A Sexual Difference in the Skulls of Asiatic Rhinoceroses.

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There seems to be no convincing evidence of any marked difference in general size between the sexes of Asiatic rhinoceroses; and apparently the only external, secondary sexual character between them lies in the horns, which in the male typically have a bigger basal girth and are usually longer than in the female. But the greater girth is correlated as a rule with the greater width of the horn-area of the nasal bones and with its coarser tuberculation or granulation in the male. By the latter character in particular the sex of fully adult and old skulls, when unnotified by the collector or donor, can usually be determined with tolerable certainty.

Of the two-horned species (*Didermocerus sumatrensis*)* the British Museum has a number of sexed and unsexed skulls. In an old male skull (79.6.14.2) from near Mt. Ophir, 50 miles from Malacca, the nasal horn-area is exceedingly rough with close-set, coarse tuberculation and is 129 mm. at its widest part; and in an old male from Pahang (Hubback, 21.2.8.2) it is similarly tubercular and 125 mm. wide. From the data supplied by these two skulls it may be inferred that an old unsexed skull (Schreber, 94.9.24.1) from Siboga, S.W. Sumatra, resembling the one from Pahang in the roughness and width of the area, is also a male. Very different from these three is a young adult male skull (Peacock, 31.5.28.1) from Mogok, Upper Burma, with m^3 not sufficiently erupted to have come into use. This skull has reached its full length, which slightly exceeds that of the skull from Mt. Ophir, but its nasal horn-area is only 86 mm. wide and much less coarsely roughened. This might have been taken for a female skull were it not that Peacock, who shot the specimen, described it as a male. It is of interest for the evidence it supplies that the coarse tuberculation and width of the horn-area above described are acquired after the animal has reached its full size and has m^3 worn.

There are three old female skulls. The type of *niger* (72.12.31.1), from the Malay Peninsula, which is about as old as the skull from Siboga, has the horn-area much less coarsely roughened and only 109 mm. wide. In the very old type of *lasiotis* (1.1.22.1), from Chittagong, the roughness is very much the same as in the type of *niger*, but the nasals are wider, 119 mm. This skull, however, is noticeably larger in all its dimensions than the other skulls of *sumatrensis* of which the localities are known. A very old skull (21.2.8.4) from Pahang, as old apparently, judging from its teeth, as the type of *lasiotis* and older than the type of *niger*, has the area 106 mm. wide and more coarsely roughened, but not so coarsely as in the males from Mt. Ophir and Pahang. On the other hand, a young adult female (21.2.8.3) from Pahang, shot like the others from that locality by Hubback and only about one inch shorter in its condylobasal length than the very old female, has the nasal area smooth and only 76 mm. wide. This is a younger skull than the male from Mogok as attested by the retention of the milk premolars, by m^1 being only slightly worn and m^2 only half erupted; but it bears out in the case of the female the conclusion suggested by that skull regarding the late acquisition of the roughness and width of the horn-area in the male. A fully adult, but not old, skull from Pegu (Theobald), younger than the type of *niger*, has the nasals similarly

* In this species the area in oldish skulls supporting the posterior horn is coarsely tubercular; but in the other two species, which have no posterior horn, the corresponding area is comparatively quite smooth.

roughened and about the same width. It may be a ♀ or a ♂ in the ♀ stage of development of the horn-area.

In the Lesser one-horned Asiatic species (*Rhinoceros sondaicus*) the external difference between the sexes in horn-development is well marked, the horn in the ♂ being comparatively well developed, whereas in the ♀ it is very small or absent. But, rather surprisingly, the available material does not attest such a manifest difference between the skulls of the two sexes as is shown in *Didermocerus sumatrensis*.

The nasal bones of *Rh. sondaicus* differ considerably from those of *D. sumatrensis*. They are more elevated and convex above, the tuberculation is not so coarse and is better developed on the summit than marginally and, although the skull is bigger in condylobasal length and in occipital and zygomatic widths, the nasals are actually narrower.

