

The Distribution of the Rhinoceros in Eastern India, Bangladesh, China, and the Indo-Chinese Region

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With 2 Figures

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Abstract

The ranges of *Rhinoceros unicornis*, *R. sondaicus* and *Dicerorhinus sumatrensis* are discussed. The possible limits of their former distributions in Eastern India and Bangladesh are suggested. In two regions of N. E. India all three species may have occurred simultaneously. The specific identity of the Chinese rhinoceros, and the few sources on its distribution, are discussed. Throughout the Indo-Chinese countries, *R. sondaicus* was the common species; the presence of *D. sumatrensis* there is uncertain. It is stressed that *R. sondaicus* may survive in southern Laos. The occurrence of *R. unicornis* in Burma and Indo-China is rejected.

1. Introduction

The former and present distributions of the three species of rhinoceros in Asia are well documented in general. The Great Indian rhinoceros, *Rhinoceros unicornis* Linnaeus, 1758, survives in several protected areas in Assam, Bengal and Nepal. A few centuries ago its range extended from Peshawar in northern Pakistan eastward along the base of the Himalayas, through the north-western provinces of India, northern Uttar Pradesh and Bihar, the Nepal terai and north Bengal into the Brahmapootra valley of Assam (MUKHERJEE 1963, LAURIE 1978). The Javan rhinoceros, *Rhinoceros sondaicus* Desmarest, 1822, once inhabited large parts of Java, Sumatra, Malaya, Burma, eastern India, Bangladesh, Thailand and the Indo-Chinese countries (LOCH 1937, SODY 1959). Nowadays it seems to be limited to the Ujung Kulon national park on Java's west point. The Sumatran rhinoceros, *Dicerorhinus sumatrensis* (G. Fischer, 1814), had a historical distribution similar to that of *R. sondaicus*, but it occurs on Borneo and has always been absent from Java. Several populations scattered throughout its range now remain (VAN STRIEN 1974). Information about all three species is contained in the reviews by HARPER (1945), TALBOT (1960) and GROVES (1967). Several problems arise when the distribution of these rhinoceroses is studied in detail (GROVES 1967).

The purpose of this paper is to clarify the situation in three regions about which very little information can be found in the sources mentioned above: 1. Eastern India and Bangladesh; 2. China; and 3. Indo-China (Laos, Cambodia, North and South Vietnam).

The rhinoceros is exterminated or much reduced in numbers in most of its former range. Its past distribution can therefore only be studied with the use of older documents, such as museum specimens, literature and the fossil record. In the regions now being discussed, very few fossils of rhinoceroses have been found. I suggest, however, that a comparative survey of all fossil rhinoceros material from Asia is bound to enhance our understanding of their taxonomy and geography. When using the literature, we face three limitations. First, very little has been written about the distribution of the rhinoceros, and practically everyth-

ing is dated between 1850 and 1950. The discussions below will be mainly concerned with this period. Secondly, the data provided are often too general to be useful. For instance, in many cases neither the species nor the locality is specified. The third restriction is the most problematical: many species determinations are potentially unreliable. The three Asiatic rhinoceroses are quite distinct and need not be confused with each other if the specimen can be studied properly. In practice, most observations in the field are of extremely short duration, under adverse conditions and in many cases by unexperienced people. Most accounts of encounters with a rhinoceros at most specify the number of horns. The possibility of a wrong identification when only this characteristic is used cannot be excluded. Both *R. unicornis* and its congeneric *R. sondaicus* are one-horned, and as their ranges hardly overlap, confusion was rare. *D. sumatrensis* has two horns, and any two-horned specimen must surely be of this species. The second horn is always smaller than the anterior one, and often so reduced in size to be hardly visible. A "one-horned" specimen is thus not automatically *R. sondaicus*. For that reason, most records are open to doubt. In order to avoid endless discussion, I shall accept all species identifications as stated in the original source and afterwards review the results critically. VAN STRIEN (1978) shows that the foot-prints of *R. sondaicus* and *D. sumatrensis* differ both in form and in size. A plaster-cast made of a clear print cannot only be determined with certainty, but also be preserved for later reference.

