the skull is not so much protruded longitudinally (p. 406). The nasal bones appear to vary in their position and relation to the adjoining bones (p. 404). It is not impossible that the position of the nasal bones may be used hereafter as a specific character in the American Manatees; and therefore he describes the two extreme forms which he has observed among ten skulls (p. 404). In one the nasal bone is like those in the skull of the *M. senegalensis* figured by De Blainville, and in another it is like that in the skull figured by him as *M. latirostris*.

The British Museum has, through the kindness of Dr. Kraus, a skeleton from Surinam, from this series.

As regards the African Manatees, Cuvier, in the 'Oss. Foss.' v. 255, gives the following as the differences between the skulls of the two species, and also the measurement of their parts:—

"1. La tête d'Amérique est plus allongée à proportion de sa largeur.

"2. Cet allongement appartient principalement au museau et aux narines.

"3. La fosse nasale est trois fois plus longue que large dans le lamantin d'Amérique. Sa largeur fait les trois quarts de sa longueur dans celui du Sénégal.

"4. Les orbites de ce dernier sont plus écartées.

"5. Les fosses temporales sont plus larges et plus courtes.

"6. Les apophyses zygomatiques des temporals sont beaucoup plus renflées.

"7. En revanche elles ont moins de hauteur.

"8. La partie extérieure de la mâchoire inférieure est courbée; dans l'espèce d'Amérique elle est droite" (p. 256).

The front part of Cuvier's figure of the skull is copied by Dr. Harlan; and the figures of the skull are copied by Schreber (Säugeth. vii. t. 380. f. 1, 3, 4, and t. 381).

In the 'Compt. Rend. Acad. Scien. Paris,' vol. ii. for 1836, p. 363, and in the 'Institut,' vol. iv. p. 114, M. Robert makes some observations on the skeleton of the "Lamantin du Sénégal."

In the 'Proceedings of the Boston Society of Natural History,' vol. ii. for 1847, p. 198, Mr. Perkins gives an account of a *Manatus* from the West Coast of Africa, named *M. nasutus* by Dr. J. Wyman; and in the third volume of the same Journal for 1830, at p. 192, Dr. J. Wyman describes the cranium of *M. nasutus*.

M. de Blainville, in the 'Ostéographie,' t. 3, figures the skull of the Senegal Manatee, which appears to be the same as that figured by Cuvier, and the lower jaw (t. 1) and the vertebræ (t. 5)



from an unmounted skeleton of a female that was sent from the Governor of Senegal to the Paris Museum (t. 3. f. 13).

At the meeting of the British Association for 1856 (Trans. of Sections, p. 98) a description of the *Ajuh*, a kind of Whale found in the River Benué by Dr. Vogel, was read by Dr. Norton Shaw; Prof. Owen considered this to be distinct from the Manatee of Senegal, and named it *M. Vogelii*. An abstract of this paper appeared in the 'Institut,' 1857, p. 61.

Dr. Baikie, in the 'Proceedings of the Zoological Society' for February 1857, described and figured the head of a Manatee from the mouth of the Kworra and the Niger, which had been called *Manatus Vogelii* by Prof. Owen. Dr. Baikie draws the following deductions:—"1st, that in the Kwóra or Niger, and its tributary, the Tsádda or Binuë, is found a *Manatus* intermediate in many of its characters between *M. australis* [of America] and *M. senegalensis* [of West Africa]; and 2ndly, that if these differences are, as Prof. Owen suggests, too marked for a mere variety, then there is no alternative but to allow it as a species" (Proc. Zool. Soc. 1857, p. 33; Mammalia, t. 51). The skull of the *Ajuh* (*M. Vogelii*) here described is now in the British Museum collection.

In the Appendix to M. Du Chaillu's 'Travels in Equinoctial Africa,' he mentions a Manatee, found near the Gaboon, under the name of *M. Owenii*.

Four skeletons from the mouth of the Gaboon, purchased from M. Du Chaillu, are in the British Museum; and there is one from M. Du Chaillu in the Museum of the College of Surgeons.

In the 'Proceedings of the Zoological Society for 1857' (p. 59) I published some observations on the species of Manatees; and in the 'Ann. and Mag. of Nat. Hist.' for July 1861, p. 64) in my notes on the animal described by M. Du Chaillu, I made some further observations on the subject. In these papers I stated that I believed the Manatees from America and Africa were distinct species, and attempted to point out the characters in the skull which separated them, and that I believed also, from the examination of skulls from various parts of America and those from the mouths of the different rivers on the West-African coast, that there was only a single species from each of those countries. The characters which I pointed out in these papers, for separating the skulls from the two countries, will, since we have received a larger series of them, require modification; for the effect of the larger series is to make the distinction founded on the form of the parts of the skull more difficult, as the skulls from Africa and America are found to vary in the same manner.



