PREHISTORIC AND FOSSIL RHINOCEROSES FROM THE MALAY ARCHIPELAGO AND INDIA

by

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With plates I—X and 1 textfigure

.... toutes mes déterminations d'espèces ont été faites sur les os eux-mêmes, ou sur de bonnes figures; il s'en faut au contraire beaucoup que j'aie observé par moi-même tous les lieux où ces os ont été découverts.

CUVIER, G., Discours sur les révolutions de la surface du globe, 3rd ed., 1825, p. 114/115.

INTRODUCTION

The present paper contains descriptions of the subfossil remains of rhinoceroses collected by Eug. Dubois in cave deposits in Central Sumatra during the years 1888-1890, as well as those of the fossil rhinoceros remains which he afterwards collected in Java and in the Siwaliks of India.

The prehistoric remains from Sumatra were never specifically identified by Dubois; they will be found mentioned under the heads *Dicerorhinus sumatrensis* (Fischer) and *Rhinoceros sondaïcus* Desmarest. The finding of the latter species in the Sumatran cave fauna is interesting, as even up to recent years there has been some doubt if *sondaïcus* is an inhabitant of Sumatra.

In 1890 Dubois commenced his paleontological researches in Java, and he was the first to record the rhinoceros in the fossil state from that island. As early as 1891 he published a preliminary list of the genera and species identified by him, among which "*Rhinoceros javanicus,* Cuv." is mentioned (Dubois, 1891, p. 94). The discovery of a new fossil species of *Rhinoceros,* from Kebon Doeren, was announced in the same year (Anonymus, 1891, p. 11). The two fossil Javanese species were mentioned again in 1907; it is stated that the first, though closely allied to the living Javanese species, still somewhat resembles *Rh. sivalensis* Falc. et Cautl. (from the Upper Siwaliks), whereas the second species belongs to the *unicornis* group (Dubois, 1907, p. 454). The next year the two species were shortly diagnosed and named *Rhinoceros sivasondaicus,* and *Rhinoceros kendengindicus* respectively (Dubois, 1908, p. 1258/59). The fossil vertebrate fauna of Java was then referred to the upper Pliocene (l.c., p. 1270); originally (1891) it was regarded as of Pleistocene age.

Stremme (1911) describes a fossil calvarium from Trinil (Java) as *Rh. sivasondaicus* Dubois; Soergel (1913) mentions *sivasondaicus* from some localities in the Kendeng beds, but neither describes nor figures his specimens. Specifically undetermined remains of rhinoceroses are recorded from Limbangan (Java) by Stehlin (1925). Van der Maarel (1932) shows that the calvarium described from Trinil by Stremme is identical with *sondaïcus*; a well preserved calvarium from Bondol (Java) is identified by him as "*Rhinoceros sondaicus* Desm. *fossilis*".

The fossil Mammals from Java are no more considered to form a unit fauna; Von Koenigswald (1935a) even distinguishes six Mammalian faunae, among which the rhinoceroses would occur as follows:

fauna	supposed age			author
Sampoeng	Holocene		*Rhinoceros sondaïcus* Desmarest	Dammerman (1934)
Ngandong	upper	Pleistocene		Von Koenigswald (1934)
Trinil	middle			
Djetis	lower		*Rh.* (cf.) *sondaïcus* ? *Coelodonta*	
Kali Glagah	upper	Pliocene		
Tji Djoelang	middle			
Tji Sande	lower		*Aceratherium boschi* v. Koen.	Von Koenigswald (1933)

The examination of the type specimens of *Rh. sivasondaicus* Dubois and of *Rh. kendengindicus* Dubois has convinced me that:

1. *Rhinoceros sivasondaicus* Dubois is identical with *Rh. sondaïcus* Desm.

2. *Rhinoceros kendengindicus* Dubois is a separate and good species, more closely related to *Rh. unicornis* L. than to any other form known at present,

but differing in certain primitive and progressive characters which renders it impossible to derive the one from the other.

In March 1895 Dubois made a trip to India, and collected Mammalian fossils in the vicinity of Haripoor on the Somb Nuddy, Sirmur State, Punjab. Nothing has yet been published on this part of the Dubois collection. It contains a mandible of *Aceratherium perimense* Falc. et Cautl., which is described at the end of this paper.

For the permission to examine the Cosijn collection, which originates from deposits with Djetis fauna, N. of Djetis and Perning (Java) I am indebted to Prof. Dr. B. G. Escher and Prof. Dr. I. M. van der Vlerk at Leiden. To this collection belong a few teeth and bones of *Rhinoceros sondaïcus* Desmarest.

Next to the recent material of the three species of Asiatic rhinoceroses in the Leiden Museum I also had the opportunity to examine that in the Zoological Museum at Amsterdam, the Zoological Laboratory of the University at Utrecht, and in the "Museum van het Onderwijs" at The Hague, for which I am indebted to Prof. Dr. L. F. de Beaufort (Amsterdam), Prof. Dr. Chr. P. Raven (Utrecht), and Dr. W. E. van Wijk (The Hague) respectively.

All measurements in the present paper are given in mm, those of the teeth are taken at the base of the crown, except otherwise stated.

The material of the Dubois Collection in the following pages is referred to as "Coll. Dub.".

TERMINOLOGY OF THE UPPER TEETH OF RHINOCEROS

The terminology for the upper molars adopted in the present paper is shown in the table on p. 4/5 and is mainly derived from Osborn. The latter author several times gave a table showing the parallel between his terms and those of previous authors (Osborn, 1898, p. 104; 1907, p. 76; 1929, p. 263). Osborn's tables contain several omissions and errors, which have been corrected by subsequent authors. Osborn adopted the nomenclature for the upper premolar cusps as proposed by Scott (1892, p. 417) whose researches on the cusp addition in the premolars were not in accord with the Cope-Osborn theory of trituberculy. According to the latter theory the antero-internal cusp of the upper molars is the primary cusp, while Scott found the main cusp of the premolars to be the antero-external. Therefore he states: "The premolars have a quite different story, and ... even when these teeth have become completely molariform, the elements which correspond in function and position to those of the molars, are not homologous with them, the key to these homologies being given by the

Terminology of the

Present paper	Lydekker (1876, 1881, 1884)	Boyd Dawkins (1867) Foote (1874)	Falconer (1868) Busk (1869)
protoloph	anterior collis	anterior collis	anterior barrel or colline
metaloph	median collis [1]), posterior collis	median collis	hind, posterior, barrel or colline
ectoloph	outer wall	external lamina	outer, longitudinal, ridge or colline
protocone fold	vertical groove on anterior side of anterior collis	—	—
antecrochet	antecrochet	—	anterior crochet
crochet	crochet	posterior combing plate or process	crochet
crista	combing plate	anterior combing plate or process	combing plate, crista
medisinus [2])	median valley	anterior valley	transverse, middle, valley; median sinus
medifossette [3])	accessory fossette	accessory valley	—
postsinus (= postfossette [4])	posterior valley	posterior valley	posterior fossette or valley or sinus
cingulum	cingulum	guard [5])	basal bourrelet or cingulum; vallum
parastyle	first costa antero-external angle buttress in part [6])	first costa	—
parastyle fold	—	—	vertical groove of the anterior outer angle
paracone style	second, anterior, costa, buttress in part [6])	second costa	anterior costa
metacone style	posterior costa	third costa	—
metastyle	postero-external angle	fourth costa	hinder border of dorsum

1) In Lydekker's paper of 1876 the term median collis is used for the metaloph with one exception (l.c., p. 24 line 1 from top) where it is named posterior collis, the term applied to the metaloph in Lydekker's subsequent papers.

2) Osborn (1898, p. 104) regards his medisinus as identical with the anterior valley of Boyd Dawkins, Foote, Busk and Lydekker. This is true as far as the first and second of these authors is concerned; the median (middle) valley of Falconer, Busk and Lydekker is identical with Osborn's medisinus. Busk (1869, p. 410) and Lydekker (1881, p. 8) use the term anterior valley or sinus for the depression between the protoloph and the anterior cingulum. Later Osborn (1907, p. 76) states the presinus to be identical with the anterior valley of the English authors, which Van der Maarel (1932, p. 81) believes to be correct. Afterwards, however, Osborn (1929, p. 263) returns to his opinion of 1898. It does not quite appear from the text which part of the tooth Osborn meant with the presinus. I make no use of his term, neither of the term prefossette (see Osborn, 1898, p. 107, fig. 19).

3) The medifossette is stated by Osborn (1898, p. 111) to be formed by the junction of crista and crochet, and is, therefore, nothing else but the "accessory

upper teeth of rhinoceros

Owen (1840—45, 1870)	Cuvier (1822) Blainville (1846) Duvernoy (1853)	Koken (1885)	Toula (1906)
anterior lobe or ridge	seconde colline colline antérieure	Vorderhügel	Vorderer Lappen
—	troisième colline colline postérieure	Hinterhügel	Hinterer Lappen
longitudinal ridge	première colline, colline externe	Aussenwand	Aussenlappen
—	—	—	—
—	—	Antistelidion	Gegensporn
promontory	crochet, cornet, de la colline postérieure	Stelidion	Sporn
—	cornet pariétal	Parastelidion	Kammfalte
principal, chief, valley; chief fold	vallon oblique	Hauptthal Mittelthal	Quertal
—	fossette, moyenne, mediane, externe	—	Mittlere Grube
second valley posterior fold	fossette, échancrure, postérieure	Hinteres Thal	Hintere Grube
basal ridge cingulum	bourrelet	Cingulum	Wulst
—	—	Vorderecke	Erste Rippe
—	—	—	Vordere Aussenfalte
—	seconde côte externe	Zweite Rippe	Zweite Rippe
—	—	—	—
—	—	—	—

fossette" (cf. Lydekker, 1881, p. 8). Lydekker, however, is not always consequent in his use of the term accessory fossette. Sometimes he indicates by it the labial part of the medisinus cut off by the crochet when it extends completely across the medisinus (Lydekker, 1881, p. 19 line 19 from top (on line 15 from top the term is used in its proper sense), 33, 43 and 44 line 3 from bottom).

4) Osborn (1898, p. 104, etc.) thought his term postfossette to have no synonym in the English terminology. But as appears at once from the comparison of his fig. 16 (l.c., p. 105, "illustrating the former system of nomenclature") and fig. 19 (l.c., p. 107) the postfossette is the "posterior valley", and thus synonymous with his postsinus, as recognized by, e.g., Toula (1906, p. 4) and Van der Maarel (1932, p. 80/81).

5) Dawkins and Foote indicate a part of the cingulum, viz., the posterior border of the postsinus as "posterior collis". The latter term had been applied to the metaloph by Lydekker since 1881 (see footnote 1).

6) The buttress consists of the parastyle and the paracone style (see Lydekker, 1876, p. 37; 1881, p. 33 line 24 from top, p. 35 line 14 from top; 1886b, p. 41).

position of the protocone" (l.c., p. 412). The correct terminology for the various elements of the rhinoceros upper premolar, following Scott, is shown in a diagram by Van der Maarel (1932, p. 79, fig. 15), besides the common Osbornian terminology for the upper molar. I cannot see reason, however, to use a terminology for the premolars different from that for the molars, for strong evidence has been brought forward against the identification of the antero-internal cusp of the upper molars (protocone) as the primary cusp and in favour of the latter being the antero-external (paracone), as in the premolars and milk premolars (see Gregory, 1916, p. 246). Osborn himself finally also adopted this modified view [1]). This being the state of affairs, Scott's nomenclature has become superfluous (cf. also Scott, l.c., p. 442). Therefore I use a uniform terminology for the upper molars, premolars and milk premolars throughout.

ON THE RECENT OCCURRENCE OF RHINOCEROS SONDAÏCUS DESMAREST IN SUMATRA

The name *Rhinoceros sondaïcus* was first applied by Desmarest (1822, p. 399 no. 627), who gives measurements and a description of a young individual, which is stated (l.c., p. 400) to come from Sumatra. This locality record, however, seems to be inexact, for in the same year Cuvier (1822b, p. 384) and subsequently again Desmarest (1827, p. 362) mention the same specimen as originating from Java.

In the 3rd edition of his work: "The history of Sumatra" Marsden (1811, p. 116) states: "The rhinoceros, *badak,* both that with a single horn and the double horned species, are natives of these woods". Raffles (1821, p. 269) remarks that the one horned rhinoceros of India (*Rh. unicornis* L.) is not known to the natives of the interior of Sumatra, but that there are stories about an animal called "tennu" by the natives, which would closely resemble the common Sumatran species except that it has only one horn and a narrow whitish belt encircling the body. The latter character evidently does not point to a rhino but to the tapir, a seemingly puzzling form which previously even had given rise to statements as to the occurrence of the hippopotamus in Sumatra [2]). Nevertheless we thus

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1) "... subsequent research by Wortman, Gidley, Gregory and others has proved both Cope and myself mistaken as to the identification of the primary reptilian cone in the upper jaw, which proves to be *paracone* of my nomenclature rather than *protocone*" (Osborn, 1931, p. 582).

2) The hippopotamus is mentioned as occurring in Sumatra by Marsden (1783, p. 93; 1811, p. 116) on the evidence of a drawing by Whalfeldt, an officer who in 1772 had met with it at the mouth of one of the southern rivers. "Of its general resemblance to that well known animal there could be no doubt..." (Marsden, 1811 p. 117). Horsfield (1821, in the description of *Tapirus "malayanus"*), however, states that the drawing proves the animal to be the tapir.

have two, though both a little doubtful, records of the existence of a one horned rhinoceros in Sumatra prior to the type description of *Rhinoceros sondaïcus* Desmarest.

In his useless attempt to split up the recent Asiatic species of rhinoceros Gray (1867, p. 1015, figs. 3-4; 1869, p. 307, figs. 36-37) refers to *Rhinoceros "floweri"* a skull which was presented to the Museum of the Royal College of Surgeons by Raffles, together with Sumatran specimens. Gray (1867, p. 1018; 1869, p. 310) had little doubt that the skull belonged to Raffles's "tennu". A skeleton in the British Museum received from the Leiden Museum through Frank as "*R. sumatranus*, from Sumatra" was identified as *sondaïcus* by Gray (1867, p. 1009; 1869, p. 301) "so that there must have been some mistake in the name and habitat; perhaps the wrong skeleton was sent". Flower (1876, p. 450) re-identified the skull of *Rhinoceros floweri* Gray as "a very characteristic specimen of *R. sondaicus*" and could see no reason to doubt the correctness of Frank's statement as to the locality of the skeleton in the British Museum referred to by Gray. Previously Busk (1869) described and figured the subfossil germs of a pair of M^2 from Sarawak, Borneo, and pointed out some characters by which they would agree with *sondaïcus* and differ from *sumatrensis*. He mentions also (l.c., p. 415/6) that Wallace showed him a pair of (recent) M^2 from Sumatra "which present indubitably all the characters of the tooth in question in *R. sondaicus*". The latter molars were presented by Wallace to the Museum of the Royal College of Surgeons and are mentioned by Flower and Garson (1884, p. 420, no. 2139). Busk's identification will be discussed on p. 9/10.

After Flower's much cited paper of 1876 *Rhinoceros sondaïcus* Desm. is mentioned without comment as occurring in Sumatra by Flower and Garson (1884, p. 418); Sterndale (1884, p. 410); Blanford (1888-91, p. 475); Flower and Lydekker (1891, p. 405); Sclater (1891, p. 203); Lydekker (1894, p. 470); Sclater and Sclater (1899, p. 288), etc.

Neumann (1885, p. 128) states that both the single horned and the two horned rhinoceros are known from the Paneh river basin in Sumatra. Hagen (1890, p. 105) mentions that the natives of Deli (E. Sumatra) distinguish two species of *Rhinoceros*, viz., a large "Bahdăk krbo" which is rather peaceful and quiet, and a smaller ("Bahdăk tingīling") which is savage and offensive. These statements point to *sumatrensis* and *sondaïcus* (Hazewinkel, 1933, pp. 103-104; Heynsius-Viruly and Van Heurn, 1935, p. 41; Van Heurn, 1935, pp. 15-16). The attributes krbo and tingiling refer to the structure of the skin, which in the latter species resembles to that of the "tenggiling" (pangolin) in having small angular scaly discs, and in the former species is more smooth, like that of the "karbau" (buffalo).

In 1894 Jentink wrote: "The material in the Musea teaches that at present we know with absolute certainty that the Rhinoceroses are distributed over the East-Indian-islands as follows: *Rh. sondaicus* over Java and *Rh. sumatrensis* over Sumatra and Borneo" (Jentink, 1894, p. 233). Some years earlier the same author had published the osteological catalogue of the Leiden Museum. In this catalogue he mentions three skeletons and three skulls of rhinoceroses from Sumatra, which all are identified as "*Ceratorhinus sumatrensis* Cuvier" (Jentink, 1887, p. 167). Among this material, however, two skulls belong to *Rhinoceros sondaïcus* Desm. This seems to have been observed first in 1902 by Toula, who paid a visit to the Leiden Museum to study recent material of *sumatrensis* for comparison with fossil rhinoceros remains from Hundsheim (Germany). Toula (1902, p. 16) gives a list of the specimens of rhinoceros from Sumatra in the Leiden Museum and a figure of the upper toothrow of each of the six Leiden specimens (l.c., figs. 12-16 and 19), two of which he correctly identified as *Rhinoceros sondaïcus* Desm. The two *sondaïcus* skulls from Sumatra in the Leiden Museum are that of an adult female from Tandjoeng Morawa, Deli, presented by Hagen in 1883 1) and that of a young individual still in the possession of the milk dentition, presented by Reinwardt 2). Apparently Toula was not interested in the distribution of the recent species or regarded it as already definitely settled. He did not especially emphasize his interesting find of two *sondaïcus* skulls from Sumatra in the Leiden Museum 3), so that unfortunately this fact has escaped the notice of subsequent authors on this subject up to now.

Other positive evidence of the occurrence of *Rhinoceros sondaïcus* Desm. in Sumatra is given by Volz (1912), who figures (l.c., p. 373 fig. 101) the head of a female of *sondaïcus,* shot by him at the northern slope of the Goudberg in Atjeh (N. Sumatra). We may pass the remarks of Koningsberger (1902, p. 59), Lekkerkerker (1916, p. 109), Robinson and Kloss (1923, p. 317), Dammerman in De Beaufort (1926, p. 60) and Kloss (1927,

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1) This skull is mentioned as d by Jentink (1887, p. 167), figured as d in Toula (1902, p. 20 fig. 12, cf. p. 17) but the measurements are given as c in the table (l.c., opposite p. 10).

2) This skull is mentioned as e by Jentink (1887, p. 167), figured as c in Toula (1902, p. 20 fig. 13, cf. p. 17) who gives the measurements as d in the table (l.c., opposite p. 10).

3) Van der Maarel (1932, tables K-O no. 14) partly copied the measurements of Hagen's adult female skull from Deli as given by Toula (1902, c in table opposite p. 10), because he could not find this specimen in the Leiden Museum. That skull, however, is mentioned as no. 3 in the tables K-O of Van der Maarel, the occiput is represented in his fig. 12 on p. 73. Evidently the reason why Van der Maarel was

p. 207) all stating *sondaïcus* as living in Sumatra, and come now to the evidence of the occurrence of *sondaïcus* in S. Sumatra (still doubted at by Volz) as given by Hazewinkel. He shot his first specimen of *sondaïcus* in August 1925 and got six more within a year, spread over a large part of S. Sumatra. Vageler (1927) wrote an enthusiastic account of Hazewinkel's discovery and states the single horned Sumatran form to be different from the Javan species; an opinion which turned out to be incorrect. De Beaufort (1928, p. 44) records a complete female skeleton of *sondaïcus*, from an animal shot by Kreth 250 km S.W. of Palembang (Sumatra), preserved in the Zoological Museum at Amsterdam. Of his successful huntings Hazewinkel gave account in several popular writings (Hazewinkel, 1932, 1933).

ON THE DISTINGUISHING DENTAL CHARACTERS OF DICERORHINUS SUMATRENSIS (FISCHER) AND RHINOCEROS SONDAÏCUS DESMAREST.

The molars of *Dicerorhinus sumatrensis* (Fischer) and *Rhinoceros sondaïcus* Desmarest are so remarkably alike that only a few authors did succeed in detecting differences between them. Busk (1869, p. 413) mentions some structural differences between the M^2 of *sumatrensis* and that of *sondaïcus*. He states first that in *sumatrensis* the crochet springs at a right angle or even less from the metaloph, whereas in *sondaïcus* the crochet is given off at an obtuse angle. This difference, however, does not hold in all cases, for in *sondaïcus* the crochet may stand almost at right angles to the metaloph (Leiden Museum, reg. no. 5688). On the other hand, in *sumatrensis* the crochet may form a larger than right angle with the metaloph. Busk (l.c.) states further that in *sondaïcus* the posterior cingulum has an emargination and never a denticle, whereas in *sumatrensis* the posterior cingulum has a more or less crenate edge and presents a very distinct and constant denticle. The material at hand again proves

not aware of having the very specimen in his hands is that he took some measurements in another way than Toula. When we compare no. 3 and no. 14 in the table K of Van der Maarel the only noticeable differences are those of the figures given for the length of the cranium (from tip of nasals to posterior surface of occipital condyles; measurement no. 1 both of Toula and Van der Maarel) and for the length from the posterior border of M^3 to posterior surface of occipital condyles (measurement no. 24 of Toula, and 20 of Van der Maarel). These differences are easily explained, for Toula, as appears from his figure (Toula, 1902, p. 12 fig. 4; no. 27 in this figure must be no. 1) measured the horizontal projections of these distances, which are 590 mm and 230 mm respectively, whilst Van der Maarel took the direct distance and consequently got greater figures (641 mm and 256 mm).

Busk's statement to be not quite correct. The shape of the posterior cingulum varies considerably within the species. In *sumatrensis* the tubercle on the posterior cingulum may be incipient (Leiden Museum, cat. b) or even totally absent (Amsterdam Museum, no. 515); in these specimens the cingulum is exactly shaped as it is sometimes in *sondaïcus* (Leiden Museum, cat. e and reg. no. 5688), presenting a more or less crenulated edge with a V-shaped incision in the middle. The latter may, however (Amsterdam Museum, nos. 511 and 512) be almost absent in *sondaïcus*. A distinct tubercle, as usual in *sumatrensis*, indeed never develops in *sondaïcus*, in which species the posterior cingulum may be emarginated without crenulations. The third difference mentioned by Busk (l.c.) is of little value too. He states that in *sondaïcus* the transverse diameter is greater as compared with the longitudinal diameter of the crown than in *sumatrensis*, in which latter species the longitudinal exceeds the transverse diameter. Taking the greatest length of the outer surface (only possible in unworn or slightly worn specimens) as compared with the antero-transverse diameter at the base, the difference is in most cases, but not in all, of some value. In *sumatrensis* I found the anterior breadth to be equal to the greatest length of the outer surface with one exception (Leiden Museum, cat. c) in which the former measurement is 3 mm greater than the latter. In *sondaïcus* I found the anterior breadth to be from 2 to 7 mm greater than the greatest length of the outer surface. As the latter measurement is not convenient because it cannot be taken on well worn molars, the antero-posterior diameters of the teeth mentioned in my tables are always taken at the base of the crown. In M^3 the antero-posterior diameter is taken at the inside of the molar, in the other teeth at the outside.

Thus I conclude that the subfossil molars from Borneo described and figured by Busk (1869, figs. 1-4) do not necessarily belong to *sondaïcus*. On the anterior aspect a vertical groove is to be seen, the protocone fold, characteristic of *sumatrensis* (see below). The teeth, therefore, must be referred to *sumatrensis* rather than to *sondaïcus*; *sumatrensis* is also the species which, unlike *sondaïcus*, is certainly known to exist in the recent state in Borneo as well. Very probably the same remark applies too to the molars from a depth of 20 m in a cavern deposit in Sarawak (Borneo), mentioned under the heading *Rhinoceros sondaicus* by Lydekker (1886a, p. 129). Dr. A. T. Hopwood of the British Museum kindly informed me that the latter specimens have been mislaid and cannot be found at present. It is significant that the bones found in association with the teeth have been referred to *sumatrensis* (cf. Banks, 1931, p. 21, and Loch, 1937, p. 145).

The breadth measurements in many cases suffice to distinguish between *sondaïcus* and *sumatrensis*. In the latter species the postero-transverse diameter is greater in relation to the antero-transverse than in *sondaïcus*. The species overlap each other, however, to a certain extent.

Flower (1876, p. 449) has drawn attention to a "tolerably constant" difference, viz., the greater depth of the postsinus as compared with the medisinus in *sumatrensis*. Indeed in my material the postsinus in *sondaïcus* is nearly always distinctly shallower than the medisinus, whereas in *sumatrensis* the postsinus is in general almost as deep as, rarely even deeper than (Leiden Museum, cat. g) the medisinus.

I may add an important difference: In *sumatrensis* there is a defined vertical depression, mostly even a distinct vertical groove, in the anterior surface of the protoloph, which is not present in *sondaïcus*. As this groove or fold is situated close to the antero-lingual angle it may conveniently be termed the protocone fold. In *sumatrensis* there is also a tendency to the development of a vertical depression in the anterior surface of the metaloph. This depression is situated more lingually than the protocone fold in the anterior surface of the protoloph but is less pronounced. Nothing of this kind, again, can be observed in *sondaïcus*.

Unworn or slightly worn specimens present another difference: In *sondaïcus* the crochet begins at the apex of the metaloph, whereas in *sumatrensis* the crochet springs off from the metaloph below the upper margin. The latter condition I found only once in *sondaïcus*, viz., in the erupting M^2 of a skull in the Zoological Laboratory at Utrecht.

The several more or less reliable differences mentioned above for M^2 also hold for M^1. M^3 is much more variable in development than M^1 and M^2, thus the specific differences are smaller in number. There is a considerable variation within the species in the shape of the postsinus, posterior cingulum and crochet. The posterior cingulum may be represented only by a weak tubercle, consequently the postsinus is completely absent (*sondaïcus*: Leiden Museum, cat. a and c, reg. no. 5688, Amsterdam Museum, no. 512) or the posterior cingulum is well raised from the surface and encloses a distinct postsinus (*sondaïcus*: Leiden Museum, cat. j, Amsterdam Museum, no. 640). In *sumatrensis* the crochet may spring off also immediately at the apex of the metaloph (Mus. Onderw. Hague, no. 44207, and at the right side in Leiden Museum, cat. c; in the left M^3 of the latter specimen the crochet is given off below the upper margin of the metaloph) as usual in the M^3 of *sondaïcus*. On the other hand in the M^3 of *sondaïcus* the crochet may be feebly developed and does not extend upwards as far as the apex of the metaloph (Leiden Museum, cat. k). But, again, a reliable difference between the M^3 of *sumatrensis* and that of *sondaïcus* is the presence of a more or less defined protocone fold in the former, and the absence of it in the latter species.

The upper premolars of *sumatrensis* and *sondaïcus* can be distinguished by some of the characters which were found as distinctive for the molars, viz., the comparatively greater depth of the postsinus, and the presence of a protocone fold in *sumatrensis*. In *sondaïcus* the upper premolars never possess a protocone fold, and the postsinus is distinctly shallower than the medisinus. In the isolated protocone of the P^2 in *sumatrensis* a fold cannot be distinguished; the only character I can find to separate it from the P^2 of *sondaïcus* is the equal or greater depth of the postsinus as compared with the medisinus.

The pd^3 and pd^4 agree with the upper molars in their distinguishing characters. The difference between the antero-transverse and the postero-transverse diameter, and the shape of the crochet is hardly of any diagnostic value, however. In *sondaïcus* the anterior cingulum is more developed, and the metacone style is less pronounced than in *sumatrensis*. I have not found any distinctive character in the anterior milk premolars, which present many variations within the species.

The mandibular teeth do not furnish specific characters. It is even impossible to determine the serial position of the loose lower molars; they grade completely into one another. There is a difference in size between the corresponding molars and premolars of recent *sumatrensis* and recent *sondaïcus*, the dimensions in the former being as a rule smaller than in the latter, but fossil and subfossil specimens often prove to be larger than the recent, so that even if the serial position of a lower tooth is certain, it is impossible to determine the species. The unidentifiable specimens from Sumatra are enumerated under the head *Rhinoceros* or *Dicerorhinus* spec.

Dicerorhinus sumatrensis (Fischer)

double horned *Rhinoceros* of Sumatra, Bell, Phil. Trans. Roy. Soc. London for 1793, part 1, p. 3, pls. II-IV.

Rhinoceros sumatrensis Fischer, Zoogn. Tabl. Syn. Illustr., ed. 3, vol. III, Moscow, 1814, p. 301 (non vidi, fide Sherborn, Index Animalium, part 25, London, 1931, p. 6320); Desmarest, Mammalogie, vol. 2, Paris, 1822, p. 401; Lesson, Manuel de Mammalogie, Paris, 1827, p. 331; Geoffroy-Saint-Hilaire and F. Cuvier, Histoire Naturelle des Mammifères, vol. 4, tome VII, Table gén. et méthod., Paris, 1842, p. 4; Anonymus, Natuurk. Tijdschr. Ned. Ind., vol. 2, 1851, p. 454; Gervais, Mammifères, Paris, 1855, p. 165; Chenu and Desmarest, Encycl. Hist. Nat., Pachydermes, & c, Paris, 1858, p. 9; Anderson, Proc. Zool. Soc. London, 1872, p. 129; Gray, Ann. Mag. Nat. Hist., ser. 4, vol. 10, 1872, p. 208; Friedel, Zool. Gart., vol. 13, 1872, p. 361; Bartlett, Proc. Zool. Soc. London, 1873, p. 104; Noll, Zool. Gart., vol. 14, 1873, p. 81; Flower, Proc. Zool. Soc. London, 1876, p. 444 fig. 1; Sclater, Trans. Zool. Soc. London, vol. 9, 1876, p. 650, pl. XCVII; Lydekker, Mem. Geol. Surv.

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1) *Didermocerus* Brookes 1828 antedates *Dicerorhinus* Gloger 1841, but the former is published in a sale catalogue, and, therefore, open to question (Palmer, 1904, p. 230).

Rhinoceros (Ceratorhinus) niger, Toula, Abh. K. K. Geol. Reichsanst., vol. 19, 1902, p. 21.
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Ceratorhinus blythii Gray, Ann. Mag. Nat. Hist., ser. 4, vol. 11, 1873, p. 360.
Rhinoceros sumatrensis blythi Lydekker, Cat. Ung. Mamm. Br. Mus., vol. 5, London, 1916, p. 50.
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Recent material examined:

1. Skeleton of female, M^2 erupting and unworn. Leiden Museum, cat. a. Padang Besi, Sumatra, don. S. Müller, 1835.
2. Skull, M^2 erupting and unworn. Museum van het Onderwijs, The Hague, no. 44207, no data.
3. Skeleton of male, M^2 erupting and unworn. Leiden Museum, cat. b. Sumatra. Cabinet d'Anatomie, 1860.
4. Skull, M^2 worn. Zoological Laboratory Utrecht, no data.
5. Skull of male, M^2 worn. Leiden Museum, cat. c. Tandjoeng Morawa, Deli, Sumatra, don. B. Hagen, 1883.
6. Skull, M^3 erupting. Amsterdam Museum, no. 515, no data.
7. Adult skull (M^3 worn). Amsterdam Museum, no. 571, no data.
8. Adult male skeleton. Leiden Museum, cat. g. North Sumatra, don. Van Engers, 1880.
9. Adult skull without teeth. Amsterdam Museum, no. 472, no data.
10. Calvarium, adult, without teeth. Leiden Museum, cat. h, reg. no. 4947. Pangkalan Kampar, Sumatra, don. E. Dubois, 1941.
11. Left humerus. Leiden Museum, reg. no. 5975, don. E. Dubois, 1941.

There is an extensive material of teeth from the cave deposits in Sumatra. They consist of the crown portions only, the roots have been gnawed off by porcupines: *Acanthion* is well represented in the cave fauna. Rhinoceros teeth are rather frequent in the collection, but are generally in a very fragmentary state of preservation. Only a comparatively small number of them is sufficiently well preserved to identify the species with certainty.

Unfortunately in many cases there is no record for the exact locality. In the report of Dubois's paleontological researches in Sumatra (Anonymus, 1889-1890) mention is made of the following caves (Ngalau = cave):

Ngalau Sampit near Pajakombo;
Caves in the Ngalau Seriboe Mts., between Boea and Sidjoendjoeng;
Ngalau Pandjang (no. 1) = Ngalau Kepala Sawah Liat, near Sibalin;
Ngalau Mansioe in the Andjing Mt. near the Sinamar river;
Ngalau Batang Pagian near Boea;

Ngalau Moeka Moeka near Moeara;
Ngalau Bandar = Ngalau Batang Siparok in the Andjing Mt.;
Ngalau Boelan near Sibalin;
Ngalau Djamboe near Tapisello;
Ngalau Lida Ajer near Pajakombo (examined before 1889);
Ngalau Lebawah near Lisawah;
Ngalau Pandjang (no. 2) near Sisawak;
Caves on the W. shore of lake Singkarah near Paningahan.

A number of teeth originate from Ngalau Sibrambang, which cave has not been mentioned by Dubois.

The complete upper teeth of rhinoceros from the Sumatran cave deposits for the greater part belong to the present species. 3 out of the 15 molars, 4 of the 8 identifiable premolars, and about 1/5 of the number of pd^3 and pd^4 belong to *Rhinoceros sondaïcus* Desmarest, and their descriptions will be found under that head. As a rule the dimensions of the specimens lie to the higher side of the range of variation in the recent species and some of the cave teeth even are decidedly larger than the recent specimens I had at my disposal. In table I, with the dimensions of the teeth of the recent specimens, I also give the measurements of the teeth of a skull in the Berlin Museum, mentioned by Stremme (1911, p. 92), which as a whole are not inconsiderably larger than those taken by myself. The range of variation thus obtained for convenience is given besides those of the subfossil specimens in the tables of measurements of the separate teeth below.

Coll. Dub. no. 642b (pl. II fig. 1), Sumatra.

M^1 dext. The paracone style is strongly developed and is not continued down to the base of the crown. Behind it, in the middle of the outer surface, a tumefaction occurs, becoming more distinct above. There is a very marked protocone fold in the anterior surface of the protoloph. Only the extreme inner portion of the anterior cingulum is left, it forms an oblique ledge below this fold, and terminates at the antero-internal angle. At the lingual entrance to the medisinus, which is only a little above the lower border of the enamel, there is a faint tubercle, attached to the base of the protoloph. The anterior surface of the metaloph slopes at the entrance to the medisinus and presents a weak vertical depression; more labially it becomes vertical. The crochet projects half way across the medisinus and is about at right angles to the metaloph. A large cylindrical tubercle rises from the bottom of the medisinus. It remains separate from the posterior surface of the protoloph, which presents a faint vertical ridge, and is attached to the inner surface of the ectoloph up to about 1 cm above the bottom of the medisinus. On this level it is still firmly attached to the labial surface of the crochet, from which it is already nearly pinched off at the grinding surface. The postsinus is just closed posteriorly, it is funnel-shaped and a little less deep than the medisinus. The dimensions of this and the three following specimens are given in the table on p. 19.

A similar and even larger accessory tubercle in the medisinus as found in the present specimen occasionally has developed in the recent specimens too (Leiden Museum, cat. g).

Coll. Dub. no. 905a (pl. II fig. 2), Sumatra.

M^1 sin. The paracone style is less prominent and also narrower than in the foregoing specimen. There is a weak median tumefaction, behind which the outer surface is concave. The protocone fold is distinct. The cingulum is strongly developed in the present molar. At the anterior side, below the protocone fold, it is thick and well raised from the surface. At the antero-internal angle it terminates hook-shapedly turned up, enclosing a distinct depression. At the lingual surface the cingulum is represented by a prominent ledge, which, however, is confined to the entrance to the medisinus. The ledge is attached both to the protoloph and the metaloph and is somewhat higher at the former. It is higher than the line in which the bases of proto- and metaloph meet, and a little below the level of the internal extremity of the anterior cingulum. There is no trace of a vertical depression in the anterior surface of the metaloph. The crochet is about at right angles to the metaloph and projects further across the medisinus than in the foregoing specimen. The present specimen too has an accessory tubercle in the medisinus which for its basal part is attached to the labial surface of the crochet up to the level of the grinding surface. The postsinus is narrower than in the foregoing specimen but is deeper than the medisinus.

Coll. Dub. no. 679a, Sumatra.

M^1 sin., much more worn than the foregoing specimens. The external surface corresponds to that of Coll. Dub. no. 642b. The protocone fold is not strongly developed, the anterior cingulum does not terminate turned up hook-shaped at the antero-internal angle. There is no tubercle at the entrance to the medisinus. A distinct vertical groove, however, is present in the anterior surface of the metaloph. The crochet is given off from the metaloph at an obtuse angle; no accessory tubercles occur in the medisinus. The crochet itself here is attached with its labial surface to the internal surface of the ectoloph up to about 1 cm above the bottom of the medisinus, a level about to be reached by the grinding surface. The postsinus is funnel-shaped and a little shallower than the medisinus.

Coll. Dub. no. 678b, Sumatra.

M^1 dext. The paracone style is moderately developed. Behind the weak median tumefaction the outer surface is somewhat concave above, due to the metastyle being a little raised. The preserved portion of the anterior cingulum forms a wide ledge, turned up like a hook at the antero-internal angle. At the lingual surface the cingulum is only represented by a small tubercle near the base of the protoloph at the entrance to the medisinus. The wear is so advanced that only the extreme lower portion of the protocone fold is visible. In the anterior surface of the metaloph there is a sharply defined vertical groove. The crochet, which extends almost wholly across the medisinus, is more sharply defined labially than lingually. In contradistinction to what has been observed in the three foregoing specimens there are no accessory tubercles in the medisinus, and the crochet remains free from the internal surface of the ectoloph down to the bottom of the medisinus, which lies on a lower level than that of the funnel-shaped postsinus.

The dimensions are as follows:

M^1	recent	Coll. Dub. no.			
		642b	905a	679a	678b
1. Antero-posterior	ca. 33—ca. 40	ca. 42	ca. 44	ca. 43	ca. 44
2. Antero-transverse . . .	48—61	55	55	56	57
3. Postero-transverse . . .	44—49	46	48	49	49
4. Ratio 3 : 2	0.91—0.96	0.84	0.87	0.88	0.86

The four subfossil specimens dealt with above are longer at the base than the recent specimens; the breadth measurements, however, are not different. The postero-transverse diameter is smaller in relation to the antero-transverse diameter than in recent *sumatrensis*.

Coll. Dub. no. 642a (pl. II fig. 3), Sumatra.

M^2 dext., not very much worn. Behind the well developed paracone style, which becomes vaguer below, there is a well defined tumefaction in the middle of the outer surface. A slight tumefaction occurs above the posterior root, and the metastyle is raised in its upper part, so that the posterior half of the outer surface is slightly convex below, and concave at the top. The anterior cingulum forms a distinct ledge, and terminates at the antero-internal angle. On the anterior surface of the protoloph there is a distinct protocone fold. The only trace of a lingual cingulum is an incipient tubercle at the base of the protoloph near the entrance to the medisinus. This entrance forms a pass which lies, however, lower than the lingual extremity of the anterior cingulum. A large crochet, bounded lingually by a well defined groove, is given off from the almost vertical anterior surface of the metaloph, which presents a weak vertical groove lingually of the pass. In its upper part the crochet remains only 1 mm distant from the posterior surface of the protoloph, down to the base it is more separated from that surface. The portion of the medisinus labially of the crochet is wide, and three projections have developed in it, viz., one rising from the base of the medisinus close to the crochet, one from the surface of the ectoloph a few mm besides the crochet, and the third from the surface of the protoloph almost opposite to the crochet. These projections are all broken off. The postsinus is rounded, it does not become much narrower towards the bottom and is as deep as the medisinus; on the posterior cingulum, labially of the V-shaped incision, a broad tubercle has developed. The part of the cingulum of the incision is well raised from the surface of the metaloph. The dimensions of this and the three following specimens are given in the table on p. 21.

Coll. Dub. no. 662a (pl. II fig. 4), Ngalau Lida Ajer (Sumatra).

M^2 dext., about half worn down. The paracone style is not strongly developed, but continued almost to the base of the crown. Posteriorly the paracone style is not distinctly defined, there is a very slight tumefaction in the middle of the outer surface, rapidly flattening downwards, and another one above the posterior root. The anterior cingulum is for the greater part worn away, only its lowest lingual portion is left. The cingulum ascends as a straight ledge from the antero-internal angle and encloses a depression at the anterior surface of the protoloph, which is accentuated by a deep vertical groove in that surface, the protocone fold. Along the lingual surface the cingulum is only represented by a tubercle in the entrance to the medisinus, mainly attached to the surface of the protoloph. The anterior surface of the metaloph has a weak vertical depression above this tubercle. The entrance to the medisinus is narrow and forms a pass; more labially the medisinus becomes wider and deeper, and then is almost obstructed by a blunt crochet, which is given off at right angles from the metaloph and projects three-fourths of the way across the medisinus. Another projection into the medisinus is given off from the ectoloph; this is, however, very weak as compared with the crochet and rather a swelling of the inner surface of the ectoloph. The postsinus is already closed posteriorly; it is elliptical, and almost as deep as the medisinus.

Coll. Dub. no. 6997a (pl. II fig. 5), Sumatra.