2. Distribution in Eastern India and Bangladesh

2.1. Records (Fig. 1)

Rhinoceros sondaicus, Javan rhinoceros (Symbol: ■)

1. From Mahunadi river (Orissa) northward into Midnapore district 22° 25' N, 87° 24' E. (JERDON 1867); contested by BALL (1877). 2. Saugor (= Sagar) island, one shot (SHEKAREA 1832). 3. Records for Sundarbans: one shot (SIMSON 1886 and BAKER 1887); Matabangah river, Sundarbans (? not Matabhanga R. in North Bengal), skull in Indian museum, Calcutta (SCLATER 1891); Khalee river (?), Sundarbans, seen 1892 (DE PONCINS 1935); Rajmangal river (?), caught 1876 (SCLATER 1876); Chillipangpi creek, Sundarbans, shot ca. 1879, skull in Zoological Survey of India, Calcutta (SCLATER 1891, GROVES 1967). See GROVES (1971) for discussion of other general Sundarbans reports, all for *R. sondaicus*. 4. Baugundee (?), Jessore district 23° 10' N., 89° 12' E., J. H. Barlow, 1834, skeleton in Asiatic Society, Calcutta (PEARSON 1840, BLYTH 1862 b). 6. Chittagong (POLLOK 1879). 8. Lower valley of Barak river (S.W. Manipur), possibly this species (HIGGINS 1935). 9. Khuga river, Manipur, skull seen 1913, possibly this species (HIGGINS 1935). 14. Sylhet district 24° 53' N., 91° 51' E., one shot by a tea-planter named Gordon Fraser (WOOD 1930). 29. Buksa forest division 26° 43' N., 89° 39' E., shot ca. 1900 (SHEBBEARE 1953). 31. Moraghat (?), Bhutan Duars, young female skull in Copenhagen museum, shot 24 February 1881 by J. A. MÖLLER (H. J. BAAØE, Copenhagen, in litt.). 32. Sikkim Terai, shot by KINLOCH ca. 1870 (SHEBBEARE 1953), or Bhutan Duars (KINLOCH 1904).

Rhinoceros unicornis, Great Indian rhinoceros (Symbol: ▲)

11. Manipur, female caught, lived in Berlin zoo 1874–1884; specific identity under discussion, probably *R. unicornis* (ROOKMAAKER 1977 a). 12. Jaintiapur jungle 25° 06' N., 92° 08' E., Sylhet (WOOD 1930 following 'Pollock'); Langai river, West Cachar district, and Cachar in general, extinct for some 50 years (BAKER 1887). 18. Where Mymensingh (= Nasirabad district 24° 45' N., 90° 23' E.) joins Assam (SIMSON 1886). 19. Tirap Frontier Tract, maybe this species (GEE 1964). 26. Between Bala (?) and Buksa 26° 43' N., 89° 39' E., seen 1865

(BALDWIN 1883). 28. Cooch Behar, some 200 shot between 1880 and 1900 (NRIPENDRA 1908). 30. Western Bhutan (BEAVAN 1865). 33. Purnea district $25^{\circ} 47' N.$, $87^{\circ} 28' E.$, Bihar (SIMSON 1886, BAKER 1887); one shot in 1871, stuffed in Indian museum, Calcutta (SCLATER 1891). 34. Champaran district ca. $26^{\circ} 49' N.$, $84^{\circ} 30' E.$, Bihar (SHEBBEARE 1953); one shot 1939 (ARA 1954).