I have examined the following specimens :—

A skull from Cuba, presented by Mr. H. Christy to the British Museum ; and a skeleton obtained at the same place, presented by Mr. H. Christy to the Museum of the College of Surgeons.

A skeleton from Surinam, in the British Museum.

A skull from Jamaica, obtained from Mr. Gosse's collection.

A skull from the West Indies.

A skull in the British Museum, and two skulls in the College of Surgeons, without any habitat, but which are most probably from America.

The skeleton of the young animal, from Jamaica, figured by Sir E. Home, in the College of Surgeons.

Five skeletons and two skulls from West Africa, from the mouth of the Gaboon, purchased from M. Du Chaillu, and named in his work *M. Owenii*.

An imperfect skull of the *Ajuh*, obtained from the River Kworra, by Dr. Vogel, presented by Dr. Baikie. Named *M. Vogelii*.

The genus is confined to nearly the same latitudes on the American and African sides of the Atlantic—that is to say, between 10° south and 25° north of the equator.

From the examination of the skulls and skeletons, I believe that the Manatees living in Africa and America are specifically distinct from one another.

The most prominent characters that separate the species are as follows :—

#### 1. *M. senegalensis*.

The skull without any nasal bones ; or the nasal bones, if present in the flesh, are not contained in a pit in the sides of the frontal and maxillary bones. The front edge of the frontal rounded and thick, forming an arched hinder margin to the nasal opening. The lower part of the gonys of the lower jaw convex, rounded, prominent. The front upper incisive edge of the lower jaw concave, with raised edges, with two small separate conical tubercles fitting into a pit in the upper jaw.

The species includes *M. senegalensis*, Desm., *M. nasutus*, Wyman, *M. Vogelii*, Owen, *M. Owenii*, Du Chaillu.

#### 2. *M. americanus*.

The skull with distinct, thick, subcylindrical nasal bones inserted in a notch on the side of the front edge, and a groove in the upper margin of the frontal bone ; front margin of the frontal bone transverse, thin, ragged or toothed. The lower part of the gonys of the lower jaw with a compressed bifid prominence, which is often rugose. The front upper edge of the



lower jaw flat, with a central, large, conical or compressed, acute tubercle fitting into a pit in the upper jaw.

The species will include *M. australis*, Tilesius, *M. americanus*, Desm., *M. latirostris*, Harlan, *M. fluviatilis*, Illiger.

The ribs of the African *M. senegalensis* are slender and compressed; the sternal end is thicker and much narrower than the middle part of the rib, but rather compressed and higher than thick. In the American *M. americanus* the ribs are very thick, solid, and heavy, compressed and broad in the middle, and nearly cylindrical at the sternal end.

The characters above given are the result of a generalized description of the skulls from each country, rather than a rigid individual description of any of them.

The nasal bones are absent in all the African skulls, and there is no appearance of any notch in the front edge of the frontal bone, or groove in the upper margin of that bone on the edge of the nasal opening; so that if there is a nasal bone in the flesh, it must be free from the other bones.

The nasal bone is absent also in M. de Blainville's figure of the skull from Senegal, in the Paris Museum.

On the other hand, there is a distinct nasal bone, or a notch in the outer edge of the first of the frontals, and a groove for its reception, in all the skulls from America in the British Museum; but the size of the bone appears to vary greatly in these specimens.

It is present, on one side, in the figure of the skull named *M. latirostris*, from Cayenne, in M. de Blainville's 'Ostéographie,' and in Dr. Harlan's figure of *M. latirostris* from Florida. Dr. Kraus states that the size and form of the nasal bone were very variable in the specimens of Manatees that he received from one locality (Surinam); and they are not present in the skulls of *M. australis* and *M. latirostris* in the Paris Museum, if we are to depend on M. de Blainville's figures; nor are the notches or grooves to be seen in these figures, and they are absent in the skull of the skeleton from Cuba in the College of Surgeons.

In the skulls of the African Manatee in the British Museum and in M. de Blainville's figure of the skull at Paris, from Senegal, the hinder or upper margin of the nasal aperture is contracted, and the front edge of the frontal bone is thick and rounded. The width of the arch of the upper edge of the nasal aperture varies in these species; in one it is narrow and ovate, in another broader, and in the third much broader and nearly straight-edged.

In all the skulls from America the front edge of the frontal bone is truncated, with a more or less thin, straight edge, which



is rugged or produced into teeth between the notches on the sides. But in one of the African skulls the front edge of the frontal is truncated, thin, and torn, as in the American skulls; but this has not any notch on the side for the reception of the hinder ends of the nasals.

