

Note on the cranial and dental characters of a specimen of *Rhinoceros sondaicus* Desm. By H. H. FINLAYSON, Hon. Curator of Mammals, South Australian Museum.

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It has recently been pointed out by Dr. Harold J. Coolidge that a mounted specimen of a rhinoceros, which has been exhibited for many years in the South Australian Museum under the name "*Rhinoceros indicus*", but not hitherto critically examined, is in reality the Lesser One-Horned Rhinoceros, *R. sondaicus* Desm.

I am indebted to Mr. Vincent Haggard the present Director of the Zoological Gardens in Adelaide, for the information that the animal was purchased in Singapore in 1885, and that it lived in the Gardens until 1907, when its remains were acquired by the Museum. A search of contemporary newspapers discloses further, that the purchase was made in person by a former Director of the Gardens, Mr. R. E. Minchin, who, on his return, stated in the Adelaide press, that the animal was one of four rhinos, brought to Singapore just prior to his arrival there, by Malay pros from Borneo. The animal was then 18 months old and the price paid was £66. In later years, widely different versions both of its age on arrival and place of origin were published, but the above statement seems the most reliable. The Bornean occurrence of *R. sondaicus* is doubtful, but it would seem reasonably certain that the specimen here considered came from one of the Sunda Islands, and was therefore topotypical.

The mounted skin (South Australian Museum, Registered Number M.1570) which represents an adult male of somewhat stunted growth, yields the following approximate measurements. Total length from extremity of the upper lip to tail tip, following the dorsal contour, 10 ft. 9 ins. ; tail, 14 $\frac{3}{4}$  ins. ; height at shoulder, 4 ft. 5 $\frac{1}{2}$  ins. ; ear, 6 $\frac{1}{2}$  ins. ; horn, dorsal contour, 14 $\frac{1}{2}$  ins. ; the same, straightline distance from anterior margin to free extremity, 12 ins. The horn is strongly recurved and artificially truncated, the tip having been excised in life to prevent its threatened contact with the occiput.

In addition to the mounted skin, the skull and part of the skeleton have been preserved apart, and in seeking to support the evidence of identity derived from the obvious external characters of the anterior shoulder fold, dermal texture, prehensile specialization of the upper lip, dimensions, etc., I have considered the characters of the skull.

The late R. I. Pocock (1944–1946) in a series of informative papers on the cranial characters and dentition of Asiatic rhinoceroses has stated that many of these features in *R. sondaicus* and *R. unicornis* which were formerly regarded as highly specific, are subject to individual variation in a marked degree. One result of this has been to throw doubt on the validity of some of the differential characters selected by Flower (1876) to distinguish these two species, and also upon some others advanced (or re-introduced) by Osborne (1898) and much later by Colbert (1942). Flower's conclusions were stated with great clarity and were based upon an abundance of cranial material, which owing to air raid damage, is not likely to be again equalled, and it is difficult to escape the feeling that part at least of the divergence which is to be found in later accounts, is due to difference in the use of descriptive terms, rather than of facts. In the case of the skull now under consideration, whether through mere coincidence or not, Flower's data, unsupported by later findings, would alone have been adequate to decisively confirm the identity of the animal with *R. sondaicus*.

A restatement of the cranial characters of recent rhinoceroses based entirely upon *feral* material would seem to be desirable, particularly now that archaeologists are increasingly inclined to seize upon structural minutiae in this

group of animals, in their excursions into postpleistocene history. Meantime in the present state of knowledge, data on additional material, even though derived from captive specimens, may not be without value.

*Cranial characters.* In its sutural condition, rugosity of temporal region, and dentition, the skull presents an appearance of advanced age somewhat at variance with the 23 years of the animal, which probably represents no more than one-half of its normal life span. It appears to be the smallest adult skull of this species yet measured, several of its dimensions falling below the minima for *sondaicus* and well within the limits of *sumatrensis* as recorded. From the latter, however, it is distinguished by the fact that (1) the postglenoid and post-tympanic processes are massively fused below the meatus over a vertical extent of 40 mm., (2) the occipital plane slopes forward from condyles to lamda, (3) the orbito-aural length (260 mm.) exceeds the orbito-nasal (217 mm.) and less reliably perhaps, by (4) the absence of the posterior horn boss, and (5) retention of incisors.

Examination of this skull has been facilitated by comparisons with the skull of an adult female *R. unicornis* Linn. (S.A.M. Reg. Numb. M1561) of unknown provenance but impeccable normality and in the sequel this individual is invariably the "*unicornis*" referred to.