M^2 dext., much worn. The paracone style is only defined anteriorly; the parastyle fold disappears near the base of the crown. The disc of the protoloph is sinuous due to the presence of a deep protocone fold in its anterior surface. Only the inner portion of the anterior cingulum is left; it is crenulated and has a breadth of 6 mm below the protocone fold. Lingually of this fold it rapidly dies away. There is only a faint indication of a lingual cingulum in the entrance to the medisinus. This entrance is wider than in the foregoing specimen, which is less worn. The depression in the anterior surface of the metaloph is somewhat more pronounced than in the last specimen. The crochet is given off from the metaloph at an obtuse angle and is not bounded lingually by a defined groove. The basal part of the crochet is attached to the ectoloph. The portion of the medisinus labially of the crochet thus is only very shallow so that on slightly further wear the crochet would have become confluent with the ectoloph. Above the place where the crochet joins the ectoloph there is a swelling of the inner surface of the ectoloph, similar to that observed in the preceding specimen. The posterior cingulum has been taken into use; the postsinus is funnel-shaped and is narrower than in the preceding specimen. It is a little shallower than the medisinus.

Coll. Dub. no. 907a, Sumatra.

M^2 sin. The external surface is shaped as in the last specimen. The anterior cingulum is not crenulated, and terminates turned up hook-shaped at the antero-internal angle. The protocone fold is somewhat less, the indent in the anterior surface of the metaloph more pronounced than in the foregoing specimen. There is an incipient tubercle in the usual place at the lingual surface. The crochet is given off at a little more than right angle, down to its base it recedes towards the ectoloph to which it is attached at the bottom of the medisinus. There is a small vertical fold in the inner surface of the metaloph. The postsinus is a little deeper than the medisinus.

The specimens present the following dimensions:

M^2	recent	Coll. Dub. no.			
		642a	662a	6997a	907a
1. Antero-posterior	ca. 39—ca. 42	ca. 44	ca. 47	ca. 47	ca. 43
2. Antero-transverse. . . .	48—60	59	61	59	59
3. Postero-transverse . . .	43—49	53	54	52	54
4. Ratio 3 : 2	0.88—0.94	0.90	0.87	0.88	0.92

Coll. Dub. no. 907b (pl. II fig. 8), Sumatra.

M^3 dext., unworn. The molar is subtriangular at the base, with a prominent parastyle and moderately developed paracone style, which becomes more defined at the top. There is a tumefaction at the base of the outer surface of the united ecto- and metaloph, opposite to the crochet. Internally to the tumefaction there is a very faint ledge at the base, with an incipient depression above it: the last traces of posterior cingulum and postsinus. The anterior surface is shaped as in the anterior molars, the apex of the protoloph is somewhat inclined forward. The cingulum has its highest point in the depression for the metastyle for M^2; it slopes and becomes more raised from the surface towards the lingual side. There is a marked protocone fold, lingually of which the cingulum rapidly dies away. There is no inner cingulum. The medisinus is wide, wider than in the anterior molars. There is no distinct pass leading into the medisinus; the bases of the protoloph and the metaloph meet in a line, the slope of the latter is rather concave below. Upwards the metaloph becomes inclined towards the anterior side, almost parallel to the slope of the protoloph. A large crochet extends up to the apex of the metaloph and projects almost completely across the medisinus, at the top it is at right angles to the metaloph and bounded lingually by a very marked groove, moreover deeper within the medisinus it recedes but little towards the antero-external angle. There are no accessory tubercles or projections in the labial part of the medisinus. The measurements of the present and the three following specimens will be found on p. 23.

Coll. Dub. no. 910a, Sumatra.

M^3 sin., only slightly worn at the apices of the protoloph and united ecto- and metaloph. The paracone style becomes more distinct at the top than in the preceding specimen, the tumefaction at the base of the outer surface is much more marked. The posterior cingulum and postsinus are represented by a large tubercle with a faint depression above it. At the anterior surface the cingulum is heavier developed, especially below the protocone fold. The bases of the protoloph and the metaloph are incomplete at the inner side, the crochet resembles that in the foregoing specimen in commencing immediately at the apex of the metaloph, but is does not extend so far across the medisinus and is bounded lingually by a less marked groove.

Coll. Dub. no. 910b, Sumatra.

M^3 sin., about one-third worn down. The outer surface is incomplete at the base; the tumefaction seems to be less marked than in the preceding specimen; there is no trace of a posterior cingulum. The anterior cingulum and the protocone fold are less distinct than in the foregoing specimen. The base of the protoloph at the inner side, and the whole bottom of the medisinus are missing. The crochet remains several mm distant from the protoloph; at its labial side it has a basal tubercle which is partly damaged.

The anterior surface of the united ecto- and metaloph is damaged labially of the crochet.

Coll. Dub. no. 663a (pl. III fig. 1), Ngalau Lida Ajer (Sumatra).

M^3 dext., much worn. The specimen is remarkable for having a long, pointed projection given off from the posterior surface of the protoloph, labially of the crochet. It is placed obliquely to the protoloph and unites with the crochet at its extremity, so that the labial part of the medisinus is cut off as a separate fossette. The posterior cingulum is well developed along the lingual third of the outer surface, and encloses a distinct postsinus.

In recent specimens I never observed such a well developed projection from the protoloph, though occasionally it is represented by a small tubercle. The latter condition is also found in an incomplete M^3 (Coll. Dub. no. 910c). This projection cannot be called an antecrochet, as a true antecrochet is placed internally to the crochet.

The dimensions of the Sumatran specimens are as follows; larger than the recent teeth measured by me:

M^3	recent	Coll. Dub. no.			
		907b	910a	910b	663a
1. Antero-posterior (inner side)	41—44	43	—	ca. 43	45
2. Antero-transverse	45—49	ca. 55	—	—	52
3. Length outer surface	49—ca. 52	56	ca. 56	ca. 55	56

Coll. Dub. no. 959a (pl. III fig. 2), Ngalau Djamboe (Sumatra).

P^2 dext. Two vertical ridges have developed on the outer surface, the paracone style and the metacone style; the latter is broader and less distinct than the former. The base of the outer surface is depressed between the roots. The parastyle is prominent anteriorly; in front of the paracone the cingulum is slightly developed, it does not continue along the protocone. The latter forms a rounded, more or less isolated cusp. The point of connection with the labial part of the protoloph and the ectoloph lies as high as the lingual entrance to the medisinus. An inner cingulum is absent. The medisinus is narrow, there is no trace of a crochet. The postsinus is already closed posteriorly, it is funnel-shaped and as deep as the medisinus. The dimensions are:

P^2	recent	Coll. Dub. no. 959a
1. Antero-posterior	ca. 21—ca. 26	ca. 23
2. Antero-transverse	28—33	30
3. Postero-transverse	31—37	34

Coll. Dub. no. 662b (pl. III fig. 4), Ngalau Lida Ajer (Sumatra).

P^3 dext. The paracone style and the metacone style are equally prominent except at the top, where the latter becomes less distinct. The anterior cingulum commences internally of the parastyle and descends, first slightly and then more steeply, towards the antero-internal angle. No trace of a cingulum is to be seen at the lingual side. The disc of the protoloph has just united with the ectoloph. A depression in its anterior surface represents the protocone fold. The entrance to the medisinus is formed by a pass, which lies higher than the internal end of the anterior cingulum The crochet is given off at right angles to the metaloph and extends three-fourths of the way across the medisinus. The posterior cingulum is not yet worn. A tubercle seems to have been present on it, labially of the V-shaped incision, but has broken off. The postsinus is wide and rounded and is as deep as the medisinus. The dimensions are as follows:

P^3	recent	Coll. Dub. no. 662b
1. Antero-posterior	ca. 27—27	ca. 35
2. Antero-transverse . . .	39—47	44
3. Postero-transverse . . .	38—42	43

Coll. Dub. no. 642c (pl. III fig. 7), Sumatra.

P^4 dext., slightly worn. The paracone style is very prominent and is bounded anteriorly by a sharp parastyle fold, which becomes indistinct below. The metacone style is not sharply defined, especially towards the top. The metastyle is a little raised in its upper part. The cingulum is not much raised from the anterior surface, it descends from the depression at the inner side of the parastyle first abruptly, in the middle of the anterior surface it runs horizontally for a small space, and then it runs down again to the antero-internal angle. A defined protocone fold is present. There is no trace of a lingual cingulum. The metaloph partly overlaps the protoloph at the base of the crown, the entrance to the medisinus is high and narrow. There is a double crochet, which projects almost completely across the medisinus and is given off from the metaloph below its upper margin. Labially of the crochet some small projections into the medisinus have developed. The postsinus is wide and a little shallower than the medisinus. The cingulum is hardly visible on the posterior surface of the metaloph, but labially of the V-shaped incision it is distinct and bears an incipient tubercle. The dimensions of this and the following specimen are given on p. 25.

Coll. Dub. no. 662c (pl. III fig. 8), Ngalau Lida Ajer (Sumatra).

P^4 sin. The outer surface is shaped as in the foregoing specimen, except in the less sharply defined parastyle fold. The anterior cingulum descends continuously to the antero-internal angle. There is a distinct protocone fold. The entrance to the medisinus is shaped as in the foregoing specimen but lies somewhat higher with regard to the posterior cingulum. A crochet is not present, the only projection into the medisinus is small and occurs in the angle formed by the ectoloph and the metaloph. The posterior cingulum is also distinct at the inner side of the incision, in contradistinction to the preceding specimen and rises into a prominent tubercle in its labial part. The two specimens present the following dimensions:

P^4	recent	Coll. Dub. no.	
		642c	662c
1. Antero-posterior	ca. 30—38	ca. 38	ca. 32
2. Antero-transverse . . .	45—52	54	52
3. Postero-transverse . . .	42—44	ca. 49	47

There is a comparatively large number of unworn or slightly worn milk premolars of rhinoceros in the Sumatran collection. As the pd^1 and the pd^2 yield no specific characters, as far as I can see, these teeth are mentioned further on under the head *Rhinoceros* or *Dicerorhinus* spec. 16 specimens of pd^3 must be referred to *sumatrensis*; their measurements are given below. The first 10 specimens are of the right side, the others of the left. Coll. Dub. no. 959c is from the Ngalau Djamboe, and no. 662e from the Ngalau Lida Ajer. The length of most specimens exceeds that of the few recent pd^3 of *sumatrensis* measured by me, the breadth measurements are not different.

Coll. Dub. no.	959c	679g	768Ac	910d	662e	910e	768Ad	678p
Antero-posterior	ca. 35	ca. 32	ca. 34	ca. 30	ca. 37	ca. 40	ca. 33	ca. 38
Antero-transverse	42	41	41	39	41	40	40	41
Postero-transverse	37	38	39	37	ca. 38	—	38	37

Coll. Dub. no.	678q	678r	681a	908c	905j	905k	910f	910g
Antero-posterior	ca. 35	ca. 33	ca. 33	ca. 35	ca. 37	ca. 33	ca. 35	ca. 37
Antero-transverse	41	39	41	40	37	41	39	40
Postero-transverse	38	38	38	37	36	38	39	—

The variability is not great; the specimens may be described as follows (see no. 679g, pl. IV fig. 1):

The paracone style is distinctly developed, flattening at the base and at the top. The posterior moiety of the outer surface is much more inclined inwards than the anterior and bears a metacone style, which is much less pronounced than the paracone style and disappears towards the top. The metastyle is a little raised. The anterior cingulum is moderately developed and descends towards the antero-internal angle. There is a distinct protocone fold, lingually of which the cingulum rapidly ends. It does not continue round the protoloph; an inner cingulum occasionally (Coll. Dub. no. 905k (pl. IV fig. 2) and no. 908c) is represented by a tubercle at the entrance to the medisinus. The anterior surface of the metaloph invariably shows a vertical groove, situated a little more lingually than the protocone fold. The crochet is long, projecting almost completely across the medisinus. In some cases (Coll. Dub. nos. 681a, 768Ad, 905j, 905k (pl. IV fig. 2), 910f) there are processes from the ectoloph representing a crista, they may unite with the crochet so as to make a medifossette. The posterior cingulum invariably bears a tubercle, the postsinus is rounded and as deep as or slightly shallower than the medisinus.

pd^4 is represented by 13 specimens (see table below), 8 of which are of the right side and 5 of the left. Some of them (Coll. Dub. no. 642f (pl. III fig. 11) and no. 642h) are decidedly larger than the recent pd^4 of *sumatrensis* measured by me. The metacone style is still less pronounced than in the pd^3, the anterior cingulum usually is more strongly developed. The protocone fold is distinct as in pd^3, the vertical groove in the anterior surface of the metaloph also. The crochet, which is long, often is recurved with its extremity towards the external side; traces of a crista may occur. A distinct tubercle occurs on the posterior cingulum, except in some cases in which it is incipient (Coll. Dub. nos. 679j and 6997b). The postsinus is about as deep as the medisinus.

Coll. Dub. no.	904a	917b	917c	678u	642f	768Ae	905l	662f
Antero-posterior	ca. 40	ca. 38	ca. 45	—	ca. 41	ca. 36	ca. 41	—
Antero-transverse	43	44	44	44	49	43	45	ca. 45
Postero-transverse	—	41	ca. 38	—	45	39	38	—

Coll. Dub. no.	679j	6997b	642g	642h	678v
Antero-posterior	ca. 44	ca. 41	ca. 39	ca. 39	ca. 39
Antero-transverse	43	42	43	49	43
Postero-transverse	—	38	39	44	39

Coll. Dub. no. 9276 (pl. X fig. 6), Pandjang cave near Sibalen (Sumatra).

Humerus dext., composed of several fragments, the spaces left between partly filled with plaster. At the proximal extremity the anterior part of the lateral tuberosity is missing, and the caput is injured posteriorly. The bone is more slender than that in *sondaïcus*, and agrees in this respect with *sumatrensis*, as appears from the ratio between the length and the breadth at the deltoid tuberosity in the table below. The distal breadth cannot be measured as the whole lateral condyle is lost, but the olecranon fossa is distinctly narrower than that in *sondaïcus*. As rightly remarked by Dubois (see Anonymus, 1889, p. 9) the bone not inconsiderably exceeds in size recent humeri of *sumatrensis*; but this was to be expected, as many teeth from the Sumatran cave fauna also are larger than recent specimens.

Humerus	*Dicerorhinus sumatrensis* (Fischer) Leiden Museum					*Rh. sondaïcus* Desm. (see table on p. 67)
	Coll. Dub. no. 9276	cat. a	cat. b	cat. g	reg. no. 5976	
1. Length from caput to condylus medialis	421	339	348	338	360	375—409
2. Breadth across caput and posterior part of lateral tuberosity . . .	148	118	132	130	129	143—162
3. Breadth at deltoid tuberosity .	125	—	105	108	103	142—153
4. Smallest diameter of corpus . .	63	43	53	47	48	61—67
5. Antero-posterior diameter of condylus medialis	122	94	99	102	100	108—120
6. 2:1	0.35	0.35	0.38	0.38	0.36	0.37—0.42
7. 3:1	0.30	—	0.30	0.32	0.29	0.37—0.39
8. 5:1	0.30	0.28	0.28	0.30	0.28	0.28—0.31

We have seen above that the teeth in the recent skulls of *sumatrensis* examined by me most often present smaller dimensions than their subfossil homologues. The measurements which Stremme (1911, p. 92) gives of the teeth of a *sumatrensis* skull in the Berlin Museum indicate an animal of the same size as, or even larger than those which left their teeth in the prehistoric Sumatran caves. The locality of Stremme's skull is not recorded. Flower (1878) records a skull of a rhinoceros killed near Comillah, in Tipperah (Bengal), possessing the essential characters of *sumatrensis*, in which the teeth are especially large. Only the breadth of P^4 is given, which is not less than 56 mm, against 45-47 in my recent, and 52-54 in the subfossil material from Sumatra. The skull as a whole, as can be seen from the accompanying table (8th column) is rather broad in proportion to its length, ratio 6 being 0.60 against 0.52-0.57 in the others; ratio 7 is 0.34, which is equalled only by the skull from Chittagong which is of the type of *Rh. lasiotis* Sclater (1st column), in the other skulls this ratio varies from 0.25 to 0.29. Sclater (vide Flower, 1878, p. 634) thought the Tipperah skull to belong probably to the form which he named *Rh. lasiotis*. Thomas (1901, p. 156) is inclined to regard *Rh. lasiotis* Sclater (of which he gives the full history and some cranial measurements) as a tenable northern subspecies of the typical *Dicerorhinus sumatrensis* (Fischer), characterized mainly by its greater size, were it not that the locality of a skeleton presented by Raffles and preserved in the Museum of the Royal College of Surgeons (no. 2142, see Flower and Garson, 1884, p. 421; it is skull no. 5 in the table of Flower (1878, p. 635) and the 2nd in the present

Dicerorhinus sumatrensis (Fischer)

	♀ Thomas, 1901, p. 155/6. Chittagong	♂ Flower, 1878, p. 635 no. 5. Sumatra	Leiden Museum, cat. h. Sumatra	Flower, 1878, p. 635		Amsterdam Museum, no. 571	Flower, 1878, p. 635		Leiden Museum, cat. g. Sumatra	Amsterdam Museum, no. 472	Leiden Museum, cat. c. Sumatra	Amsterdam Museum, no. 515
				no. 4 Pegu	no. 2 Malacca ♀		no. 3 Sumatra ♀	no. 1 Tipperah				
1. Length from occipital crest to extremity of nasals	600	584	560	544	526	525	518	508	508	500	493	465
2. Zygomatic breadth . .	327	305	296	282	300	295	282	305	289	285	273	256
3. Preorbital breadth (in groove above lacrymal eminence)	203	152	144	150	152	147	132	172	143	143	138	121
4. Length P^2–M^2	—	193	—	175	165	—	167	203	167	—	178	175
5. Greater breadth of P^4 .	—	52	—	46	48	48	47	56	46	—	—	46
6. 2 : 1	0.55	0.52	0.53	0.52	0.57	0.56	0.54	0.60	0.57	0.57	0.55	0.55
7. 3 : 1	0.34	0.26	0.26	0.28	0.29	0.28	0.25	0.34	0.28	0.29	0.28	0.26

table) which is practically of the same size as the type of *Rh. lasiotis* Sclater, is given as Sumatra. He doubts the correctness of this locality-record, "for Sir Stamford Raffles, as a collector of Natural History objects, and a great Governor and Administrator, might easily have had brought to him a skull from any part of the East Indies" (l.c.). Furthermore he writes "The Pegu skull... [column 4 in my table] is intermediate in size, as in locality; while all the Malaccan and other Sumatran skulls are comparatively small, as are those from Borneo" (l.c.).

A skull from Sumatra in the Leiden Museum (cat. h, 3rd column in the table) is seen to be again intermediate in size between the Chittagong skull and Raffles's specimen on one side, and the Pegu skull on the other, so that even if Raffles's skull did not really come from Sumatra, the northern form is not constantly larger than that of Sumatra.

We must see the question as follows: From the cave teeth described in the foregoing pages it is now evident that in Sumatra the rhinoceros has undergone a diminution in size during the Holocene period. The comparatively large skulls from Chittagong and Tipperah show that in some parts of the Asiatic continent there still are living individuals which possess these greater prehistoric dimensions. The so-called *Rh. lasiotis* Sclater, therefore, in my opinion has no right to distinction from *D. sumatensis* (Fischer) since this would be on the ground of size alone, the external characters of colour and hair development originally noticed by Sclater having proved to be not of specific importance (vide Thomas, 1901, p. 155).

Rhinoceros or **Dicerorhinus** spec.

There are 18 complete more or less worn specimens of pd^1 in the collection. These teeth present many variations but I did not succeed in distributing them over *sumatrensis* and *sondaicus*. The dimensions are given below:

Coll. Dub. no.	905c	679c	678c	959b	826a	961a	866a	866b	642d	678d	678e
Length	26	24	26	28	25	25	26	25	25	26	28
Breadth	22	20	22	22	20	22	22	19	21	24	22

Coll. Dub. no.	678f	961b	961c	961d	924a	906a	1126Ba
Length	28	28	26	25	27	26	26
Breadth	23	23	20	22	20	20	21

The nos. 961a-d are from Ngalau Sibrambang, nos. 826a and 1126Ba from Ngalau Lida Ajer, and no. 959b from Ngalau Djamboe; the localities of the other specimens are not known exactly. The first nine specimens are of the right side, the others of the left.

This tooth is characterized by the excessive prolongation of the antero-external angle; the anterior surface is placed very obliquely to the outer surface. The latter has a median vertical ridge. This is more distinctly developed in the pd² but lacks in the posterior milk premolars and the premolars and molars of a rhinoceros. It corresponds in position to the mesostyle of the horse molar (Osborn, 1907, pp. 175-176) and may be termed so. Behind the mesostyle there is always a faint indication of the metacone style. The protoloph usually has a more or less isolated protocone, as in the P². Occasionally the protocone is connected with the antero-external angle by a ridge, in front of which a cingulum occurs, enclosing a depression (Coll. Dub. nos. 642d (pl. IV fig. 12), 679c, 961b (pl. IV fig. 11) and 961d). In most of the specimens the metaloph forms a continuous crest about at right angles to the ectoloph, but in some the hypocone forms an isolated cusp; thus the postsinus is connected with the medisinus (Coll. Dub. nos. 678d (pl. IV fig. 13), 905c and 906a). In the latter specimens the protocone is isolated too (as usual), so that the medisinus is open to the anterior, posterior and inner side. A tubercle may have developed at the lingual entrance to the medisinus (Coll. Dub. nos. 678d, 959b and 1126Ba). In a number of specimens the processes projecting into the medisinus are completely absent (Coll. Dub. nos. 678c, 826a, 866b (pl. IV fig. 10), 906a, 961c and 1126Ba). Only the crochet may have developed (Coll. Dub. no. 678f), or only the crista (Coll. Dub. nos. 679c and 905c). Both crochet and crista, the former usually small and the latter occasionally double, are present in some specimens (Coll. Dub. nos. 642d, 678d, 866a, 961a, 961b, 961d). The postsinus is always shallower than the medisinus.

Of pd² we possess 27 complete specimens, the measurements of which are given in the table below. The first 19 specimens are of the right side, the others of the left. Nos. 662d and 663d are from Ngalau Lida Ajer near Pajakombo, the exact localities where the other specimens were obtained are unknown. I have not been able to separate the pd² of *sumatrensis* from those of *sondaïcus;* the latter present greater dimensions than the former, at least as far as concerns the small number of recent milk premolars I was able to examine. The dimensions of nearly all Sumatran specimens are larger than those of the recent pd² of *sumatrensis*. There is one specimen (Coll. Dub. no. 642e; last mentioned in the table), not inconsiderably larger than the other specimens, which even also exceeds the recent pd² of *sondaïcus* in size. It is almost certain that the latter specimen belongs to *sondaïcus*.

Coll. Dub. no.	908a	678g	768Ab	924b	679d	905d	924c	679e	679f
Antero-posterior	ca. 27	ca. 29	ca. 29	ca. 30	ca. 27	ca. 30	ca. 28	ca. 28	ca. 30
Antero-transverse	31	31	32	30	33	32	33	31	34
Postero-transverse	34	ca. 30	32	31	33	ca. 32	32	30	33

Coll. Dub. no.	678h	678i	678j	678k	678l	678m	905e	905f	662d
Antero-posterior	ca. 26	ca. 28	ca. 27	ca. 28	ca. 28	ca. 27	ca. 28	ca. 29	ca. 27
Antero-transverse	30	31	30	33	32	32	31	30	33
Postero-transverse	30	32	30	32	31	31	30	32	34

Coll. Dub. no.	663b	905g	905h	905i	678n	678o	866c	908b	642e
Antero-posterior	ca. 29	ca. 27	ca. 29	ca. 29	ca. 28	ca. 29	ca. 29	ca. 27	ca. 33
Antero-transverse	33	31	33	31	32	31	31	31	40
Postero-transverse	34	31	34	ca. 30	33	31	32	32	42

The pd^2 is subquadrate at the base, the antero-transverse diameter being about equal to the postero-transverse diameter. There is a very distinctly developed mesostyle, in contradistinction to the other rhinoceros-teeth. It remains distinct down to the base of the outer surface and flattens towards the apex of the ectoloph. The metacone style forms a faint vertical ridge; the paracone style occasionally (Coll. Dub. nos. 768Ab (pl. IV fig. 7), 679d, 662d, 678o) is very faintly developed. The anterior cingulum is highest in the depression of the parastyle, descends abruptly along the parastyle and less steeply along the anterior surface of the protoloph. Usuallv it is slightly developed only extending along two-thirds of the anterior surface of the protoloph, and not to the antero-internal angle. In some specimens the cingulum is represented too on the lingual third of the anterior surface of the protoloph as a faint ledge (Coll. Dub. nos. 678k, 678i (pl. IV fig. 6), 663b, 905h, 866c). In Coll. Dub. no. 642e (pl. IV fig. 8), which is much worn down, the lingual portion of the anterior cingulum only is left, it terminates at the antero-internal angle and is more developed than in any other specimen of pd^2 in the Sumatran collection. The entrance to the medisinus is low and comparatively wide, the slope of the protoloph is concave near the base. Occasionally a tubercle has developed at the entrance (Coll. Dub. nos. 679e, 678j, 663b). There is always a long and slender crochet, given off about at right angles from the metaloph. Most often it has united with the crista, projecting from the ectoloph, so as to form a medifossette. The crista, however, is completely absent in some cases (Coll. Dub. nos. 678l (pl. IV fig. 5), 679d, 866c). In Coll. Dub. no. 642e (pl. IV fig. 8) a medifossette is formed too, the crista is thicker than the crochet. There is a slight projection from the metaloph into the medifossette in this specimen. The extremity of the crochet or of the crista in a number of specimens (Coll. Dub. nos. 905e, 663b, 768Ab (pl. IV fig. 7), 905h, 678o) has united with the protoloph, so that there are two fossettes cut off from the medisinus, viz., one enclosed by the crochet and crista, and the other formed by the union of the crista and the protoloph. The postsinus is rounded and usually does not differ much in depth from the medisinus. The posterior cingulum in most cases bears a low tubercle.

Of 14 complete specimens of pd_2 from Sumatra the dimensions are given here; the first 8 are of the left side, the others of the right. Coll. Dub. nos. 961 e-g are from the Sibrambang cave. In not less than 9 specimens the posterior valley becomes deeper as it passes outwards.

Coll. Dub. no.	866d	866e	866f	826b	684a	684b	917d	961e	684c	916a
Antero-posterior	30	28	27	29	28	30	29	27	27	30
Transverse	13	14	15	14	13	14	14	13	13	13

Coll. Dub. no.	917e	917f	961f	961g
Antero-posterior	27	29	30	27
Transverse	13	14	14	14

We possess 62 complete specimens of pd_3 from Sumatran caves, Coll. Dub. nos. 826c-f originate from the Lida Ajer cave, nos. 961h-k from the Sibrambang cave, and nos. 1019a-g from the Djamboe cave near Tapisello. The measurements are given here; the first 27 specimens are of the left side, the others of the right. This tooth is characterized by its bilobed anterior portion of the metalophid. Variations were not seen, except in no. 1019e, in which both anterior lobes of the metalophid are directed inwards, instead of one only.

Coll. Dub. no.	681b	681c	681d	684d	684e	687a	826c	826d	866g	866h
Antero-posterior	39	40	40	42	40	37	39	40	38	37
Transverse	17	18	19	20	19	17	20	20	18	18

Coll. Dub. no.	866i	866j	866k	868Ca	908d	917g	917h	917i	917j	917k
Antero-posterior	37	41	39	44	38	39	40	39	40	38
Transverse	17	19	18	20	20	18	18	19	20	17

Coll. Dub. no.	917l	961h	961i	1019a	1019b	1036a	1036b	681e	681f	681g
Antero-posterior	39	37	39	42	40	40	40	39	43	38
Transverse	18	18	18	19	18	18	18	19	23	18

Coll. Dub. no.	681h	684f	684g	684h	684i	768Af	768Ag	768Ah	826e	826f
Antero-posterior	35	40	44	41	39	44	43	43	36	40
Transverse	16	19	21	19	17	21	22	20	17	18

Coll. Dub. no.	866l	866m	866n	866o	866p	866q	866r	866s	917m	917n
Antero-posterior	39	39	36	40	37	39	39	38	43	41
Transverse	18	20	16	17	17	19	18	18	19	18

Coll. Dub. no.	917o	917p	917q	917r	961j	961k	1019c	1019d	1019e	1019f
Antero-posterior	39	37	40	37	40	42	40	40	37	39
Transverse	18	18	18	17	19	19	18	19	19	18

Coll. Dub. no.	1019g	1036c
Antero-posterior	41	40
Transverse	18	18

The pd_4 is represented by 48 specimens, the first 22 of the left, the others of the right side. Coll. Dub. nos. 826g-k are from the Lida Ajer cave, nos. 961 l-n from the Sibrambang cave, and no. 1019h originates from the Djamboe cave.

Coll. Dub. no.	681i	681j	681k	684j	684k	684l	687b	768Ai	768Aj	826g
Antero-posterior	41	38	43	41	40	40	44	41	40	40
Transverse	19	23	22	20	22	23	22	21	19	20

Coll. Dub. no.	826h	826i	866t	866u	866v	866w	908e	917s	917t	961l
Antero-posterior	40	41	42	40	40	42	40	39	44	41
Transverse	20	21	23	21	20	23	22	17	22	20

Coll. Dub. no.	1036d	1036e	681l	681m	681n	681o	681p	681q	684m
Antero-posterior	42	40	42	43	41	40	38	44	40
Transverse	22	20	22	23	21	20	21	22	23

Coll. Dub. no.	684n	684o	684p	687c	768Ak	768Al	826j	826k	866x
Antero-posterior	41	39	42	40	43	41	42	43	42
Transverse	21	21	22	21	22	21	22	22	22

Coll. Dub. no.	866y	866z	917u	917v	917w	961m	961n	1019h	1036f	1036g
Antero-posterior	43	41	43	43	41	44	43	40	40	41
Transverse	21	20	21	24	22	22	21	20	22	21

There is only one complete (left) specimen of P_2 in the Sumatra collection (Coll. Dub. no. 684q). The dimensions (antero-posterior 28 mm, transverse 19 mm) agree with those in *sondaïcus.*

Of P_3 we have 11 complete specimens, 6 of the left, and 5 of the right side. Coll. Dub. no. 768Am has still preserved its posterior root.

Coll. Dub. no.	681r	681s	682a	684r	684s	768Am	681t	682b	684t	866aa	918a
Antero-posterior	32	31	33	36	34	31	32	34	33	34	33
Transverse	22	23	23	25	23	22	21	23	22	23	22

P_4 is present in 9 complete left, and 12 right specimens, 21 specimens in all. In two specimens (nos. 768An and o) the posterior valley forms a pit, like often seen in the pd_2. Coll. Dub. no. 826l is from the Lida Ajer cave, no. 961o from the Sibrambang cave, and no. 1019i from the Djamboe cave.

Coll. Dub. no.	681u	681v	682c	682d	684u	687d	768An	768Ao	908f	681w	682e
Antero-posterior	38	36	36	41	38	37	35	37	39	38	40
Transverse	24	23	25	25	26	27	25	26	24	24	27

Coll. Dub. no.	682f	682g	684v	768Ap	768Ag	826l	866ab	917x	961o	1019i
Antero-posterior	41	39	38	36	38	38	35	39	37	38
Transverse	26	25	25	25	25	26	24	26	26	25

The lower molars, which are represented by many specimens, grade so completely into one another, that their serial position cannot be determined with certainty. Of the lower molars in the recent species M_2 is the largest,

M_3 is always narrower, and sometimes longer than M_2. In the subfossil specimens I noticed two variations:

Coll. Dub. no. 682h. Right lower M. The posterior cingulum rises to a distinct pillar (entostylid?) close to the postero-internal angle, with a height of 24 mm above the base of the crown.

Coll. Dub. no. 826m. Right lower M, rather worn. There is a distinct ledge in the vertical depression on the outer surface between metalophid and hypolophid, with a length of 8 mm, and about 10 mm above the base of the crown.

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? *Rhinoceros ? sondaicus* Desm. *fossilis* Van der Maarel, Wet. Med. Dienst Mijnb. Ned. Ind., no. 15, 1932, p. 63, fig. 6.

Recent material examined:

1. Skull of very young individual. Leiden Museum, cat. h. Parang, Java, Coll. Boie and Macklot.
2. Idem. Leiden Museum, cat. i. Java.
3. Skeleton of young individual. Leiden Museum, cat. b. Java, don. S. Müller, 1834.
4. Skull of young individual. Amsterdam Museum, no. 516, no data.
5. Skeleton of young individual. Amsterdam Museum, no. 889, no data.
6. Idem. Leiden Museum, cat. g. Java, don. Reinwardt.
7. Skull, M^2 erupting and unworn. Zoological Laboratory Utrecht, no data.
8. Skull, idem. Leiden Museum, cat. k (mentioned as *sumatrensis* cat. e by Jentink, 1887, p. 167). Sumatra, don. Reinwardt.
9. Skull, M^2 worn. Amsterdam Museum, no. 511, no data.

10. Skull, M^3 erupting. Leiden Museum, cat. e. Received in 1870. Labelled "Sumatra?"

11. Adult skull (M^3 worn). Amsterdam Museum, no. 512, no data.

12. Adult skeleton. Leiden Museum, cat. a. Java, don. Reinwardt, 1820.

13. Adult skull. Leiden Museum, cat. d. Java, don. Reinwardt.

14. Adult skeleton. Amsterdam Museum, no. 507, no data.

15. Adult female skull. Leiden Museum, cat. j (mentioned as *sumatrensis* cat. d by Jentink, 1887, p. 167). Tandjoeng Morawa, Deli, Sumatra, don. B. Hagen, 1883.

16. Adult skull. Zoological Laboratory Utrecht, "Coll. Van Son", no data.

17. Adult skull. Zoological Laboratory Utrecht, labelled "1.6.12", no data.

18. Adult dentition. Leiden Museum, reg. no. 5688, don. E. Dubois, 1941.

19. Adult skull. Amsterdam Museum, no. 510, no data.

20. Adult female skeleton. Amsterdam Museum, no. 640. 250 km S.W. of Palembang, Sumatra, leg. Kreth, don. L. Ruhe (recorded by De Beaufort, 1928, p. 43).

21. Adult skeleton. Leiden Museum, cat. c, don. M.A. de Wilde, 1820.

22. Very old skull. Leiden Museum, cat f. Java.

23. Unworn P^{2-3} sin. Leiden Museum, reg. no. 5976, don. E. Dubois, 1941.

I gave already (pp. 6-12) an account of the literature dealing with the recent occurrence of the species in the island of Sumatra, and the characters which serve to distinguish its teeth from those of *sumatrensis*. The measurements of the teeth will be found in the tables III-VI.

The left M^3 of one of the Leiden Museum skulls (cat. d) presents some remarkable anomalies. Three views of the tooth are given on plate I. For convenience a normally shaped left M^3 (Leiden Museum, reg. no. 5688) has been figured in the same positions.

The tooth is not much worn; the internal portion of the metaloph is not yet touched by wear. To the inner half of the anterior surface is attached what seems to be an extra tooth (I). The crown portion is covered with irregularly formed enamel, and is about 16 mm high and wide. It is supported by two roots, of which one is short and curved outwards, while the other is long, directed vertically and fused with the internal root of the molar. At the antero-internal angle of the molar there is a pear-shaped body (II), measuring 20 mm in its greatest (vertical) diameter. The apex is covered with enamel. An opening anteriorly, and one internally, lead to the interior of it. It has a tapering root, which is united with the inner root of the molar, and which bears a small enamel-covered denticle on its anterior surface. A large mass of dentine is attached to the internal surface of the protoloph (III). It measures 16 mm antero-posteriorly, at the top it is free from the protoloph, and reaches to 15 mm above the bottom of the medisinus. The outer portion (opposite the protoloph) is coated with enamel, but there is a definite line of demarcation from the enamel of the protoloph. Posteriorly it gives off a vertical plate-like projection, which swings forward around the inner surface and which is the remainder of a partly resorbed root.

There are further only minor aberrations. Between the roots of the molar a cementome occurs. It has in the centre an opening, leading to the pulp cavity of the tooth. The enamel shows signs of decalcification: irregularly elevated patches of enamel occur in the depression for the metastyle of M^2, in the outer portion of the medisinus, and on the outer surface, internally of the paracone style. The anterior cingulum descends more steeply to the inner side than in a normal tooth; its inner portion is replaced by the crown of the anterior accessory tooth (I). The medisinus is normal in shape, it is wide, open to the base of the crown internally, and does not deepen as it passes outwards. The crochet is also normal. The posterior surface, internally of the well developed paracone style, is fairly flat; the posterior cingulum and the postsinus are represented by two ascending ridges, with a vertical depression between.

The postero-external root in normal specimens of M^3 most often has united with the postero-internal one (the latter being commonly fused with the antero-internal root), but also may be separate (Leiden Museum, cat. f and j; Amsterdam Museum, no. 640). In the just described specimen it is separate, partly exposed on the lateral surface of the maxillary, and with the apex bent inwards.

The left M^2 of the skull is affected by caries, which has destructed its posterior surface. Caries is extremely rare among wild Ungulates; Colyer (1936, p. 616) records only four cases in 2687 specimens [1]). It seems improbable that the disease started in the enamel, as the medi- and postsinus of rhinoceros molars always are filled with food remnants without giving rise to caries. As the excrescences on the anterior surface of M^3 must have offered a great pressure on the approximal surface of M^2, it is not improbable that the dentine had become exposed by fracture. The pressure has also somewhat delayed the eruption of the abnormally shaped M^3; it is inclined forwards, and still on a higher level than the right M^3,

1) In addition I may remark that I found a carious persisting left pd^4 in an adult hippopotamus skull from Mozambique (Leiden Museum, cat. n). The specimen is very remarkable for having a displaced persistent milk incisor, this case has been fully described elsewhere (Hooijer, 1941).

which is more worn. Consequently in the lower jaw the left M_3 is less worn than the right.

The other teeth in the skull present no abnormalities.

The presence of extra formations of dental tissue is difficult to account for. The term odontome is often used in this respect. Colyer (l.c., p. 709) remarks: "It is difficult to draw a border-line between composite odontomes, abnormally shaped teeth and extra teeth, and it is probable that they are different stages of the same thing, i.e. exuberant growth of the epithelial dental formative organ".

Patte (1934) describes and figures a fossil rhinoceros M^3 from Dong Son (Annam), which presents outgrowths at the base posteriorly. Several interpretations are discussed, viz., a "simple" anomaly, a successional tooth, a supernumerary element, a result of trauma. Patte does not arrive at a definite opinion as to the nature of the accessory cusps.

In our case the bone adjacent to the tooth shows no alterations, and it seems improbable that trauma has played part in the production of the extra dental tissue. The tooth possesses all the elements of a normal M^3, and the bodies attached to the protoloph are clearly separated from the surface, therefore it would seem clear that they are not due to aberrant growth of the third molar.

In the description I wrote of the dental mass on the anterior aspect (I) as seemingly an extra tooth, as it has an enamel-covered crown and two roots. The masses at the antero-internal angle (II) and to the internal aspect of the protoloph (III) likewise possess enamel and roots; they may be attributed to abnormal growth of the germs of other supernumerary teeth, but more probably the three elements together belong to one malformed, supernumerary molar. In the latter case I represents the paracone, II the protocone, and III the metacone.

As evidence of the prehistoric occurrence of the present species in Sumatra I give first the description of some teeth from the cave deposits, collected by Dubois during 1888-1890 (for the list of the caves see p. 16/17).

Coll. Dub. no. 917a (pl. II fig. 6), Sumatra.

M^2 dext., slightly worn. The paracone style, most distinct in front, flattens towards the base of the crown. Behind it the external surface bears a broad median tumefaction, also disappearing at the base. The metastyle is very much raised, so that the surface behind the median tumefaction is deeply concave. The lower border of the external enamel, however, is almost straight from the paracone style backwards. The anterior breadth is only 1 mm more than the greatest length of the outer surface. Also in recent specimens this difference may be very small. The highest part of the anterior cingulum, above the antero-external root, is rounded off, labially of this part it rapidly ends in some weak tubercles; lingually it descends, first abruptly and then less steeply, gradually becoming more raised from the anterior surface of the protoloph, which shows no protocone fold. The cingulum narrows again gradually and stops with a faint upturn at the antero-internal angle; an inner cingulum has not developed. The medisinus is comparatively wide and has no distinct "pass", the protoloph and the metaloph meet in a line, the slope of the latter is concave and has no vertical depression. The apex of the metaloph, which just has come into use, hangs over to the anterior side; a large crochet, beginning immediately at the apex of the metaloph, extends almost entirely across the medisinus. It is given off at a very open angle from the metaloph; in this angle another but much smaller projection of the enamel is formed, likewise it begins at the apex of the metaloph; it stands about at right angles both to the metaloph and the crochet, and extends downward only a little further than the half of the depth of the medisinus. The postsinus is shallower than the medisinus and becomes very narrow at the base. The posterior cingulum is divided by an incision into a lower and little crenulated labial part and a higher, not crenulated, lingual part which is more raised from the surface. There is no tubercle on the posterior cingulum.