The character of the form of the gonys of the lower jaw is more variable and less distinctive. In four lower jaws from Africa the gonys is convex, rounded, and but slightly grooved; and in three of the lower jaws of the skulls from America the gonys is much more produced, compressed, and divided into two rugosities by a central groove. Yet in one of the lower jaws from Africa there is a slight indication of an approach to the form of the tubercle in the American jaws; in one of the American lower jaws the tubercle of the gonys is scarcely divided, and less developed than in those above described, and in another American lower jaw the tubercle is so like that of the African specimen as not to be distinguished from it.

The tubercle or tubercles in the front of the upper surface of the incisive part of the lower jaw appear to be constant in the specimens in the British Museum. They vary in size according to the age of the specimen, being least developed in the younger ones.

The flatness or concavity of this part of the lower jaw is not so distinctive; it is very concave in all African skulls, and flat in the American ones; but the sides are more or less raised in the different specimens. But, combined with the form of the tubercle, it affords some assistance in determining the species.

In all the African skulls the lower part of the aperture of the nose is above a line drawn across the beak of the skull on a level with the surface of the alveoli of the teeth. In all the American skulls the aperture is similarly situated as regards such a line; but in one (the specimen from Jamaica), with a very largely developed intermaxillary bone, the lower edge of the nasal aperture is just on a level with such a line.

After the most mature consideration and comparison of the specimens from the different parts of Africa and America, and the comparison of the figures on which the presumed species from each of these countries have been founded, I have come to the conclusion that, as far as the material at my command will allow me to form an opinion, there is but a single species in each locality. The species in each country vary in the size and shape of the nasal cavity, in the length of the rostrum of the skull, and the angle at which it is bent in regard to the line of the palate, and also in the size and form of the intermaxillary bones, and this even in specimens from the same locality, as is proved by the observations of Dr. Kraus on the specimen from Surinam.



The lower jaw is very apt to vary, in both species, in the form of the coronoid process, which is sometimes broad, at others narrow, and placed at very different positions as regards the ramus, as is illustrated by the skulls in the British Museum.

Of the two skulls that are most unlike, one comes from Jamaica, and the other from Cuba. I am therefore induced to believe that they may be the sexes of the same species. These are both the skulls of adult animals, having seven developed teeth on each side, and another visible or nearly ready to come up. The one from Jamaica has the beak of the upper jaw wide at the base and much dilated in the middle, and the intermaxillary bones very large and solid, the plate of the maxillary bone under the orbit very broad—much broader than in any of the other skulls; but they are unequally broad on the two sides. The other skull from the West Indies, on the contrary, has a moderately short beak, only a very little longer than the tooth-line; it is bent up from the tooth-line at a very obtuse angle. The bones of which it is formed are much smaller and less massive. The palatine surface is contracted at the base, and rather dilated on the sides. A third skull of an adult animal, from Cuba, is almost intermediate between the one from Jamaica and that from the West Indies in the length, angle, and solidity of the rostrum, and also in the form of the palatine surface of the beak.

The following are the measurements of the skulls in the British Museum:—

	Length of skull.		Length of rostrum below.		Length of rostrum above.		Width at zygoma.		Width at middle of orbits.		Width at intermaxillary side-suture.		Length of front intermaxillary suture.		Length of nose-aperture.		Width of nose-aperture.		Length of lower jaw.		Length of upper symphysis.		Length of lower symphysis.			
	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.	in.	l.		
<i>M. Americanus.</i>																										
Cuba .....	16	35	7	4	3	9	10	5	6	2	2	3	0	6	3	4	0	11	2	2	10	3	10			
West Indies .....	14	64	6	5	3	9	2	5	3	2	1 $\frac{1}{2}$	3	0	5	1	3	10	9	7	2	11	3	7 $\frac{1}{2}$			
Jamaica (imperfect)...	...	...	5	5	...	6	6	2	7	3	9	6	3	4	7	10	6	3	3	3	3	9				
Surinam .....	12	10	3	11	4	4	8	2	4	3	1	7	2	1	5	7	2	6	8	4	2	2	3	0		
Hab. unknown (young)	11	4	3	10	4	1	7	6	4	7	1	6	2	2	3	11	3	3	7	3	2	4	2	6		
<i>M. Africanus.</i>																										
Gaboon (B.) .....	14	3	3	11	4	9	9	0	5	3	1	10	2	2	5	6	3	9	9	1	2	3	3	6		
Gaboon (E.) .....	13	4	3	6	4	5	8	5	3	1	11	2	3	5	4	3	7	8	9	2	1	3	0			
<i>M. Vogelii</i> (D.) .....	11	9	3	6	3	9	...	4	6	1	5 $\frac{1}{2}$	1	11	4	4	3	1	7	9	1	9	2	11			
Gaboon (A.) .....	13	3	4	14	4	...	4	6	1	8 $\frac{1}{2}$	2	0	5	1 $\frac{1}{2}$	3	1 $\frac{1}{2}$	8	8	1	11 $\frac{1}{2}$	2	9 $\frac{1}{2}$				
Gaboon (C., set up)...	13	6	4	3	5	0	9	8	6	0	2	0	2	9	5	16	4	0	10	0	2	9	3	6		