The zygomatic outline as seen from above differs from the figures available in a marked infra-orbital expansion, so that the general outline is much less triangular than for instance the figure of Carter and Hill's (1942). The posterior angle of the arch is also more obtuse than in this figure and does not differ much from the *unicornis* skull. Pocock (1945) regards this feature as highly variable. A lacrymal process is developed.

The horn boss is in substantial agreement with the figures and statements of Carter and Hill (1942), and Colbert (*loc. cit.*) having a rather sharply angular or peaked profile quite different from the smoothly rounded boss in *unicornis*. The surface of the boss is coarsely rugose as is usual in males, and on its anterior slope the nasals are incompletely fused to their extremity. In the *unicornis* skull which is probably younger, fusion is complete. Pocock (1945, b) states that the relative development of the boss is variable in both species, and that it may sometimes be low and rounded in *sondaicus*. It does not appear from his summary, however, that it is ever sharp and peaked in *unicornis*.

The post-palatal margin has a median process (incomplete) projecting into the fossa, and the free extremities of the pterygoids are produced into slender hamulate processes; both features being absent from the *unicornis* skull.

In the vomer and its relation to the pterygoids and basisphenoid, the two skulls are in fairly close agreement with the respective conditions illustrated by Flower (1876) for the two species, though some amplification is called for. In the *sondaicus* skull the fragile lamelliform vomer is incomplete and falls short of the posterior foramina of the alisphenoid canals by a full 50 mm. The entire floor of the basisphenoid from its junction with the basi-occipital to the free end of the vomer, a distance of 100 mm., is flat and of nearly equal width. In the *unicornis* skull on the other hand the floor bulges ventrally between these foramina and is markedly constricted from side to side. The sutures are too obscure to furnish a guide here, but it would appear that either a posterior extension of the vomer or an ingrowth of the pterygoids meeting in the mid-line, has roofed over a small canal between these elements and the basisphenoid; the posterior cavity of this canal is plainly visible in a superior or posterior view of this part of the skull. Pocock (1945, a) opines that the condition of the vomer illustrated by Flower for *unicornis* must have been an "individual peculiarity", but the evidence of the skull now discussed shows that this is not so. The two conditions of the vomer and its relation to surrounding parts shown by the present skulls are strikingly different and it is difficult to believe that the gap between them could ever be bridged by any normal age changes which they might still have undergone. As "individual"

variations they are still more incredible. Nevertheless, Pocock (1945, *a* fig. 1A) shows that a fused condition of the vomer with an emarginate free extremity, does occur, if rarely, in *sondaicus*, but whether this is comparable to the thickened "canalized" condition just described for *unicornis* is doubtful.

The occipital surfaces in the two skulls show breadth : height ratios in substantial agreement with Pocock's values ; that for the *sondaicus* skull being 1 : 1.14 and for the *unicornis* 1 : 1.43. The marginal outlines of these surfaces are different, *sondaicus* showing a low even arch while in the *unicornis* the curve becomes suddenly steeper at the halfway point and is surmounted by a nearly flat top at the vertex.

The mandible is extremely massive and contributes  $7\frac{1}{4}$  lb. to the total  $15\frac{3}{4}$  lb. weight of the completed cranium. The ratio of length to height is as 1 : 0.45 and the coronoid process is directed markedly forwards. In the *unicornis* skull the ratio is 1 : 0.50 and the coronoid process is upright.

**Dentition.**—The full dentition is represented except for  $P^1$  of the left maxilla and  $P_1$  of both sides of the mandible. The somewhat incisiform spatulate lower "canines" are excellently preserved and still show large smooth enamel areas. The inner edges are sharp, but the outer are thick and round and they terminate in blunt round points. The "canines" in the *unicornis* skull are very different, the enamel areas being much reduced and the free margins ragged and irregular and in some places razor sharp.

The upper cheek teeth of the *sondaicus* skull are at an advanced stage of wear. Both median and posterior fossae are all much reduced in area and in  $P^2$ – $M^1$ , are completely isolated from the marginal enamel, and almost so in  $M^2$ . In  $M^3$  alone is the median fossa open posteriorly. The attrition of the crowns brings into exaggerated prominence the outer wall of the ectoloph and thereby illustrates one of the earliest of the differential characters between the two species to be observed—that is, the greater prominence in *sondaicus* of the accessory column supporting the antero-buccal angle of the cheek teeth. The value of this was re-affirmed as lately as 1942 by Colbert (*loc. cit.*), but Pocock in disputing its identity as a parastyle developed from the cingulum, also doubted its constancy. In  $P^3$ – $M^2$  of both of the present skulls the antero-buccal third of the tooth wall is markedly bilobed but in *sondaicus* the posterior of the two is much the larger in cross-section and juts out from the general level of the buccal margin, justifying the old term, buttress. In the corresponding teeth of the *unicornis* skull, the lobes are subequal and the general buccal outline is less disturbed. There are, of course, corresponding differences in the shape of the ectoloph in the same region, but in their postero-buccal course the contrast is less noticeable.