Individual peculiarities in the present molar are the excessive concavity of the posterior moiety of the labial surface, and the presence of a second crochet. In the right M^2 of a recent *sondaïcus* skull (Leiden Museum, cat. e) the concavity of the external surface is but little less pronounced. This molar also has a small projection of the metaloph internally of the crochet, but it extends not so far downward as in this Sumatran M^2; it is absent in the corresponding left molar of the skull.

Coll. Dub. no. 678a (pl. II fig. 7), Ngalau Sibrambang (Sumatra).

M^2 sin., about half worn down. The paracone style is prominent above, becoming flattened towards the base of the outer surface. A very weak tumefaction occurs in the middle of the outer surface, likewise disappearing near the base. The posterior half of the outer surface is concave, especially above. On the anterior surface the enamel presents a number of weak tubercles in the depression lingually of the parastyle, the depression in which fits the metastyle of M^1. The anterior cingulum descends obliquely from these tubercles; at the labial side the anterior cingulum is only a line, abruptly descending along the parastyle, but at the lingual side of the tubercles the cingulum becomes more prominent as it descends, forming an overhanging ledge below the lingual third of the anterior surface of the protoloph on which there is no trace of a protocone fold. The cingulum narrows gradually towards the antero-internal angle, where it ends as an upturned hook. A cingulum has not developed at the lingual surface of protoloph or metaloph. The anterior surface of the metaloph has no vertical depression. It is almost vertical and somewhat concave near the lingual entrance to the medisinus. More labially it gradually becomes overhanging. Without any fold or distinction it gives off a moderately pointed crochet, which almost follows the turn of the posterior surface of the protoloph and thus does not make the medisinus much narrower than it is lingually of the crochet. The portion of the medisinus labially of the crochet is twice as broad as at the crochet, which thus at its labial side is more defined from the metaloph; as a whole the crochet is directed parallel to the outer surface of the molar. The postsinus is funnel-shaped and a little elongated antero-posteriorly. It is much less deep than the medisinus and is entered by a V-shaped incision in the posterior cingulum, which is not crenulated.

M^2	recent	Coll. Dub. no.	
		917a	678a
1. Antero-posterior	ca. 37—ca. 47	ca. 48	ca. 50
2. Antero-transverse	53—60	57	64
3. Postero-transverse	45—52	44	51
4. Ratio 3 : 2	0.79—0.91	0.77	0.80

When the table above is compared with that on p. 21 the M^2 of *sondaïcus* are seen to differ from the corresponding molars of *sumatrensis* in the comparatively smaller postero-transverse diameter. The latter diameter in the first mentioned specimen of *sondaïcus* even is smaller than in all recent specimens. The anterior breadth of the second specimen exceeds that of the largest recent M^2 known to me.

Coll. Dub. no. 768Aa (pl. III fig. 3), Sumatra.

M^3 dext., much worn. The basal plane is subtriangular with a prominent parastyle. The paracone style is distinct except at the base. A broad tumefaction occurs at the base of the outer surface opposite to the crochet. The posterior cingulum is represented by a distinct tubercle, there is no postsinus. The anterior cingulum is well developed, there is no protocone fold on the anterior surface of the protoloph, consequently the cingulum narrows gradually towards the antero-lingual angle. The cingulum is continued on the lingual surface of the protoloph as a smooth swelling along the base. The entrance to the medisinus is on a level with the lower border of the enamel and is wide and rounded. The slope especially of the protoloph is concave. The crochet is given off at a wide angle from the metaloph and is recurved at its extremity towards the antero-external angle. It is connected with the inner surface of the ectoloph (opposite to the parastyle fold) by a low ridge, which evidently represents the crista. On further wear a medifossette thus would be cut off from the medisinus (in the left M^3 of a recent *sondaïcus* skull (Leiden Museum, cat. j) the crista is represented by a prominent tubercle given off from the inner surface of the ectoloph opposite to the parastyle fold; it does, however, not unite with the crochet at the base). The portion of the medisinus enclosed by the crochet and the incipient crista is deeper than the remainder of the medisinus.

M^3	recent	Coll. Dub. no. 768Aa
1. Antero-posterior . . . . (inner side)	36—46	51
2. Antero-transverse . . .	43—55	57
3. Length outer surface . .	44—58	58

The subfossil M^3 exceeds in size all the recent specimens examined by me.

Coll. Dub. no. 857a (pl. III fig. 5), Ngalau Sibrambang (Sumatra).

P^2 dext. The paracone style and the metacone style are distinctly developed and sharply defined both to the front and to the back. The base of the outer surface is less depressed between the roots than in the P^2 of *sumatrensis* described on p. 23 and figured pl. III fig. 2, and the parastyle is less prominent anteriorly. The cingulum on the anterior surface of the paracone is more prominent. The protocone is separated from the labial part of the protoloph by a narrow cleft. Along the protocone there is no trace of a cingulum. The lingual entrance to the medisinus is narrow and high, but lower still than the connection of the protocone with the labial part of the protoloph; the medisinus would have been closed first towards the front and then towards the inside. The medisinus is wider than in the P^2 of *sumatrensis* and is distinctly deeper than the postsinus. The lingual cingulum is represented at the metaloph as a faint ledge, ascending abruptly from the base of the metaloph close to the protocone up to the postero-internal angle. The dimensions are distinctly greater than those of the P^2 of *sumatrensis* (see the measurements on p. 23).

P^2	recent	Coll. Dub. no. 857a
1. Antero-posterior	ca. 27—ca. 32	ca. 28
2. Antero-transverse . . .	34—44	37
3. Postero-transverse . . .	39—44	40

Coll. Dub. no. 971a (pl. III fig. 6), Ngalau Sibrambang (Sumatra).

P^3 sin. Unfortunately the outer surface has broken off. The tooth is remarkable for the strong development of the cingulum and the presence of many secondary folds. The anterior cingulum forms a broad ledge, gradually descending towards the lingual side. It is continued along the lingual side but here it bears the character of a continuous series of tubercles, forming, however, a ledge too. Along the protoloph it runs a little upward, it ascends more steeply along the metaloph up to the postero-internal where it passes into the posterior cingulum, which is not crenulated and has the usual V-shaped incision. The disc of the protoloph on slightly further wear would have become confluent with the ectoloph. It bears no indication of a protocone fold on its anterior surface. The lingual entrance to the medisinus is narrow and lies only slightly higher than the internal end of the anterior cingulum. The metaloph gives off a long and slender crochet, flanked by two similar but smaller, diverging projections. The latter rapidly disappear downward. On the inner surface of the ectoloph two projections occur, one near the bottom of the medisinus and the other more anteriorly. From the posterior surface of the metaloph two processes project into the postsinus, a large internal and a smaller external. The postsinus remains wide down to its bottom, which is much higher than that of the medisinus. As the external surface of the tooth is missing the usual dimensions cannot be taken. The tooth is decidedly larger, however, than the P^3 of *sumatrensis* (see p. 24, pl. III fig. 4); the antero-posterior diameter measured across the cingulum is 38 mm in the present tooth and 32 mm in the P^3 of *sumatrensis*. In recent *sondaïcus* skulls the internal cingulum of P^3 and P^4 is usually indicated as a row of incipient tubercles, which only exceptionally (Amsterdam Museum, no. 640) form a ledge as in the present specimen. A threefold crochet I observed in some recent P^4 of *sondaïcus* (Leiden Museum, cat. d, Amsterdam Museum, no. 512). Processes from the metaloph projecting into the postsinus may occur in recent *sondaïcus* too.

Coll Dub. no. 679b (pl. III fig. 9), Sumatra.

P^4 dext., damaged at the base of the parastyle. The paracone style is moderately developed; behind it the upper part of the outer surface is raised in the middle. The metacone style is vaguely indicated above and becomes more distinct below. The metastyle is raised in its upper part. The cingulum is well developed anteriorly, becoming broader as it descends. In the lingual third of the anterior surface it becomes narrow again; it terminates at the antero-internal angle. There is no protocone fold. The base of the metaloph overlaps that of the protoloph to a greater extent than in the P^4 of *sumatrensis* described above (p. 24/25). The entrance to the medisinus is narrow, like the medisinus itself. The pass ascends less steeply between the protoloph and metaloph than in the P^4 of *sumatrensis* described above. A large crochet projects from the metaloph the whole way across the medisinus, internally to the crochet there is a small process which rapidly flattens downward. There is a faint indication of a cingulum along the slope of the metaloph. The postsinus is much shallower than the medisinus and is much compressed laterally. The posterior cingulum is divided by the usual V-shaped incision into a large inner and a small outer part, from the latter a ridge descends obliquely down to the postero-external angle.

Coll. Dub. no. 905b (pl. III fig. 10), Sumatra.

P^4 dext., much worn down. The paracone style is rather prominent at the worn surface, but absent at the base. There is a weak metacone style which, however, does not flatten towards the base. Only the lingual portion of the anterior cingulum is left; it narrows gradually towards the antero-internal angle where it terminates hook-shapedly turned up. The disc of the protoloph, which bears no trace of a protocone fold, is about to unite with that of the metaloph; the base of the metaloph is seen to overlap that of the protoloph as in the foregoing specimen. The crochet projects from the metaloph above, it is attached to the inner surface of the ectoloph near the bottom of the medisinus. The portion of the medisinus labially of the crochet is only very shallow and on slightly further wear would be cut off from the medisinus so as to form an accessory fossette. The postsinus is closed posteriorly and is elongated in a direction parallel to that of the metaloph. It is much shallower than the main part of the medisinus.

P^4	recent	Coll. Dub. no.	
		679b	905b
1. Antero-posterior	ca. 36—ca. 42	—	ca. 35
2. Antero-transverse	51—60	51	52
3. Postero-transverse	47—54	ca. 48	ca. 48

The subfossil P^4 are not especially large.

Four specimens of pd^3 belong to the present species. They are larger than those of *sumatrensis* (p. 25), as appears from the table below (the first 2 specimens are of the right side, the latter 2 of the left). They differ in several respects from the *sumatrensis* specimens. The metacone style is less developed, and the anterior cingulum forms a very prominent ledge. There is no trace of a protocone fold on the anterior surface of the protoloph, nor of a vertical groove on the anterior surface of the metaloph. The entrance to the medisinus is wider than usually in *sumatrensis*. The crochet is long and slender, in Coll. Dub. no. 678t (pl. IV fig. 3) its extremity is recurved towards the external side. The other specimens possess projections from the ectoloph into the medisinus; a true crista has developed in Coll. Dub. no. 679h (pl. IV fig. 4), united with the crochet and is thus enclosing a medifossette. The posterior cingulum presents the common V-shaped incision but no tubercle; the postsinus is distinctly shallower than the medisinus.

Coll. Dub. no.	678s	679h	678t	679i
Antero-posterior	—	ca. 40	ca. 41	ca. 40
Antero-transverse	45	45	46	43
Postero-transverse	—	40	43	40

Two specimens of pd^4 of *sondaïcus* occur in the collection from Sumatra. They are much larger than the recent specimens examined by me. The first specimen is of the right side (pl. III fig. 12); the second, of the left side, lacks a good deal of the posterior surface. The paracone style is very prominent, more than in most of the *sumatrensis* specimens. Otherwise the present specimens differ from the pd^4 of *sumatrensis* in the same characters as already noticed when dealing with the pd^3, viz., the less developed metacone style, the more prominent anterior cingulum, absence of protocone fold and of vertical groove on the anterior surface of the metaloph, wider entrance to the medisinus, absence of tubercle on posterior cingulum, and comparatively shallower postsinus.

Coll. Dub. no.	678w	642i
Antero-posterior	ca. 44	ca. 43
Antero-transverse	51	50
Postero-transverse	47	ca. 50

We thus have evidence of the former existence of *Rhinoceros sondaïcus* Desm. in at least one Sumatran cave, viz., Ngalau Sibrambang. As the remains are scarcer than those of *Dicerorhinus sumatrensis* (Fischer), it seems to have been less abundant than the latter species already in prehistoric Sumatra.

In the following pages the fossil remains of *sondaïcus* from Java are described, preceded by a short account of the literature.

The only character mentioned by Dubois (1908, p. 1258/59) to separate *sivasondaicus* from *sondaïcus* is that the fossil form is intermediate between *sivalensis* and *sondaïcus* in the relation between length and breadth of the upper molars.

A calvarium of *Rhinoceros* from Trinil (Java), obtained by the Selenka expedition, was referred to *sivasondaicus* by Stremme (1911, p. 89), though he failed to detect the distinguishing character given by Dubois. Some limb bones also were referred to Dubois's species. Stremme pointed out the close resemblance of the fossil skull to *sondaïcus* and noticed some dental differences from *sondaïcus,* which were, however, shown by Van der Maarel (1932, p. 75/76) to be of no importance. The latter author describes two calvariums from Bondol (Java), the best preserved of which doubtless could be referred to *sondaïcus.* Von Koenigswald (1934, p. 191) records *sondaïcus* from the Trinil- and the Ngandong fauna of Java. The form from Ngandong is stated to be comparatively large (l.c., 1933, p. 95/96, 1935a, p. 190). A rather strong crochet is observed at a rolled upper molar from Boemiajoe (l.c., 1933, p. 95). *Rh. sondaïcus* has been recorded from an "abri-sous-roche" near Sampoeng in Central Java by Dammerman (1934, p. 482). The lower C are stated to be rather heavy.

From the Djetis fauna always "*Rhinoceros* cf. *sondaïcus*" is mentioned by Von Koenigswald (1934, p. 191, 1935a, p. 193, 1939, p. 35), apparently because only isolated teeth and badly preserved jaw fragments, mainly from the lower jaw, were found (cf. l.c., 1934, p. 193). A corroded tooth fragment from Tjisaär (E. of Soebang, W. Java) and a strongly corroded lower molar from the Tjitaroem valley near Bandoeng, however, are referred without reserve to *sondaïcus* (l.c., 1935b, p. 86, 87 fig. 10). The former tooth originates from the Tambakan layers and is stated to belong to the Djetis fauna, the latter very probably also (cf. l.c., pp. 86, 88).

Coll. Dub. no. 1983 (pl. VII figs. 5, 6; pl. VIII), Solo valley.

Right maxillary with complete toothrow pd^1-M^3. To the same individual belong also the anterior portion of the left maxillary with pd^1-P^3 and the posterior portion of the latter, the fronto-parietal upper surface of the skull, and a great part of the left zygomatic arch. I shall first describe the dentition which belonged to a fully adult individual as appears from the well worn M^3 (pl. VIII).

The right and left pd^1 are considerably worn. The contour is subtriangular. The outer surface is convex from before backwards and bears a mesostyle, more defined in the left than in the right. The inner surface forms an acute angle with the outer and is almost straight; the posterior surface is the smallest and is convex from side to side. Two distinct pits occur on the worn surface. One is placed internally, slightly in advance of the middle of the tooth, and represents the depression between the anterior cingulum and the protoloph (cf. the slightly worn pd^1 from Sumatra represented on pl. IV fig. 11), and is not yet isolated inwards.

The other fossette is wider and deeper; it is situated internally and posteriorly of the middle of the tooth and represents the medisinus.

Right and left P^2. The outer surface is produced into a weak paracone style at one-third of the length from the antero-external angle. In front of it the surface is slightly depressed; the paracone style disappears towards the base. The posterior moiety of the outer surface is convex from before backwards. The base of the outer surface is depressed between the roots. The disc of the protoloph is about to unite with the ectoloph in the right P^2; in the left it just has become confluent with the ectoloph. In front of the point of connection a distinct pit is enclosed by the anterior cingulum, which is well developed and runs almost horizontally to the antero-internal angle, where it terminates with a faint upturn. The inner surface has no trace of a cingulum. The medisinus is not yet closed internally and is entered by a pass which ascends steeply between proto- and metaloph and is higher than the lowest point of the anterior cingulum. The disc of the metaloph is broader than that of the protoloph, the crochet is small, in the right it is bifid. The postsinus is rounded and much shallower than the medisinus.

Right and left P^3. The greater part of the ectoloph of the left tooth has broken off, the right is complete. The tooth is much broader than P^2, on the outer surface the paracone style is situated more anteriorly, and is quite distinct. Likewise it flattens towards the base. There is a very slight median tumefaction on the outer surface; above the posterior root commences another vertical rib, the metacone style. It is broader and less prominent than the paracone style, and flattens towards the top. Only the inner half of the anterior cingulum is not yet touched by wear; it slopes gradually down to the antero-internal angle. There is a slight trace of a tubercle at the entrance to the medisinus. The base of the metaloph overlaps that of the protoloph, so that the entrance to the medisinus is somewhat obliquely to the inner border of the tooth and slightly curved; the pass between proto- and metaloph ascends less steeply than in P^2. The crochet is reduced to a broad swelling of the anterior surface of the metaloph in the right P^3; in the left it is still more defined. The postsinus forms a shallow rounded pit, much less deep than the medisinus.

Right P^4. This tooth is larger than P^3; the outer surface resembles that of the foregoing tooth in every detail. Of the anterior cingulum still less is left than in P^3 but it presents no differences. The tubercle at the entrance to the medisinus is somewhat more distinct. The metaloph overlaps the protoloph at the base to the same extent as in P^3. The crochet is more defined than in the right P^3, but less than in the left. The medisinus is shallower than in P^3, but still distinctly deeper than the postsinus.

Right M^1. This molar is strikingly broad, broader even than M^2. Though much worn, the paracone style is still prominent and well defined anteriorly; it gets more indefinite below. There is a weak median tumefaction. The posterior moiety of the outer surface, except for a slight swelling above the posterior root, is fairly flat and is more inclined inwards than the anterior moiety. There is no trace of a protocone fold on the anterior surface of the protoloph. The anterior cingulum forms a prominent ledge, which gradually becomes narrower descending to the antero-internal angle, where it terminates hook-shapedly turned up. At the entrance to the medisinus a small but distinct tubercle has developed; the entrance itself lies slightly higher than the internal end of the anterior cingulum. The medisinus gradually becomes wider passing from the entrance to the crochet, which is not very prominent. The portion of the medisinus labially of the crochet is wide and rounded, without any accessory fold. The postsinus is wide, shallower than the medisinus and slightly elongated in antero-posterior direction.

Right M^2. The paracone style on the outer surface has very distinctly developed, the parastyle is distinct too. The parastyle fold separating the two styles is not continued down to the base. In the middle of the outer surface there is a weak tumefaction, behind which the surface is slightly concave from before backwards and strongly inclined towards the inner side. The upper portion of the metastyle is missing. On the anterior surface there is a prominent cingulum and no protocone fold. The cingulum descends less steeply than in M^1, it terminates at the antero-internal angle on a lower level than in M^1, and has a faint upturn. There is no trace of an inner cingulum. The entrance to the medisinus is narrow again, but is lower than in M^1, proto- and metaloph being connected only up to the level of the lowest point of the anterior cingulum. The medisinus is shaped as in M^1 but slightly narrower; the postsinus is just closed posteriorly, it is somewhat more laterally compressed than in M^1 and is distinctly shallower than the medisinus.

Right M^3. The basal plane is sub-triangular. Both the paracone style and the parastyle are distinctly developed, they are separated by the parastyle fold which is continued almost to the base of the crown. Behind the paracone style the outer surface is convex from before backwards, especially above the posterior root. The anterior surface is flat without any indication of a protocone fold. The anterior cingulum slopes down still less steeply than in M^2 and terminates slightly before reaching the antero-internal angle, not turned up as a hook. There is no inner cingulum. The entrance to the medisinus is wide and on a level with the lower margin of the enamel. The medisinus gradually deepens as it passes outwards. The slope of the metaloph is concave below, it gives off a blunt crochet which projects half way across the medisinus. There are no traces of crista or antecrochet; the posterior cingulum is prominent and encloses a small pit, the postsinus.

In his first description of *sivasondaicus*, of which species the present specimens must be considered as the type, Dubois (1907, p. 454) states that it is very closely related to *sondaïcus*, but still has some resemblance to *sivalensis*. Later Dubois (1908, p. 1258) writes that the Kendeng form fills the gap that exists between *sivalensis* and *sondaïcus*. The few differences from *sondaïcus* indicated by Lydekker are stated to be still smaller between the Javan form and *sondaïcus*. Especially in the relation between length and breadth of the upper molars *sivasondaicus* should be intermediate between *sivalensis* and *sondaïcus*.

Now Lydekker first mentioned four points in which the upper molars of *sivalensis* would differ from those of *sondaïcus*, viz., the more produced "buttress", the consequently more curved "dorsum" or outer surface, the larger anterior cingulum, and the larger and more pointed crochet (Lydekker, 1876, p. 27). Later, however, Lydekker (1881, p. 31) remarks that the only difference between the upper molars of *sivalensis* and those of *sondaïcus* is that the greatest length of the anterior surface is equal to the greatest length of the outer surface in little worn teeth of the former species, whereas in *sondaïcus* the former measurement is greater than the latter. As already stated above (p. 10), *sumatrensis* usually differs in the same respect from *sondaïcus*, though the difference does not hold in all cases. Lydekker gives the measurements of two upper molars of *sondaïcus* (apparently M^2), in which the anterior surface exceeds the outer about 6 mm in maximum length. This falls within the range of variation found by me, viz., 2-7 mm.

The values for the length of the anterior and of the outer surface of an M^2 of *sivalensis* from the Siwaliks of the Potwar district (Lydekker, 1876, pl. V fig. 5), first given as 61 and 65 mm (l.c., p. 27) are later given as both maximally 66 mm (Lydekker, 1881, p. 31). The first breadth is certainly not taken at the base of the crown, otherwise I cannot understand how one can take such different breadths from one and the same tooth, even if the paracone style is not encounted in the first case. Lydekker (1881, p. 31) also gives the measurements of a second M^2, a slightly worn specimen from the lower Manchhar beds of Sind (l.c., pl. V fig. 2). This specimen, however, must be left out of consideration, as it is re-identified as *R. sivalensis* var. *intermedius* (Lydekker, 1884a, p. 5, pl. I fig. 3) and transferred to *Chilotherium* by Matthew (1929, p. 508) and Colbert (1935, p. 201).

Besides in the relation of the anterior breadth and the greatest length of the outer surface, there is another point in which the upper molars of *sivalensis* differ from those of *sondaïcus* and agree with those of *sumatrensis,* viz., in the presence of a protocone fold. This fold is well represented in the typical M^2 of *sivalensis* (Lydekker, 1876, pl. V fig. 5; less distinctly in l.c., 1884a, pl. I fig. 7). Lydekker (1881, p. 30) states that the vertical groove on the anterior aspect of the protoloph occurs in all the specimens; it is also shown in the M^3 (Lydekker, 1881, pl. V fig. 4) and in the P^3 (ibid., fig. 6). Moreover the teeth of *sivalensis* are often considerably larger than those of *sondaïcus.*

As the molars of the type of *sivasondaicus* are well worn it is not possible to measure the greatest length of the outer surface to determine whether it is equal to, or smaller than, the anterior breadth. Less worn molars, which will be described below, are fully in accord with *sondaïcus* in this respect. Moreover I can hardly see how a species can be intermediate between *sivalensis* and *sondaïcus* in this respect, the least difference between the breadth and the greatest length in *sondaïcus* being only 2 mm, too small to be of any value.

As to the second dental difference between *sivalensis* and *sondaïcus, sivasondaicus* is perfectly in accord with *sondaïcus,* having no trace of a protocone fold on the anterior surface of the protoloph. The teeth agree with those of *sondaïcus* in every detail. They differ from those of *sumatrensis* in the absence of the protocone fold and of a vertical depression on the anterior surface of the metaloph, in the comparatively shallow postsinus, and in the relatively smaller postero-transverse diameter of M^1 and M^2.

The third difference between the molars of *sivalensis* and of *sondaïcus* is a difference in size. Now the length of the complete upper tooth series of *sivasondaicus* certainly is greater than in any recent *sondaïcus* skull seen by me, being 267 mm against 242-255 mm in the recent specimens [1]), but the difference is not important; the length of the complete upper

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1) The greatest value for the length of the complete upper series in recent *sondaïcus* was found by Van der Maarel (1932, table K) as 266 mm in his specimen 10. I measured that specimen too (Amsterdam Museum, no. 507), and found the length certainly not greater than 255 mm (Van der Maarel measured this specimen without removing the lower jaw; see l.c., p. 71).

tooth series in *sivalensis* is not less than 324 mm (Baker and Durand, 1836, p. 502). Of many of the teeth the dimensions are larger than in the recent specimens. The breadth of M^1 (65 mm against 51-60 mm in the recent) is especially great, but Colbert (1935, p. 180) records an M^1 of *sivalensis* of which the breadth is not less than 80 mm.

The teeth of *sivasondaicus* thus certainly are not intermediate between *sivalensis* and *sondaïcus*. The relatively small size difference from *sondaïcus* certainly is not sufficient for specific distinction. Furthermore Dubois (1908, p. 1259) states that the upper molars of *sivasondaicus* differ from those of *karnuliensis* in the absence of the cingulum on the inner surface of the protoloph, and of the tubercle in the medisinus. This just are the only characters I can find to separate the upper molars of *karnuliensis* (Lydekker, 1886b, pl. X fig. 1) from those of *sondaïcus*, and that the differences are of no importance will appear on p. 112.

The fragments of the calvarium equally present but slight differences from the corresponding parts of the skull of *sondaïcus*. The palate seems to be rather concave, especially in the premolar region. A good deal of the roots of the teeth is exposed on the lateral surface of the maxillaries, as common in old individuals. The infraorbital foramen is preserved on the left side, it is situated above pd^1. In front of pd^1 the maxillaries are produced into two slender diverging processes, indicating the presence of premaxillaries, which are, however, missing. On the right side a small part is preserved of the anterior zygomatic root, its posterior border is placed above the hinder part of M^2. The lower part of the orbit is also seen, its anterior border is situated above the front of P^4. All these features are fully consistent with *sondaïcus*. The following fragment also presents no differences. It is the posterior part of the left maxillary, in which the tips of the roots of M^3 are preserved. This fragment comprises also a part of the perpendicular portion of the palatine and of the pterygoid process of the sphenoid and extends backwards to the alar foramen. The left zygomatic arch can be matched to the foregoing fragment with almost complete certainty. The prominence which marks the posterior border of the orbit is rather flat. The zygomatic arch is slender. The outer surface is rugose below. The lower edge is less sharp than the upper. The height in the middle, where the upper edge strongly hangs over to the inside, is 58 mm, which is a few mm more than in the recent *sondaïcus* skulls examined by me. The fragment has broken off just in advance of the glenoid cavity.

The preserved upper portion of the skull comprises the frontals (composed of several fragments, the spaces left between them partly filled with plaster), the parietals and the supraoccipital. The sutures are wholly obliterated. As seen in profile (pl. VII fig. 6) the upper surface is strongly concave from before backwards, the frontals are smooth, indicating the absence of horns. The profile line, carefully compared (by means of a pasteboard model) with all recent *sondaïcus* skulls available to me, proved to be more curved than in any of them, though the difference from an old female skull of a skeleton in the Leiden Museum (cat. c; the sex judged from the characters of the pelvis and from the slightly curved nasals) is not great. As we have only the upper surface of the fossil calvarium it is not possible to decide whether the greater depression of the frontal region is due to the greater prominence of the occipital portion or to that of the nasal portion, or perhaps to both. In *Rh. sivalensis*, as in *unicornis*, the occiput is more elevated than in *sondaïcus;* this was the main reason for Baker and Durand (1836, p. 491) who paid little attention to the structure of the teeth, to identify a *sivalensis* skull, with other rhinoceros remains, from the Siwaliks as *Rh. indicus fossilis*.

At the right side the frontal has broken off about 4 cm in advance of the overhanging processus supraorbitalis. At the left side the bone is preserved some 6 cm more anteriorly and certainly comprises the posterior part of the nasal, the supraorbital process of the frontal is missing here. As the sagittal line of the skull can be determined with sufficient certainty, the greatest width of the frontals can be given as ca. 205 mm, which is not greater than may occur in *sondaïcus*, the variation in which I found to range from 167 mm (Leiden Museum, cat. d) to 219 mm (Zool. Laboratory Utrecht, Coll. Van Son). The width of the frontals in *sivalensis* is 254 mm (Baker and Durand, 1836, p. 502).

The sides of the skull are very imperfect, it is even impossible to locate the exact position of the orbit. The upper border of the occiput is not indented. As seen from behind the nuchal crest is regularly convex from side to side, and seen from above it is almost straight. This is remarkable because in most adult *sondaïcus* skulls the upper border of the occiput is deeply indented in the middle, but there is a great amount of variation in this character, and in some skulls (Leiden Museum, cat. d and j, Amsterdam Museum, no. 510) the shape of the superior portion of the occiput is approximately the same as that in our fossil. The depressions for the cranio-cervical muscles on either side of the (incomplete) median protuberance are of moderate development. As the preserved occipital portion of the skull is not higher than about 8 cm, the degree of the backward slope of the occiput cannot be determined. In the parietal region of the skull there is a very low and smooth median ridge, which fades away in the frontal portion. At their greatest width, the frontals are very slightly depressed in the median line, for the rest the upper surface is flat transversely. The right fronto-parietal crest is not preserved, the left is complete. The crests converge gradually backwards and then diverge abruptly into the temporal crests. The least distance between the parietal crests is ca. 66 mm. Below them, on each side the slope of the parietals is straight as far as preserved; the temporal fossa is regularly concave from before backwards. A parietal foramen is present at the left side.

A peculiarity of the present fossil skull is that the parietals slope downward below the parietal crests in a straight line, as seems to be the case also in *sivalensis* (Fauna Antiqua Sivalensis, pl. 73 fig. 2). Even in the three recent *sondaïcus* skulls in which the flat sagittal upper surface enclosed by the parietal ridges is broader than in the fossil, the parietals are still somewhat convex on the sides. These skulls are Leiden Museum, cat. d (70 mm), cat. j (68 mm), and Amsterdam Museum, no. 510 (69 mm). As stated above, only these skulls agree with our fossil in the not indented occipital crest, which thus appears to coincide with a broad region between the parietal crests.

In conclusion it may be said that, though the fossil skull certainly presents some differences from a series of twelve adult skulls of *sondaïcus*, viz., the larger teeth, the higher zygomatic arch, the more concave frontals, and the flatness of the parietals, these differences certainly are wholly insufficient to warrant specific distinction. Certainly some of, or perhaps all the differences, would disappear when examining a larger series of recent skulls. *Rhinoceros sivasondaicus* Dubois, therefore, must be placed in the synonymy of *Rh. sondaïcus* Desm.

Coll. Dub. no. 1980 (pl. IX fig. 5), Kedoeng Panas.

Large fragment of calvarium with right P^4-M^3 and left P^3-M^3. As the specimen is somewhat crushed, the two toothrows do not occur in their exact natural mutual position. The left series is not damaged; at the right side the anterior part of the ectoloph of P^4 and M^2 is missing, and the protoloph of M^3 is damaged internally. The left series only has been figured.

The dentition is in a somewhat less advanced stage of wear than that described at length above. Due to the lesser wear, the crochet in all teeth is more distinct than in the foregoing specimen. As can be seen from the figure, the teeth present not a single difference in structure from the recent *sondaicus*, and their full description, after all that has been written above, appears to be superfluous. As seen from the table of measurements the dimensions all fall within the range of variation found in the recent specimen, except for the postero-transverse diameter of M^1, which is 2 mm greater.

There is a great number of loose teeth in the collection, which only exceptionally need special remarks. They are enumerated below; the measurements, except those of the upper I, are given in the table V b.

Coll. Dub. no. 1476, Trinil.

Right upper I, in the germ stage, with only partially developed root. The posterior extremity is incomplete. The elongated and low crown forms a median longitudinal ridge, which is straight, though the inner side of the crown is slightly concave, and the outer convex from before backwards. The tooth does not differ in any important particular from the corresponding one in *sondaicus*. The dimensions of this, and of an undetermined specimen (described on p. 108), besides those of the recent upper I (unfortunately lost in most skulls) are given in the following table.

Upper I	Coll. Dub. no.		Leiden Museum			Amsterdam Museum	
	1476	500a	cat. k	cat. j	cat. c	no. 507	no. 510
Length	ca. 54	57	55	52	52	55	52
Breadth	15	19	16	16	15	17	ca. 16

P^2

Coll. Dub. no. 1979a (Trinil). P^2 dext., double crochet.

Coll. Dub. no. 1979b (Trinil). P^2 sin., single crochet.

Coll. Dub. no. 325b (Trinil) P^2 sin., much worn.

Coll. Dub. no. 1976d (Kebon Doeren). P^2 sin., crista long and slender.

Coll. Dub. no. 91a (Soedo). P^2 dext., ectoloph broken off, damaged anteriorly and posteriorly.

Coll. Dub. no. 425g (Kebon Doeren). P^2 dext., ectoloph broken off.

Coll. Dub. no. 109a (?Djeroek). P^2 dext., antero-internal angle.

Coll. Cosijn, Geol. Mus. Leiden, no. 27805 (Java). P^2 dext., ectoloph only.

Coll. Dub. no. 92a (locality unknown). P^2 dext., ectoloph broken off. The specimen is remarkable for the presence of an inner cingulum. The anterior cingulum is continued around the antero-internal angle as a weak ledge; in the middle of the inner surface of the protoloph it expands suddenly, being not less than 6 mm broad at the entrance to the medisinus. It narrows gradually ascending at the slope of the metaloph, and apparently joins the posterior cingulum.

Coll. Dub. no. 6971 (locality unknown). P^2 dext., postero-internal angle broken off.

Coll. Dub. no. 1694g (id.). P^2 sin., ectoloph and metaloph incomplete.

P^3

Coll. Dub. no. 1976e (Bogo). P^3 sin., complete. Wide postsinus.

Coll. Dub. no. 1979c (Trinil). Associated P^{3-4} sin., much worn. Anterior surface of P^3 incomplete.

Coll. Dub. no. 324e (Kebon Doeren). P^3 dext., ectoloph broken off.

Coll. Dub. no. 425h (Kebon Doeren). P^3 sin., ectoloph missing.

Coll. Dub. no. 425i (Kebon Doeren). P^3 sin., ectoloph missing, metaloph incomplete.

Coll. Dub. no. 425j (Kebon Doeren). P^3 dext., ectoloph only.

Coll. Dub. no. 6390 (Kedoeng Broeboes or Kedoeng Madoh). P^3 sin., part of anterior surface.

Coll. Dub. no. 6262 (locality unknown). P^3 sin., much worn. Ectoloph and anterior surface missing.

Coll. Dub. no. 2456 (id.). P^3 sin., ectoloph broken off. There is an inner cingulum at the protoloph, as a continuation of the anterior cingulum. It consists of a row of tubercles, forming a distinct ledge. It dies away ascending at the slope of the metaloph. There is also a projection from the metaloph into the postsinus.

Coll. Dub. no. 2462c (id.). P^3 dext., ectoloph missing. Inner cingulum as in foregoing specimen.

Coll. Dub. no. 429d (id.). P^3 dext., ectoloph lost.

Coll. Dub. no. 103d (id.). P^3 dext., ectoloph and the greater part of metaloph lost.

Coll. Dub. no. 305a (id.). P^3 dext., ectoloph only.

P^4

Coll. Dub. no. 325e (Trinil). P^4 dext., postero-internal angle damaged.

Coll. Dub. no. 1979g (Trinil). P^4 sin., much worn. Antero-external angle incomplete.

Coll. Dub. no. 109b (Djeroek). P^4 dext., ectoloph broken off.

Coll. Dub. no. 253f (Kedoeng Broeboes). P^4 dext., ectoloph broken off.

Coll. Dub. no. 324f (Kebon Doeren). P^4 sin., ectoloph broken off.

Coll. Dub. no. 2454a (locality unknown). P^4 dext., anterior portion of outer surface and inner part of metaloph missing.

Coll. Dub. no. 102b (id.). P^4 dext., proto- and ectoloph for the greater part lost. Inner cingulum.

Coll. Dub. no. 429e (id.). P^4 dext., ectoloph lost, antero-internal angle damaged.

Coll. Dub. no. 1694h (id.). P^4 sin., protoloph and medisinus only.

Coll. Dub. no. 103a (id.). P^4 dext., part of anterior surface.

M^1

Coll. Dub. no. 1979d (Trinil). Germs of right and left M^1 of one and the same individual. In the angle formed by the crochet and the metaloph there is an enamel projection. The greatest length of the outer surface is 51 mm, thus 3 mm smaller than the anterior breadth.

Coll. Dub. no. 1978e (Soember Waroe). M^1 dext., tubercle at entrance to medisinus.

Coll. Dub. no. 317 (Trinil). M^1 dext., much worn.

Coll. Dub. no. 109d (Djeroek). M^1 dext., very much worn.

Coll. Dub. no. 320a (Trinil). M^1 dext., very much worn. Postero-external angle missing, inner surface of metaloph incomplete.

Coll. Dub. no. 109c (Djeroek). M^1 sin., antero-internal angle damaged.

Coll. Dub. no. 91b (Soedo). M^1 sin., outer and anterior surface only.

Coll. Dub. no. 324g (Kebon Doeren). M^1 sin., ectoloph only.

Coll. Dub. no. 2175b (locality unknown). M^1 sin., ectoloph and protoloph damaged.

Coll. Dub. no. 102a (id.). M^1 dext., ectoloph, paracone style damaged superiorly.

M^2

Coll. Dub. no. 1979e (Trinil). Right and left M^2 of one and the same individual. Tubercle at entrance to medisinus.

Coll. Dub. no. 1978d (Soember Waroe). M^2 sin., not much worn. The greatest length of the outer surface is 49 mm; 6 mm smaller than the anterior breadth.

Coll. Dub. no. 1976f (Pl. IV fig. 14) (Tritik). M^2 sin., complete. Remarkable for having an inner cingulum at the protoloph, which joins small tubercles at the entrance to the medisinus. Cf. *karnuliensis*, p. 112.

Coll. Dub. no. 1978c (Soember Waroe). M^2 sin., tubercle in the medisinus labially of the crochet. Cf. *karnuliensis*, p. 112.

Coll. Dub. no. 1977c (Kedoeng Broeboes). M^2 dext., very slight trace of crista.

Coll. Dub. no. 325f (Trinil). M^2 dext., very strong paracone style.

Coll. Dub. no. 315 (Trinil). M^2 dext., much worn; postero-internal angle lost.

Coll. Dub. no. 6955b (Tritik). M^2 dext., enamel on outer side damaged, and lost on the inner side of the metaloph.

Coll. Dub. no. 109e (Djeroek). M^2 sin., anterior, inner, and posterior surface incomplete.

Coll. Dub. no. 104a (Kedoeng Broeboes). M^2 sin., enamel lost along the sides.

Coll. Dub. no. 109f (Djeroek). M^2 sin., ectoloph broken off, inner surface of protoloph incomplete.

Coll. Dub. no. 109g (Djeroek). M^2 sin., preservation like foregoing specimen; strong tubercle at entrance to medisinus, attached to metaloph.

Coll. Dub. no. 86b (?Kali Gedeh). M^2 dext., protoloph. Very faint trace of inner cingulum.

Coll. Dub. no. 324h (locality unknown). M^2 dext., enamel damaged along the sides.

Coll. Dub. no. 103b (id.). M^2 sin., protoloph and central portion of medisinus.

Coll. Dub. no. 1694j (id.). M^2 dext., metaloph with postsinus.

M^3

Coll. Dub. no. 1976h (Kedoeng Loemboe). M^3 sin., slightly worn.

Coll. Dub. no. 1976g (Kedoeng Broeboes). M^3 dext., entire. Incipient tubercle represents posterior cingulum.

Coll. Dub. no. 1977d (8 km N.W. of Kedoeng Broeboes). M^3 sin., slightly damaged at the anterior surface.

Coll. Dub. no. 1979f (Trinil). M^3 sin., parastyle incomplete.

Coll. Dub. no. 1977e (Tritik). M^3 sin., much worn. The three angles incomplete.

Coll. Dub. no. 109h (Djeroek). M^3 sin., antero-external angle missing; outer surface, and inner surface of metaloph damaged.

Coll. Dub. no. 2459a (Tritik). M^3 sin., greater part of protoloph and ectoloph lost.

Coll. Dub. no. 253g (Tegoean). M^3 sin., metaloph and inner part of protoloph incomplete.

Coll. Dub. no. 425k (Kebon Doeren). M^3 dext., metaloph only.

Coll. Dub. no. 6955c (Tritik). M^3 dext., metaloph only.

Coll. Dub. no. 109j (Djeroek). M^3 dext., inner portion of metaloph.

Coll. Dub. no. 109i (Djeroek). M^3 dext., medisinus only.

Coll. Dub. no. 324j (locality unknown). M^3 dext., damaged at inner side of protoloph.

Coll. Dub. no. 1976i (id.). M^3 dext., upper portion of metaloph damaged.

Coll. Dub. no. 324i (id.). M^3 sin., antero-external angle and enamel on inner side of protoloph missing.

Coll. Dub. no. 103c (id.). M^3 dext., metaloph and medisinus.

Coll. Dub. no. 1694i (id.). M^3 sin., metaloph with the large postsinus.

Milk premolars (table III):

Coll. Dub. no. 2518 (Bangle). pd^1 dext., with anterior cingulum.

Coll. Dub. no. 320b (Trinil). pd^2 sin., mesostyle damaged, protoloph and inner side of metaloph incomplete.

Coll. Dub. no. 305b (locality unknown). pd^2 dext., part of ectoloph with mesostyle.

Coll. Dub. no. 325c (Trinil). pd^3 sin., double crista.

Coll. Dub. no. 3801 (Trinil). pd^3 dext., postero-internal angle.