When Cuvier had a skull of the American and one of the African Manatee, he gave eight characters by which the African skull could be known from the American. Now we have a series of skulls of each kind, we find that not one of these characters



will separate the skulls of the two countries from one another. Indeed the skulls of each kind are so variable that, after having them laid out before me for two or three days, studying them every now and then, and inducing two proficient in the study of bones and in observing minute characters, to give me their assistance, we came to the conclusion that we believed there was no character, common to all the skulls of each kind, which could be used to separate them. As a proof of the difficulty of so doing, I may state that there was one skull in the series which had been long in the Collection, and had been received without any habitat, and neither of the three could decide to which of the series this skull should be referred; and it was not until I accidentally observed the character derived from the absence of the nasal bones in the African kind that this question could be settled. It may be asked, Why was not the absence or the presence of the nasal bones observed earlier in the examination? The reply is easy: these bones are anomalous in the genus, being small, far apart, and easily lost; for they were only present in one of the skulls, and their existence in the other American skulls is only proved by the scar, or rather groove which is left in the bones; and though they are not found in the skull of the African Manatee, we have no proof that they are not free in the flesh of the nose in that species.

The examination of a large series of skulls of the Bears (*Ursus*) and *Paradoxuri* shows how difficult it is to distinguish species by the study of the skulls alone. Thus, when we have a series of skulls of Bears from different localities, which, from their external form and habits, are known to be distinct species, it is easy to say which is the skull of *U. tibetanus*, *U. syriacus*, *U. arctos*, *U. cinereus*, and *U. americanus*, when we have the habitat marked on each; but the true test of the power of distinguishing the one from the other is to determine to what species a skull belongs, of which we have no information as to its origin; and we have several skulls in the British Museum under these circumstances, and I cannot, even with the best assistance at my command, determine to which species they ought to be referred. And it is the same with the skulls of the *Paradoxuri*. I have observed, in a large series of skulls, that there is, in some genera at least, more difference between the skulls of the same species from the same locality than there is between two species from different localities which are well established by external characters.

If this is the case with skulls (and I particularly allude to them, as they are generally regarded as the most characteristic bones of a skeleton, and are therefore the bones most usually studied by zoologists), how must the difficulty of distinguishing species with certainty be increased when we have only fossil bones,



which are generally more or less imperfect, to examine and compare, or of which only a limited number of examples are to be obtained and compared?

By these observations I by no means wish to throw any doubt on any determinations which have been made, or to deny that there are well-determined fossil species, but merely to show the necessity of extreme caution in determining fossil bones as well as recent ones, and to point out that, in some cases at least, it is not sufficient to compare a recent skull, much less a fossil one, with one entire skull, and then determine whether it is a new or an extinct species—more especially as such abstruse questions as the antiquity of Man and other theoretical questions have been attempted to be settled by the results of such examinations.

The skulls of certain genera seem much more liable to vary than those of others. They vary in most genera much more than was expected before series of the skulls of each species were collected and compared. It must be observed that these variations of the skull do not in the least prove the want of distinctness between species, but only show that the bones are as liable to vary as any other part of the body. Nor does it in the least detract from the importance of studying the bones in connexion with the external characters.

In some genera, where a very similar kind of colour is common to all the species, and where the colours seem to show an inclination to run into one another, as in the four species of *Helictis* from Java, Nepaul, China, and Formosa, the examination of the skulls at once shows that the species are really distinct, and may be divided by the skull into two most distinct groups.

XVI.—*Descriptions of Species of Phytophaga received from Pulo Penang or its Neighbourhood.* By the Rev. HAMLET CLARK, M.A., F.L.S.

Subfam. Eumolpidæ.

Genus CORYNOEIDES.

Generi *Corinodi* (Hope, Marshall, "Corynodor. recensio," Linn. Soc. Journ. Zool. vol. viii. p. 25) valde affine. *Caput* verticale. *Oculi* pene circulares (vix oblongi) et ad latus haud sinuati sed excavati. *Antennæ* ut in genere *Corynode* positæ, sed valde elongatiores; in ♀, corporis dimidium longitudine superantes; in ♂, corporis longitudinem pene attingentes: in ♂ articulus 1<sup>mus</sup> globosus, 2<sup>dus</sup> brevis; ceteri elongati, subcylindrici, ad apices incrassati; in ♀ articuli breviores, et 7–11 compresso-latiusculi (haud ut in *Corynode* latissimi, et pene transversi, sed elongatiores), formam articulorum





Gray, John Edward. 1865. "XV.—On the species of Manatees (Manatus), and on the difficulty of distinguishing such species by Osteological characters." *The Annals and magazine of natural history; zoology, botany, and geology* 15, 130–139.

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