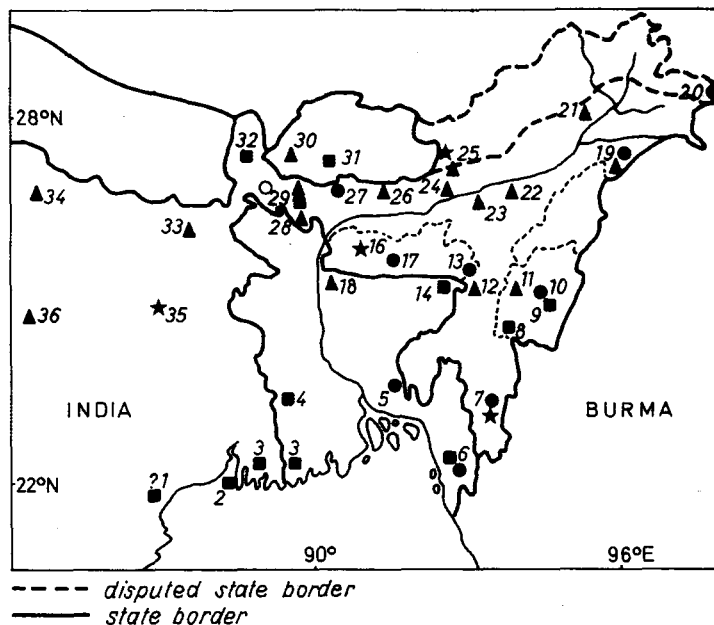


Fig. 1. Records on the distribution of *Rhinoceros unicornis* (▲), *Rhinoceros sondaicus* (■), *Dicerorhinus sumatrensis* (●), and of rhinos of unknown identity (★), mainly from the literature (see text), in eastern India and in Bangladesh

Present distribution of *R. unicornis* (LAURIE 1978):

21. North Lakhimpur district, ca. $28^{\circ} N.$ $95^{\circ} 30' E.$ 22. Kaziranga $26^{\circ} 30' N.$ $93^{\circ} 30' E.$
 23. Laokhowa $26^{\circ} 15' N.$ $92^{\circ} 30' E.$ 24. Orang $26^{\circ} 20' N.$ $92^{\circ} 05' E.$ 25. Sonai Rupa $26^{\circ} 50' N.$
 $92^{\circ} 25' E.$ 26. Manas $26^{\circ} 40' N.$ $90^{\circ} 50' E.$ Jaldapara $26^{\circ} 40' N.$ $89^{\circ} 30' E.$, and Gorumara
 $26^{\circ} 40' N.$ $89^{\circ} 00' E.$

***Dicerorhinus sumatrensis*, Sumatran rhinoceros (Symbol: ●).**

5. 20 miles south of Comilla $23^{\circ} 28' N.$ $91^{\circ} 10' E.$, shot February 1876; skull formerly in the Museum of the Royal College of Surgeons, London, no. 2146 (MANSON 1876, FLOWER and GARSON 1884). 6. Sungoo river (?), Chittagong, one caught November 1867 (HOOD 1869, MANSON 1876); this specimen lived in the London zoo from 15 February 1872 until 31 August 1900, and it is the type of *Rhinoceros lasiotis* (ANDERSON 1872, SCLATER 1872), the place of capture being the typical locality (HARPER 1940); Chittagong (POLLOK 1879, BAKER 1887, GEE 1950). 7. Mizo (= Lushai) hills, until 1935 (GEE 1964). 10. Manipur state, one caught in 1874 (SCLATER 1877). 13. North Cachar district (MILROY 1935). 17. "Cosyah hills, south of Char-yolah" (ANDERSON 1872), the hilly region east of Shillong $25^{\circ} 34' N.$ $91^{\circ} 53' E.$ in middle Meghalaya. 19. Dihing river (Noa Dihing), Tirap Frontier Tract, ca. $27^{\circ} 20' N.$ $96^{\circ} 20' E.$,

about 1953 (SHEBBEARE 1953); the same record as *R. unicornis* (GEE 1964); extinct in Tirap Frontier Tract (GEE 1950). 20. Nam Tsai, tracks seen in 1895, 27° 30' N. 97° 00' E. (HENRI 1898). 27. Sankos river, N.E. of Dohbree (Dhubri 26° 01' N. 90° 00' E.), shot (SCLATER 1875 b), one seen in 1864 (INGLIS et al. 1919); a two-horned trophy seen in Assam (BLYTH 1863). 29. Dalgaoon forest 26° 34' N. 92° 12' E., one shot ca. 1915 (INGLIS et al. 1919), mentioned as this species but the record may refer to some other rhinoceros.

Records of uncertain species (Symbol: ★).