Coll. Dub. no. 324d (locality unknown). pd^3 sin., antero-external angle missing.

Coll. Dub. no. 6653a (Soedo). pd^4 dext., crushed; antero-external angle damaged.

Coll. Dub. no. 2457 (pl. X fig. 8), Trinil.

Upper portion of skull of young individual. It consists of the supraoccipital (without the median lower portion) and the parietals, incomplete on the sides. The sutures between the bones are already closed, but the junctions with the frontal and with the squamosal are shown, they form the anterior and the lateral borders of the fragment respectively. The external parietal crests are hardly indicated; the occipital crest is regularly curved from side to side and is not indented posteriorly. The depressions for the cranio-cervical muscles are well shown, between them there is a slight median vertical crest. The lower portion of the supraoccipital is inclined forward. The internal surface is concave and presents a median protuberance.

In *sondaïcus* the parietal and the parieto-occipital sutures are just closed when M^1 is erupting (Leiden Museum, cat. g, Amsterdam Museum, no. 889), and the squamosal commences to fuse with the supraoccipital and the parietal when M^2 has yet no signs of wear (Leiden Museum, cat. k). In older skulls also the parietal crests become more and more distinct. Also in these three young skulls there is some variation in the shape of the occipital crest: deeply indented posteriorly in the first two, and hardly in the last. On account of the very close resemblance of the fossil to the corresponding portion of young recent *sondaïcus* skulls I have no doubt about their specific identity. The fossil must have belonged to a skull in which M^2 was not yet in use. Some comparative measurements (the only that can be taken from the fossil) are given below:

	Leiden Museum cat. g	Amsterdam Museum no. 889	Coll. Dub. no. 2457 Trinil	Leiden Museum cat. k
Greatest breadth of supraoccipital	124	138	144	ca. 150
Distance from middle of occipital crest to parieto-frontal suture	72	88	80	108

Coll. Dub. no. 305 (pl. X fig. 13). Soember Waroe.

Lower jaw. The left horizontal ramus only lacks a portion below M_3; the ascending ramus is complete, only the coronoid process has broken off. The symphysis, except for a part of the lateral walls of the alveoli for the C, is entire. Of the right ramus horizontalis and ramus ascendens the greater parts are preserved, but the fragments cannot be matched with certainty to one another and to the symphysis. The lower border of the ramus is slightly convex from before backwards, that of the symphysis is inclined upwards. In front of the alveolus of P_2 the symphysis is slightly constricted, posteriorly it extends to the middle of P_2. There are three mental foramina in an antero-posterior line on the lower surface of the symphysis on the left side; on the right they are situated more backwards except the anterior, which is double. A larger mental foramen, double on the right side, is found below P_2. The horizontal ramus is slender, medially it has a very shallow longitudinal depression. The mandibular foramen is on a level with the molars. As seen from the side, the angle of the mandible forms a quarter of a circle; the posterior border of the ascending ramus is slightly notched below the condyle. The condyle is elongated transversely, slopes downwards to the inner side, with a depression anteriorly in the inner part. Posteriorly, to the inner side, it has a facet for the postglenoid process of the squamosal. The processus coronoideus, as said above, has broken off.

The C are lost, but their large alveoli are present, they extend backwards to below the anterior root of P_2. Between them there is no trace of median I. The P_2 is lost on the right side, part of its posterior root only remains on the left. The further tooth-series is complete and undamaged on the left side; on the right the inner portion of P_4, the M_2, and the inner part of the metalophid of M_3 are missing. In the premolars the posterior valley is narrow, though larger still than the anterior valley.

On the outer surface there is a deep vertical groove between metalophid and hypolophid, in P_4 it is obstructed at the base by a tubercle. In the molars the posterior valley is wide, and the anterior becomes lower and wider when passing before backwards. A slight cingulum runs upwards and forwards from the entrance to the anterior valley along the inner surface of the metalophid. In the right M_3 the inner cingulum is represented by two incipient tubercles at the entrance to the posterior valley; they are absent in the left. On the anterior surface of the molars there is a faint cingulum, running upwards and inwards from the base of the metalophid. An outer cingulum has not developed, but a posterior is present, in the form of an upwards curved transverse basal ridge.

From table VI it appears, that the measurements fall within the range of variation of the recent *sondaïcus,* and I cannot perceive a single structural difference. It is of no importance that the small median I are not present; in two skulls (Leiden Museum, cat. c and j) the alveoli of these functionless teeth have almost disappeared.

None of the specimens mentioned below presents characters by which it can be distinguished from the recent material of the present species.

Coll. Dub. no. 319, Trinil.

Anterior portion of lower jaw, broken off behind P_4. The symphysis extends backwards to the middle of P_3. The alveoli for the small median I are present, the right C has broken off. P_2 is missing on the right side, damaged on the left.

Coll. Dub. no. 422, Tegoean.

Symphysis. Alveoli for I and C are shown, the right P_2 and P_3 undamaged.

Coll. Dub. no. 2491, Trinil.

Great portion of left horizontal ramus, with complete ramus ascendens, M_2 and M_3 are present. The coronoid process is entire, thin transversely, projects upwards and somewhat forwards, and is slightly curved medially. It rises ca. 20 mm above the condyle.

Coll. Dub. no. 2465, locality unknown.

Right ramus horizontalis, broken off in advance of P_3. The ramus has a shallow longitudinal depression in the inner surface, the mandibular foramen is partly below the level of the molars, of which only M_3 is present. The coronoid process is missing, the condyle damaged.

Coll. Dub. no. 428b, Pati Ajam.

Portion of right horizontal ramus, with M_2, M_3, and the anterior moiety of M_1.

Coll. Dub. no. 390, locality unknown.

Right horizontal ramus, broken off in advance of the mental foramen. Only M_2 and M_3, which are well worn. The angle of the mandible is incomplete, the coronoid process lost, of the condyle the outer part present.

Coll. Dub. no. 3807, Tawang.

Posterior portion of left ramus, with posterior part of M_2 and erupting M_3.

Coll. Dub. no. 430, Kedoeng Broeboes.

Right and left ramus horizontalis of young individual with milk dentition. Left pd_2 broken off, the right is complete. The posterior valley forms an isolated pit, just like in the pd_2 of a young *sondaïcus* skull in the Leiden Museum (cat. b). The pd_3, entire on both sides, has a bilobed anterior portion of the metalophid. One lobe forms the anterior wall of the anterior valley, and extends almost as far inwards as the posterior parts of metalophid and hypolophid, the other projects forwards, and disappears towards the base. The metaconid is somewhat constricted above. The posterior valley is wider than the anterior, there is no trace of a cingulum. The pd_4 resembles pd_3, but lacks the anterior projection of the metalophid, the inward projection of the anterior part of the metalophid is more slender, the posterior valley distinctly lower than the anterior. The hypolophid of the right pd_4 is damaged. M_1 is not yet erupted; the height of the ramus below pd_4 is 64 mm, 58 mm in the young skull of *sondaïcus* in the Amsterdam Museum (no. 889) which is in exactly the same stage of growth. The dimensions of the teeth agree with those of the recent specimens.

Coll. Dub. no. 429g, Kedoeng Broeboes.

Fragment of right ramus with pd_3 and pd_4, the roots of pd_1 and pd_2 are present. The height of the ramus below pd_4 is 54 mm. The teeth are slightly more worn than those in the foregoing jaw.

Coll. Dub. no. 515 (pl. X fig. 10), Trinil.

Lower jaw of young individual. At the left side it has broken off behind the already formed alveolus for M_1, the height of the ramus below pd_4 is 60 mm; the right ramus is lost behind pd_2, which is the only tooth which is present on both sides. In the symphysis are three pairs of alveoli. One pair for the median I, which are close together, about 7 mm in diameter and exposed along their entire length (30 mm). Laterally there are the alveoli for the deciduous canini, their greatest and smallest diameters are 17 and 13 mm respectively. Between these alveoli, and on a higher level, the alveolus for the C has developed on both sides. Some young jaws of *sondaïcus* (Leiden Museum, cat. g and k; Amsterdam Museum, no. 889) are in approximately the same stage of growth, and present the same arrangement of the teeth in the anterior portion of the symphysis. In a younger jaw (Leiden Museum, cat. b) with pd_4 erupting, the very small deciduous median incisors are not yet shed. Their diameter is only 3 mm, behind them the calcified tips of the I are visible. A table with comparative measurements of the recent jaws is given here.

	Leiden Museum cat. g	Amsterdam Museum no. 889	Coll. Dub. no. 515 Trinil	Leiden Museum cat. k
Length of symphysis	95	86	77	114
Least width of symphysis	62	71	67	77
Height of ramus at pd_2	58	55	58	66

The present specimen might very well belong to the same individual as the upper portion of the young skull from Trinil (Coll. Dub. no. 2457) described on p. 59, the two specimens even were collected in the same year (1900).

Owen (1840-45, p. 589) states that he was informed by Falconer, that one of the Siwalik species of *Rhinoceros* had six incisors in both jaws. The same remark we find in the Palaeontological Memoirs of Falconer (1868 I, p. 21), where the species is mentioned as *Rh. sivalensis*. In this respect it would resemble the Siwalik species of *Hippopotamus* with the same specific name (which, therefore, often is referred to a distinct genus *Hexaprotodon*). Lydekker (1876, p. 53) rightly observes that none of the figures in the Fauna Antiqua Sivalensis bear out this statement, and that, on the contrary, the lower jaw assigned to *Rh. sivalensis* is tuskless. (This type of jaw was later (Lydekker, 1881, p. 39) referred to *Coelodonta platyrhinus* (Falc. et Cautl.)).

The present young lower jaw of *sondaïcus* possesses six alveoli in the symphysis. The jaws figured as *platyrhinus* in Fauna Antiqua Sivalensis (pl. 72 fig. 4, pl. 75 fig. 10) have, like *sondaïcus*, one pair of small I between the C (these jaws are referred to *Rh. palaeindicus* by Lydekker (l.c.)). I believe that Falconer's statement that one of the Siwalik rhinoceroses is hexaprotodont rests upon a superficial examination of a specimen of that form, in the same stage of growth as I described above.

Colyer (1936, p. 144) describes a specimen of *sondaïcus* in the Museum of the Royal College of Surgeons in the following words: "In each side of the mandible there are three milk incisors, the large second incisor, the small first incisor and another one between or rather behind these two". As Flower and Garson (1884, p. 419) state that in this specimen M_1

has not yet fully developed, it is of the same age as the jaws mentioned above, and it is evident that Colyer regards the developing C as an extra milk incisor.

Postcranial skeleton.

Coll. Dub. no. 4258, Trinil.

Scapula sin. The uppermost portion of the infraspinous fossa and a small part of the posterior border are lost, the greater part of the tuber spinae is preserved. In front of the spina scapulae the bone, which in recent specimens forms a thin and even translucent plate, is for the greater part missing. The spina scapulae extends from the upper border to the neck of the bone, and forms no acromion. The tuber spinae is given off slightly above the middle of its height, and is directed posteriorly. It has broken off about 5 cm behind the spine, in recent specimens its extremity extends to the posterior border of the bone. The anterior border, above the large rough tuber scapulae, only presents a slight incisura scapulae, and is convex above. The posterior border is slightly concave except in its upper third, where it becomes convex and thickened. The glenoid cavity is almost round in outline, and slightly damaged at the costal border. The lower half of the costal surface of the bone is strongly convex in front, and concave behind, above it is convex from before backwards. The measurements of this and the five following specimens are given in the table on p. 65, together with those of the recent specimens.

Coll. Dub. no. 9055, Trinil.

Scapula dext., smaller than the preceding specimen. The tuber spinae is completely lost, the greater part of the infraspinous fossa is also missing. The upper border is almost complete, the border of the glenoid cavity damaged. The anterior border is well convex above.

Coll. Dub. no. 9043, Trinil.

Scapula dext. Again the infraspinous fossa is not complete; the spina scapulae is damaged superiorly, the tuber spinae is lost. The glenoid cavity is complete.

Coll. Dub. no. 8452 (pl. IX fig. 2), Bangle.

Proximal part of left scapula. The lateral border of the glenoid cavity is incomplete. From the costal side of the large and rough tuber scapulae, of the same shape as in the foregoing specimens, there projects a separate and distinct processus coracoideus. It is directed downward and is thickened at its extremity. It is not so pronounced in the other specimens.

Coll. Dub. no. 9426, Bangle.

Proximal part of left scapula, the border of the glenoid cavity is lost.

Coll. Dub. no. 9427, Bangle.

Proximal part of right scapula. The glenoid cavity, of which the border is complete, is oval in outline.

SCAPULA	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.					
	cat. a	cat. c	507	640	4258	9055	9043	8452	9426	9427
Height from anterior border of glenoid cavity to upper margin at the spina scapulae	390	405	395	435	442+	367+	406+	—	—	—
Antero-posterior diameter above the tuber spinae .	218	245	202	215	234	200+	216	—	—	—
Antero-posterior diameter of the collum scapulae . .	113	114	105	114	119	108	100	112	119	117
Antero-posterior diameter from tuber scapulae to posterior border of glenoid cavity	146	157	141	138	157	135	140	149	—	154
Antero-posterior diameter of glenoid cavity	84	94	85	86	94	82	85	88	—	96
Transverse diameter of the latter	82	88	79	80	80	—	78	—	—	75
Transverse diameter of the tuber scapulae	55	52	47	48	52	51	51	45	54	51

The six fossil scapulae, the dimensions of which are given here, present no differences from recent scapulae of *sondaïcus*, except, as before remarked, the well pronounced coracoid process in one.

Coll. Dub. no. 6782, Trinil.

Humerus dext. At the proximal extremity there are injuries at the anterior and posterior parts of the lateral and medial tuberosities. The deltoid tuberosity is complete, the thin bony plate separating the coronoid fossa from the olecranon fossa is injured.

The anterior part of the lateral tuberosity projects forward, its extremity is curved inward. That of the medial tuberosity has broken off. The caput is low and convex, the fossa only shallow. The upper half of the bone is almost flat anteriorly, there is a distinct crest running from the base of the anterior part of the lateral tuberosity to the deltoid tuberosity, and also one running obliquely from the posterior part of the lateral tuberosity to the deltoid tuberosity, enclosing a triangular roughened area on the lateral surface. The remainder of the lateral and posterior surfaces is smooth and forms the musculo-spiral groove. Below the deltoid tuberosity which is very prominent and curved backward, the bone narrows, and then expands again in the lower third. The lateral condyloid crest is not pronounced. The olecranon fossa is much deeper than the coronoid fossa, the trochlea consists of two condyles, of which the medial is by far the larger, and separated by a constriction from the lateral condyle, which is placed lower and further back. The bone agrees in every respect with recent humeri of *sondaïcus,* except that the lateral condyloid crest in one (Leiden Museum, cat. c) is more salient. The measurements of this and the seven following fossil specimens are given in the table on p. 67.

Coll. Dub. no. 6781, Trinil.

Humerus dext., less complete than the preceding specimen. Of the proximal extremity only the caput and the posterior part of the lateral tuberosity are preserved. The deltoid tuberosity and the area above it are missing, and the thin bony plate between the coronoid and the olecranon fossa is perforated, but this certainly is artificial. It differs from Coll. Dub. no. 6782 only in the more developed lateral condyloid crest.

Coll. Dub. no. 4334, Kedoeng Broeboes.

Proximal half of right humerus, the medial tuberosity and the deltoid tuberosity have broken off, and the lateral tuberosity is injured. It agrees in size with the foregoing specimens. In the middle of the posterior surface, about 11 cm below the level of the caput, there is a large rounded indentation, with a diameter of 25 mm. Below it, and separated by an interval of 17 mm, there is another but much smaller and shallower indentation, 12 mm in diameter. A third indentation is found on the lateral surface, slightly above the level of the large posterior one. It is of the same size as the latter, and ca. 38 mm distant from it. Two similar indentations occur at the proximal surface, in the anterior portion of the caput. One, almost in the centre of the proximal surface, has a diameter of ca. 27 mm, and the other separated by an interval of ca. 17 mm, is placed medially of the former and is 25 mm in diameter. No doubt these injuries were inflicted by the teeth of crocodiles. The two posterior ones seem to have been caused simultaneously. It is remarkable that the 3rd and 4th premaxillary tooth in a large skull of *Crocodylus porosus* Schneider (Leiden Museum, cat. n) present the same disproportional size and mutual position. The less prominent position of the teeth in advance of and behind these two may account for the absence of traces of other teeth of the same series. On the opposite (anterior) surface of the bone no indentations occur. The two proximal indentations seem to have been caused by the pair of lower central teeth of a crocodile like *porosus.*

Coll. Dub. no. 10715, Kedoeng Broeboes.

Small proximal fragment of right humerus, consisting of the slightly injured caput, and the medial tuberosity, of which the anterior extremity is lost. The only measurement that can be given, viz., the antero-posterior diameter from the caput to the medial portion of the bicipital groove, is ca. 140 mm, and intermediate between those in two recent humeri of *sondaïcus* (Leiden Museum, cat. a: 136 mm, cat. c: 143 mm).

Coll. Dub. no. 8454, Kedoeng Broeboes.

Large distal fragment of humerus dext., the epicondylus lateralis is for the greater part lost.

Coll. Dub. no. 9027, Trinil.

Large distal fragment of humerus dext. Epicondylus medialis injured.

Coll. Dub. no. 6731, Trinil.

Large distal fragment of humerus dext. Condylus lateralis broken off.

Coll. Dub. no. 9258, Kedoeng Broeboes.

Trochlea of humerus dext. Condylus lateralis superficially damaged.

From the table below it can be seen, that the fossil bones are smaller than the recent, with the exception of one in the Amsterdam Museum (no. 507).

HUMERUS	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.						
	cat. a	cat. c	507	640	6782	6781	4334	8454	9027	6731	9258
1. Length from caput to condylus medialis . . .	394	390	375	409	389	386	—	—	—	—	—
2. Breadth across caput and posterior part of lateral tuberosity	154	162	145	150	143	147	137	—	—	—	—
3. Breadth at deltoid tuberosity	150	153	142	152	145	—	—	—	—	—	—
4. Smallest diameter of corpus	66	64	58	63	65	61	ca. 64	66	67	62	—
5. Distal breadth	148	152	140	155	140	139	—	131	141	—	—
6. Breadth of trochlea . .	105	102	97	106	94	94	—	97	ca. 90	—	100
7. Antero-posterior diameter of condylus medialis	116	120	114	116	109	108	—	112	—	110	112
8. Antero-posterior diameter of condylus lateralis	112	116	111	103	99	99	—	—	91	—	—
9. 2 : 1	0.39	0.42	0.39	0.37	0.37	0.38	—	—	—	—	—
10. 3 : 1	0.38	0.39	0.38	0.37	0.37	—	—	—	—	—	—

Coll. Dub. no. 8821, Trinil.

Radius sin., entire. The humeral articular surface presents two concave facets, of which the medial is the larger. They are separated by a ridge, also concave from before backward. In front it ends in the coronoid process, posteriorly it rises to a greater height. The coronoid process is more or less continuous with the radial tuberosity, which is at the medial side of the anterior surface. The lateral tuberosity is distinct, the medial has not developed. At the lateral side of the posterior surface there is a depression for the lateral part of the ulna below its semilunar notch. Around it there is the roughened triangular area to which the ulna was attached. The posterior surface flattens more downward and is even concave from side to side below; it shows a medial ridge. The lower part of the lateral surface is rough again, and presents a heavy prominence, about 7 cm above the articular surface for the lunar, which fitted into the large depression at the approximal surface of the ulna. The distal extremity has two facets, which are not distinctly separated. The medial is that for the scaphoid, it is concavo-convex from before backward, the lateral is smaller and convex antero-posteriorly, it articulates with the lunar.

The fossil radius from Trinil identified by Stremme (1911, p. 96) as *Rh. sivasondaicus* Dubois agrees in size with the present specimen. The measurements of this and the four following specimens are given in the table below.

Coll. Dub. no. 6699 (pl. X fig. 5), Kedoeng Broeboes.

Radius dext. The coronoid process and the posterior prominence of the sagittal ridge on the humeral articular surface are missing, but for the rest the bone is complete. It is somewhat larger than the preceding radius but presents no specific differences from the latter.

Coll. Dub. no. 9541, Kebon Doeren.

Proximal part of radius dext.

Coll. Dub. no. 9406, Trinil.

Proximal part of radius dext. Smaller than the first described radius. Lateral border of humeral articular surface damaged.

Coll. Dub. no. 529, Kedoeng Broeboes.

Distal fragment of radius dext.

RADIUS	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.					Stremme, 1911, p. 96
	cat. a	cat. c	507	640	8821	6699	9541	9406	529	
Median length . . .	329	318	322	328	345	359	—	—	—	343
Proximal breadth. .	111	109	107	109	110	117	114	—	—	99
Proximal antero-posterior diameter (medial side) . .	53	60	64	62	66	69	68	55	—	54
Breadth at narrowest part of shaft . .	53	54	44	50	52	57	—	50	—	—
Breadth of distal articulai surface . .	92	93	93	90	90	102	—	—	90	—
Distal antero-posterior diameter (medial side) . .	58	60	61	57	64	69	—	—	61	—

Coll. Dub. no. 8931 and 9137 (pl. X fig. 5), Kedoeng Broeboes.

Large proximal and large distal part of ulna dext. Unfortunately a small part of the shaft is not preserved, but it is extremely probable that the two parts belong together, and both to the radius from Kedoeng Broeboes (Coll. Dub. no. 6699) mentioned above, to which they fit nicely. The olecranon is slightly damaged at the medial surface. The proximal extremity is long and laterally compressed, the medial surface is concave, the lateral convex. The processus anconaeus is entire, it overhangs the semilunar notch, which is convex from side to side. Its medial part has broken off, it becomes broader below and has a large synovial fossa. The shaft which, as said before, is not complete, is triangular in cross-section, below it has a large depression for the tuberosity at the approximal surface of the radius. The distal extremity has the facet for the cuneiform, concave antero-posteriorly, and convex transversely. The surface encroaches on the medial surface posteriorly, and here articulates with the pisiform, whereas on the antero-medial side of the facet for the cuneiform the lunar is seen to make also a contact with the ulna. The measurements of this and the four next specimens are found in the table below.

Coll. Dub. no. 9425, Bangle.

Ulna dext. The olecranon is rather damaged. Like the foregoing specimen it has all the characters of recent ulnae of *sondaïcus*.

Coll. Dub. no. 8959, Bangle.

Ulna dext. Olecranon incomplete, processus anconaeus missing, and distal extremity broken off.

Coll. Dub. no. 8950, Bogo.

Proximal part of ulna sin. Olecranon slightly damaged medially.

Coll. Dub. no. 11109, Bangle.

Fragment of ulna sin., consisting of the main part of the shaft, and the lower part of semilunar notch with the large synovial fossa.

ULNA	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.				
	cat. a	cat. c	507	640	8931 9137	9425	8959	8950	11109
Extreme length	452	435	449	469	—	474	—	—	—
Length from proc. anconaeus to extremity of olecranon	167	161	152	150	163	ca. 168	—	161	—
Breadth of semilunar notch	91	88	84	85	—	94	92	84	—
Smallest antero-posterior diameter of shaft . . .	51	46	40	49	—	50	51	—	42
Antero-posterior diameter of distal articular surface	59	63	55	60	67	61	—	—	—
Transverse diameter of idem	39	35	34	37	40	—	—	—	—

Coll. Dub. no. 9342, Trinil.

Magnum sin., complete. The anterior surface is relatively small, it has a prominence laterally, whereas it is excavated medially. Its lower border is formed by the large articular surface for the 3rd metacarpal, which is concave from before backward, and convex transversely. Below and behind the latter facet there is a large downward projection. The medial surface has an upper and a lower facet, the latter slightly convex, for articulation with the 2nd metacarpal, the former, somewhat concave, for the trapezoid. The upper surface presents two articular surfaces, which meet under an obtuse angle, the medial articulates with the scaphoid, the lateral with the unciform anteriorly, and with the lunar posteriorly. The latter facet is much concave behind and encroaches on the posterior surface. The facet for the unciform meets that for the 3rd metacarpal at a right angle. The greater part of the lateral, and the posterior half of the medial surface, are excavated and rough. The bone agrees so very closely with the corresponding bone of recent *sondaïcus* that there can be no doubt about their specific identity.

MAGNUM	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.
	cat. a	cat. c	507	640	9342
Vertical diameter	86	91	76	86	90
Antero-posterior diameter	73	73	68	72	71
Transverse diameter	52	56	54	50	49

Coll. Dub. no. 6214, Trinil.

Unciform dext. The anterior surface laterally is higher than medially, the articular surface for the cuneiform, which forms the greater part of the upper surface, is straight transversely, and convex from before backward. It encroaches somewhat on the anterior surface, and meets the facet for the lunar at an obtuse angle. Behind these facets the surface is excavated and rough, there is a thick blunt posterior prolongation. The lower and the lateral surface of the bone form a continuous surface, for the magnum, the 3rd, 4th, and (rudiment of the) 5th metacarpal respectively. It presents no differences from recent unciforms of the present species.

UNCIFORM	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.
	cat. a	cat. c	507	640	6214
Vertical diameter	55	57	52	53	51
Antero-posterior diameter	92	93	91	93	93
Transverse diameter	73	76	74	73	69

Coll. Dub. no. 9124, Kedoeng Broeboes.

Metacarpal II dext. The large proximal facet is concave transversely in front, and convex behind. It articulates with the trapezoid. The lateral surface presents two proximal facets, of which the upper articulates with the magnum, and the lower with the 3rd metacarpal. Below the latter facet the bone is excavated. The facets for trapezoid and magnum form a median projection on the posterior surface, with a vertical ridge below it, which, however, rapidly fades away. In the lower half of the shaft the posterior surface is approximately flat, with the exception of a vertical crest at the medial side, which, however, is not strongly pronounced and does not extend high up the bone. The distal extremity is thickened again and bears the articular surface for the first phalanx. It has a sagittal ridge posteriorly, somewhat closer to the lateral than to the medial side. On either side the distal extremity has an indentation, with a tubercle above it; the lateral is deeper than that at the medial surface. In all respects the present fossil resembles recent 2nd metacarpals of *sondaïcus*.

Coll. Dub. no. 10109a, Kali Gedeh.

Metacarpal II sin. The medial portion of the facet for the trapezoid is missing, and the distal extremity is superficially damaged. The facet or articulation with the trapezoid is more concave transversely in front than in the foregoing specimen.

Coll. Dub. no. 674a, Goea Djimbe near Redjotangan (Res. Kediri, E. Java).

Distal extremity of metacarpal II dext. The bone has almost a recent appearance, the spongiosa are still open, as is the case also with other remains from this cave.

METACARPAL II	Leiden Mus.		Amst. Mus. no.		Coll. Dub. no.		
	cat. a	cat. c	507	640	9124	10109a	674a
Median length	156	158	151	154	165	ca. 164	—
Proximal breadth	40	39	45	42	45	—	—
Proximal antero-posterior diameter	45	44	47	45	50	50	—
Middle breadth	43	42	42	41	46	ca. 44	—
Least antero-posterior diameter . .	20	20	21	20	23	ca. 23	—
Breadth distal articular surface . .	46	44	47	46	48	—	46
Antero-posterior diameter distal articular surface	41	42	43	43	44	—	42

Coll. Dub. no. 8562 (pl. X fig. 4), Trinil.

Metacarpal III sin. In the upper portion of the anterior and medial surfaces there are injuries, the lateral portion of the distal articular surface is missing.

The proximal facet for articulation with the magnum is much concave transversely, and convex from before backward, it encroaches on the posterior surface. On its medial side is the oblique facet for the 2nd metacarpal. Laterally of the magnum facet there are three facets, two anteriorly, and one posteriorly in a somewhat lower position. Between them there is a synovial fossa. Of the two anterior facets on the lateral surface the upper is for articulation with the unciform, whereas the lower, and the posterior facet, articulate with the 4th metacarpal. The corpus is almost flat on both sides and rather broad. The distal extremity presents the articular surface for the first phalanx, with the usual sagittal ridge posteriorly. On either side there is a depression, surmounted by a tubercle. Like the 2nd metacarpal described above the present bone is slightly larger than that of recent specimens, but it presents no specific differences.

Coll. Dub. no. 8892, Kedoeng Broeboes or Kebon Doeren.

Proximal part of metacarpal III sin. The facet for the 2nd metacarpal is injured.

Coll. Dub. no. 6741, Tegoean.

Distal part of metacarpal III dext. Distal articular surface complete. The antero-posterior diameter of its medial condyle exceeds that of the lateral condyle, as in recent specimens.

METACARPAL III	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.		
	cat. a	cat. c	507	640	8562	8892	6741
1. Median length	172	170	170	173	187	—	—
2. Proximal breadth	70	71	67	68	67	58+	—
3. Proximal antero-posterior diameter	50	51	47	50	44	48	—
4. Middle breadth	62	65	63	59	61	—	—
5. Least antero-posterior diameter	20	21	22	22	22	—	26
6. Breadth distal articular surface	57	57	58	58	—	—	57
7. Antero-posterior diameter distal articular surface	43	44	46	43	41	—	43
8. 4 : 1	0.36	0.38	0.37	0.34	0.33	—	—

Coll. Dub. no. 6534, Soember Waroe.

Portion of right os coxae, consisting of the acetabulum, with the shaft and part of the wing of the ilium, composed of several fragments. There is also a great portion of the wing of the left ilium, and a fragment of the body of the right ischium, all belonging to one and the same individual.

Nothing is preserved of the acetabular branch of the pubis, and only a very small portion of the acetabular branch of the ischium. The acetabulum is not damaged. Its medial part is cut into by a large acetabular notch, the non-articular depression or fossa is very shallow. The highest part of the ischiatic spine is preserved, between this and the dorsal border of the acetabulum there is a considerable rough excavation for muscular attachment. The pelvic surface of the three-sided shaft of the ilium, viz., that opposite to the acetabulum, is smooth and slightly concave below; the ventral surface is smaller and almost flat, there is an only slightly developed psoas tubercle. Just above the most constricted part the lateral portion of the shaft of the ilium is missing, but a part (about 10 cm) of the lateral border of the wing of the ilium is preserved. The tuber coxae and the whole anterior border are not present, the medial part of the wing which articulates with the sacrum has almost completely broken off. The preserved portion of the wing of the ilium has two smooth surfaces. The pelvic surface presents a faint ilio-pectineal line which divides it into an almost flat lateral and a convex medial portion. The gluteal surface is slightly concave transversely and a little convex from before backward. Its medial border is complete.

The preserved portion of the wing of the left ilium is still less complete than that of the right, all its borders are lost, except 9 cm of the medial. It comprises, however, a small part of the rough auricular surface.

The fragment of the body of the right ischium is not characteristic, nothing is preserved of its borders.

The present fragments agree so very closely in every respect with the corresponding parts of the pelvis of recent *sondaïcus* that they doubtless belong to the present species. Not enough is present, however, to determine with certainty the sex of the individual to which they belonged. The shape of the greater ischiatic notch agrees better with that in the male pelvis (Leiden Museum, cat. a) than with those in the females.

Coll. Cosijn, Geol. Mus. Leiden, no. 28053, Res. Soerabaja.

Acetabular portion of right os coxae. Only the lateral and anterior borders of the acetabulum are preserved, the acetabular branches of pubis and ischium are completely lost. About at its most constricted part the shaft of the ilium has broken off. The psoas tubercle is somewhat more developed than in the preceding specimen.

PELVIS	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.	Coll. Cosijn
	cat. a.	cat. c	507	640	6534	no. 28053
Antero-posterior diameter of acetabulum	95	99	99	89	98	—
Transverse diameter of the latter . .	94	97	93	92	90	—
Height of ischiatic spine above lateral border of acetabulum	81	79	74	80	78	—
Least width of lateral surface of shaft of ilium	74	74	72	71	73	—
Least width of ventral surface of shaft of ilium	57	54	58	54	47	56
Greatest width of ventral surface of shaft of ilium	82	87	80	83	80	79

Coll. Dub. no. 6532 and 6533, Soember Waroe.

Right and left femur, of one and the same individual. Various parts are lacking in the two bones. I shall begin with the left femur, which is the most complete, and proceed with the right for the description of the distal part.

Femur sin. Some substance is lost at the anterior border of the caput; the anterior part of the trochanter major, and the edge of the third trochanter are injured. The two ridges of the trochlea are superficially damaged, and the lateral condyle and epicondyle have broken off.

The caput is cut into medio-posteriorly by a deep notch, the fovea capitis. The trochanter major has a convex triangular rough upper surface, which posteriorly rises above the level of the caput. It descends, first slightly and then more steeply, to the antero-lateral angle of the proximal surface. Like the caput it slightly overhangs the anterior surface, which above is broad and slightly concave transversely. The trochanteric ridge is not very strongly developed, but encloses a deep trochanteric fossa. The posterior surface medially of the crista trochanterica is wide and flat, it remains of equal width in the upper third of the bone, due to the presence of a thick rough median ridge, the trochanter minor. The third trochanter is placed slightly above the middle of the height, it is very prominent laterally, and curved forwards The smallest transverse diameter of the shaft is found not far below this process, above it the lateral surface is separated from the anterior by a vertical ridge (the downward continuation of the anterior part of the great trochanter), but below the third trochanter the lateral, medial, and anterior surfaces of the shaft are continuous and strongly convex from side to side. The posterior surface only remains almost flat. The distal extremity is well preserved in the right femur. Only the upper part of the lateral condyle, and the medial surface of the trochlea are superficially damaged. This bone has broken off above the third trochanter (which is less complete than that of the left femur) and also comprises part of the lesser trochanter. The lower part of the shaft is incomplete. On the posterior surface, above the lateral condyle, the supracondyloid fossa is shallow, and not large, above the intercondyloid fossa the surface is concave. The medial and lateral condyles project well backward, they are about equal in size, and the latter has a somewhat higher position than the former. The medial epicondyle is a thick prominence, the lateral is less developed, behind the latter there is a depression. The trochlea presents two ridges, of which the medial is broader and much more projecting forward than the lateral. They are separated by a groove. Both the lateral and the medial part of the trochlea are continued on the anterior surface as vertical ridges, of which the medial again is the best developed. They rapidly fade away, between them there is a distinct depression. The present bones agree in size with the fossil femur from Trinil mentioned by Stremme (1911, p. 96), which was referred by him to *Rh. sivasondaicus* Dubois. These bones are not different from recent femora of *sondaïcus*. The female femora (Leiden Museum, cat. c, Amsterdam Museum, nos. 507 and 640) have a rough vertical line in the middle of the anterior surface, especially distinct above. It is absent in the male femur (Leiden Museum, cat. a) and in the present fossil bones. Moreover the crista trochanterica is stronger developed in the females than in the male and the present fossils. This would seem to point to a male sex of the fossil femora. This is probably the case too with the pelvis from the same locality described above, and as the state of preservation also is exactly the same, it is not improbable that pelvis and femora belonged to one and the same individual. The dimensions of the present, and the following fourteen specimens, will be found in the table on p. 77.

Coll. Dub. no. 432, Trinil.

Femur sin. Caput superficially damaged, base of trochanter major and extremity of third trochanter injured, lateral part of trochlea missing.

Coll. Dub. no. 2466, Kedoeng Broeboes.

Femur dext., rather small. Trochanter tertius broken off, lateral condyle and epicondyle damaged. The caput is slightly damaged posteriorly.

Coll. Dub. no. 421, Trinil.

Femur sin. Caput and great trochanter, and also a great part of the third trochanter, missing.

Coll. Dub. no. 420, Kedoeng Broeboes.

Femur sin. Caput, trochanter minor, and third trochanter broken off, lateral part of trochlea and lower surface of lateral condyle damaged. This bone is larger than most of the others, and equals in size the recent femora of *sondaïcus.*

Coll. Dub. no. 4333, Kedoeng Broeboes.

Proximal portion of femur sin., broken off below the third trochanter, which is almost entirely missing. The great trochanter is slightly injured. It is one of the longest of all fossil specimens, and almost equals in length the largest recent *sondaïcus* femur.

Coll. Dub. no. 9257, Kedoeng Loemboe.

Proximal part of femur sin. Caput damaged at the base, trochanter major slightly damaged. Broken off below the incomplete third trochanter. This specimen is rather small, and agrees in size with Coll. Dub. no. 2466.

Coll. Dub. no. 9303, locality unknown.

Distal part of femur sin. The medial surface and the condyles, especially the lateral, are damaged. Agrees in size with recent specimens.

Coll. Dub. no. 9304, locality unknown.

Distal part of femur sin. Medial portion of trochlea and medial epicondyle damaged.

Coll. Dub. no. 10864, locality unknown.

Distal part of femur sin. Trochlea almost entirely lost, epicondyles injured.

Coll. Cosijn, Geol. Mus. Leiden, no. 28062, Res. Soerabaja.

Distal part of femur dext. Lower surface of lateral condyle damaged. Belongs again to the group of smaller bones.

Coll. Cosijn, Geol. Mus. Leiden, no. 28149, locality unknown.

Distal part of femur dext. Condyles, especially the medial, and the medial epicondyle much injured.

Coll. Dub. no. 8145, Kedoeng Broeboes.

Lower portion of shaft of femur sin., with base of third trochanter, and part of trochlea.

Coll. Dub. no. 10142, 5 à 6 km E. of Tegoean.

Central portion of shaft of femur dext., with base of trochanter tertius.

Coll. Dub. no. 10716, Kedoeng Broeboes.

Lower part of shaft of femur sin.

From the table on p. 77 it can be seen that some of the fossil bones are decidedly smaller than the recent (Coll. Dub. no. 2466, 9257, and Coll. Cosijn, no. 28062). These bones are from different localities. Perhaps they must be referred to a small variety of the present species.

Coll. Dub. no. 6749, Trinil.

Tibia sin. The tuberositas tibiae and the groove for the middle patellar ligament at its medial side are somewhat damaged. Of the two saddle-shaped proximal condyles the medial is the larger. In the middle of the proximal surface the latter rises to a greater height than the lateral condyle, the two prominences are separated by an antero-posterior fossa.

The shaft is three-sided above, and becomes smaller and flattened in antero-posterior direction below. The distal extremity is expanded again. The proximal anterior tuberosity is continued downward as a very thick crest, which is prominent and slightly overhanging to the lateral side above, and is reduced in the distal third. In the proximal third its medial surface is rough and convex. The lateral surface is wide and concave above, and become narrower and convex below. It winds gradually to the anterior surface of the bone, distally it is broad and flat and faces forward.

FEMUR	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.										Coll. Cosijn		Coll. Dub. no.			Stremme, 1911, p. 96
	cat. a	cat. c	507	640	6532 6533	432	2466	421	420	4333	9257	9303	9304	10864	28062	28149	8145	10142	10716	
Length from caput to medial condyle	495	477	440	484	462	476	438	—	—	—	—	—	—	—	—	—	—	—	—	458
Proximal breadth over caput and trochanter major	219	217	207	215	195+	187+	174+	—	—	195+	171+	—	—	—	—	—	—	—	—	198
Breadth across third trochanter	145	154	137	139	140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Smallest transverse diameter of shaft	73	75	74	68	67	64	56	63	70	—	—	72	—	70	58	—	60	69	61	63
Antero-posterior diameter at the same level	57	60	58	55	56	52	45	51	60	—	—	61	—	54	47	—	54	57	48	60
Distal breadth across epicondyles	151	157	151	150	150	136	—	136	151	—	—	—	—	—	120	—	—	—	—	143
Distal breadth across condyles	117	127	119	121	110	110	—	108	113	—	—	—	112	—	100	—	—	—	—	—
Antero-posterior diameter of caput	85	89	86	82	83	—	—	—	—	82	—	—	—	—	—	—	—	—	—	82
Distal antero-posterior diameter (medial side)	171	173	173	167	173	168	139+	170	177	—	—	168	—	—	149	—	—	—	—	167
Distal antero-posterior diameter (lateral side)	138	142	135	130	137	—	—	134	—	—	—	—	137	—	117	124+	—	—	—	137
Antero-posterior diameter from middle of trochlea to intercondyloid fossa	91	90	—	87	89	—	76	91	95	—	—	97	93	—	—	83	—	—	—	—
Length from trochanter major to base of third trochanter	271	277	267	267	256	262	—	—	—	286	237	—	—	—	—	—	—	—	—	—

The lateral border is concave, and has facets above and below to which the fibula was attached. The posterior surface is concave transversely above, narrows in the middle third in which there is the popliteal line running from the lateral border above to the medial below. The medial border is rounded proximally, and fades out in the distal half. The distal extremity is widened transversely, and quadrangular in shape, it has two grooves, separated by an antero-posterior ridge, for the astragalus. The medial groove is narrower but longer antero-posteriorly than the lateral, and bounded laterally by the medial malleolus. The lateral boundary of the lateral groove, forming part of the fibula, is not present. From recent tibiae of *sondaicus* the present bone differs only in the slightly more marked popliteal line. The measurements of this and the six following specimens are given in the table below.

Coll. Dub. no. 6572, Trinil.

Tibia sin. The medial border of the medial condyle is lost, the proximal tuberosity is damaged. The popliteal line is less marked than in the preceding specimen.

Coll. Dub. no. 8451, Bangle.

Tibia sin. The lateral border of the lateral condyle, and the posterior of the medial condyle are damaged.

Coll. Dub. no. 8929, Kedoeng Broeboes.

Distal part of tibia sin. The anterior surface is injured above the medial malleolus.