The crotchet is well developed in most of the cheek teeth, though much blunted by wear. It is duplicated on  $P^4$ . The crista is very faintly indicated on the left  $M^2$ . The accessory median fossette is quite absent. In the *unicornis* skull the crotchet is present on all the cheek teeth from  $P^3$ – $M^3$ , either free or fused with a crista ; in  $P^4$  it is represented by three spurs jutting into the median fossa from the metaloph. A free crista is present on  $M^2$  and faintly indicated on  $M^3$ , where it is developed from the protoloph. The accessory fossette is present in completed form on  $P^2$ ,  $P^3$  and  $M^1$  ; in  $M^2$  and  $M^3$  the fusion of crista and crotchet is imminent.

**Dimensions.**—The following figures give the dimensions in mm. in turn of the *sondaicus* and *unicornis* skull and teeth discussed in the foregoing account, arranged to parallel those of Carter and Hill. In the *sondaicus* skull the premaxillae are detached and measurements involving this element as a terminal are approximate only. The dimensions of the cheek teeth represent the greatest antero-posterior length multiplied by the greatest transverse width of crown.

Condylonasal length 546, 675 ; occipitonasal length 437, 602 ; condylobasal length 523 ca., 663 ; basal length 503 ca., 638 ; palatal length 255 ca., 310 ;

breadth of horn boss 108, 125 ; zygomatic breadth 318, 376 ; interorbital breadth 203, 260 ; breadth across post-orbital processes 181, 222 ; temporal constriction 87, 117 ; mastoid breadth 260, 285 ; height of occiput (basion to vertex) 192, 233 ; maxillary alveoli ( $P^1 M^3$ ) 217, 267. Greatest length of mandible 463, 563. Mandibular alveoli  $P^3 M^3$  194, 231 ;

$P^1$  ( $19.3 \times 15.8$ ), ( $24.0 \times 21.5$ ) ;  
 $P^2$  ( $26.8 \times 34.8$ ), ( $36.0 \times 46.0$ ) ;  $P^3$  ( $37.2 \times 46.7$ ), ( $42.0 \times 60.0$ ) ;  
 $P^4$  ( $40.0 \times 52.8$ ), ( $47.5 \times 65.0$ ) ;  $M^1$  ( $43.3 \times 54.1$ ), ( $50.0 \times 64.5$ ) ;  
 $M^2$  ( $44.5 \times 49.0$ ), ( $58.5 \times 69.0$ ) ;  $M^3$  ( $36.0 \times 42.8$ ), ( $51.0 \times 61.5$ ) ;  
 $P_2$  ( $23.2 \times 16.2$ ), ( $31.0 \times 22.5$ ) ;  $P_3$  ( $34.3 \times 22.6$ ), ( $40.0 \times 28.5$ ) ;  
 $P_4$  ( $39.3 \times 23.7$ ), ( $42.5 \times 27.0$ ) ;  $M_1$  ( $38.5 \times 26.0$ ), ( $43.0 \times 27.5$ ) ;  
 $M_2$  ( $39.7 \times 27.0$ ), ( $53.0 \times 30.0$ ) ;  $M_3$  ( $41.0 \times 28.1$ ), ( $57.0 \times 29.0$ ).

Upper central incisor ( $49.7 \times 12.8$ ), ( $55.0 \times 20.0$ ).

Upper lateral incisor ( $17.0 \times 10.7$ ), (—).

Lower central incisor (diameter of enamel cap) 7.0, (—).

Canine (L  $\times$  B of enamel area) ( $52.4 \times 35.4$ ), (—).

Since Barbour and Allen (1932) published their useful inventory of the museum specimens of *R. sondaicus* the number recorded has increased considerably. Including the specimens here noticed, the tally would now appear to be :—Mounted skins 20, of which 6 are males ; mounted heads 6, of which 4 are males ; 44 skulls ; 21 skeletons.

#### SUMMARY.

A hitherto unexamined specimen of *Rhinoceros sondaicus* Desm. in the South Australian Museum is recorded. Attention is drawn to uncertainty in the diagnostic value of some cranial and dental characters formerly used in separating *sondaicus* and *unicornis*, following upon the recent work of Pocock.

The skull of the present specimen is compared with a skull of *unicornis*, and on the whole found to accord with the earlier statements of Flower, etc. Dimensions of the two skulls are quoted and a revised inventory of museum specimens of *sondaicus* given.

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