An adult ♂ skull from the Sanderbans (76.3.30.1), with m^3 a little worn, stands apart from the rest in having the horn-area more elevated, more pointed and less evenly convex, more coarsely granular above and laterally, and noticeably wider, being 120 mm. or more, tolerably closely resembling in width and coarseness of its granulation the old ♀ type of *D. sumatrensis lasiotis* from Chittagong. An adult ♀, the type of *inermis*, from the same locality, according to Peters's figures (Mon. Ak. Wiss. Berlin, 1876, pl. 1*), has the nasals noticeably lower and more evenly rounded above, only very slightly roughened and 95 mm. wide. The sexual difference between these two skulls is exceptionally well marked. In the remaining available skulls it is not so manifest, there being considerable individual variation in the width and elevation of the nasals in skulls of which the sex is known and this makes the determination of the sex, when unrecorded, a difficult matter.

An unlocalised, unsexed, adult skull (51.11.10.11), with m^3 considerably worn, I infer to be a ♂ because the summit of the nasals is sawn off indicating the presence of a horn removed when the animal was killed. The nasals are 110 mm. wide. This skull comes nearest to the ♂ skull from the Sanderbans in the width of the nasals, but their height and granulation are unknown. They are also unknown in a ♂ skull from near Bantam, Java (Maxwell, 20.10.13.1), which has the horn attached. It is about the same age as the last and its nasals are 105 mm. wide The horn is also attached to another ♂ skull from Java (723, d.), younger than the last, m^3 being unworn, and the width of the nasals is 98 mm. A third ♂ skull from Java (Buma, 2.12.18.1), with m^3 only slightly worn and the facial sutures unfused, has the nasals only slightly elevated, nearly smooth and 98 mm. wide. A fully adult ♂ skull from the Malay Peninsula (Cantor, 79.11.21.178), with the teeth not quite so worn as in the skull from near Bantam in Java, has the nasals more elevated and rougher than in the last and 100 mm. wide. This skull, at least as old as the ♂ from the Sanderbans, differs markedly from it in the height, width and roughness of the nasals. An unsexed adult from Sumatra (17.12.29.7, 723 f), with m^3 unworn, I believe to be ♂ because the nasals are rough, although not quite to the same extent as in the older skull from the Malay Peninsula, and are about as elevated and nearly the same width, namely 103 mm., closely approaching in this last particular the older skull from near Bantam in Java, known to be ♂. For similar reasons I also regard as ♂ an unsexed, unlocalised skull (723 a), about the same age as those from the Malay Peninsula and from near Bantam, which has the nasals as rough as those of the former but more elevated and a little wider, 106 mm. An adult, unsexed skull from Cochin China (Boucard, 81.6.30.9), a little younger than the skull from the Malay Peninsula, is puzzling. Its nasals are more elevated and rougher but much narrower than in that skull, being only 86 mm. wide. This skull is provisionally

* Peters's figure of the skull of the calf of this ♀ shows that the nasals are relatively considerably wider and much higher, approaching in these respects the skull of the ♂, although quite smooth. Its dentition consisted of the four premolars of the milk set. Possibly the nasals indicate that it was a ♂.

regarded as ♂ on account of the elevation and coarseness of the tuberculation of the horn area.

There are in the British Museum only two skulls definitely and reliably marked ♀, a very old one from Perak (Vernay, 32.10.21.1) with the nasals low, smooth and 95 mm. wide, as in the skull from the Sanderbans; and a young one from Lower Tenasserim (Hubback, 21.5.15.1) with m^3 imbedded, m^2 hardly at all worn and pm^4 and pm^3 of the permanent dentition half erupted. In this the nasals are smooth but a little more elevated than in the old skull from Perak and a trifle wider, 101 mm. An unsexed fully adult skull from Java, figured by Peters (*op. cit.*, pl. 3), is about as old apparently as the ♂ skull from the Malay Peninsula and a little older than the ♀ skull from the Sanderbans. Its nasals are a little less elevated than in the latter but are practically smooth and only 85 mm. wide, judging from the figure. It is no doubt a ♀ skull.

From the data supplied by these skulls it seems that ♀ skulls in this species have the nasals smoother than ♂ skulls and on the average at least a little narrower; but there is complete intergradation between the two sexes in the latter respect as in elevation; and it may be noted that in the ♀ skulls the widest nasals are found in the young skull from Lower Tenasserim.