Coll. Dub. no. 9235, Tritik.

Distal part of tibia dext.

Coll. Dub. no. 10532, Kedoeng Broeboes.

Distal part of tibia dext., injured medially.

Coll. Dub. no. 10533, Trinil.

Distal part of tibia sin., injured laterally.

TIBIA	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.						
	cat. a	cat. c	507	640	6749	6572	8451	8929	9235	10523	10533
Length from intercondyloid eminence to median ridge of distal articular surface	335	323	324	328	334	320	337	—	—	—	—
Proximal breadth	127	134	130	127	111+	—	114+	—	—	—	—
Proximal antero-posterior diameter	137	149	138	130	128	—	—	—	—	—	—
Least breadth of shaft . .	53	54	57	57	51	49	57	—	—	—	—
Least antero-posterior diameter of shaft	49	54	50	46	46	45	47	—	46	47	45
Distal breadth	108	109	159	99	97	98	103	105	—	100	—
Distal antero-posterior diameter	68	73	74	70	64	64	69	70	69	—	63

Coll. Dub. no. 6748, Trinil.

Astragalus sin. Of the trochlea on the proximal and anterior surface the medial ridge is lower and narrower than the lateral, there is a deep synovial fossa in the lower part of the groove separating the two ridges. The distal surface is convex from before backward, and is separated by a slight crest into a large medial facet for articulation with the navicular, and a small, somewhat oblique, lateral one for the cuboid. The medial surface has a large distal tuberosity, the lateral has a large non articular fossa below. The latter is continued on the posterior surface, and separates the articular surfaces for the calcaneum, of which there are three, viz., one large in the upper half on the lateral side, concavo-convex from above downward, a small one below the latter, and one of intermediate size in the centre of the lower half. The differences from recent *sondaïcus* astragali are without importance. Of the present and the six following specimens the dimensions are given in the table below.

Coll. Dub. no. 8853, locality unknown.

Astragalus sin. The lower medial facet for the calcaneum slightly injured.

Coll. Dub. no. 6790, Trinil.

Astragalus sin. Medial ridge of trochlea, and lower facet for articulation with the calcaneum damaged.

Coll. Dub. no. 8951, Bogo.

Astragalus dext. The posterior surface is superficially injured above and below.

Coll. Dub. no. 7516, Trinil.

Astragalus dext. The distal facets are damaged posteriorly.

Coll. Dub. no. 10989, Bangle.

Astragalus dext. The posterior surface is much injured, the lateral upper facet for the calcaneum only is entire.

Coll. Dub. no. 8952, Bogo.

Astragalus dext., rather small. Lower facet for calcaneum, and facet for navicular damaged.

ASTRAGALUS	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.						
	cat. a	cat. c	507	640	6748	8853	6790	8951	7516	10989	8952
Medial height	73	73	75	76	73	73	72	74	74	67	61
Breadth of trochlea	82	81	82	88	81	78	78	81	84	70	68
Medial antero-posterior diameter	62	63	62	60	54	57	—	—	55	—	—

Coll. Dub. no. 7970, Trinil.

Calcaneum sin. The proximal extremity of the corpus is enlarged to form the tuber calcis; in the middle the body is constricted and laterally compressed. Slightly below the middle of the height there is a large medial process, the sustentaculum tali. The lower surface of the latter bears a slightly concave articular surface for the astragalus. A larger facet, convexo-concave from above downward, is found at about the same level on the body, and a small third vertical one on the distal extremity. Between these surfaces there is a non-articular fossa. A large facet on the distal extremity, facing downward and backward, articulates with the cuboid. The lateral surface has a distal prominence. It agrees in size and characters with recent calcanei of *sondaïcus*. Measurements of this and the four next specimens will be found in the table below.

Coll. Dub. no. 9163, Kedoeng Broeboes.

Calcaneum sin. The anterior part of the tuber calcis, as well as the distal extremity are damaged.

Coll. Dub. no. 8258, locality unknown.

Calcaneum sin., entire.

Coll. Dub. no. 8643, Trinil.

Calcaneum sin. The posterior surface is damaged below.

Coll. Dub. no. 8257, locality unknown.

Calcaneum sin. Sustentaculum tali broken off, tuber calcis and lower part of medial surface injured.

CALCANEUM	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.				
	cat. a	cat. c	507	640	7970	9163	8258	8643	8257
Height	129	137	127	128	125	—	140	121	—
Least breadth of corpus . .	33	31	38	32	35	38	42	32	32
Breadth over sustentaculum tali	84	83	89	91	76	86	87	78	—
Antero-posterior diameter at the same level	71	71	71	71	67	—	69	61	—

Coll. Dub. no. 8256 (pl. X fig. 2), locality unknown.

Metatarsal III dext. The proximal facet, which articulates with the ectocuneiform, is injured posteriorly. It is slightly concave transversely and laterally it is higher than medially. Of the two small proximal facets on the medial surface, which articulate with the 2nd metatarsal, only the anterior is preserved. On the lateral surface there are two proximal facets on the medial surface, which articulate with the 2nd metatarsal, only the anterior is preserved. On the lateral surface there are two proximal facets for the 4th metatarsal, of which the anterior is almost vertical, and faces outward and backward, whereas the posterior faces outward and upward. The latter in the fossil is not complete. Between these two facets there is an excavation. The distal articular surface is damaged laterally, it presents an antero-posterior ridge in the middle of its posterior part; the distal indentations on either side are equally developed, and surmounted by a tubercle, of which that on the medial surface is slightly more prominent than that on the lateral surface. The present fossil is somewhat longer than recent metatarsals of *sondaïcus*. This is also the case with the metacarpals described above.

METATARSAL III	Leiden Museum		Amsterdam Museum no.		Coll. Dub. no.
	cat. a	cat. c	507	640	8256
1. Median length	155	153	150	153	165
2. Proximal breadth	56	60	60	61	56
3. Proximal antero-posterior diameter	47	47	45	44	—
4. Middle breadth	56	59	57	54	55
5. Least antero-posterior diameter	21	20	19	20	22
6. Breadth of distal articular surface	56	56	56	56	—
7. Antero-posterior diameter of distal articular surface	40	41	41	41	41
8. 4:1	0.36	0.39	0.38	0.35	0.33

Rhinoceros unicornis L.

Rhinoceros unicornis Linnaeus, Systema Naturae, 10th ed., vol. 1, Holmiae, 1758, p. 56; Schreber, Die Säugthiere, part 2, Erlangen, 1776, p. 229, pl. LXXVII; Kerr, Animal Kingdom, London, 1792, p. 113; Geoffroy-Saint-Hilaire, Cat. Mamm. Mus. Hist. Nat. Paris, Paris, 1803, p. 239; Gray, List Mamm. Coll. Br. Mus., London, 1843, p. 186; Blainville, Ostéographie, Rhinocéros, Paris, 1846, p. 64; Cantor, Journ. As. Soc. Beng., vol. 15, 1846, p. 262; Gervais, Mammifères, Paris, 1855, p. 164; Chenu and Desmarest, Encycl. Hist. Nat., Pachydermes, &c., Paris, 1858, p. 7; Owen, Trans. Zool. Soc. London, vol. 4, 1862, p. 31; Gray, Cat. Bones Mamm. Br. Mus., London, 1862, p. 281, Proc. Zool. Soc. London, 1867, p. 1010, Cat. Carn. Pach. and Edent. Mamm. Br. Mus., London, 1869, p. 302; Murie, Proc. Zool. Soc. London, 1870, p. 609; Sclater, ibid., 1871, p. 8; Schlegel, Dierentuin, Zoogdieren, Amsterdam, 1872, p. 132; Gray, Handlist Edent. Thickskinn. Rum. Mamm. Br. Mus., London, 1873, p. 46, pls. XIV-XV; Noll, Zool. Gart., vol. 14, 1873, p. 48; Flower, Proc. Zool. Soc. London, 1876, p. 446, fig. 3; Sclater, Trans. Zool. Soc. London, vol. 9, 1876, p. 645, pl. XCV; Brandt, Mém. Acad. Imp. Sci. St. Pétersbourg, ser. 7, vol. 26, no. 5, 1878, p. 38; Martin, Ill. Naturgeschichte, vol. 1, Leipzig, 1882, p. 573; Flower and Garson, Cat. Spec. Osteol. and Dent. Vertebr. Anim. Mus. Roy. Coll. Surg., part 2, London, 1884, p. 416; Lydekker, Mem. Geol. Surv. Ind., ser. 10, vol. 3, 1884, p. 132, Cat. Foss. Mamm. Br. Mus., part 3, London, 1886, p. 138, Mem. Geol. Surv. Ind., ser. 10, vol. 4, 1886, pl. X fig. 3, Rec. Geol. Surv. Ind., vol. 20, 1887, pp. 72, 73; Blanford, Fauna British India, Mamm., London, 1888-1891, p. 472, fig. 154; Flower, The Horse, London, 1891, p. 57; Sclater, Cat. Mamm. Ind. Mus., part 2, Calcutta, 1891, p. 202; Trouessart, Catalogus Mammalium, nov. ed., vol. 2, Berlin, 1898, p. 754, ibid., Quinquennale Supplementum, Berlin, 1905, p. 630; Marx and Koch, Ber. Senckenb. Naturf. Ges., vol. 41, 1910, p. 161; Lydekker, Cat. Indian Big Game bequeathed by Hume, &c., London, 1913, p. 41; Antonius, Verh. Zool. Bot. Ges. Wien, vol. 64, 1914, p. (21); Hilzheimer and Heck, Brehm's Tierleben, 4th ed., vol. 12, Leipzig, 1915, p. 601; Lydekker, Wild Life of the World, vol. 2, London, ca. 1915, p. 117, Cat. Ung. Mamm. Br. Mus, vol. 5, London, 1916, p. 47; Breuning, Verh. Zool. Bot. Ges. Wien, vol. 73, 1924, p. 45, fig. 31; Ali, Journ. Bombay Nat. Hist. Soc., vol. 31, 1927, p. 1031; Hornaday, Guide New York Zool. Park, New York, 1927, p. 121; Scott, Proc. Zool. Soc. London, 1927 II, p. 503; Zdansky, Pal. Sinica, ser. C, vol. 5, fasc. 4, 1928, p. 82; Flower, Proc. Zool. Soc. London, 1931 I, p. 202; Forster-Cooper, Phil. Trans. Roy. Soc. London, ser. B, vol. 223, 1934, p. 578 fig. 4D; Zeuner, Ber. Naturf. Ges. Freib., vol. 34, 1934, p. 30; Colbert, Trans. Am. Phil. Soc., n.s., vol. 26, 1935, p. 190 fig. 85C; Dollman, Ward's Records of Big Game, 10th ed., London, 1935, p. 335; Colyer, Variations and Diseases of the teeth of Animals, London, 1936, p. 144, 145 fig. 180; Antonius, Zool. Gart., n.s., vol. 9, 1937, p. 19; Colbert, Am. Mus. Novit., no. 1207, 1942, p. 2; Pocock, Proc. Zool. Soc. London, vol. 114, 1945, p. 437.

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R[hinoceros] stenorhynchus (err. pro *stenocephalus*) Busk, Proc. Zool. Soc. London, 1869, p. 413 footnote.

Rhinoceros namadicus Lydekker, Mem. Geol. Surv. Ind., ser. 10, vol. 1, 1876, p. 32, pl. IV figs. 5-6, ibid., Preface, 1880, p. VIII.

Recent material examined:

1. Skull of female, M^2 erupting. Leiden Museum, cat. a. Bengal, from Frank, 1852. The left P_2 is duplicated. The two teeth are placed behind each other, and both obliquely to the line of the teeth. They are equal in size, and only slightly smaller than the right P_2. There is no trace of pd_1 on the left side; on the right its alveolus is present.

2. Skull, M^2 erupting. Leiden Museum, cat. b, no data.

Two fossil upper molars of the present species from the pleistocene Narbada beds were first described by Lydekker (1876, p. 2, pl. IV figs. 5-6) as *Rh. namadicus,* the name given by Falconer (1868 I, p. 21) to the fossil rhinoceros from these deposits. In the Fauna Antiqua Sivalensis one astragalus only is figured as originating from the Narbada valley (pl. 76

fig. 18), and Lydekker believes that Falconer had no teeth at his disposal. A re-examination convinced Lydekker (1880, pp. VIII-IX) that the Narbada teeth were specifically indistinguishable from those of *unicornis*. A rhinoceros humerus from the Narbada, however, being considerably different from that of *unicornis*, seemed to indicate a second species in the Narbada beds, for which Lydekker provisionally retains the name *namadicus*.

Lydekker (l.c.) also records an M^3 of *unicornis* from the alluvium of Madras, figures it later on (Lydekker, 1886b, pl. X fig. 3), and remarks that this specimen bears evidence of the very extensive range of the species in former times. In recent years there is still only a small number of specimens in N. Bengal, Cooch Behar, Bhutan, Assam, Nepal, and possibly Siam (Hobley, 1931, p. 21, 1932, p. 20). In a book, entitled: "Thirty-seven years of Big Game Shooting in Cooch Behar, The Duars, and Assam. A rough diary by the Maharajah of Cooch Behar" (London and Bombay, 1908) mention is made of the killing of 207 rhino's. How many of these specimens are preserved now in any museum?

Lydekker (1881, p. 57) remarks that of the Siwalik rhinoceroses no one can be decidedly fixed upon as the direct ancestor of *Rh. unicornis*. The fossil form from Java recorded by Dubois as *Rh. kendengindicus* differs less than any other from *unicornis*, but also cannot be placed in its ancestral line, as will appear below.

Rhinoceros kendengindicus Dubois

Rhinoceros kendengindicus Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 25, 1908, p. 1259; Martin, Unsere palaeozoologische Kenntnis von Java, Leiden, 1919, p. 108; Stehlin, Wet. Med. Dienst Mijnb. Ned. Ind., no. 3, 1925, p. 3; Van der Maarel, Leidsche Geol. Med., vol. 5, 1931, p. 475; Van Es, The Age of Pithecanthropus, The Hague, 1931, p. 31; Van der Maarel, Wet. Med. Dienst Mijnb. Ned. Ind., no. 15, 1932, p. 66; Von Koenigswald, De Ing. in Ned. Ind., vol. 1, part 11, sect. IV, 1934, p. 196.

Rhinoceros kendengendicus Raven, Bull. Am. Mus. Nat. Hist., vol. 68, 1935, p. 261.

R[hinoceros] kendengindicus, Patte, Bull. Soc. Géol. France, ser. 5, vol. 4, 1934, p. 778.

non *Rh[inoceros] kendengindicus* Von Koenigswald, Quartär, vol. 2, 1939, p. 38.

? *Coelodonta* Von Koenigswald, De Ing. in Ned. Ind., vol. 1, part 11, sect. IV, 1934, p. 193, Proc. Kon. Akad. Wet. Amst., vol. 38, 1935, p. 193.

Revised diagnosis:

One nasal horn, strong frontal depression. Inferior squamosal processes enclose the subaural channel. Outer surface of upper molars approximately straight, paracone style slightly produced. Protoloph free from ectoloph at the apex. Vertical depression in anterior surface of protoloph (protocone fold), most distinct below. Anterior, but no inner cingulum. Protoloph much produced backwards internally. Crochet large, often united with crista, forming a medifossette. Laterally compressed postsinus, shallower than medisinus. Premolars like molars but with lesser backward extension of the protoloph and higher internal pass to the medisinus. In the milk premolars, however, the paracone style is much produced, pd^1 persistent in the adult.

The species is distinguished from *Rhinoceros unicornis* L. by the characters of its teeth only. They are in a less advanced stage of hypsodonty in the fossil Javan species. But *kendengindicus* differs from *unicornis* also in some progressive features: the postero-internal angle of the upper premolars is more produced, which makes them more molariform than those in *unicornis*, and the upper molars are comparatively narrower posteriorly.

In 1891, after having recorded *Rhinoceros sondaïcus* Desm. in the fossil state from Java, Dubois announces the discovery of a new fossil rhinoceros from Kebon Doeren in Java (Anonymus, 1891, p. 11). This second fossil species is mentioned again in 1907 as being unicorn and closely allied to *Rh. unicornis* (Dubois, 1907, p. 454). In 1908 the form is designated as *Rhinoceros kendengindicus* (Dubois, 1908, p. 1259) and stated to differ from the living *unicornis* only in subordinate points. Dubois remarks that the metaloph of the upper molars is relatively broader, and that the nasals are narrower and have sharper borders.

In 1934 Von Koenigswald (1934a, p. 196) states that, among other forms, *Rhinoceros kendengindicus* Dubois does not belong to the Trinil fauna in its restricted sense. The older Djetis fauna is stated to contain, besides *Rh.* cf. *sondaïcus* Desm., a second species, cf. *Coelodonta* (Von Koenigswald, 1935a, p. 193) on the evidence of a tooth fragment from Sangiran (l.c., 1934a, p. 193). It is not improbable that this fragment belongs to Dubois's *kendengindicus*, as the molars of *Coelodonta antiquitatis* (Blumenbach) are formed on the same general plan as those of *unicornis*, and, consequently, as in *kendengindicus*. This seems, however, not to have been considered by Von Koenigswald, who in 1939, contrary to his former statement, mentions *Rh. kendengindicus* Dub. as a synonym of *Rh. sondaïcus* Desm. from the Trinil fauna (Von Koenigswald, 1939, p. 38).

Coll. Dub. no. 1991 (pl. VI, VII figs. 1-4), Kebon Doeren.

Upper dentition, the right series complete, the left series lacking the P^4. To the same individual also belong parts of the right and left zygomatic arch, the lower portion of the occiput, and the upper surface of the skull, very incomplete in the frontal region.

The dentition indicates a fully adult animal, M^3 being about one-third worn down; it will be described first (pl. VI).

The right and left pd^1 are too much worn to show any detail of their structure, except the shape of the basal plane, which is subtriangular. In the posterior moiety of the tooth the enamel layer even is worn away. There are no traces of fossettes on the worn surface. The right, however, still shows a part of the anterior cingulum on the inside.

Right and left P^2. The posterior border of the left is incomplete. At one-third of the length from the antero-external angle there is a slight paracone style on the outer surface. It is marked in front by a shallow depression which does not extend down to the base of the crown. Posteriorly to the paracone style, in the middle of the outer surface, a narrow vertical depression occurs. It is more marked in the left than in the right, and is continued to the base. The posterior moiety of the outer surface is slightly convex from before backwards. The protocone is still isolated from the ectoloph; they are connected by means of a ridge which is not yet worn. Anteriorly to this ridge there is a pit enclosed by the anterior cingulum. This cingulum does not extend to the antero-internal angle, there is no inner cingulum. The medisinus, which thus is still open towards the front, is already closed internally; the disc of the protocone is just uniting with that of the metaloph. Proto- and metaloph are connected on the inside to about 17 mm above the base, and the dividing line ascends almost vertically. The medisinus is deep, its shape is markedly different in the right and the left tooth; the right possesses a small crochet, whereas in the left there is no crochet but a crista, issued from the ectoloph and partly broken off. The postsinus forms a shallow triangular pit.

Right and left P^3. The antero-external angle of the left is missing. The tooth is much broader than P^2. The outer surface bears two equally feebly developed vertical ridges, the paracone style and the metacone style. Both disappear towards the base; this is also the case with the even still fainter developed vertical ridge, which occurs in the middle of the outer surface. On the anterior side only a small inner part of the cingulum is left; it does not continue along the inner surface of the tooth but terminates at the antero-internal angle, 15 mm above the lower border of the enamel. The protoloph is confluent with the ectoloph, but still constricted in front of the medisinus. The base of the metaloph does not overlap that of the protoloph; seen from the inside the width of the metaloph remains the same down to the base. Like in P^2 there is an almost vertical ascent of the pass to the medisinus on the inside. In the left P^3 the medisinus is already isolated inwards, in the right the discs of proto- and metaloph are about to unite. The crochet is so large that the medisinus is only a few mm wide everywhere, in the right tooth the crochet has a tendency to become bifid. A true crista has not developed, in the right P^3, however, there are some undulations on the inner surface of the ectoloph which seem to represent one. The postsinus is a wide triangular pit, which is much less deep than the medisinus.

Right P^4. The outer surface agrees with that of P^3, except that its base is depressed between the roots. The anterior cingulum terminates more gradually at the internal angle. The base of the metaloph again does not overlap that of the protoloph, so that the entrance to the medisinus is at right angles to the inner border of the tooth. The metaloph, as seen from the inside, remains of equal width down to the base. The crochet is large and pointed, it extends completely across the deep medisinus. On either side of the crochet the medisinus is wider than in P^3. There is a small but distinct crista.

Right and left M^1. Though much worn, the characteristic features are well shown. The outer surface is slightly convex above each of the external roots, consequently the middle of the outer surface is somewhat depressed. Only the inner portion of the anterior cingulum is left, it descends steeply to the internal angle. At about 12 mm from this angle there is a clear indication of a protocone fold on the anterior side. An inner cingulum has not developed. The inner portion of the protoloph is much expanded posteriorly, it forms three-fifths of the inner surface of the tooth. The entrance to the medisinus forms a pass, much lower, however, than in the premolars, and which is about to be worn; it is at right angles to the inner side of the tooth. At about 20 mm from the inner border the metaloph gives off a large crochet. It is directed anteriorly, parallel to and only slightly separated from the posterior surface of the protoloph, and strongly hangs over to the anterior side. Its extremity has united with a crista, projecting from the ectoloph, thus forming a medifossette. Consequently the medisinus is reduced to a narrow sinuous fissure, with its inner portion about at right angles to the inner side of the tooth, the middle portion running almost antero-posteriorly, and the head produced again towards the antero-external angle. The medifossette is funnel-shaped and much shallower than the medisinus. The postsinus is much compressed laterally and is likewise shallow.

Right and left M^2. The outer surface is flat except for two very weak vertical ridges above the two external roots. Both flatten towards the base and towards the top. The base of the outer surface is depressed in the middle, above which a third vertical ridge commences, which is also vague but seems to become more distinct at the top. The anterior cingulum descends less steeply than in M^1; on the anterior surface, about 15 mm from the internal angle, a well defined protocone fold occurs. There is a faint ledge along the base of the inner surface, which may represent the cingulum. Like in M^1, the inner portion of the protoloph is well expanded posteriorly. Proto- and metaloph are connected up to about 8 mm above the base of the crown but form a wide pass, as the slopes diverge about at right angles to each other. Labially of this pass there is a sudden descent into the deep medisinus, the anterior border of the metaloph becomes vertical and more overhanging. The very large crochet unites with the crista and thus cuts off a wide and rounded medifossette, which is shallower than the remainder of the medisinus. The extremity of the crochet, however, remains free and extends almost completely across the medisinus, which has the same sinuous appearance as already described for M^1. The postsinus is not yet closed posteriorly, it is entered by a narrow V-shaped incision in the posterior cingulum, which is on the same level as the pass leading into the medisinus and considerably above the lowest point of the anterior cingulum. The postsinus is much laterally compressed and as deep as the medifossette.

Right and left M^3. The antero-external angle (parastyle) is sharp, near this angle there is a very weak vertical ridge on the outer surface, flattening both towards the base and the top. The posterior cingulum is represented by a prominent tubercle. The anterior surface is produced in the middle, the cingulum descends, first steeply and then less abruptly, to the antero-internal angle and encloses a distinct depression. This is due to the deep protocone fold in the anterior surface of the protoloph, about 15 mm from the internal angle and most distinct below. The inner portion of the protoloph again is much expanded posteriorly at the base, and forms about two-thirds of the inner border. Along the inner surface of the protoloph the cingulum is continued as a very faint ledge, gradually fading away. The slope of the protoloph at the entrance to the medisinus is concave, it becomes vertical more outwards, the anterior surface of the united ecto- and metaloph slightly hangs over to the anterior side. The bases of proto- and metaloph meet in a line and form a wedge-shaped entrance to the medisinus, almost on a level with the cingulum. The medisinus deepens as it passes outwards. The crochet is given off at right angles to the metaloph, it is slightly thickened in the middle and pointed at its extremity. It extends completely across the medisinus. The crista projects into the medisinus on the same side as the crochet, in the right it extends only half way across the medisinus; in the left, however, its extremity has united with that of the crochet, forming a medifossette, which is not shallower than the remainder of the medisinus.

The fossil teeth agree with those of *Rh. unicornis* in almost every detail. They differ widely from those of *sondaïcus* in the absence of a prominent paracone style, consequently in the more flattened outer surface which is not more inclined inwards in its posterior moiety, in the presence of a protocone fold, in the greater backward extension of the inner portion of the protoloph, in the presence of a larger crochet, and in the presence of a crista, often united with the crochet so as to form a medifossette.

From table VII it can be seen, that Dubois (1908, p. 1259) was erroneous in his statement, that the metaloph in the upper molars of *kendengindicus* is relatively broader than that in those of *unicornis*. On the contrary the postero-transverse diameter of M^1 and M^2 in *kendengindicus* is smaller when compared with the antero-transverse diameter than in *unicornis*.

The dimensions of the teeth in the two recent *unicornis* skulls (Leiden Museum, cat. a and b) differ not inconsiderably. As, however, the dimensions of the teeth of *kendengindicus* are intermediate between those in the two skulls, even this scanty material for comparison proves undoubtedly that there is no difference in size between the two forms.

Besides the different relation between the anterior and the posterior breadth of the molars, the only difference from *unicornis* I can perceive is that in *kendengindicus* the postero-internal angle of the premolars is more produced than in *unicornis*. In this respect *kendengindicus* agrees with *Coelodonta platyrhinus* (Falc. et Cautl.) from the Upper Siwaliks (Lydekker, 1881, pl. VIII), which form, however, is much larger, the length P^2-M^3 being 318 mm (Lydekker, l.c., p. 49) against only 243 mm in *kendengindicus*.

The less worn condition of some other fossil teeth shows certain further details, therefore the final comparison of the teeth of the fossil Javan form with those of *unicornis* will be given after the description of all specimens. First follows the description of the cranial remains of the individual to which the just described dentition belongs.

The portion of the right zygomatic arch (Pl. VII fig. 4) comprises the glenoid cavity with the entire processus postglenoideus. The fragment has broken off about 8 cm in advance of the cavity. The interior of the bone is occupied by large air-cells of irregular form. The glenoid cavity is convex from before backwards in front, and concave behind. The transverse width is 125 mm. The posterior border at the inner side forms a huge postglenoid process which is very broad at the base and gradually narrows towards the tip. The height of this process is 60 mm. The portion of the squamosal above and behind the postglenoid process is very incomplete, but fortunately enough bone is preserved to ascertain that the posttympanic process has united with the postglenoid process below the subaural channel, as is the case in *unicornis* too. The lower surface of the zygomatic arch in front of the glenoid cavity presents a depression, the outer surface is rugose.

The fragment agrees in size with the corresponding portion of the skull of *unicornis*, and the only difference I can perceive is that in *unicornis* the postglenoid process is more slender, it is less expanded at the base in the recent species. The variation in this respect which I found in the series of *sondaïcus* skulls, however, seems to indicate that the difference is not important.

The fragment of the left side consists of the inner portion of the glenoid cavity only; the postglenoid process has broken off. It needs no special remarks.

The lower portion of the occiput (pl. VII fig. 3) consists of the two occipital condyles, and the entire foramen magnum. The height of the latter is ca. 32 mm, the width 46 mm. The condyles are widely separated above (about 60 mm), but the width of the incisura intercondyloidea on the lower surface of the skull is not more than 18 mm. The width over the outer edges of the condyles is 129 mm. At the right side the hypoglossal foramen is preserved.

From the corresponding portion of the skull of *unicornis* the present fragment is not different. The width across the condyles is 128-129 mm in the two *unicornis* skulls, and that of the incisura intercondyloïdea 13-20 mm.

The nasals are completely preserved (pl. VII figs. 1-2), they are well arched from side to side. The strong rugosities upon them indicate the presence of a horn. Towards the tip there is a slight longitudinal median groove, the lateral borders are sharp. On either side a good deal of the naso-maxillary notch is seen. The width below the summit of the nasals is 114 mm.

The frontal portion of the skull is very incomplete, but yet it is in contact with the nasal on the upper surface. The left supraorbital process is preserved, this enables us to give the greatest width of the frontals as ca. 190 mm. As seen in side view (pl. VII fig. 2), the upper surface is strongly concave antero-posteriorly behind the summit of the nasals. As the surface moreover is perfectly smooth, a frontal horn evidently was absent. The sharp and overhanging fronto-parietal crests converge to the posterior part, the least distance between them is ca. 45 mm. Unfortunately the summit of the occiput is missing, but as in the fragment the parietal crests are already seen to diverge posteriorly, it is certain that not much has broken off. The depth of the depression between the summit of the nasals and that of the occipital portion, measured perpendicularly to a line drawn tangential to both, is not less than 78 mm.

Dubois (1908, p. 1259) stated that in *kendengindicus* the nasals are narrower and sharper at the border than in *unicornis*. The first statement is not correct, as in the two *unicornis* skulls in the Leiden Museum (cat. a and b) the breadth of the nasals is 110 mm and 120 mm respectively, thus smaller and greater respectively than in the fossil. In the two not wholly adult *unicornis* skulls (which in all probalitity were also the skulls used by Dubois for comparison) the border of the nasals indeed is not so sharp as in our fossil. The series of *sondaïcus* skulls, however, proves that the difference is not reliable and more or less depends on the age of the individual.

The greatest breadth of the frontals in *unicornis* (cat. a) is 188 mm, thus almost equal to that in the fossil, in cat. b it is 10 mm smaller. The least distance between the parietal crests is ca. 36 mm in both *unicornis* skulls, which is also not much different from that in the fossil skull. The depth of the frontal depression of the two not adult *unicornis* skulls is 65 mm and ca. 60 mm respectively; these are just the highest values I found in adult *sondaïcus*. As the profile line of the skull becomes more curved in older animals, in adult *unicornis* skulls the depth of the frontal depression will increase, with little doubt, to 78 mm, the value found in the fossil skull.

We thus arrive at the conclusion that in its cranial characters the fossil Javan form is indistinguishable from *unicornis*, which is certainly a remarkable result. The dentition, however, proves *kendengindicus* to be specifically distinct from *unicornis*. I shall now proceed with the description of the separate teeth from various localities in Java which belong to the present species.

Coll. Dub. no. 429b (pl. V fig. 8), locality unknown.

P^2 dext., the outer surface broken off. The tooth is more worn than that in the type skull of *kendengindicus*; the protocone is about to unite with the ectoloph. The protocone has become confluent with the ectoloph on the inside of the tooth. Both a crochet and a crista are present, but they do not come into contact. The postsinus is still present, but is very small.

Coll. Dub. no. 1977a (pl. V fig. 1), Kedoeng Broeboes.

P^3 sin., unworn. The outer surface shows two faint vertical ridges, the paracone style and the metacone style, of which the former is more distinct than the latter. Both flatten towards the base and towards the top. There is also a narrow median vertical ridge; it fades away 10 mm above the base of the crown, and below it there is a slight concavity. The base of the outer surface is pinched in between the roots. The apex of the ectoloph is slightly twisted in the middle. The metastyle is slightly raised in its upper part. The anterior cingulum descends to the inner side. It does not properly extend to the antero-internal angle and terminates 15 mm above the lower border of the enamel. It encloses a distinct depression on the anterior surface of the protoloph, the result of the presence of a protocone fold in that surface. The apex of the protoloph is somewhat inclined forward. The protoloph is separated from the ectoloph by a cleft of 12 mm depth, only 2 mm above the highest point of the anterior cingulum. The lingual entrance to the medisinus, however, is still somewhat lower, so that the medisinus would have been closed first towards the front and then towards the inside. The base of the metaloph does not overlap that of the protoloph at the inside of the tooth, so that the entrance to the medisinus is at right angles to the inner border of the tooth, and not curved. The entrance forms a pass, 22 mm above the base, which ascends steeply between proto- and metaloph and has an almost vertical descent into the deep medisinus. The metaloph, as seen from the inside, remains of equal width down to the base, and the postero-internal angle at the base of the crown is as produced as the antero-internal angle. The lower border of the enamel on the inside is almost horizontal. The inner portion of the metaloph (hypocone) is constricted at the top. The crochet is large, and divides the narrow medisinus into two nearly equal parts. The crista is represented by two vertical rows of small tubercles on the internal side of the ectoloph, which do not extend to the crochet. The apex of the metaloph joins the ectoloph 6 mm below the apex of the latter. The postsinus is wide and becomes triangular below. It is much shallower than the medisinus and is entered by a deep V-shaped incision in the posterior cingulum, which is lower than the pass leading into the medisinus.

The comparison with the, fortunately also unworn, P^3 in the two *unicornis* skulls reveals some important differences. Firstly in *unicornis* (pl. V fig. 3) the metaloph does not remain of equal width (as seen from the inside) down to the base. The postero-internal angle at the base of the crown is not produced, and on this level the inner surface passes gradually into the posterior surface. Moreover the lower border of the enamel on the inside is not almost horizontal in *unicornis*, but oblique, and distinctly higher below the metaloph than below the protoloph. On the anterior surface the cingulum descends lower down on the internal angle, and terminates only 7 mm above the base. The tooth of *kendengindicus* differs also from that of *unicornis* in the relative height of the crown.

P^3	*sondaïcus* Leiden Museum	*kendengindicus* Coll. Dub. no.	*unicornis* Leiden Museum	
	reg. no. 5976	1977a	cat. a	cat. b
1. Greatest breadth (anteriorly) .	51	56	62	54
2. Greatest height (outer surface) .	51	58	68	61
3. Ratio 1 : 2	1.00	0.97	0.91	0.89
4. Greatest length outer surface .	42	46	50	47
5. Ratio 4 : 2	0.82	0.79	0.74	0.77

From the table it clearly results that the P^3 of *kendengindicus* is much like that of *sondaïcus* in the ratio of the breadth to the height of the unworn crown. Taking the tooth of *sondaïcus* as the standard to which

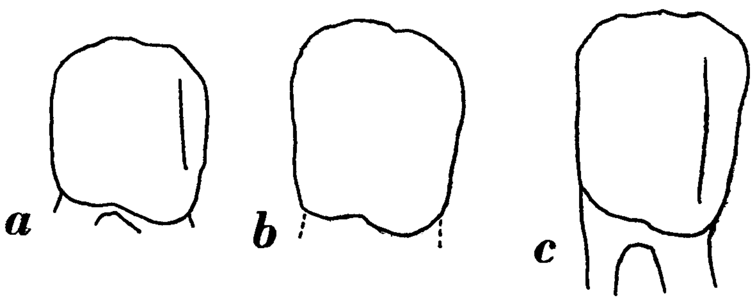

Fig. 1. Outlines of outer surface of P^3 sin. a, *Rhinoceros sondaïcus* Desmarest, Leiden Museum, reg. no. 5976; b, *Rhinoceros kendengindicus* Dubois, Coll. Dub. no. 1977a; c, *Rhinoceros unicornis* L., Leiden Museum, cat. b. About one half natural size.

the term mesodont may be applied (cf. Forster-Cooper, 1934, p. 579) *unicornis* is distinctly hypsodont. In fig. 1 a-c the outlines of the outer surfaces of the unworn P^3 of *sondaïcus*, *kendengindicus*, and *unicornis* are represented. In the ratio of the length of the outer surface (measured high up the crown) to the height *kendengindicus* is seen to be intermediate between the two recent species.

For the rest there is agreement between *kendengindicus* and *unicornis* in the presence of a protocone fold, in the cleft between proto- and ectoloph, in the constricted top of the hypocone, and in the shape and relative depth of the postsinus. The peculiar twist of the apex of the ectoloph is more stressed in *unicornis*. The paracone style in *unicornis* cat. b is very distinctly developed, but in cat. a it is not more produced than in the fossil tooth.

Coll. Dub. no. 429a (pl. V fig. 2), Tegoean.

P^3 sin., slightly worn. The outer surface is missing. It differs from the preceding specimen only in the slightly less produced postero-internal angle. The anterior cingulum terminates slightly externally of the internal angle, 14 mm above the base of the crown. Proto- and metaloph are connected on the inside up to 23 mm above the base. The crista is single.

Coll. Dub. no. 324b, locality unknown.

P^3 sin., ectoloph broken off. The medisinus is already closed. The protocone fold and the produced postero-internal angle are well shown.

Coll. Dub. no. 253e (pl. V fig. 4), Kedoeng Broeboes.

P^3 dext., much worn. The posterior surface has broken off, the paracone style on the outer surface is still visible. The medisinus is isolated, the crochet is large, the crista only faintly indicated. A shallow triangular pit represents the postsinus. This specimen again shows well the postero-internal angle, which is such a distinctive character of the premolars of the present species. The shape of the basal plane is approximately quadrangular, whereas the contour of the basal plane of the corresponding tooth in *unicornis* is regularly curved on the posterior side from the antero-internal angle to the postero-external, without a distinct postero-internal angle.

Coll. Dub. no. 324c, locality unknown.

P^4 dext. The ectoloph has broken off, and the posterior surface is incomplete. The anterior cingulum terminates at the internal angle 18 mm above the base. Proto- and metaloph are already confluent on the inside. The dividing line is straight and almost vertical as seen from the inner side; the metaloph is of equal width down to the base. The crochet is large, the postsinus triangular in outline and much less deep than the medisinus.

Coll. Dub. no. 1978b (pl. V fig. 7), Soember Waroe.

M^1 sin., very much worn down. The outer surface is equally convex above the two roots, and depressed between. The protocone fold is still visible. The medisinus is isolated inwards and forms a narrow sinuous fissure, so that no doubt there was a union of crochet and crista. The medifossette, however, is completely worn away. The bottom of the postsinus is still present as an enamel protuberance on the grinding surface.

The postero-transverse diameter is smaller when compared with the antero-transverse than in *unicornis.*

Coll. Dub. no. 1978a (pl. V fig. 5), Soember Waroe.

M^2 dext., about one-third worn down. The outer surface bears two narrow vertical ridges above the roots. They are both but slightly produced. The posterior (metacone style) commences higher above the base than the anterior (paracone style) and is sharply defined above. There is also a very weak median vertical ridge, which towards the base passes into a slight concavity. The base of the outer surface is depressed in the middle. The upper part of the metastyle is a little raised. The disc of the protoloph has not yet united with the ectoloph, in the anterior surface of the protoloph there is a very distinct protocone fold. The anterior cingulum is crenulated, it descends as a slightly curved ledge to the antero-internal angle. Below the protocone fold it encloses a triangular depression. It terminates at the antero-internal angle only 7 mm above the lower border of the enamel. There is no cingulum on the inside. The inner portion of the protoloph is much produced backwards, and forms three-fifths of the inner surface. The entrance to the medisinus forms a wide pass, which lies much higher than the lowest point of the anterior cingulum. The crochet is very large, and thickened in its middle portion, pointed at the extremity. The extremity is recurved towards the external side, it remains free from the posterior surface of the protoloph but is connected with the inner surface of the ectoloph by means of a slender crista. In the medifossette thus formed, which is shallower than the medisinus, there occur some tubercles on the surface of the ectoloph. The posterior cingulum has a narrow V-shaped incision, on a level with the lingual entrance to the medisinus, leading into the laterally compressed postsinus, which is only slightly shallower than the medisinus.

The thorough comparison of the present fossil with the M^2 of *unicornis* reveals, besides the comparatively smaller postero-transverse diameter in *kendengindicus,* only one difference, viz., in the height of the crown. The exact height of the outer surface of the M^2 of *kendengindicus* in the unworn state is impossible to estimate; the height, however, of the incision between the protoloph and the ectoloph (still untouched by wear) above the base of the outer surface is 44 mm in the fossil, whereas in the two M^2 of *unicornis* (Leiden Museum, cat. a and b) it is 56 and 52 mm respectively. The crown in *kendengindicus,* therefore, must have been lower than in *unicornis.* The cleft between proto- and ectoloph is an additional character in which *kendengindicus* and *unicornis* differ from *son-*

daïcus, in the latter species the protoloph reaches the top of the ectoloph.

Coll. Dub. no. 1977b (pl. V fig. 9), 8 km N. W. of Kedoeng Broeboes.

M^2 dext. The outer surface is still more straight than in the foregoing specimen, the metastyle is less raised and the styles have fainter developed. The anterior cingulum is broader, the disc of the protoloph has just united with the ectoloph. The crochet, thickened in the middle, extends completely across the medisinus. There is a slender crista as in the preceding specimen, it does, however, not unite with the extremity of the crochet but joins a slight projection given off from the posterior surface of the protoloph, somewhat external to the crochet. In this way the medisinus labially of the crochet is divided into two parts, and to none of them the term medifossette can be correctly applied.

In *unicornis* (Leiden Museum, cat. b) the crochet also does not join the crista, and there is also an indication of the projection from the posterior surface of the protoloph.

Coll. Dub. no. 1976a, Kebon Doeren.

M^2 dext., half worn down. This specimen differs from the two preceding only in the thicker crista, which does not join the crochet.

Coll. Dub. no. 322, locality unknown.

M^2 dext., very much worn. The anterior part of the ectoloph, the inner and posterior surfaces missing. The protocone fold is distinct, the medifossette reduced to a small pit.

Coll. Dub. no. 1694b, Kedoeng Broeboes.

M^2 sin., very much worn down. The ectoloph has broken off. The protocone fold is distinctly shown; the medisinus is a narrow sinuous fissure. Two enamel protuberances represent the bottoms of medifossette and postsinus.

Coll. Dub. no. 325a, ? Kedoeng Broeboes.

M^2 dext., ectoloph broken off. Shows protocone fold, medifossette, and the backwardly produced inner portion of the protoloph.

Coll. Dub. no. 425b, locality unknown.

M^2 sin., agrees with the foregoing specimen, but also incomplete at the inner side of the protoloph.

Coll. Dub. no. 425c, Kebon Doeren.

M^2 dext., outer half, parastyle broken off. Paracone style weak, medifossette.

Coll. Dub. no. 425d, Kedoeng Loemboe.

M^2 dext., ectoloph only, with weak vertical ridges.

Coll. Dub. no. 425f, locality unknown.

M^2 sin., central portion with postero-internal angle. Crochet large, small crista.

Coll. Dub. no. 4484, locality unknown.

M^2 dext., like foregoing specimen, but without postero-internal angle.

Coll. Dub. no. 2175a, locality unknown.

M^2 sin., central portion of medisinus. Large crochet; crista.

Coll. Dub. no. 2462b, locality unknown.

M^2 sin., like foregoing specimen. Crochet very large.

Coll. Dub. no. 1694f, locality unknown.

M^2 dext., idem. Crochet, crista.

Coll. Dub. no. 306, locality unknown.

M^2 dext., antero-internal angle. Protocone fold.

Coll. Dub. no. 1694d, locality unknown.

M^2 dext., antero-external angle. Slight paracone style; crista.

Coll. Dub. no. 1694e, locality unknown.

M^2 sin., postero-external angle. Metacone style (very weak); narrow postsinus.

Coll. Dub. no. 534 (pl. IX fig. 4), locality unknown.

Fragment of left maxillary with M^{2-3}. The posterior portion of the much worn M^1 is present too. M^2 is entire and agrees so very closely with the corresponding molar of the type of *kendengindicus* that description is useless. The M^3 unfortunately lacks the greater part of the outer surface and also is incomplete at the inner side of the protoloph. There is an almost closed medifossette, and a well formed postsinus.

Coll. Dub. no. 1694a (pl. V fig. 6), Kedoeng Loemboe.

M^3 sin., very slightly worn; the inner portion of the protoloph and the metaloph are not yet touched by wear. The parastyle is sharp, the paracone style only very slightly produced. The posterior cingulum consists of two prominent tubercles which enclose a depression. A narrow cleft occurs between the apices of protoloph and ectoloph. The anterior surface of the protoloph is sharply pinched in above the cingulum, 16 mm from the inside of the crown. As seen from the inside, the protoloph forms a cone, with slightly concave slopes, the base occupies two-thirds of the inner border. The entrance to the medisinus is low and wedge-shaped. The crochet projects almost completely across the medisinus, the crista is represented by some small tubercles only, on the same side as the crochet.

The crown of the present specimen is not so high as that of the M^3 of *unicornis*. The height from the base to the top of the protoloph on the unworn inside of the molar is 35 mm, this measurement in *unicornis* is not less thans 54 mm (Lydekker, 1876, pl. IV fig. 5). The height of the outer surface of the present tooth, measured opposite to the crochet as this part of the metaloph is still unworn, is 55 mm. This is exactly the height of the same portion of the already worn outer surface of an M^3 of *unicornis* figured by Lydekker (1886b, pl. X fig. 3a).

With the collection there is also a fragment of an unworn left M^3 (Coll. Dub. no. 429c) that consists of the outer surface except the extreme inner portion. The specific identification is rendered certain by the presence of a very slightly produced paracone style, of a cleft between ecto- and protoloph, and by that of a complete medifossette. The greatest height of the outer surface is 55 mm; this specimen, therefore, is even lower than the one just described from Kedoeng Loemboe. The height of the unworn outer surface of an M^3 of *unicornis* is given by Lydekker (1876, p. 35) as 71 mm.

This result confirms that of the examination of the unworn P^3; *kendengindicus* was a less hypsodont species than *unicornis*.

For the rest the present fossil M^3 agrees with *unicornis*, and differs from *sondaïcus*, in the very slightly produced paracone style, in the presence of a cleft between the protoloph and the ectoloph, in the presence of a protocone fold, in the inner portion of the protoloph being much extended posteriorly, in the large crochet, and in the presence of a crista, which may, or may not, unite with the crochet so as to make a medifossette.

These distinguishing characters (or only in part when the tooth is not complete) are also shown in the following specimens, which need not to be described at length:

Coll. Dub. no. 1976c, locality unknown.

M^3 sin., slightly more worn than the preceding specimen, but still exhibiting the cleft between protoloph and ectoloph. Upper portion of metaloph broken off.

Coll. Dub. no. 1976b, locality unknown.

M^3 sin., disc of protoloph about to unite with ectoloph. Internal upper portion of protoloph broken off.

Coll. Dub. no. 425e, locality unknown.

M^3 sin., antero-external angle only.

Coll. Dub. no. 253c, Kedoeng Broeboes.

M^3 sin., protoloph united with ectoloph. Anterior surface of protoloph missing.

Coll. Dub. no. 253b, Kedoeng Broeboes.

M^3 sin., half worn down. The greater part of the protoloph broken off.

Coll. Dub. no. 253a, Kedoeng Broeboes.

M^3 sin. Antero-external angle and inner surface of protoloph missing.

Coll. Dub. no. 253d, Kedoeng Broeboes.

M^3 sin., antero-external angle and the greater part of the protoloph broken off. A medifossette has been formed by the union of crista and crochet, as in the M^3 of the type of *kendengindicus*.

Coll. Dub. no. 307, locality unknown.

M^3 dext., the inner portion of proto- and metaloph missing.

Coll. Dub. no. 2076b, locality unknown.

M^3 sin., medisinus only. Perfectly isolated medifossette.

Coll. Dub. no. 1694c (pl. V fig. 11), Soember Waroe.

M^3 dext., very much worn down. The tooth is distinguishable from that of *sondaïcus* even in this far advanced stage of wear by its not produced paracone style, by the presence of a protocone fold, still distinctly shown, by its much produced inner portion of the protoloph, forming two-thirds of the inner side, and by the large size of the crochet.

We possess also milk premolars of the present species:

Coll. Dub. no. 6486 (pl. V fig. 10), Kedoeng Broeboes.

Fragment of right maxillary with pd^{2-3}. The anterior moiety of the ectoloph, and also the upper portion of the protoloph, of pd^2 is missing. The mesostyle is very prominent, it is well defined posteriorly (the anterior part is lacking). A large medifossette has been formed by the union of crista and crochet. The postero-external angle of the medifossette again is completely cut off by two slender processes, given off from the metaloph and the ectoloph respectively, so that there is an accessory fossette in the medifossette. The postsinus is narrow, and slightly shallower than the medisinus. The tooth differs from *sumatrensis* and *sondaïcus* (except Coll. Dub. no. 642e, from Sumatra), in which there is often a medifossette, in the slightly superior size, and also in the apparently broader mesostyle and more compressed postsinus; it is of the same shape and size as in *unicornis*.

The pd^3 is complete except for the internal portion of the metaloph, which has broken off. There is a very strong paracone style, bounded anteriorly by a sharp parastyle fold, continued down to the base. Posteriorly the paracone style is less sharply defined, it broadens and slightly flattens to the base. There is also a, less distinct, metacone style; it narrows towards the top. The metastyle is raised in its upper part. On the anterior side the protocone fold is only very vaguely indicated, the cingulum terminates slightly before reaching the antero-internal angle. The entrance to the medisinus is wedge-shaped, there is a well formed medifossette, slightly deeper than the medisinus. The postsinus is as deep as the medisinus and is laterally compressed. The specimen differs from the pd^3 of *sondaïcus* in the more developed metacone style (more also than in *sumatrensis*), in the more produced inner portion of the protoloph, in the narrower postsinus, and in the greater size as compared with the recent specimens; it equals in size the subfossil pd^3 of *sondaïcus* from Sumatra. It agrees with *unicornis* in all these respects.

The lower jaw of *unicornis* differs from that of *sondaïcus* in the higher ramus ascendens (height of condyle 1 ft. or even a trifle more: Blyth, 1862, p. 160), and the higher horizontal ramus, with a more curved inferior border. The teeth are considerably more hypsodont than in *sondaïcus*.

Now I found among the fossil lower jaws and teeth from Java some specimens, which fall outside the range of variation of *sondaïcus* and resemble *unicornis*; for the very close resemblance we noticed between *unicornis* and *kendengindicus* in the calvarium and the upper teeth, we are justified in referring those specimens to the present species. For measurements see table VIII.

Coll. Dub. no. 395 (pl. X fig. 14), Kebon Doeren.

Portion of right ramus with M_3. The width of the ramus is 53 mm, the height 85 mm. The tooth is already worn, but fortunately the inner parts of metalophid and hypolophid are not touched by wear. The anterior part of the metalophid projects on the inner side as far as the posterior parts of metalophid and hypolophid. The anterior valley has a wedge-shaped entrance, which is on a higher level than that of the wider posterior valley. The hypolophid is separated from the metalophid by a cleft at the apex, and by a deep vertical groove on the outer surface, in the unworn state it is much lower than the metalophid. There is no trace of a cingulum on the inner or outer side of the molar; anteriorly there is a ridge ascending steeply to the inside from the antero-external angle, posteriorly the cingulum is represented by a broad tubercle.

The ramus is more massive than in *sondaïcus*, and the length and breadth of M_3 are greater, but the most important difference is found in the height of the unworn crown. In the present specimen the median internal column, the metaconid, rises not less than 44 mm above the base of the crown, and the postero-internal column, the entoconid, 35 mm. There is a large anterior fragment of a left M_3 in the collection (Coll. Dub. no. 2175b), which agrees with the present tooth in every detail. From the table with the comparative measurements of the M_3 of *sondaï-*

M_3 No. of specimen	*sondaïcus*									*kendengindicus*		*unicornis*
	10	11	12	13	14	18	Coll. Dub. no.			Coll. Dub. no.		Leiden Mus.
							305	2491	2465	395	2175b	cat. a
Height of metaconid	34	—	—	—	—	—	—	—	—	44	44	47
Height of entoconid	29	26	29	28	25	27	26	27	27	35	—	37

cus and *unicornis, Rh. kendengindicus* is seen to be much more hypsodont than *sondaïcus,* and only slightly inferior to *unicornis* in this respect.

Coll. Dub. no. 392 (pl. X fig. 12), Soember Waroe.

Right and left horizontal ramus. Of the teeth only the roots are present; as M_3 must have been fully in place the jaw belonged to an adult individual. The ascending portions are missing, the angle of the right is present. The left ramus has broken off in advance of P_3, the right fortunately exhibits a part of the symphysis, in which the apex of the root of the C is still present. It is situated 15 mm in advance of the anterior root of P_2. In *sondaïcus* the lower C does not extend less backwards than the anterior border of P_2 (Leiden Museum, cat. c, Coll. Dub. no. 305). The inferior border of the ramus is more curved than in any specimen of *sondaïcus* seen by me, with the exception of one in the Amsterdam Museum (no. 640). Below P_2 there is a large mental foramen; in *sondaïcus* it is usually situated below the anterior root of P_3. The ramus is higher than in *sondaïcus* (82 mm below M_1), and, finally, the mandibular foramen is situated below the level of the molars, in which position it is found only in one *sondaïcus* jaw (Leiden Museum, cat. j).

The mandible of *unicornis* differs from that of *sondaïcus* in the same points as the present fossil does, except in the lesser backward extension of the C, in which respect *unicornis* agrees with *sondaïcus.*

Coll. Dub. no. 394b, Soember Waroe.

Fragment of right horizontal ramus, teeth broken off. The height of the ramus below M_1 is 80 mm.

Coll. Dub. no. 391, Kedoeng Broeboes.

The greater parts of the right and left ramus. The angle of the left is preserved, but damaged posteriorly, the ascending portion is missing. The left ramus had broken off in advance of M_2, the right at P_3; the inferior borders are incomplete. The mandibular foramen is situated below the level of the molars. The teeth are missing, except the right M_1, part of the right M_2, and the left M_2. They are much worn down. The height of the ramus is 84 mm, both below M_1 and M_3.

The specimen differs from *sondaïcus* in the higher horizontal ramus; the mandibular foramen has a lower position than usually in that species.

Coll. Dub. no. 429f (pl. IV fig. 9), locality unknown.

P_3 dext., almost unworn. The base on the outer side is incomplete. The anterior portion of the metalophid projects to the inside, but remains one-third of the breadth distant from the inner border. The anterior valley is wedge-shaped, the metaconid is somewhat constricted off. The upper margin of the metalophid is crenulated, with the highest point in the protoconid. The much lower hypolophid has already been taken into use, the entoconid is still untouched. The posterior valley is wider and deeper than the anterior, and slightly deepens as it passes outwards. The lower border of the enamel is sharply curved upwards on the inside between the roots. There is no cingulum along the sides of the tooth, anteriorly and posteriorly it forms two faint ascending ridges.

The shape of the posterior valley at first puzzled me, as normally in *sondaïcus* and in *unicornis* there is no "pass" leading to the posterior valley of the lower teeth. Lydekker (1876, p. 50, pl. VI fig. 3) describes a lower M from near Attock (Punjab) presenting the same peculiarity. He supposes that the tooth belongs to a distinct species, with affinities to *Ceratotherium simum* (Burchell); later (Lydekker, 1881, p. 55) he again refers to the tooth, which he leaves specifically undetermined. In the P_2 and P_3 of *Ceratotherium simum* (Burchell) (Leiden Museum, cat. a and b) the posterior valley has a wall on the inside, but the same occasionally is found in *sondaïcus* too. In the right P_2 of one specimen (Leiden Museum, cat. c) the posterior valley forms an isolated fossette, whereas in the corresponding tooth on the left side in the same skull the posterior valley is normally shaped, and deepens as it passes inwards; it would never become closed internally. We may, therefore, safely regard the presence of a pass to posterior valley as an individual peculiarity.

The present fossil P_3 differs from that of *sondaïcus* in the inward projection of the anterior part of the metalophid, and in the considerably higher crown. In these respects it resembles *unicornis*, in which species, however, the unworn crown is still slightly higher, as shown in the table given here.

P_3	*sondaïcus* Amst. Museum	*kendengindicus* Coll. Dub. no.	*unicornis* Leiden Museum
	no. 511	429f	cat. a
Height of metaconid	32	40	42
Height of entoconid	25	31	33

Coll. Dub. no. 424 (pl. X fig. 9), Tegoean.

Right ramus horizontalis with milk teeth, M_1 being not yet erupted. The pd_1 is lost, the pd_2-pd_4 are damaged on the internal side, the pd_4 also at the outer surface of the metalophid. The structure of the milk premolars is not different from that in *sondaïcus*, except that there is a sharp vertical groove in the outer surface of the metalophid of pd_2 and pd_3 opposite the anterior valley. This groove is less marked in *sondaïcus*. As the teeth are worn, it cannot be ascertained if the milk premolars of *kendengindicus,* like its permanent teeth, are more hypsodont than in *sondaïcus.* The teeth, like in *unicornis,* exceed those of *sondaïcus* in size. The ramus also is higher, being 75 mm below pd_4, against 54-64 mm in the five *sondaïcus* jaws (Leiden Museum, cat. g; Amsterdam Museum, no. 889; Coll. Dub. no. 430, 429g, and 515) which are in a corresponding stage of growth.

To the present species I refer three fragments of humeri, all from Kedoeng Broeboes. They are not inconsiderably larger than those of *sondaïcus,* both recent and fossil (the latter often present smaller dimensions than the former), but due to the imperfect state of the specimens I could not perceive structural differences from *sondaïcus.* As appears from the measurements given by Cuvier (1822a, p. 40) the bones of *unicornis* also exceed those of *sondaïcus* in size.

Coll. Dub. no. 6780 (pl. X fig. 7), Kedoeng Broeboes.

Large proximal fragment of humerus dext. Of the proximal extremity only the superficially injured lateral tuberosity, and the lateral part of the bicipital groove are preserved. The deltoid tuberosity is complete. The bone has broken off at the narrowest part of the shaft.

Coll. Dub. no. 9224, Kedoeng Broeboes.

Large proximal fragment of humerus dext. The caput is damaged, the medial and lateral tuberosities are for the greater part lost. The deltoid tuberosity is missing, and about 7 cm below it the bone has broken off.

Coll. Dub. no. 8709, Kedoeng Broeboes.

Condylus lateralis of humerus dext., with part of the coronoid and olecranon fossa.

HUMERUS	*Rh. kendengindicus* Dubois Coll. Dub. no.			*Rh. sondaïcus* Desm. (see table on p. 67)
	6780	9224	8709	
Breadth across caput and posterior part of lateral tuberosity	—	190+	—	137—162
Breadth at deltoid tuberosity	176	—	—	142—153
Antero-posterior diameter of condylus lateralis	—	—	132	91—116

Coll. Dub. no. 5546 (pl. X fig. 3), locality unknown.

Metacarpal III dext. The bone is superficially injured, especially at the lateral part of the distal extremity. The proximal articular surfaces are the same as in *sondaïcus,* that for the unciform is somewhat less oblique. The facet below it, which articulates with the anterior portion of the 4th metacarpal, stands almost vertically instead of facing also somewhat downwards as in *sondaïcus.*

METACARPAL III	*Rh. kendengindicus* Dub. Coll. Dub. no. 5546	*Rh. sondaïcus* Desm. (see table on p. 72)
1. Median length	208	170—187
2. Proximal breadth	70	67—71
3. Proximal antero-posterior diameter	50	44—51
4. Middle breadth	57	59—65
5. Least antero-posterior diameter	23	20—26
6. Breadth distal articular surface	—	57—58
7. Antero-posterior diameter of the latter	45	41—46
8. 4 : 1	0.27	0.33—0.38

The present fossil is longer and more slender than the corresponding bone in *sondaïcus.* Cuvier (1822a, p. 36) states that the metacarpals in *sondaïcus* are shorter, broader, and flatter than those in *unicornis* and *bicornis.* The length of the median (3rd) metacarpal in *unicornis* he gives, however, as 180 mm (l.c., p. 40), which falls within the range of variation of *sondaïcus* found by me.

Two fragments of femora must be referred to the present species too. They exceed the recent *sondaïcus*-femora in size, and agree in this respect with *unicornis* (Cuvier, 1822a, p. 41). The fossil femora of *sondaïcus* often are smaller than the recent. I have not found any structural difference. Cuvier (l.c., p. 19) states that in the femur of *unicornis* the great trochanter is prolonged downward so as to meet an upward prolongation of the third trochanter, thus cutting off a large oval foramen, which is not found in *sondaïcus* (l.c., p. 36). His statements have been copied by Blainville (1846, pp. 23 and 35, see his atlas, pl. VII), who states that the difference probably is due to different age. The condition Cuvier found in *unicornis* certainly is an individual variation, and not of any systematic value. Furthermore Cuvier (1822a, p. 36) states that the distal extremity is broader posteriorly in *sondaïcus* than in *unicornis,* but in this he is not followed by Blainville, who is unable to add any further difference. The first of the two present fragments is from Trinil, and it is the only part of *kendengindicus* in the Dubois collection from that locality.

Coll. Dub. no. 9233, Trinil.

Distal part of femur sin. The medial part of the trochlea, and the condylus medialis are injured, both the lateral and the medial surface are superficially damaged. Somewhat damaged also is the antero-lateral angle of the trochlea, so that the antero-posterior diameter given in the table must have been a few mm greater in the complete bone. Nevertheless it is already nearly as great as in *unicornis.*

Coll. Dub. no. 9254, locality unknown.

Lower part of shaft of femur dext., with upper portion of medial epicondyle.

FEMUR	*Rh. kendeng-indicus* Dubois Coll. Dub. no.		*Rh. unicornis* L., Cuvier, 1882a, p. 41	*Rh. sondaïcus* Desm. (see table on p. 77)
	9233	9254		
Smallest transverse of diameter shaft	—	78	—	56—75
Antero-posterior diameter at the same level	—	61	—	45—61
Distal antero-posterior diameter (lateral side)	154+	—	156	117—142
Antero-posterior diameter from middle of trochlea to fossa inter-condyloidea	102	—	—	76—97

Finally with the collection there is a 3rd metatarsal, which is longer and more slender than the corresponding bone in *sondaïcus,* and must belong to Dubois's species too.

Coll. Dub. no. 8011 (pl. X fig. 1), locality unknown.

Metatarsal III sin., entire. The proximal extremity presents the same facets as in *sondaïcus,* the anterior facet for the 4th metatarsal faces more backward than in *sondaïcus.* The distal articular surface is exactly shaped as in the latter species. Cuvier (1822a, p. 42) gives the length of the 3rd metatarsal in *unicornis* as 182 mm, which is almost exactly the length of the present fossil! The examination of more material from the postcranial skeleton of *kendengindicus* very probably will show that in

METATARSAL III	*Rh. kendeng-indicus* Dubois Coll. Dub. no.	*Rh. sondaïcus* Desm. (see table on p. 81)
	8011	
1. Median length	180	50—165
2. Proximal breadth	60	56—61
3. Proximal antero-posterior diameter	52	44—47
4. Middle breadth	52	54—59
5. Least antero-posterior diameter	24	19—22
6. Breadth of distal articular surface	57	56
7. Antero-posterior diameter of the latter	45	40—41
8. 4 : 1	0.29	0.33—0.39

its skeletal characters the latter species is indistinguishable from *unicornis*. As I have shown above, also in the skull and lower jaw *kendengindicus* agrees with *unicornis*. That they, however, doubtless represent distinct species, is shown by the three dental characters mentioned above.

Having completed the descriptions of *Rh. kendengindicus* Dubois, it remains to consider its relations to the other forms. The only fossil Asiatic species which displays the same general plan of structure of the upper molars is *Coelodonta platyrhinus* (Falc. et Cautl.) from the Upper Siwaliks, the probable ancestor of *Coelodonta antiquitatis* (Blumenbach). A fine right upper tooth series of *platyrhinus* is figured by Lydekker (1881, pl. VIII). It is about one-third larger than *kendengindicus*, which, besides its evidently bicorn character (l.c., pl. IX fig. 2) establishes its distinctness from the Javan form. It is very remarkable, however, that, as seen from Lydekker's figure, the premolars differ from those of *unicornis* in the same point as do those of *kendengindicus*; the metaloph on the inside does not narrow to the base so that there is a postero-internal angle at the base of the crown, which is not produced in *unicornis*.

To *Rh. unicornis* L. the fossil Javan form is very closely related. The two species afford specific differences only in their teeth. These are less hypsodont in *kendengindicus*, and this, of course, must be considered as a primitive feature of *kendengindicus* as compared with the living Indian form. The more produced postero-internal angle in the upper premolars of *kendengindicus* makes them more molariform than the upper premolars in *unicornis*; this also is very important, as it must be regarded as a progressive difference from *unicornis*. The third dental difference, viz., the comparatively smaller posterior breadth of the upper molars of *kendengindicus* as compared with *unicornis*, is constant in my material, but with a view to the variability in this respect in *sondaïcus* and *sumatrensis* it is to be expected that with more ample material the two species will be seen to overlap each other to a certain degree, as do *sumatrensis* and *sondaïcus* too. In this character the molars of *unicornis* would seem to be more generalized than those of *kendengindicus*.

We thus arrive at the conclusion that it is impossible to derive the one from the other, and that the relations between *Rh. unicornis* L. and *Rh. kendengindicus* Dubois are best characterized by saying that they represent collateral species.

As stated above, Von Koenigswald did not find *Rhinoceros kendengindicus* Dubois in the Trinil fauna in restricted sense; therefore he states that this species must occur in another horizon. He mentions a tooth fragment from Sangiran I (Djetis fauna) as akin to *Coelodonta*. The remains of *kendengindicus* in the Dubois collection originate from Kebon Doeren, Kedoeng Broeboes, Kedoeng Loemboe, Soember Waroe, and Tegoean; one tooth from 8 km N.W. of Kedoeng Broeboes, and a femur from Trinil. From all these localities we have also remains of *Rh. sondaïcus* Desmarest, which are much more abundant. As judged by Van Es's maps (Van Es, 1931) Kebon Doeren, Kedoeng Broeboes, Kedoeng Loemboe, Soember Waroe, and Tegoean all are situated on the outcrop of the Trinil beds (Kaboeh layers: Duyfjes, 1936, p. 146). But 8 km N.W. of Kedoeng Broeboes, however, we have a region mapped by Van Es as Miocene marls and tuffs! The remains from the first five localities might have been found below the level of the Kaboeh layers [1]), but the inscription Trinil on the distal part of the large femur (Coll. Dub. no. 9233) proves that *kendengindicus* occurred with the Trinil fauna sensu stricto, as Dubois's Trinil-material originated only from the Kaboeh layers and not from lower deposits.

There are still other records of the rhinoceros in the fossil state in Java. Van Es (1931, p. 131/132) mentions a rhinoceros femur from the Bareng beds near Bara, supposed of Middle Pliocene age. Van Es doubted if a terrestrial animal could be indigenous in that period, and supposed the bone to have formed part of a floating carcass originating from Borneo or another part of the Archipelago connected with the Asiatic continent.

The oldest known Mammal from Java is:

"Aceratherium" boschi Von Koenigswald

Aceratherium boschi Von Koenigswald, Wet. Med. Dienst Mijnb. Ned. Ind., no. 23, 1933, p. 121, pl. XVIII figs. 7-8, Proc. Kon. Akad. Wet. Amst., vol. 38, 1935, p. 196.

This species is based on the germ of a left M^3, found in an upper Miocene or lower Pliocene limestone, containing *Cycloclypeus*, from Tji Sande (W. Java). The description contains several inaccuracies, so, e.g., the anterior and the posterior side are reversed. From the figures (in the explanation of which it is called a right M^3) the following points are clear:

1. the internal portion of the metaloph is missing (in the text it is called the outer, resp. the anterior part);

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1) The deposits with Djetis fauna are found below the Trinil beds at Kedoeng Broeboes (Von Koenigswald, 1934, p. 188). Von Koenigswald (l.c., p. 190) accepts that the remains of *Manis palaejavanica* Dubois, recorded from Kedoeng Broeboes (Dubois, 1926), originate from the Djetis deposits.

2. the upper border is damaged;
3. there is a distinct anterior cingulum;
4. the paracone style is prominent;
5. there is no protocone fold, and
6. the inner portion of the protoloph is not much expanded posteriorly.

The characters 4-6 distinguish the tooth from the corresponding of *Rh. kendengindicus* Dubois. The dimensions (antero-posterior ca. 40 mm, antero-transverse 53 mm) fall within the range of variation of *Rh. sondaïcus* Desm., and judging by the figures the tooth also looks much like that species. According to the text, however, a crochet has not developed. If it is possible to ascertain the absence of the crochet, notwithstanding the defective state of preservation of the metaloph, the tooth represents a third species for Java, and Von Koenigswald is right in making a new species of it. The absence of a crochet, and the not constricted protocone, render it possible to exclude all Asiatic forms except *Aceratherium bugtiense* Pilgrim (1912, p. 26, pl. VIII figs. 3-4) from the Gaj series of the Bugti Hills, which is, however, much larger (dimensions: antero-posterior 71 and 74 mm, antero-transverse 79 mm).

Rhinoceros spec.

Coll. Dub. no. 500a (pl. IV fig. 15), locality unknown.

Left upper I, with fully developed root. The crown is obliquely worn, more on the outer side than on the inner, and concave from before backwards. The shape is fully consistent with that in *sondaïcus* in the same stage of wear; as appears from the table on p. 55 it is only a little less compressed laterally than in the few recent teeth I had for comparison. The upper I of *kendengindicus* are not known, but as those of *unicornis* appear not to differ materially from those of *sondaïcus*, except perhaps in the greater breadth (19 mm in *unicornis*, Leiden Museum, cat. b), the present fossil possibly belongs to *kendengindicus*.

The nasal portion of the type skull of *kendengindicus* is indistinguishable from that of some, apparently male, skulls of *sondaïcus* (Leiden Museum, cat. a; Amsterdam Museum, no. 512); therefore the specific determination of the separate nasals, mentioned below, must remain uncertain.

Coll. Dub. no. 394a (pl. X fig. 11), Trinil.

The nasals, perfectly smooth superiorly and not much curved antero-posteriorly. The length of the fragment is 16 cm. The perpendicular portions have broken off, but in front of the lateral notch the border is complete, and rather sharp. There is a slight longitudinal median groove.

In all important characters it agrees with the corresponding portion of female *sondaïcus* skulls (Leiden Museum, cat. j; Amsterdam Museum, no. 640), so that it must have belonged to a female.

Coll. Dub. no. 1998, locality unknown.

Nasals, length of fragment 15.5 cm. They are more pointed towards the tip than in the preceding specimen. 8.5 cm behind the tip the right border is lost. The upper surface is not rugose, and not much curved antero-posteriorly; the fragment likewise apparently belonged to a female specimen.

Coll. Dub. no. 2467, Kedoeng Broeboes.

Large fragment of nasals. In front of the distinct summit the left has broken off. Also the lateral border of the left, and the tip of the right nasal, are missing. From the strong rugosities on the upper surface it belonged probably to a male individual.

Coll. Dub. no. 428a, Bangle.

Central fragment of nasals, with deep longitudinal median groove. The summit is well shown, a small part of the left border is present.

As the lower teeth of *kendengindicus* and *sondaïcus* differ mainly in their stage of hypsodonty, the specific determination of loose worn specimens is impossible. They are enumerated below, together with some unidentifiable jaw fragments.

Coll. Dub. no. 2468 (Bangle). Incomplete symphysis.

Coll. Dub. no. 1990 (Kedoeng Broeboes). Damaged left ramus with part of symphysis, without teeth.

Coll. Dub. no. 426 (?Kedoeng Broeboes). Five fragments of lower jaw.

Coll. Dub. no. 2464 (Tegoean). Symphysis with erupting C, and two fragments of ramus.

Coll. Cosijn, Geol. Mus. Leiden, no. 27805 (Java). Fragment of right ramus with ? P_3.

Coll. Dub. no. 2493 (locality unknown). Fragment of right ramus with anterior portion of ? M_1.

Coll. Dub. no. 8373 (Dekes). Fragment of right ramus with P_3-M_1.

Coll. Dub. no. 4775a (Kedoeng Broeboes). Fragment of left ramus with ?M_1.

Coll. Dub. no. 2084e (Kedoeng Broeboes). Small fragment of right ramus.

Coll. Dub. no. 6994 (locality unknown). Idem.

Coll. Dub. no. 359 (idem). Fragment of symphysis with part of left C.

Coll. Dub. no. 2458 (idem). Posterior fragment of right ramus.

	Dimensions antero-posterior	Dimensions transverse
pd_4		
Coll. Dub. no. 1719a (locality unknown) pd_4 sin.	40	22
P_2		
Coll. Dub. no. 6488 (Kedoeng Broeboes). P_2 sin.	28	20
Coll. Dub. no. 1719b (locality unknown). P_2 dext.	29	19
Coll. Dub. no. 1719c (idem). P_2 dext.	28	20
Coll. Dub. no. 1719d (idem). P_2 sin.	30	21
P_3		
Coll. Dub. no. 104b (Kedoeng Broeboes). P_3 sin.	39	24
Coll. Dub. no. 1719j (Tawang). P_3 dext.	35	24
Coll. Dub. no. 1694p (Bangle). P_3 sin.	39	25
Coll. Dub. no. 109k (Djeroek). P_3 sin.	—	26
Coll. Dub. no. 1694q (locality unknown). P_3 dext.	38	25
Coll. Dub. no. 1694r (idem). P_3 sin.	36	24
Coll. Dub. no. 1719g (idem). P_3 dext.	38	26
Coll. Dub. no. 1719h (idem). P_3 sin.	35	24
P_4		
Coll. Dub. no. 1719k (Tawang). P_4 sin.	38	26
Coll. Dub. no. 6487 (Kedoeng Broeboes). P_4 dext.	42	30
Coll. Dub. no. 1694l (Kedoeng Loemboe). P_4 dext.	—	28
Coll. Dub. no. 11465 (Kedoeng Broeboes). P_4 sin.	—	26
Coll. Dub. no. 2462d (locality unknown). P_4 sin.	41	29
Lower M		
Coll. Dub. no. 108 (Tritik). Lower M dext.	49	37
Coll. Dub. no. 109l (Djeroek). Lower M sin.	52	27
Coll. Dub. no. 109m (idem). Lower M dext.	52	28
Coll. Dub. no. 109n (idem). Lower M dext.	49	27
Coll. Dub. no. 109 o (idem). Lower M dext.	44	29
Coll. Dub. no. 1694m (Kebon Doeren). Lower M sin.	47	31
Coll. Dub. no. 1719f (Tegoean). Lower M dext.	53	31
Coll. Dub. no. 104c (Kedoeng Broeboes). Lower M sin.	—	26
Coll. Dub. no. 104d (idem). Lower M sin.	—	28
Coll. Dub. no. 109p (Djeroek). Lower M dext.	—	30
Coll. Dub. no. 1694n (Bangle). Lower M sin.	—	30
Coll. Dub. no. 324k (locality unknown). Lower M dext.	45	27
Coll. Dub. no. 429h (idem). Lower M dext.	43	29
Coll. Dub. no. 429i (idem). Lower M sin.	47	28
Coll. Dub. no. 1694 o (idem). Lower M dext.	45	25

	Dimensions antero-posterior	Dimensions transverse
Coll. Dub. no. 1719i (idem). Lower M dext.	47	29
Coll. Dub. no. 1719l (idem). Lower M sin.	46	25
Coll. Dub. no. 1719m (idem). Lower M sin.	47	25
Coll. Dub. no. 1719n (idem). Lower M dext.	48	26
Coll. Dub. no. 253i (idem). Lower M sin.	42	26

In one of the lower molars (Coll. Dub. no. 429i) the entrance to the posterior valley is blocked by a tubercle, so that after prolonged wear the posterior valley would present an isolated fosette. A similar tubercle, but of smaller size, has developed in the right and the left M_2 of a *sondaïcus* skull in the Leiden Museum (cat. j).

Both *kendengindicus* and *sondaïcus* possess lower C, as we have seen above. Of the lower C in the jaw of *kendengindicus* (Coll. Dub. no. 392) not enough is preserved to determine if it differs in shape from that of *sondaïcus*. The lower C of *unicornis* seems not to differ from that of *sondaïcus*. In the Dubois collection there are four separate almost complete lower C:

	Dimensions transverse	Dimensions vertical
Coll. Dub. no. 1694k (Kebon Doeren). Lower C sin.	36	23
Coll. Dub. no. 1711a (Kedoeng Broeboes). Lower C dext.	30	19
Coll. Dub. no. 6485 (idem). Lower C sin.	35	21
Coll. Dub. no. 102c (locality unknown). Lower C sin.	37	26

Four fragments of femora present no specific characters, though size and the presence of the third trochanter, and the evident absence of *Equus* in the fauna of Java [1]) render the generic position certain.

Coll. Dub. no. 10359 (Trinil). Central fragment of shaft of femur dext., with small part of third trochanter.

Coll. Dub. no. 10187 (locality unknown). Small central fragment of femur sin. with part of third trochanter.

Coll. Dub. no. 396 (Tegoean). Small fragment of femur dext., with base of the third trochanter.

Coll. Dub. no. 2307 (locality unknown). Idem.

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1) The horse has been mentioned as occurring with the Sampoeng fauna of Java by Van Es (1930, p. 336), but was not found by Dammerman (1934, p. 479), who supposes that Van Es mistook buffalo-teeth for those of the horse.

Rhinoceros karnuliensis Lydekker

Rhinoceros sp.? *javanicus* Foote, Rec. Geol. Surv. Ind., vol. 18, 1885, p. 232.
Rhinoceros karnuliensis Lydekker, Rec. Geol. Surv. Ind., vol. 19, 1886, p. 120, Cat. Foss. Mamm. Br. Mus., part 3, London, 1886, p. 183, Mem. Geol. Surv. Ind., ser. 10, vol. 4, 1886, p. 40, pl. X figs. 1-2, 4, Rec. Geol. Surv. Ind., vol. 20, 1887, p. 72; Dubois, Natuurk. Tijdschr. Ned. Ind., vol. 48, 1888, p. 151; Pavlow, Bull. Soc. Imp. Nat. Moscou, n.s., vol. 6, 1892, p. 200; Zdansky, Pal. Sinica, ser. C, vol. 5, fasc. 4, 1928, p. 82.
R[hinoceros] karnuliensis, Nicholson and Lydekker, A Manual of Palaeontology, 3rd ed., vol. 2, Edinburgh and London, 1889, p. 1369; Lydekker, The Royal Natural History, vol. 2, London, 1894, p. 485; Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 25, 1908, p. 1259.
Atelodus karnuliensis, Trouessart, Catalogus Mammalium, nov. ed., vol. 2, Berlin, 1898, p. 759.
Dicerorhinus karnuliensis, Trouessart, Catalogus Mammalium, Quinquennale Supplementum, Berlin, 1905, p. 629.
Rhinoceros karnuliensish Lydekker, Rec. Geol. Surv. Ind., vol. 19, 1886, p. 121.
Rhinoceros carnuliensis Schlosser, Abh. K. Bayer. Akad. Wiss., Math.-Phys. Kl., vol. 22, 1903, p. 198.
[Rhinoceros] carnuliensis, Matthew, Bull. Am. Mus. Nat. Hist., vol. 56, 1929, p. 461.
[Rhinoceros] karnulensis Matthew, Bull. Am. Mus. Nat. Hist., vol. 56, 1929, p. 451.

I strongly doubt if the present form is really separable from *sondaïcus*. The associated M^{2-3} sin. (Lydekker, 1886b, pl. X fig. 1) are characterized by having an accessory tubercle in the medisinus, labially of the crochet, and a cingulum not only on the anterior side, but also on the inner side of the protoloph. The same variations, however, occur in *sondaïcus* too. An accessory tubercle in the medisinus, in the same position and of the same size as in the specimens figured by Lydekker, occurs in the M^2 and M^3 of a *sondaïcus* skull (Leiden Museum, cat. j), and is found also in a fossil M^2 of that species from Soember Waroe (Coll. Dub. no. 1978c). In the upper molars of the Karnul rhinoceros the anterior cingulum continues around the antero-internal angle; it rapidly fades away, however, not extending beyond the half of the inner surface of the protoloph. There also is no tubercle at the entrance to the medisinus. In Coll. Dub. no. 1976f (pl. IV fig. 14), an M^2 of *sondaïcus* from Tritik, the internal cingulum is even stronger developed than that in the figured specimens from the Karnul caves. It is a continuous row of tubercles, which extends to the entrance to the medisinus, and even runs for some mm on the inner surface of the metaloph.

Another molar of *sondaïcus*, an M^2 sin. from the Trinil layers at Sangiran, preserved in the Mining Department of the Technical College at Delft (K.A. 15424) exhibits the same variation. The anterior cingulum here also continues around the antero-internal angle; for some 5 mm in the middle of the inner surface of the protoloph it is weakly developed (or damaged), but it becomes distinct again more posteriorly, and terminates at the entrance to the medisinus, or rather behind it, in a prominent tubercle, attached to the metaloph. I am indebted to Prof. J. H. F. Umbgrove for the permission to figure this specimen (pl. IX fig. 3).

In some upper premolars of *sondaïcus* (Coll. Dub. no. 92a, 2456, and 2462e) the internal cingulum even forms a distinct ledge; the P^3 dext. of the Karnul form (Lydekker, l.c., pl. X fig. 2) has only a tubercle at the entrance to the medisinus.

Lydekker (l.c., pl. X figs 4, 4a) figures the greater portion of a left horizontal ramus. P_3-M_3 are present and well worn, of P_2 the alveolus is present, in front of this tooth the upper surface is lost. The specimen comprises also the hinder portion of the symphysis. Lydekker (l.c., p. 41) states that the mandible corresponds in size with *sondaïcus*, but that in the broken extremity of the symphysis there is no trace of alveoli for C, and that this circumstance, together with the sudden inward curvature of the external border of the ramus in advance of P_3, and four other characters, indicate that the specimen was tuskless. In this respect I may quote Matthew (1929, p. 461), who re-examined the specimen and states that not enough is preserved to be certain on this point.

The external border, as seen in the upper view (Lydekker, l.c., pl. X fig. 4) is curved inwards in advance of P_3. A line tangential to the inner borders of the teeth intersects the outer surface of the ramus ca. 45 mm in advance of P_3. This is also the case in some lower jaws of *sondaïcus* (Leiden Museum, cat. c and j). More anteriorly, however, in *sondaïcus* the symphysis expands again, whereas from the upper view of the Karnul jaw it would appear that the constriction is even more sudden from 45 to 60 mm in advance of P_3. The tip of the preserved portion of the symphysis is situated 60 mm in advance of P_3, and is found in a line with the inner border of the ramus. As appears from the side view, however (Lydekker, l.c., pl. X fig. 4a), this tip is no more situated on the outer, but on the lower surface of the symphysis. The preserved portion of the outer surface extends only to ca. 45 mm in advance of P_3, that is, just to the most constricted part of the symphysis in *sondaïcus*. It is, therefore, impossible to ascertain if the external border again curves outwards more than 45 mm in advance of P_3.

Lydekker draws attention to four other characters which would indicate that C are absent. They are not conclusive:

1. The backward extension of the symphysis to the anterior border of P_3 (from the figure it seems that the symphysis extends backwards to the middle of P_3) is found also in *sondaïcus* (Leiden Museum, cat. j).