In the Greater one-horned species (*Rhinoceros unicornis*) the external difference between the sexes in the horns is not so pronounced as in *Rh. sondaicus*, owing to the presence in the ♀ of a horn which is almost as well developed as in the ♂, there being at most some not altogether convincing evidence that it is on the average narrower at the base in the ♀. But in the sculpturing, height and width of the nasal bones the sexual differences are so strongly emphasized that there is no difficulty in guessing the sex, when unrecorded, at least of old skulls. Incidentally, it may be added, the nasals are wider than in *Rh. sondaicus*, the ♂ skull of the latter from the Sanderbans being the only one which, with its exceptionally wide nasals, reaches those of ♀ skulls of *Rh. unicornis* in breadth. The sculpturing is also coarser; and in oldish ♂ skulls it approaches that of *D. sumatrensis* in being usually better developed marginally than above, although it is not so coarse as in the latter.

Four reliably sexed skulls illustrate the sexual differences above mentioned. An unlocalized, fully adult ♂ (Zool. Soc., 51.11.10.2)* and an adult, but younger ♂, 15 or 16 years old, from Nepal (Zool. Soc., R.C.S. Museum, 45.23) have the horn-area coarsely tubercular throughout and about 150 mm. wide. † A third ♂ from Nepal (Zool. Soc., R.C.S. Mus., 42.12), about 20 years old, has the area similarly tubercular, and 160 mm. wide. On the other hand, in an adult ♀ skull from Assam (Vanderbyl, 1.3.10.1) the area is comparatively finely tubercular above, smooth at the sides and much narrower, about 120 mm. wide.

The features of the horn-area of the ♂ skulls justify the inference that an unsexed, unlocalized, adult skull in the British Museum (722 d), with the area similarly tubercular and just about 150 mm. wide, is also ♂; and I do not doubt that an adult skull from Gauripore, Assam (Sir C. Russell, 72.12.30.1), with the area approximately as rough but only 137 mm. wide, is of the same sex. A young adult ♂ skull from Kuch Behar (The Maharajah, 3.2.13.1), from 1 to 2 inches shorter in condylobasal length than the foregoing and with m^3 not erupted, has the tuberculation of the nasals comparatively weak, just beginning to develop, and the area only 122 mm. wide. From this skull it may be inferred that ♂ skulls of this Rhinoceros resemble ♀ skulls, as attested by Vanderbyl's Assamese specimen, until they are almost full sized, as is the case in the other Asiatic species.

There are in the British Museum four unsexed adult skulls which I regard as ♀ on the evidence supplied by Vanderbyl's skull from Assam. In one labelled Assam (Sanderson, 84.1.22.1), the horn-area is only a little roughened

* I am indebted to Professor A. J. E. Cave, M.D., for the information that this skull belonged to the specimen dissected by Owen in 1851 of which the visceral anatomy was described in Trans. Zool. Soc. Lond. 4, 1862.

† This skull was described by me in Proc. Zool. Soc. Lond. 1945, p. 310.

above and about 120 mm. wide. A second from Nepal (Oldfield, 26.6.7.8) has the horn still attached to the nasal bones, but these are smooth at the sides and only 110 mm. wide*. A third, without locality, (722 f), has the summit of the area cut away, but what remains of it is much smoother than in ♂ skulls and 122 mm. wide. A fourth, which has neither locality nor number, is also only a little roughened above and 117 mm. wide.

The following two are of doubtful sex. A young skull from Nepal (Prince of Wales, 1883), with pm^4 of the milk dentition still retained and m^3 imbedded, has the horn-area smooth, 115 mm. wide and only moderately elevated. This I think is probably ♀; but a still younger one from Dacca in Bengal (Sanderson, 84.1.22.3), with all the premolars of the milk dentition retained and only m^1 erupted but unworn, I take to be ♂, because the horn-area, although smooth, is about as wide as in the last, but unusually elevated, at least to the same extent as in a very old, unlocalized skull figured by Blainville, which is no doubt a ♂.

* This skull was collected by Dr. Oldfield about the middle of the last century and presented by his widow in 1926. It is of special interest from its horn being indistinguishable in basal girth from that of ♂ ♂, despite the narrowness of the area to which it is attached.