2. The convexity of the inferior border of the ramus. I cannot see a difference from *sondaïcus* in this respect.

3. The backward position of the mental foramen. In the Karnul jaw it is placed below the anterior moiety of P_3. In *sondaïcus* (adult) this foramen has exactly the same position (Leiden Museum, cat. a, c, f, j; Amsterdam Museum, no. 510 and 640).

4. The narrow and deep symphysial channel. The posterior part of the symphysis in some specimens of *sondaïcus* (Leiden Museum, cat. c, and especially f) is so deeply hollowed, that in the figured specimen it is certainly not more stressed.

Thus there remains only one point, viz., that Lydekker did not see any trace of the alveolus of the left C in the broken extremity of the symphysis. In the recent and fossil *sondaïcus* jaws examined by me the alveolus of the lower C extends backwards to a varying degree, ranging from the anterior border of P_2 (Leiden Museum, cat. c; Coll. Dub. no. 305) to the middle of P_3 (Leiden Museum, cat. a). If there is indeed no trace of an alveolus of C in the broken extremity of the symphysis of the Karnul jaw (that the contour of the alveolus, when filled with matrix, is sometimes almost indistinguishable, I experienced during the preparation of the jaw of *Aceratherium perimense* Falc. et Cautl.), the alveolus of the lower C, if present, must have been considerably shallower than in *sondaïcus*, supposed that the variation in the latter species is not greater than found here.

As I have shown, in all clearly shown characters the Karnul rhinoceros is indistinguishable from *sondaïcus*, and we must await the discovery of a better preserved mandibular symphysis to eventually become certain if it is really a distinct species. If *karnuliensis* will turn out to be a synonym of *sondaïcus*, the Pleistocene range of that species (Lydekker (l.c., p. 26) places the Karnul fauna in the upper Pleistocene) must have extended far east- and southward of that in historic times, as shown in a map by Loch (1937) [1]).

Aceratherium perimense Falconer et Cautley

Rhinoceros, Clift, Trans. Geol. Soc. London, ser. 2, vol. 2, 1829, p. 373, pl. 40 fig. 1.
Rhinoceros (*Acerother*: ?) *perimensis* Falconer et Cautley, Fauna Antiqua Sivalensis, London, 1847, pl. 75 figs. 13-16.
Rhinoceros perimensis Falconer et Cautley, Fauna Antiqua Sivalensis, London, 1847, pl. 76 figs. 14-17; Lydekker, Cat. Foss. Mamm. Br. Mus., part 3, London, 1886, p. 155, 156 fig. 19, Rec. Geol. Surv. Ind., vol. 20, 1887, p. 75.

1) Loch correctly does not include Borneo in the geographical range of *sondaïcus*. As I have shown above (p. 10) the subfossil teeth from Sarawak described and figured as *sondaïcus* by Busk (1869) must be referred to *sumatrensis*.

Rh[inoceros] perimensis, Foote, Mem. Geol. Surv. Ind., ser. 10, vol. 1, 1874, p. 15; Zittel, Handbuch der Palaeontologie, part 1, vol. 4, Vertebrata (Mammalia), Munich and Leipzig, 1893, p. 290.

Aceratherium perimense, Lydekker, Mem. Geol. Surv. Ind., ser. 10, vol. 3, 1884, pl. I fig. 5, p. 132, Cat. Siw. Vert. Indian Mus., part 1, Calcutta, 1885, p. 66; Pavlow, Bull. Soc. Imp. Nat. Moscou, n.s., vol. 6, 1892, p. 200; Trouessart, Catalogus Mammalium, nov. ed., vol. 2, Berlin, 1898, p. 749; Pilgrim, Rec. Geol. Surv. Ind., vol. 40, 1910, p. 200, Mem. Geol. Surv. Ind., n.s., vol. 4, part 2, 1912, p. 26, Rec. Geol. Surv. Ind., vol. 43, 1913, p. 297; Matthew, Bull. Am. Mus. Nat. Hist., vol. 56, 1929, p. 461, 507; Colbert, Trans. Am. Phil. Soc. Philad., n.s., vol. 26, 1935, p. 181, figs. 86-89.

A[ceratherium] perimense, Steinmann and Döderlein, Elemente der Paläontologie, Leipzig, 1890, p. 774; Osborn, Bull. Am. Mus. Nat. Hist., vol. 13, 1900, p. 249; Stamp, Geol. Mag., vol. 59, 1922, p. 498.

Acerotherium perimense, Lydekker, Rec. Geol. Surv. Ind., vol. 9, 1876, p. 90, 91, Mem. Geol. Surv. Ind., ser. 10, vol. 1, 1876, p. 51, pl. VI figs. 2, 5-6, Rec. Geol. Surv. Ind., vol. 12, 1879, p. 46; Medlicott and Blanford, Manual Geology India, Calcutta, 1879, part 1, p. 343, 393, part 2, p. 472, 574; Lydekker, Journ. As. Soc. Beng., vol. 49, part 2, 1880, p. 35, Preface to Mem. Geol. Surv. Ind., ser. 10, vol. 1, 1880, p. XIII, Rec. Geol. Surv. Ind., vol. 14, 1881, p. 156, Mem. Geol. Surv. Ind., ser. 10, vol. 2, 1881, p. 9, pls. I-II, IIA, III-IV, IX fig. 1, Rec. Geol. Surv. Ind., vol. 15, 1882, p. 104, ibid., vol. 16, 1883, p. 89.

Teleoceras ? perimense, Schlosser, Abh. K. Bayer. Akad. Wiss., Math.-Phys. Kl., vol. 22, 1903, p. 206.

Teleoceras perimense, Trouessart, Catalogus Mammalium, Quinquennale Supplementum, Berlin, 1905, p. 628.

Rhinoceros iravadicus Lydekker, Mem. Geol. Surv. Ind., ser. 10, vol. 1, 1876, p. 36, pl. V figs. 1-4, Journ. As. Soc. Beng., vol. 49, part 2, 1880, p. 35, Preface to Mem. Geol. Surv. Ind., ser. 10, vol. 1, 1880, p. XIII; Patte, Bull. Soc. Géol. France, ser. 5, vol. 4, 1934, p. 782.

Aceratherium iravadicus, Colbert, Trans. Am. Phil. Soc. Philad., n.s., vol. 26, 1935, p. 200.

[Aceratherium] iravadicus, Matsumoto, Sc. Rep. Tôhoku Imp. Univ. Sendai, ser. 2, vol. 5, 1921, p. 91.

R[hinoceros] iravaticus Medlicott and Blanford, Manual Geology India, Calcutta, 1879, part 2, p. 574, pl. XIX fig. 2.

Rhinoceros planidens Lydekker, Mem. Geol. Surv. Ind., ser. 10, vol. 1, 1876, p. 41, pl. IV figs. 7, 9.

R[hinoceros] planidens Lydekker, Rec. Geol. Surv. Ind., vol. 11, 1878, p. 96, ibid., vol. 12, 1879, p. 47; Medlicott and Blanford, Manual Geology India, Calcutta, 1879, part 2, p. 574.

Aceratherium planidens, Colbert, Trans. Am. Phil. Soc. Philad., n.s., vol. 26, 1935, p. 200.

A[ceratherium] planidens, Matsumoto, Sc. Rep. Tôhoku Imp. Univ. Sendai, ser. 2, vol. 5, 1921, p. 91.

Aceratherium lydekkeri Pilgrim, Rec. Geol. Surv. Ind., vol. 40, 1910, p. 65, 200, Mem. Geol. Surv. Ind., n.s., vol. 4, part 2, 1912, p. 26, Rec. Geol. Surv. Ind., vol. 43, 1913, p. 297; Stamp, Geol. Mag., vol. 59, 1922, p. 497; Matthew, Bull. Am. Mus. Nat. Hist., vol. 56, 1929, p. 449, 462; Colbert, Trans. Am. Phil. Soc. Philad., n.s., vol. 26, 1935, p. 200, Bull. Am. Mus. Nat. Hist., vol. 74, 1938, p. 402.

This species, distinguished from the other Siwalik rhinoceroses by its larger size, is named after the Perim Island in the Gulf of Cambay, from which island remains are figured in Fauna Antiqua Sivalensis. It has been recorded by Lydekker under different names from the (lower [1])) Irrawaddy beds of Burma, the Siwaliks of the Punjab, and the lower Manchhars of Sind. Remains in the American Museum Siwalik collection were described and figured by Colbert (1935).

In the Dubois collection there is a lower jaw of the present species, collected in March 1895.

Coll. Dub. no. 3077 (pl. IX fig. 1), Malhur, 2½ miles W.N.W. of Haripoor on the Somb Nuddy, Sirmur State, Punjab.

Lower jaw. The ascending portion of the left ramus is lost; the right ramus has broken off behind M_3. The symphysis is incomplete at its extremity, and somewhat crushed; both rami are fractured, and the fragments are displaced along the fractures. The very hard matrix has not been removed above the symphysis, and it was also impossible to place the fragments of the rami again in their natural position without further demolishing the specimen.

In the broken extremity of the symphysis is seen the full contour of the large alveolus for the left C, which is filled with matrix, and in part also that of the right. The width of the symphysis at the constriction immediately in advance of P_2 is ca. 90 mm. More anteriorly the right outer surface is lost, but on the left side the external border of the symphysis is seen to curve slightly outward. There is a large mental foramen below P_2, close to the lower border; a smaller and double one is found higher up, below P_3. The ramus is high and massive, the width is 55 mm at M_1, and 65 mm at M_3. The lower border seems to have been almost straight, but that of the symphysial portion is inclined upwards.

On the left side the premolars and M_1 have crumbled away. Of the right P_2 the enamel is lost, on the anterior part of P_3 the enamel is also missing. It is, however, in part preserved on the sides of the tooth. The external surface exhibits a deep median vertical groove. The enamel is sharply pinched in on the inside posteriorly. The posterior border, and the anterior of P_4, have become dissolved away from mutual pressure. The external surface of the hypolophid of P_4 shows a smooth swelling at the base, representing the cingulum. The anterior border of the right M_1 is dissolved away too; the inner surface is slightly pinched in medially, and broken off behind. The external border of the hypolophid is damaged at the base, it is distinctly wider (in antero-posterior sense) than that of the metalophid, and separated from it by a deep vertical groove. The right M_2 has for the greater part crumbled away, M_3 completely broken

1) Vide Stamp (1922).

off. On the left side part of the grinding surface of M_2 is preserved, and a good deal of the outer surface, which, like that of M_3, exhibits a deep vertical groove between meta- and hypolophid, continued to the base. The comparative measurements of the lower jaw are given below:

	Lydekker, 1881		Colbert, 1935, p. 198, fig. 89.	Coll. Dub. no. 3077 pl. IX fig. 1
	p. 27 F.A.S., pl. 75 fig. 13.	p. 26, pl. IV.		
Depth of ramus at M_1	—	114	106	105
P_2 antero-posterior	—	—	32	ca. 29
transverse	—	—	23	—
P_3 antero-posterior	—	—	40	ca. 37
transverse	—	—	26	31
P_4 antero-posterior	—	—	49	ca. 44
transverse	—	—	37	33
M_1 antero-posterior	58	67	53	47
transverse	—	—	36	34
M_2 antero-posterior	71	71	64	ca. 57
transverse	—	—	40	34
M_3 antero-posterior	76	—	72	63
transverse	—	—	35	35
Length P_2—P_4	—	130	123	109 [1])
Length M_1—M_3	—	—	187	ca. 165

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1) Much reduced through resorption from mutual pressure.

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TABLE I

Dicerorhinus sumatrensis (Fischer)

No. of specimen	1		2		3		4		5		6		7		8		Stremme, 1911, p. 92
	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	
pd^1 antero-posterior .	ca. 20	ca. 20	ca. 20	ca. 20	ca. 19	ca. 19	ca. 18	—	—	—	—	—	—	—	—	—	17
transverse	ca. 18	ca. 18	21	21	ca. 20	ca. 20	21	—	—	—	—	—	—	—	—	—	19
P^2 antero-posterior .	—	—	—	—	—	—	ca. 24	—	ca. 21	—	ca. 23	ca. 21	—	—	—	ca. 22	26
antero-transverse .	—	—	—	—	—	—	33	—	31	—	30	29	—	—	—	29	28
postero-transverse	—	—	—	—	—	—	35	—	37	—	34	33	—	—	31	31	—
P^3 antero-posterior .	—	—	—	—	—	—	ca. 29	—	—	ca. 27	ca. 28	ca. 27	ca. 29	ca. 29	ca. 29	ca. 28	37
antero-transverse .	—	—	—	—	—	—	43	—	39	40	39	39	42	41	40	40	47
postero-transverse	—	—	—	—	—	—	ca. 42	—	40	41	40	39	39	40	38	38	—
P^4 antero-posterior .	—	—	—	—	—	—	—	—	—	—	ca. 31	ca. 30	ca. 33	ca. 32	ca. 31	ca. 30	38
antero-transverse .	—	—	—	—	—	—	—	—	—	—	46	46	47	47	45	46	52
postero-transverse	—	—	—	—	—	—	—	—	—	—	44	43	42	42	43	43	—
M^1 antero-posterior .	ca. 33	ca. 35	ca. 37	ca. 37	ca. 40	ca. 40	ca. 38	ca. 38	ca. 37	ca. 36	ca. 35	ca. 35	ca. 36	ca. 36	ca. 35	ca. 34	39
antero-transverse .	48	48	53	53	51	51	53	53	48	48	48	48	49	49	48	48	61
postero-transverse	44	44	49	49	48	48	48	48	45	45	44	44	47	47	46	46	—
ratio ant. : post.tr.	0.92	0.92	0.92	0.92	0.94	0.94	0.91	0.91	0.94	0.94	0.92	0.92	0.96	0.96	0.96	0.96	—
M^2 antero-posterior .	—	—	—	—	—	—	—	—	ca. 40	ca. 41	ca. 41	ca. 40	ca. 39	ca. 39	ca. 41	ca. 40	42
antero-transverse .	—	—	—	—	51	51	54	54	49	50	49	48	52	52	52	52	60
postero-transverse	—	—	—	—	—	—	—	—	44	45	43	43	49	49	47	48	—
ratio ant. : post.tr.	—	—	—	—	—	—	—	—	0.90	0.90	0.88	0.90	0.94	0.94	0.90	0.92	—
M^3 antero-posterior .	—	—	—	—	—	—	—	—	—	—	—	—	43	44	42	41	—
antero-transverse .	—	—	—	—	—	—	—	—	—	—	—	—	45	46	47	46	49
length outer surface	—	—	—	—	—	—	—	—	—	—	—	—	—	—	ca. 52	ca. 52	49
pd^2 antero-posterior .	ca. 22	ca. 21	ca. 25	ca. 25	ca. 26	ca. 26	—	—	—	—							
antero-transverse .	—	27	31	30	ca. 30	ca. 30	—	—	—	—							
postero-transverse	27	28	32	32	30	30	—	—	—	—							
pd^3 antero-posterior .	ca. 27	ca. 27	ca. 32	ca. 32	ca. 31	ca. 31	—	—	—	—							
antero-transverse .	35	36	41	41	40	40	—	—	—	—							
postero-transverse	33	34	39	39	—	—	—	—	—	—							
pd^4 antero-posterior .	ca. 29	ca. 29	ca. 35	ca. 35	ca. 34	ca. 34	ca. 36	ca. 36	ca. 33	ca. 34							
antero-transverse .	—	ca. 38	44	44	43	43	43	43	40	40							
postero-transverse	34	34	41	41	37	38	41	41	36	36							

TABLE II

Dicerorhinus sumatrensis (Fischer)

No. of specimen	1		2		3		4		5		6		7		8	
	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.
C transverse	—	—	—	—	—	—	23	23	—	—	—	—	18	18	25	25
vertical	—	—	—	—	—	—	14	14	—	—	—	—	12	12	15	15
pd_1 antero-posterior . .	15	15	—	—	17	17	—	—	—	—	—	—	—	—	—	—
transverse	8	8	—	—	10	10	—	—	—	—	—	—	—	—	—	—
P_2 antero-posterior . .	—	—	—	—	—	—	26	—	—	—	25	24	25	25	24	24
transverse	—	—	—	—	—	—	15	—	—	—	14	14	16	16	14	14
P_3 antero-posterior . .	—	—	—	—	—	—	31	—	30	30	29	29	30	30	27	27
transverse	—	—	—	—	—	—	19	—	22	22	19	19	20	19	19	19
P_4 antero-posterior . .	—	—	—	—	—	—	—	—	—	—	32	32	33	33	32	32
transverse	—	—	—	—	—	—	—	—	—	—	22	22	22	22	22	22
M_1 antero-posterior . .	37	37	38	38	38	38	41	41	36	36	36	36	37	37	37	37
transverse	24	24	26	25	25	25	25	25	25	25	24	24	25	25	24	24
M_2 antero-posterior . .	—	—	40	40	40	40	42	42	39	39	37	37	42	42	40	40
transverse	—	—	—	—	25	25	25	25	25	25	23	23	26	25	24	24
M_3 antero-posterior . .	—	—	—	—	—	—	—	—	—	—	—	—	43	43	39	39
transverse	—	—	—	—	—	—	—	—	—	—	—	—	24	24	24	24
pd_2 antero-posterior . .	23	22	—	—	25	24	—	—	—	—						
transverse	13	13	—	—	14	14	—	—	—	—						
pd_3 antero-posterior . .	33	33	—	—	33	33	—	—	—	—						
transverse	17	17	19	—	20	20	—	—	—	—						
pd_4 antero-posterior . .	33	33	35	35	35	35	—	—	34	34						
transverse	19	19	21	21	21	21	—	—	20	20						

TABLE III

Rhinoceros sondaicus Desmarest

No. of specimen	3		4		5		6		7		8		Coll. Dub. no.		
	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	.r.	320b	324d	325c
pd^2 antero-posterior	ca. 30	ca. 30	ca. 30	ca. 29	ca. 30	ca. 29	—	—	ca. 26	ca. 26	ca. 29	ca. 29	ca. 30	—	—
antero-transverse	33	33	36	36	36	36	—	—	35	—	34	33	—	—	—
postero-transverse	35	34	37	36	34	34	—	—	32	33	35	36	—	—	—
pd^3 antero-posterior	ca. 37	ca. 37	ca. 36	ca. 36	ca. 37	ca. 36	—	ca. 37	ca. 33	ca. 33	ca. 36	ca. 36	—	ca. 34	ca. 38
antero-transverse	42	42	44	44	42	42	—	42	40	40	42	42	—	—	42
postero-transverse	37	37	41	40	37	37	—	37	35	35	40	39	—	ca. 37	39
pd^4 antero-posterior	—	—	—	—	ca. 38	ca. 38	—	ca. 39	ca. 34	ca. 34	ca. 36	ca. 36	—	—	—
antero-transverse	ca. 45	ca. 45	45	45	45	46	—	45	42	41	44	44	—	—	—
postero-transverse	—	—	42	42	41	41	—	40	38	38	42	41	—	—	—

TABLE IV

Rhinoceros sondaicus Desmarest

No. of specimen	2		3		4		5		6		7		8		Coll. Dub. no.				
															430		515		429g
	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	
pd_2 antero-posterior	28	28	27	27	29	28	26	26	—	27	—	—	25	—	—	29	29	29	—
transverse	14	14	15	15	16	16	15	15	—	15	15	15	16	—	—	16	16	16	—
pd_3 antero-posterior	41	41	41	41	41	41	39	39	43	43	37	37	40	40	43	43	—	—	42
transverse	20	20	22	21	21	21	22	22	22	22	20	20	21	21	20	21	—	—	23
pd_4 antero-posterior	—	—	40	40	41	41	39	40	42	42	38	38	40	40	42	42	—	—	41
transverse	—	—	—	—	22	22	24	24	24	23	22	22	23	23	22	23	—	—	23
Length pd_2—pd_4	—	—	111	111	110	111	110	109	—	111	100	100	104	—	105	104	—	—	114

TABLE V*a*

Rhinoceros sondaïcus Desmarest

No. of specimen	7		8		9		10		11		12		13		14	
	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.
pd^1 antero-posterior	ca. 21	ca. 22	ca. 20	ca. 20	ca. 22	ca. 23	ca. 24	ca. 25	ca. 22	ca. 22	ca. 23	ca. 24	ca. 22	ca. 22	—	—
transverse	19	21	ca. 20	ca. 20	—	ca. 19	ca. 20	ca. 21	ca. 20	ca. 20	ca. 20	ca. 21	ca. 22	ca. 22	—	—
P^2 antero-posterior	—	—	—	—	—	—	ca. 31	ca. 30	ca. 29	ca. 28	ca. 30	ca. 30	ca. 31	ca. 32	—	—
antero-transverse	—	—	—	—	—	—	38	39	37	38	43	43	44	44	—	—
postero-transverse	—	—	—	—	—	—	39	40	39	39	42	43	44	44	—	—
P^3 antero-posterior	—	—	—	—	—	—	ca. 36	ca. 36	ca. 35	ca. 36	ca. 35	ca. 35	ca. 37	ca. 35	ca. 38	ca. 37
antero-transverse	—	—	—	—	—	—	49	50	51	50	52	51	54	54	55	55
postero-transverse	—	—	—	—	—	—	ca. 48	48	45	45	47	47	49	49	49	49
P^4 antero-posterior	—	—	—	—	—	—	—	ca. 38	ca. 39	ca. 38	ca. 39	ca. 38	ca. 42	ca. 41	ca. 40	ca. 40
antero-transverse	—	—	—	—	—	—	—	53	52	52	54	54	57	58	58	58
postero-transverse	—	—	—	—	—	—	—	50	47	48	49	49	51	52	52	51
M^1 antero-posterior	ca. 35	ca. 35	ca. 40	ca. 41	ca. 40	ca. 39	ca. 39	ca. 38	ca. 40	ca. 40	ca. 42	ca. 42	ca. 41	ca. 40	ca. 41	ca. 41
antero-transverse	51	51	54	54	54	54	54	55	54	54	54	54	57	57	58	58
postero-transverse	45	45	50	50	48	48	51	51	48	48	48	48	52	52	51	50
ratio ant. : post.tr.	0.88	0.88	0.93	0.93	0.89	0.89	0.94	0.93	0.89	0.89	0.89	0.89	0.91	0.91	0.88	0.86
M^2 antero-posterior	—	—	—	—	ca. 42	ca. 41	ca. 41	ca. 42	ca. 43	ca. 43	ca. 44	ca. 44	ca. 45	ca. 45	ca. 44	ca. 45
antero-transverse	—	—	55	54	54	53	54	55	54	54	55	54	58	58	59	59
postero-transverse	—	—	—	—	47	47	48	47	46	45	46	47	48	49	49	48
ratio ant. : post.tr.	—	—	—	—	0.87	0.89	0.89	0.85	0.85	0.83	0.84	0.87	0.83	0.84	0.83	0.81
M^3 antero-posterior	—	—	—	—	—	—	—	—	37	37	39	40	1)	41	43	43
antero-transverse	—	—	—	—	—	—	—	—	46	46	48	46		50	51	51
length outer surface	—	—	—	—	—	—	—	—	45	45	45	45	50	50	50	50
Length pd^1—M^3	—	—	—	—	—	—	—	—	242	249	249	249	—	253	255	255

No. of specimen	15		16		17		18		19		20		21		22	23
	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	r.	l.	l.
pd^1 antero posterior	ca. 20	ca. 20	—	—	—	—	—	—	ca. 20	—	ca. 23	ca. 22	—	—	—	—
transverse	—	—	—	—	—	—	—	ca. 18	—	—	ca. 20	ca. 21	—	—	—	—
P^2 antero-posterior	ca. 27	ca. 27	ca. 28	ca. 28	ca. 29	ca. 29	ca. 31	ca. 31	ca. 29	—	ca. 30	ca. 30	ca. 30	ca. 30	—	ca. 27
antero-transverse	36	36	39	40	39	41	39	39	42	—	35	36	42	40	—	40
postero-transverse	—	41	42	41	42	41	41	41	41	—	39	39	41	41	—	41
P^3 antero-posterior	ca. 35	ca. 34	ca. 36	ca. 36	ca. 35	ca. 35	ca. 36	ca. 36	ca. 34	—	ca. 36	ca. 35	ca. 37	ca. 37	—	ca. 35
antero-transverse	48	48	54	55	52	52	51	52	57	—	50	50	52	53	—	51
postero-transverse	49	49	ca. 51	ca. 50	47	47	47	48	49	—	49	49	48	48	—	46
P^4 antero-posterior	—	ca. 40	ca. 42	ca. 42	ca. 39	ca. 40	ca. 40	ca. 40	ca. 40	—	ca. 40	ca. 39	ca. 41	ca. 39	—	—
antero-transverse	—	54	60	60	56	56	56	56	58	—	56	56	57	56	—	—
postero-transverse	—	—	53	53	49	50	50	49	50	—	53	54	53	53	—	—
M^1 antero-posterior	ca. 43	ca. 42	ca. 42	ca. 42	ca. 41	ca. 41	ca. 42	ca. 42	ca. 40	—	ca. 43	ca. 42	ca. 43	ca. 42	—	—
antero-transverse	59	58	59	60	57	58	54	54	56	—	59	58	56	55	—	—
postero-transverse	52	51	51	51	52	52	46	46	48	—	51	52	49	49	—	—
ratio ant. : post.tr.	0.88	0.88	0.86	0.85	0.91	0.90	0.85	0.85	0.85	—	0.86	0.90	0.88	0.89	—	—
M^2 antero-posterior	ca. 45	ca. 44	ca. 45	ca. 45	ca. 45	ca. 45	ca. 46	—	ca. 46	—	ca. 45	ca. 46	ca. 46	ca. 47	ca. 37	—
antero-transverse	58	58	60	60	57	57	57	—	59	—	58	58	57	56	56	—
postero-transverse	50	49	49	49	52	52	45	—	48	—	ca. 51	ca. 51	48	47	46	—
ratio ant. : post.tr.	0.86	0.84	0.82	0.82	0.91	0.91	0.79	—	0.81	—	0.88	0.88	0.84	0.84	0.82	—
M^3 antero-posterior	46	44	43	43	41	41	40	40	44	44	ca. 45	ca. 45	ca. 44	ca. 43	ca. 36	—
antero-transverse	53	51	53	53	49	49	49	49	52	53	55	54	50	51	43	—
length outer surface	53	52	52	52	50	50	47	48	53	53	ca. 58	ca. 57	50	50	44	—
Length pd^1—M^3	244	246	253	253	247	247	—	—	242	—	246	245	—	ca. 250	—	—

1) Abnormally shaped. See note on p. 38/40.

TABLE

Rhinoceros sondaïcus

	Cuvier, 1822a, p. 38/39 Paris Museum		Stremme, 1911, p. 92/94 Berlin Museum	Stremme, 1911, p. 92/94 Trinil	Van der Maarel, 1932, table K & N Bondol		Coll. Dub. no. 1983 Type of "*sivasondaicus*"	
	[1]				l.	r.	l.	r.
pd[1] antero-posterior	—	—	18	20 21	—	22	ca. 20	ca. 20
transverse	20	—	17	24 28	—	22	22	22
P[2] antero-posterior	—	—	27	28	30	30	ca. 30	ca. 30
antero-transverse	39	40	34	40	42	ca. 41	43	43
postero-transverse	—	—	—	—	—	—	45	45
P[3] antero-posterior	—	—	37	36	—	37	—	ca. 47
antero-transverse	49	52	47	52	—	52	57	57
postero-transverse	—	—	—	—	—	—	—	53
P[4] antero-posterior	—	—	36	38	40	40	—	ca. 42
antero-transverse	53	57	51	51	ca. 56	58	—	62
postero-transverse	—	—	—	—	—	—	—	59
M[1] antero-posterior	—	—	40	39	41	40	—	ca. 44
antero-transverse	53	57	54	56	58	—	—	65
postero-transverse	—	—	—	—	—	—	—	56
ratio ant. : post.tr.	—	—	—	—	—	—	—	0.86
M[2] antero-posterior	—	—	44	45	45	44	—	ca. 47
antero-transverse	56	58	56	56	61	62	—	62
postero-transverse	—	—	—	—	—	—	—	53
ratio ant. : post.tr.	—	—	—	—	—	—	—	0.85
M[3] antero-posterior	—	—	—	—	—	—	—	48
antero-transverse	47	48	48	49	52	53	—	56
length outer surface	—	—	51	52	51	50	—	62
Length pd[1]—M[3]	248	—	—	248	—	272	—	267

[1]) The length measurements of Cuvier are not given in the table, because apparently they were not taken at the base of the crown.

V*b*
Desmarest

Coll. Dub. no. 1980 Kedoeng Panas		Coll. Dub. no.											
l.	r.	1979a-f	1976d	325b	6971	1976e	425j	305a	2518				
—	—								25				
—	—								24				
—	—	ca. 30	ca. 32	ca. 30	ca. 29								
—	—	39	45	40	42								
—	—	41	43	43	—								
ca. 34	—	ca. 35				ca. 37	ca. 33	ca. 32					
50	—	48				51	—	—					
49	—	ca. 45				ca. 50	—	—					
			Coll. Dub. no.										
ca. 37	—	ca. 38	1979g										
55	—	51	59										
				Coll. Dub no.									
52	52	48	53	324g	91b	320a	109c	1978e	102a				
ca. 43	ca. 42	ca. 43		ca. 41	ca. 45	—	ca. 44	ca. 42	ca. 41				
58	58	54		—	—	57	—	57	—				
54	54	49		—	—	—	—	—	—				
			Coll. Dub no.										
0.93	0.93	0.91	325f	1976f	1978c	1978d	1977c	109e	315				
ca. 47	ca. 47	ca. 45	ca. 44	ca. 43	ca. 44	ca. 44	ca. 44	ca. 47	ca. 43				
59	—	60	57	56	55	55	55	—	59				
50	50	54	49	50	49	47	49	—	—				
								Coll. Dub. no.					
0.85	—	0.90	0.86	0.89	0.89	0.85	0.89	324j	1976g	1977d	1976h	1976i	324i
46	46	46						44	45	43	47	45	43
53	52	51						—	52	54	52	48	—
53	53	—						53	52	54	54	55	—
—	—												

TABLE

Rhinoceros sondaicus

No. of specimen	8	9	10	11	12	13	14	15	16	17
	l. r.	l. r.	l. r.	l. r.	l. r.	l. r.	l. r.	l. r.	l. r.	l. r.
C transverse	— —	— —	41 40	— —	39 39	36 36	33 33	32 32	38 38	— —
vertical	— —	— —	21 21	— —	22 23	25 25	24 24	21 21	26 26	— —
pd_1 antero-posterior . .	14 14	16 16	18 18	— —	— —	— —	— —	— —	— —	— —
transverse	10 10	10 10	11 11	— —	— —	— —	— —	— —	— —	— —
P_2 antero-posterior . .	— —	27 —	29 —	28 28	30 —	— —	— —	— —	— —	— —
transverse	— —	16 —	18 18	19 18	19 19	21 21	— —	— —	21 20	— —
P_3 antero-posterior . .	— —	35 36	35 35	— 35	36 36	38 37	39 39	34 33	— 36	37 37
transverse	— —	24 24	24 24	24 24	24 24	26 26	25 25	24 23	— 27	25 25
P_4 antero-posterior . .	— —	— —	39 39	37 37	39 39	40 39	39 39	37 37	42 42	40 40
transverse	— —	— —	25 25	25 25	26 25	28 28	27 27	27 27	30 29	28 27
M_1 antero-posterior . .	42 42	42 42	43 43	42 42	43 43	42 43	43 43	43 43	43 43	41 41
transverse	26 26	26 26	26 26	28 28	27 27	31 31	29 29	28 28	31 30	31 30
M_2 antero-posterior . .	44 44	43 43	43 43	43 43	44 44	45 45	45 45	43 43	45 45	44 44
transverse	27 27	27 27	26 26	28 28	28 28	31 31	29 29	28 28	31 30	31 30
M_3 antero-posterior . .	— —	— —	— —	41 41	43 43	46 46	45 45	44 44	44 44	43 43
transverse	— —	— —	— —	25 25	25 25	27 26	26 26	27 27	27 27	27 26
Length P_2—M_3	—	—	—	234	237	241	242	230	246	237
Length of symphysis .	—	—	—	123	126	123	128	121	126	135
Least width of symphysis	—	—	—	84	93	80	74	73	86	—
Median depth of symphysis	—	—	—	42	42	36	35	33	37	43
Depth of ramus at M_1 .	—	—	—	72	68	64	66	59	74	75
Height of condyle above lower border of ramus	—	—	—	207	226	214	215	220	234	218
Width of condyle . . .	—	—	—	123	116	113	113	120	129	129

VI
Desmarest

18	19	20	21	22	Cuvier, 1822a, p. 38/39 Paris Mus.	Coll. Dub. no.						
						305	319	422	2491	2465	428b	390
l. r.	l. r.	l. r.	l. r.	l. r.		l. r.	l. r.					
— —	36 36	33 33	— —	34 34	— —	— —	33 —	—	—	—	—	—
— —	27 27	21 22	— —	22 22	— —	— —	26 —	—	—	—	—	—
— —	— —	— —	— —	— —	17 —	— —	— —	—	—	—	—	—
— —	— —	— —	— —	— —	10 —	— —	— —	—	—	—	—	—
25 25	— —	— 25	— 26	— —	28 27	— —	— —	27	—	—	—	—
17 17	— —	— 18	— 19	19 19	18 18	— —	— —	20	—	—	—	—
37 37	— —	35 35	37 37	35 35	38 35	36 35	35 35	33	—	—	—	—
25 25	— —	24 24	25 25	26 26	24 25	25 25	— 27	24	—	—	—	—
41 41	39 —	35 36	41 41	— 37	38 39	37 —	39 39	—	—	—	—	—
26 26	28 —	26 26	27 27	27 27	25 26	27 —	29 29	—	—	—	—	—
42 42	40 41	40 40	42 42	— 41	41 42	42 42	— —	—	—	—	—	—
27 27	28 28	29 29	31 31	30 30	26 28	27 28	— —	—	—	—	27	–
46 46	45 45	42 42	46 46	42 42	47 48	44 —	— —	—	47	—	44	43
29 29	29 29	29 29	31 31	30 30	27 30	28 —	— —	—	32	—	29	28
45 45	46 46	44 44	45 45	— 39	45 46	46 46	— —	—	47	47	44	43
25 25	27 27	26 26	28 28	— 25	26 26	27 27	— —	—	28	27	25	24
—	—	228	241	219	— —	240	—	—	—	—	—	—
—	133	121	131	118	134 139	129	—	123	—	—	—	—
—	86	84	73	77	— —	88	79	87	—	—	—	—
—	40	40	37	26	— —	42	44	38	—	—	—	—
—	69	68	72	73	— —	73	—	—	—	74	—	—
—	219	219	240	206	— —	237	—	—	246	—	—	217
—	126	120	118	118	124 124	115	—	—	125	—	—	—

TABLE

	Rhinoceros unicornis L.					
	Leiden Museum cat. a		Leiden Museum cat. b		Cuvier, 1822a, p. 38/39	Lydekker, 1876, p. 34/35
	l.	r.	l.	r.	[1]	
pd^1 antero-posterior	ca. 23	ca. 23	ca. 23	ca. 23	—	
transverse	ca. 25	ca. 24	24	ca. 23	25	
P^2 antero-posterior	ca. 32	ca. 30	ca. 26	—	—	
antero-transverse	46	47	40	—	44	
postero-transverse	48	49	40	—	—	
P^3 antero-posterior	ca. 43	ca. 43	ca. 38	—	—	
antero-transverse	62	62	54	—	53	
postero-transverse	57	56	51	—	—	
P^4 antero-posterior	—	—	—	—	—	
antero-transverse	—	—	—	—	69	
postero-transverse	—	—	—	—	—	
M^1 antero-posterior	ca. 43	ca. 42	ca. 39	ca. 39	—	
antero-transverse	67	65	59	60	71	
postero-transverse	62	60	57	56	—	
ratio ant. : post.tr.	0.93	0.92	0.97	0.93	—	
M^2 antero-posterior	—	ca. 50	—	ca. 42	—	—
antero-transverse	—	68	—	59	67	60 [2]
postero-transverse	—	61	—	54	—	—
ratio ant. : post.tr.	—	0.90	—	0.92	—	—
M^3 antero-posterior	—	—	—	—	—	—
antero-transverse	—	—	—	—	62	53
length outer surface	—	—	—	—	—	64
Length pd^1—M^3	—	—	—	—	275	
pd^2 antero-posterior	—	—	—	ca. 31		
antero-transverse	—	—	—	ca. 38		
postero-transverse	—	—	—	39		
pd^3 antero-posterior	—	—	—	ca. 36		
antero-transverse	—	—	—	46		
postero-transverse	—	—	—	41		
pd^4 antero-posterior	ca. 44	ca. 45	ca. 38	ca. 39		
antero-transverse	56	56	50	49		
postero-transverse	50	50	49	48		

1) See note 1 to table V*b*.
2) Measured from the figure (Lydekker, l.c., pl. IV). In the text the anterior breadth is given as 2 inches only.

VII

Rhinoceros kendengindicus Dubois													
holotype Coll. Dub. no. 1991		Coll. Dub. no.											
l.	r.	1977a	253e										
—	ca. 22												
—	—												
ca. 28	ca. 28												
41	41												
44	43												
—	ca. 38	ca. 37	—										
—	57	56	55										
55	55	54	53										
—	ca. 39												
—	63												
		Coll. Dub. no.											
		534	1978b										
—	60												
ca. 44	ca. 44		ca. 42										
64	65		58										
56	56		51										
				Coll. Dub. no.									
				1976a	1978a	1997b							
0.88	0.86		0.88										
ca. 46	ca. 47	ca. 46		ca. 45	ca. 42	ca. 46							
66	66	61		65	62	65							
55	55	52		55	53	55							
							Coll. Dub. no.						
							1694c	1976b	1976c	253a	253b	253c	1694a
0.83	0.83	0.85		0.85	0.85	0.85							
46	45	44					44	45	44	45	—	—	46
55	54	ca. 53					ca. 58	—	53	—	—	59	57
58	59	ca. 57					—	58	55	—	61	60	60
—	260												
	Coll. Dub. no.												
		6486											
		—											
		39											
		ca. 39											
		46											
		—											

TABLE VIII

	Rhinoceros unicornis L.					*Rhinoceros kendengindicus* Dubois			
	Leiden Museum cat. a.		cat. b.		Cuvier, 1822a, p. 38/39	Coll. Dub. no.			
	l.	r.	l.	r.		395	429f		
P_2 antero-posterior	36	37	31	—	—	—	—		
transverse	24	25	19	—	—	—	—		
P_3 antero-posterior	43	43	37	37	32	—	39		
transverse	29	29	—	22	30	—	25		
P_4 antero-posterior	—	—	—	—	38	—	—		
transverse	—	—	—	—	35	—	—		
M_1 antero-posterior	51	51	47	47	36	—	—		
							Coll. Dub. no. 391		
transverse	28	28	26	26	31	—			
M_2 antero-posterior	56	56	48	48	47	—	48		
transverse	27	27	—	—	30	—	30		
M_3 antero-posterior	—	—	—	—	50	50	—		
transverse	—	—	—	—	33	30	—	Coll. Dub. no.	
Length of symphysis	—		—		165	—	—	392	394b
Depth of ramus at M_1	79		87		—	—	84	82	80
						Coll. Dub. no. 424			
Width of condyle	—		—		146		—		
pd_2 antero-posterior	—	—	—	—	—	31			
transverse	—	—	—	—	—	18			
pd_3 antero-posterior	—	—	—	—	—	46			
transverse	—	—	—	—	—	24			
pd_4 antero-posterior	45	45	43	43	—	44			
transverse	25	25	23	23	—	—			
Length pd_2—pd_4	—	—	—	—	—	127			

EXPLANATION OF THE PLATES

Plate I

Rhinoceros sondaïcus Desmarest. 1-3, M^3 sin., Leiden Museum, cat. d; 4-6, M^3 sin., Leiden Museum, reg. no. 5688. 1, 4, anterior view; 2, 5, inner view; 3, 6, crown view. ¾ natural size.

Plate II

Crown views of teeth from cave deposits in the Padang Highlands, Sumatra.

Figs. 1-5, *Dicerorhinus sumatrensis* (Fischer); fig. 1, M^1 dext., Coll. Dub. no. 642b; fig. 2, M^1 sin., Coll. Dub. no. 905a; fig. 3, M^2 dext., Coll. Dub. no. 642a; fig. 4, M^2 dext., Ngalau Lida Ajer, Coll. Dub. no. 662a; fig. 5, M^2 dext., Coll. Dub. no. 6997a.

Figs. 6-7, *Rhinoceros sondaïcus* Desmarest; fig. 6, M^2 dext., Coll. Dub. no. 917a; fig. 7, M^2 sin., Ngalau Sibrambang, Coll. Dub. no. 678a.

Fig. 8, *Dicerorhinus sumatrensis* (Fischer), M^3 dext., Coll. Dub. no. 907b.

All figures ¾ natural size.

Plate III

Crown views of teeth from cave deposits in the Padang Highlands, Sumatra.

Figs. 1-2, *Dicerorhinus sumatrensis* (Fischer); fig. 1, M^3 dext., Ngalau Lida Ajer, Coll. Dub. no. 663a; fig. 2, P^2 dext., Ngalau Djamboe, Coll. Dub. no. 959a.

Fig. 3, *Rhinoceros sondaïcus* Desmarest, M^3 dext., Coll. Dub. no. 768Aa.

Fig. 4, *Dicerorhinus sumatrensis* (Fischer), P^3 dext., Ngalau Lida Ajer, Coll. Dub. no. 662b.

Figs. 5-6, *Rhinoceros sondaïcus* Desmarest; fig. 5, P^2 dext., Ngalau Sibrambang, Coll. Dub. no. 857a; fig. 6, P^3 sin., Ngalau Sibrambang, Coll. Dub. no. 971a.

Figs. 7-8, *Dicerorhinus sumatrensis* (Fischer); fig. 7, P^4 dext., Coll. Dub. no. 642c; fig. 8, P^4 sin., Ngalau Lida Ajer, Coll. Dub. no. 662c.

Figs. 9-10, *Rhinoceros sondaïcus* Desmarest; fig. 9, P^4 dext., Coll. Dub. no. 679b; fig. 10, P^4 dext., Coll. Dub. no. 905b.

Fig. 11, *Dicerorhinus sumatrensis* (Fischer), pd^4 dext., Coll. Dub. no. 642f.

Fig. 12, *Rhinoceros sondaïcus* Desmarest, pd^4 dext., Coll. Dub. no. 678w.

All figures ¾ natural size.

Plate IV

Figs. 1-8, 10-13, crown views of teeth from cave deposits in the Padang Highlands, Sumatra.

Figs. 1-2, *Dicerorhinus sumatrensis* (Fischer); fig. 1, pd^3 dext., Coll. Dub. no. 679g; fig. 2, pd^3 sin., Coll. Dub. no. 905k.

Figs. 3-4, *Rhinoceros sondaïcus* Desmarest; fig. 3, pd^3 sin., Coll. Dub. no. 678t; fig. 4, pd^3 dext., Coll. Dub. no. 679h.

Figs. 5-8, *Rhinoceros* or *Dicerorhinus* spec.; fig. 5, pd^2 dext., Coll. Dub. no. 678l, fig. 6, pd^2 dext., Coll. Dub. no. 678i; fig. 7, pd^2 dext., Coll. Dub. no. 768Ab; fig. 8, pd^2 sin., Coll. Dub. no. 642e.

Fig. 9, *Rhinoceros kendengindicus* Dubois, P_3 dext., Java, Coll. Dub. no. 429f, crown view.

Figs. 10-13, *Rhinoceros* or *Dicerorhinus* spec.; fig. 10, pd^1 dext., Coll. Dub. no. 866b; fig. 11, pd^1 sin., Ngalau Sibrambang, Coll. Dub. no. 961b; fig. 12, pd^1 dext., Coll. Dub. no. 642d; fig. 13, pd^1 sin., Coll. Dub. no. 678d.

Fig. 14, *Rhinoceros sondaïcus* Desmarest, M^2 sin., Tritik, Java, Coll. Dub. no. 1976f, inner view.

Fig. 15, *Rhinoceros* spec., upper I sin., Java, Coll. Dub. no. 500a, outer view.

All figures ¾ natural size.

Plate V

Figs. 1-2, 4-11, crown views of fossil teeth from Java.

Figs. 1-2, *Rhinoceros kendengindicus* Dubois; fig. 1, P^3 sin., Kedoeng Broeboes, Coll. Dub. no. 1977a; fig. 2, P^3 sin., Tegoean, Coll. Dub. no. 429a.

Fig. 3, *Rhinoceros unicornis* L., P^3 sin., Leiden Museum, cat. b, crown view.

Figs. 4-11, *Rhinoceros kendengindicus* Dubois; fig. 4, P^3 dext., Kedoeng Broeboes, Coll. Dub. no. 253e; fig. 5, M^2 dext., Soember Waroe, Coll. Dub. no. 1978a; fig. 6, M^3 sin., Kedoeng Loemboe, Coll. Dub. no. 1694a; fig. 7, M^1 sin., Soember Waroe, Coll. Dub. no. 1978b; fig. 8, P^2 dext., Coll. Dub. no. 429b; fig. 9, M^2 dext., 8 km N.W. of Kedoeng Broeboes, Coll. Dub. no. 1977b; fig. 10, pd^{2}-^{3} dext., Kedoeng Broeboes, Coll. Dub. no. 6486; fig. 11, M^3 dext., Soember Waroe, Coll. Dub. no. 1694c.

All figures ¾ natural size.

Plate VI

Rhinoceros kendengindicus Dubois, pd^1-M^3 dext. and pd^1-P^3, M^1-M^3 sin., Kebon Doeren, Java, Coll. Dub. no. 1991 (holotype), crown view, $^3/_5$ natural size.

Plate VII

Figs. 1-4, *Rhinoceros kendengindicus* Dubois, Kebon Doeren, Java, Coll. Dub. no. 1991 (holotype); figs. 1-2, partial calvarium; fig. 1, upper view; fig. 2, left view; fig. 3, lower portion of occiput, posterior view; fig. 4, portion of right zygomatic arch, right view.

Figs. 5-6, *Rhinoceros sondaïcus* Desmarest, partial calvarium, Solo valley, Java, Coll. Dub. no. 1983 (type of *Rhinoceros sivasondaicus* Dubois); fig. 5, upper view; fig. 6, left view.

Figs. 1-4, $^2/_9$ natural size; figs. 5-6, ¼ natural size.

Plate VIII

Rhinoceros sondaïcus Desmarest, pd^1-M^3 dext. and pd^1-P^3 sin., Solo valley, Java, Coll. Dub. no. 1983 (type of *Rhinoceros sivasondaicus* Dubois), crown view, $^4/_9$ natural size.

Plate IX

Fig. 1, *Aceratherium perimense* Falconer et Cautley, lower jaw, Malhur, Sirmur State, Punjab, Coll. Dub. no. 3077, upper view.

Figs. 2-3, *Rhinoceros sondaïcus* Desmarest; fig. 2, scapula sin., Bangle, Java, Coll. Dub. no. 8452, proximal view; fig. 3, M^2 sin., Sangiran, Java, Mining Dept. Technical College at Delft, K. A. 15424, crown view.

Fig. 4, *Rhinoceros kendengindicus* Dubois, fragment of left maxillary with M^1-M^3, Coll. Dub. no. 534, crown view.

Fig. 5, *Rhinoceros sondaïcus* Desmarest, P^3-M^3 sin., Kedoeng Panas, Java, Coll. Dub. no. 1980, crown view.

Figs. 1-2, ¼ natural size; fig. 3, ¾ natural size; figs. 4-5, $^2/_5$ natural size.

Plate X

Fig. 1, *Rhinoceros kendengindicus* Dubois, metatarsal III sin., Coll. Dub. no. 8011, anterior view.

Fig. 2, *Rhinoceros sondaïcus* Desmarest, metatarsal III dext., Coll. Dub. no. 8256, anterior view.

Fig. 3, *Rhinoceros kendengindicus* Dubois, metacarpal III dext., Coll. Dub. no. 5546, anterior view.

Figs. 4-5, *Rhinoceros sondaïcus* Desmarest; fig. 4, metacarpal III sin., Trinil, Java, Coll. Dub. no. 8562, anterior view; fig. 5, radio-ulna dext., Kedoeng Broeboes, Java, Coll. Dub. nos. 6699, 8931 and 9137, anterior view.

Fig. 6, *Dicerorhinus sumatrensis* (Fischer), humerus dext., Pandjang cave near Sibalen, Sumatra, Coll. Dub. no. 9276, posterior view.

Fig. 7, *Rhinoceros kendengindicus* Dubois, proximal fragment of humerus dext., Kedoeng Broeboes, Java, Coll. Dub. no. 6780, posterior view.

Fig. 8, *Rhinoceros sondaïcus* Desmarest, upper portion of skull, Trinil, Java, Coll. Dub. no. 2457, posterior and slightly upper view.

Fig. 9, *Rhinoceros kendengindicus* Dubois, right ramus horizontalis with pd_2-pd_4, Tegoean, Java, Coll. Dub. no. 424, upper view.

Fig. 10, *Rhinoceros sondaïcus* Desmarest, lower jaw, Trinil, Java, Coll. Dub. no. 515, upper view.

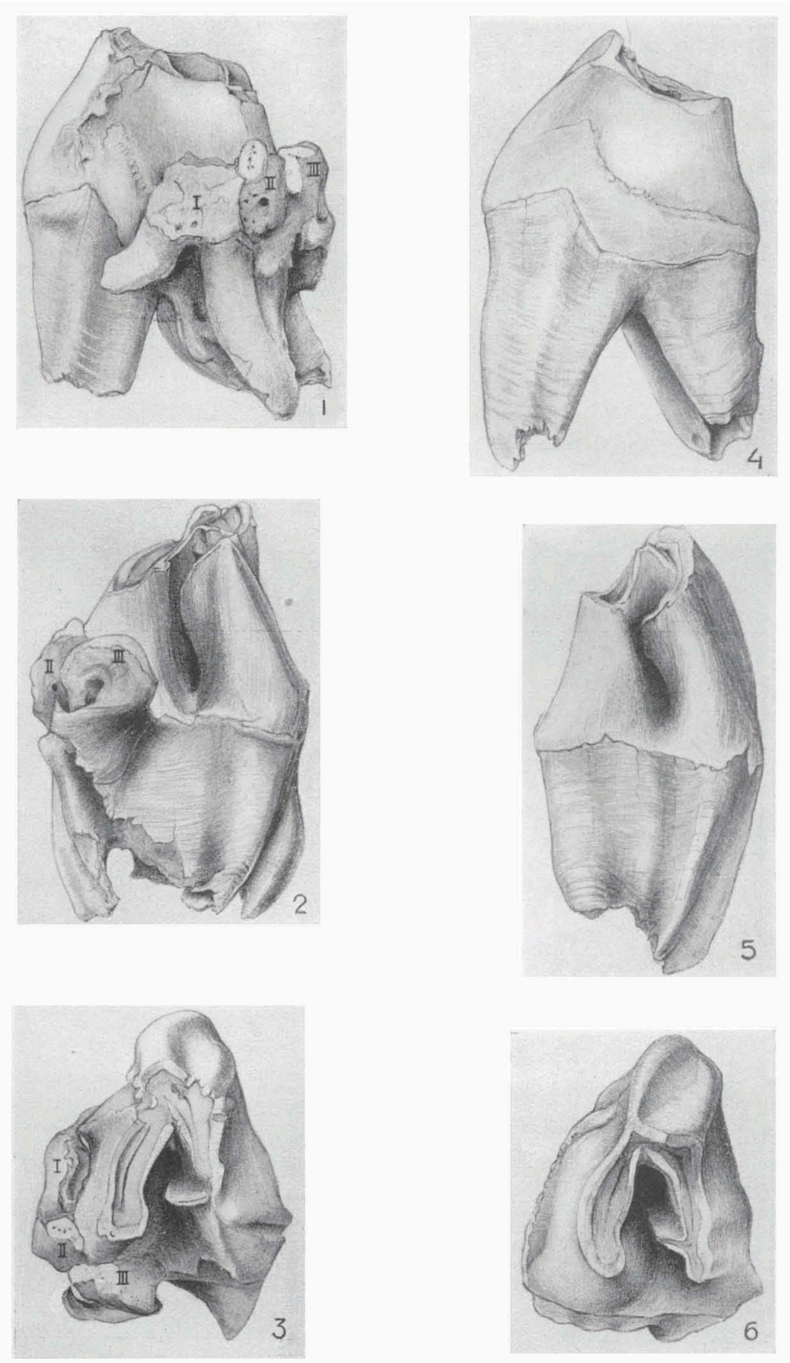
Fig. 11, *Rhinoceros* spec., nasals of female individual, Trinil, Java, Coll. Dub. no. 394a, upper view.

Fig. 12, *Rhinoceros kendengindicus* Dubois, right ramus horizontalis, Soember Waroe, Java, Coll. Dub. no. 392, inner view.

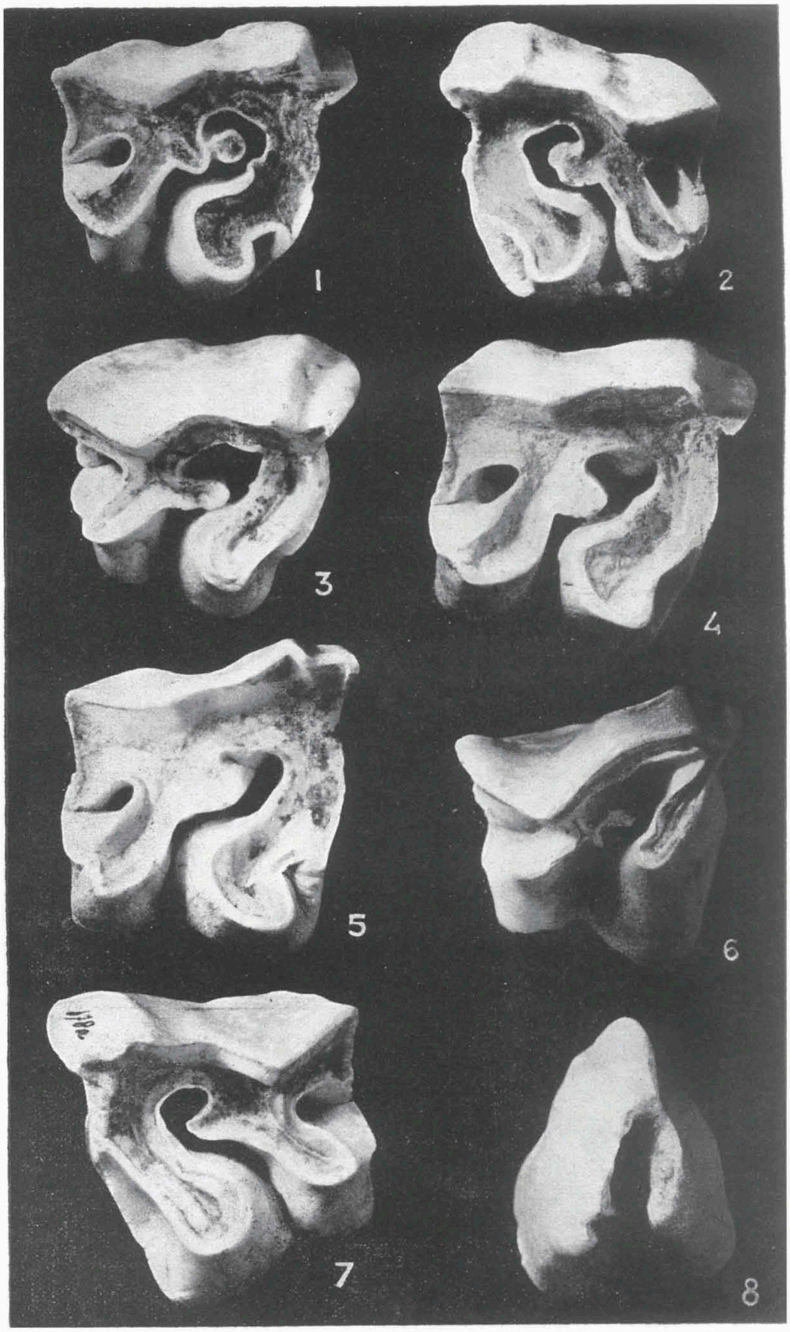
Fig. 13, *Rhinoceros sondaïcus* Desmarest, lower jaw, Soember Waroe, Java, Coll. Dub. no. 305, left view.

Fig. 14, *Rhinoceros kendengindicus* Dubois, portion of right ramus horizontalis with M_3, Kebon Doeren, Java, Coll. Dub. no. 395, inner view.

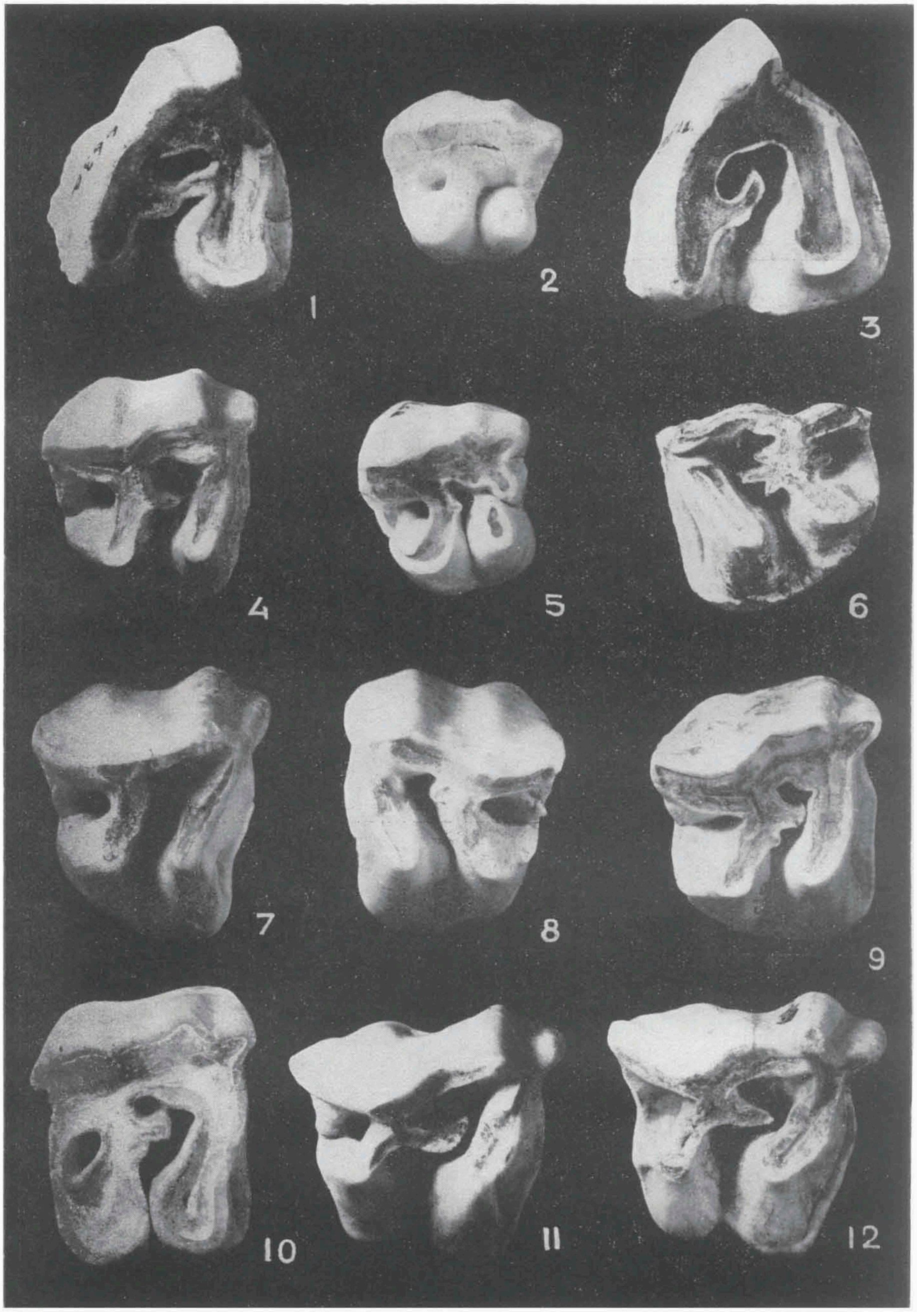
Figs. 1-4, 10-11 and 14, $^2/_9$ natural size; figs. 5-7 and 12-13, $^1/_7$ natural size; figs. 8-9, ¼ natural size.



P. van 't Zelfde del.



Dr. C. de Jong phot.



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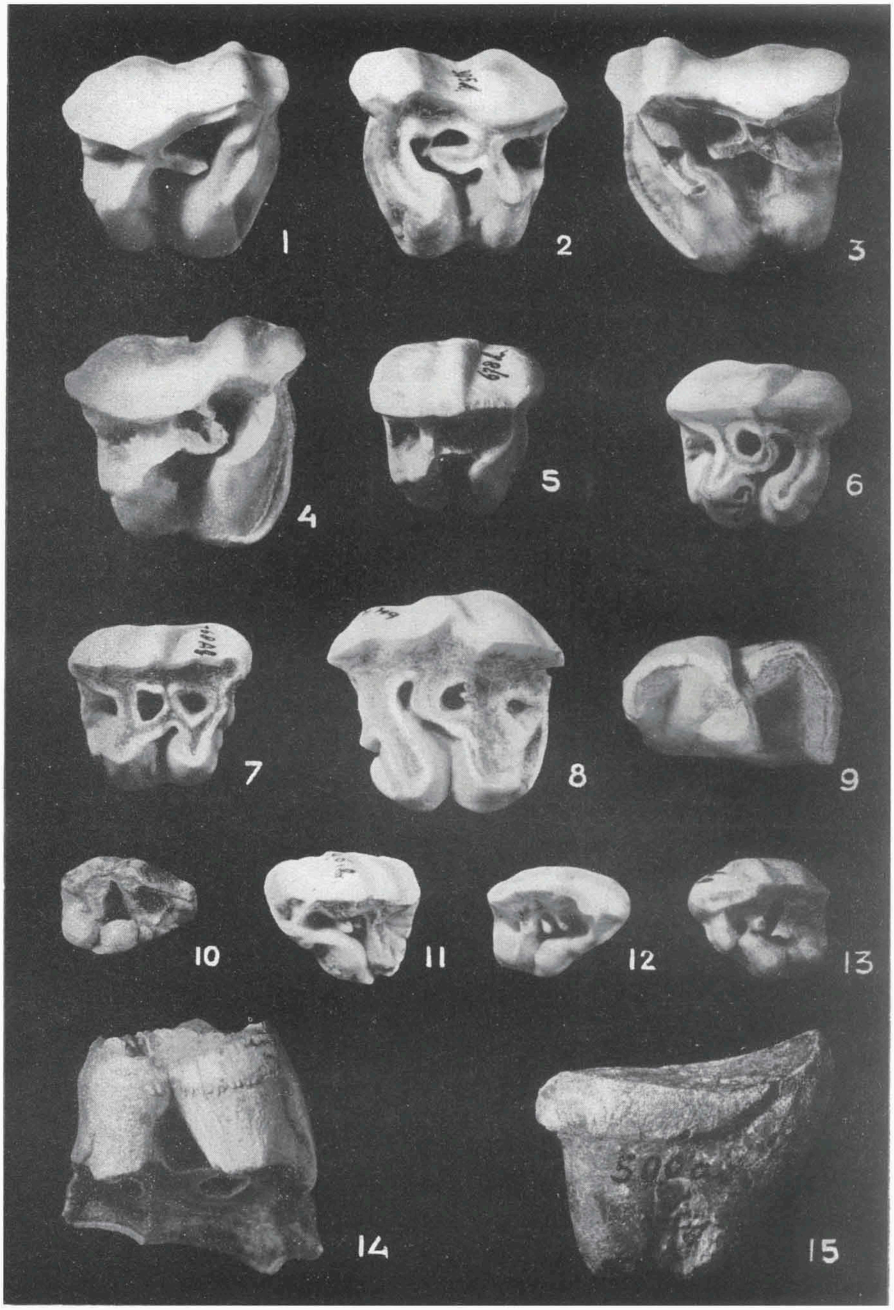

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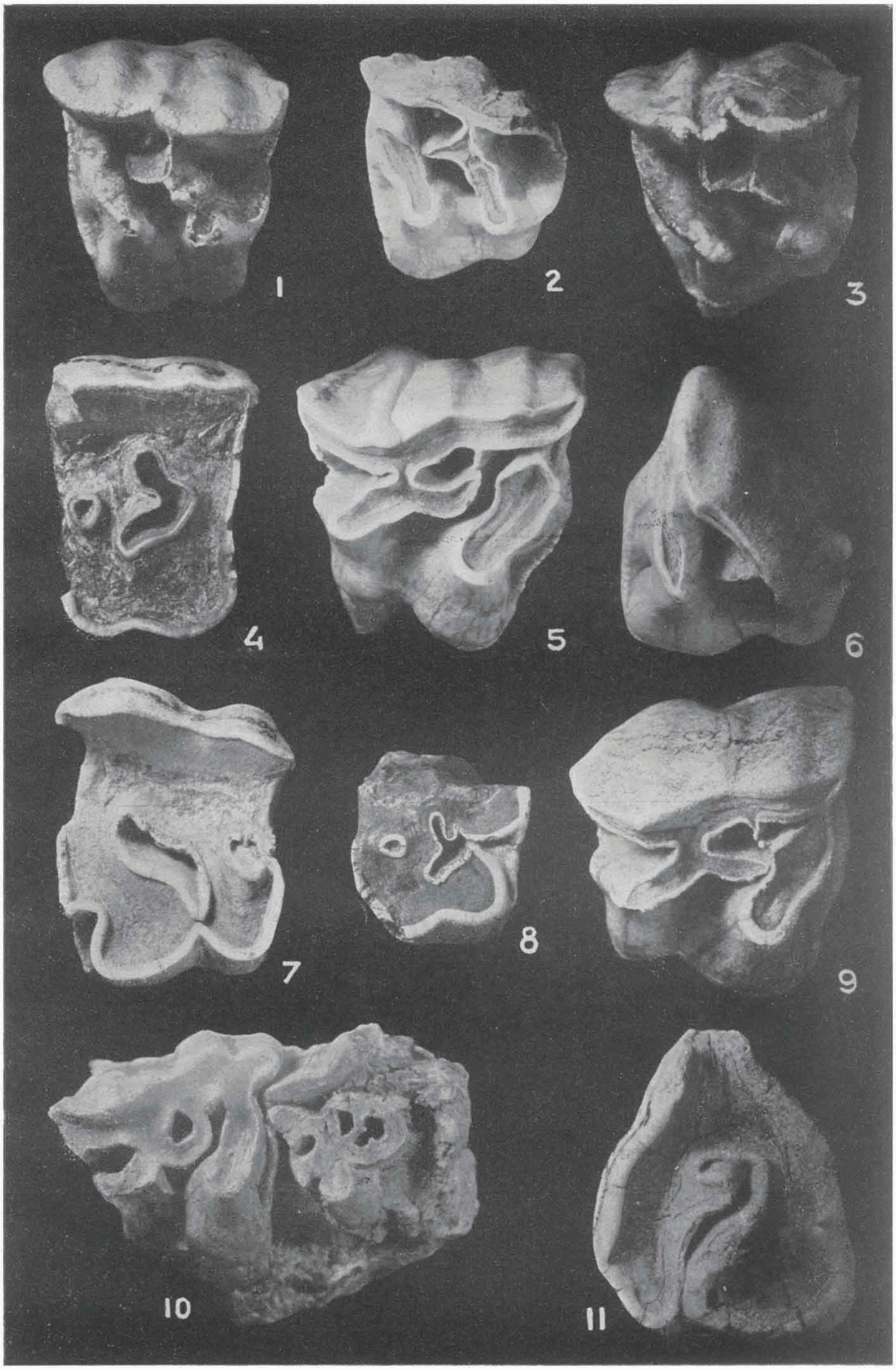

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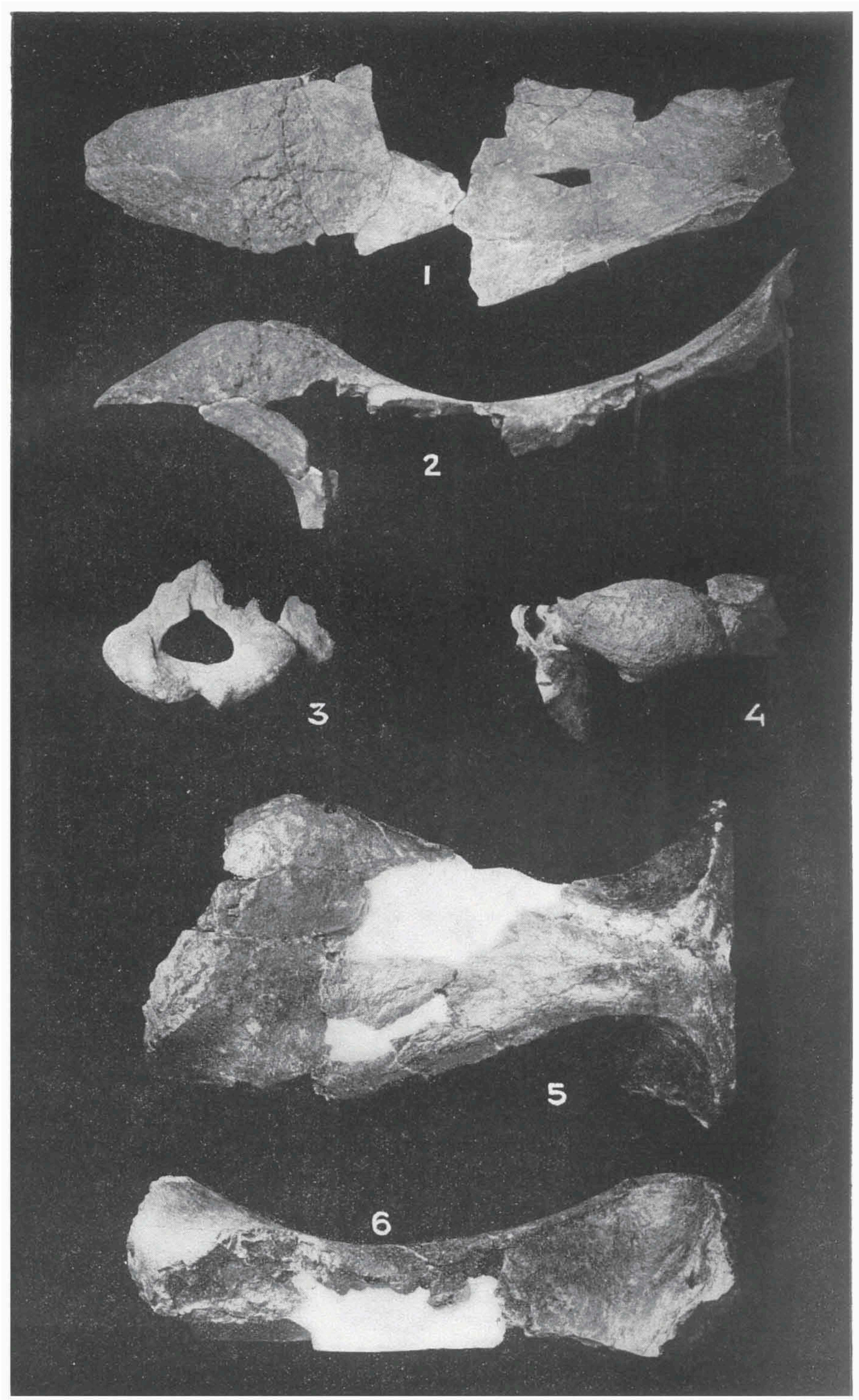

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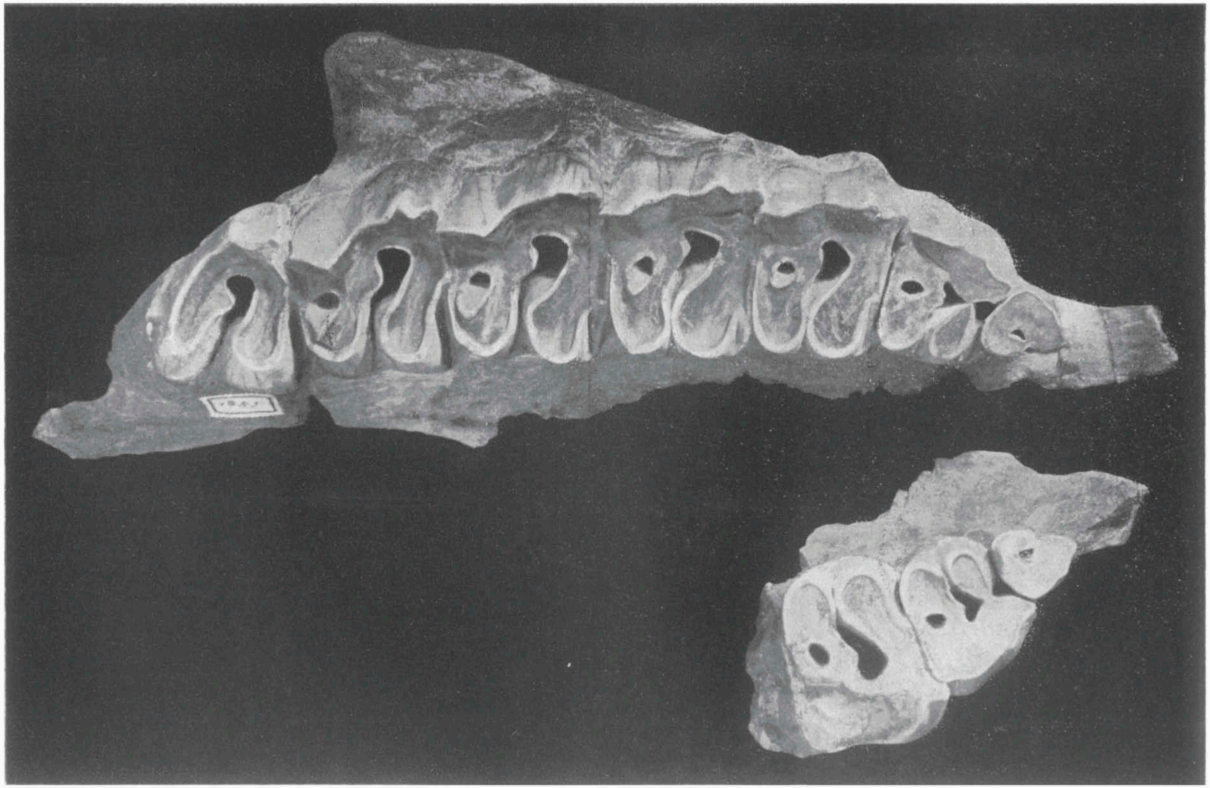

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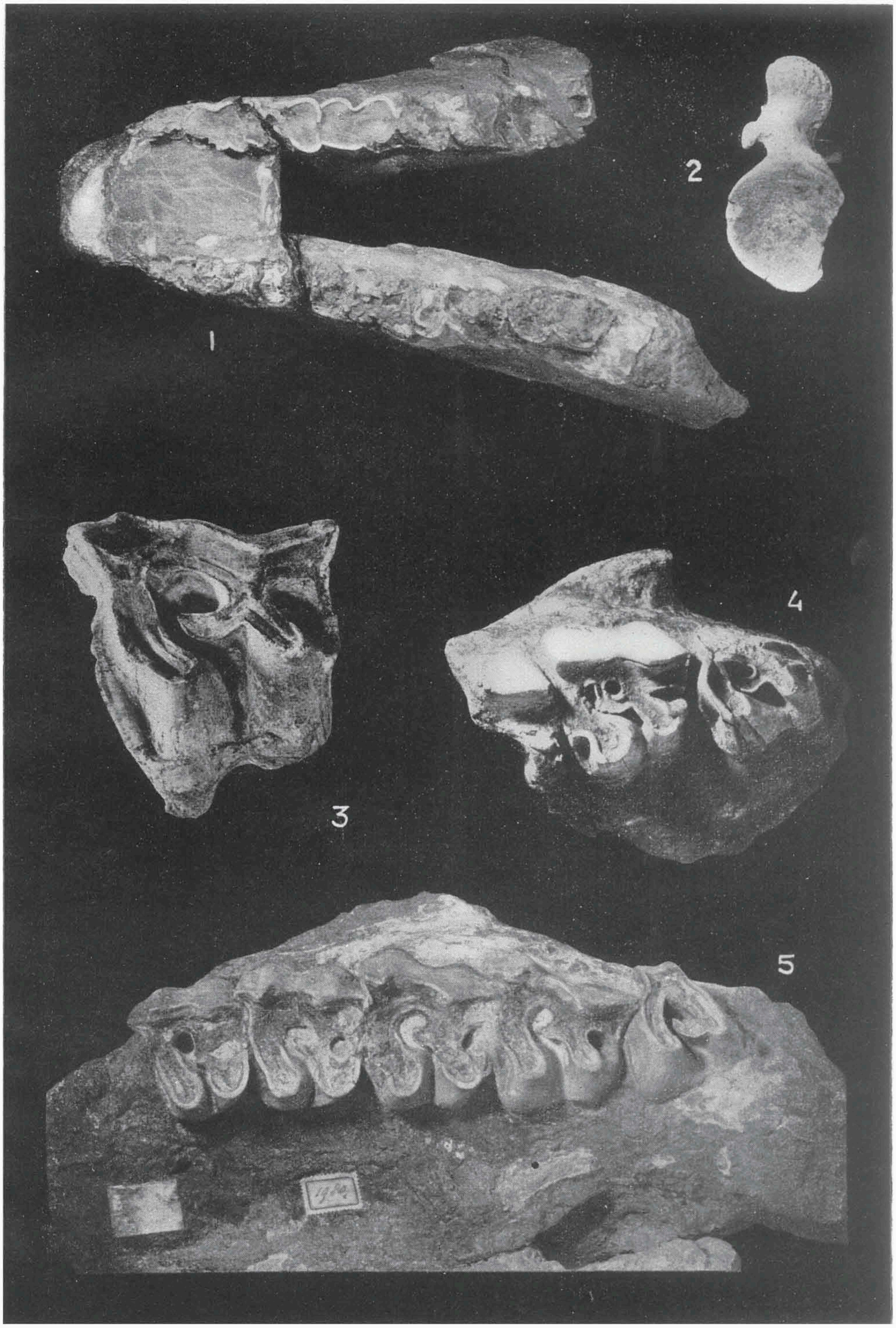
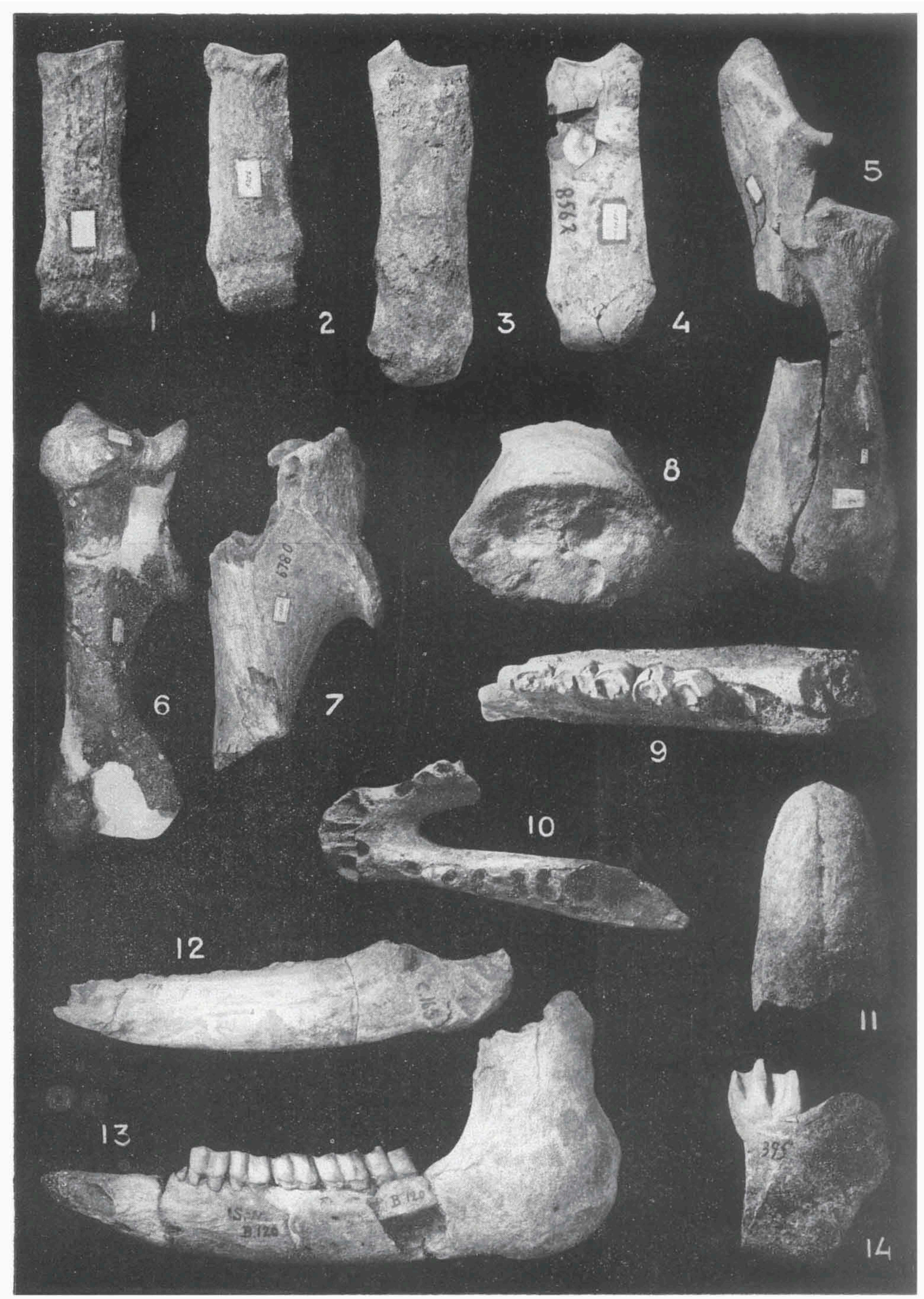


Fig. 3, C. van Werkhoven, cet. Dr. C. de Jong phot.



Dr. C. de Jong phot.