7. Mizo (= Lushai) hills (MILROY 1935, GEE 1964). 16. Garo hills (POLLOK 1879). 25. Sonai Rupa (GEE 1948), at present *R. unicornis* is known there (LAURIE 1978). 30. Lower valleys of Bhutan (WHITE 1909); Bhutan (SCLATER 1875 a). 35. Rajmahal hills, either *R. unicornis* (BLYTH 1862 a, BLANFORD 1888–1891, MUKHERJEE 1963) or *R. sondaicus* (JERDON 1867) or unknown (BAKER 1887).

2.2. Conclusions about India and Bangladesh

Looking at the reports above and at the map (Fig. 1), it is immediately evident that the boundaries once limiting the ranges of the three species of rhinoceros can no longer be assessed properly. There are two regions where the three rhinoceroses seem to have coexisted. This would be a rather remarkable (past) situation and therefore needs careful attention. The two areas concerned are first, the Jalpaiguri district of northern Bengal and the adjoining parts of Assam, Sikkim and Bhutan; and secondly, the regions bordering on North-Eastern Bangladesh.

Doubtless, *Rhinoceros unicornis* was the common species in Jalpaiguri (29). The MAHARADJA OF COOCH BEHAR, NRIPENDRA (1908), who shot some 200 rhinos in his territory between 1880 and 1900, only mentions this species. *Rhinoceros sondaicus* is reasonably well documented, even though POLLOK (1879) asserted its absence north of the Brahmapootra river. SHEBBEARE (1953) gives the only two good reports for this rhinoceros. According to him, Alexander Kinloch shot a specimen in the Sikkim terai around 1870. I have been unable to find this report in two works by KINLOCH, but SHEBBEARE may have referred to the statement of KINLOCH (1904) about the occurrence of *R. sondaicus* "in small numbers in the Bhutan Duars, where I once saw one shot by a friend." Early in this century, J. W. A. GRIEVE killed a rhinoceros in the Buxa forest division (29) and ROWLAND WARD identified it as *R. sondaicus*. In 1865, BALDWIN (1883) saw a *R. unicornis* in the same place. The best and most conclusive evidence is a *R. sondaicus* skull from the Bhutan Duars (31) in the zoological museum of Copenhagen. *Dicerorhinus sumatrensis* is only known from a single specimen killed in 1875 on the Sankos river (27) (SCLATER 1875 b). The two-horned trophy seen by BLYTH (1863) in Assam may have come from some other Assamese area. With INGLIS et al. (1919), we can only conclude that the three species of rhinoceros have actually been seen in the Jalpaiguri district or surroundings. Of course, we remain ignorant about a possible small scale spatial or temporal difference. *D. sumatrensis* may have wandered only occasionally into the area; *R. sondaicus* was extinct by 1875, and *R. unicornis* was to be expected. It seems unlikely that the last invaded the area only after the extermination of the two other kinds of rhinoceros.

The situation is even less clear in the districts of Nasirabad, Sylhet and Cachar of N.E. Bangladesh and the adjoining parts of Assam and Meghalaya. *Dicerorhinus sumatrensis* is mentioned for northern Cachar by MILROY (1935). Anderson states it was in the 'Cossyah hills' (17). POLLOK (1879) specifies the occurrence of the lesser rhinoceros *Rhinoceros sondaicus* "throughout Assam [south of the Brahmapootra], throughout Sylhet, the Garrow hills, Tipperah . . ." This could be correct, but

Pollok's identifications must be used with great caution. For instance, he accepts the presence of *R. unicornis* in southern Burma (see para. 3) and maintains the absence of *D. sumatrensis* north of Chittagong. A specimen of *R. sondaicus* was shot by GORDON FRASER in Sylhet (14), according to WOOD (1930), who like POLLOK disclaims knowledge of the two-horned species in Assam. *Rhinoceros unicornis* must also have existed in the region. SIMSON (1886), who shot a Javan rhinoceros in the Sundarbans, records the larger species in the N.W. Nasirabad district (18). One year later, however, BAKER (1887) could only establish the absence of tracks in the valley of the Langai river and in Cachar, suspecting the extermination of *R. unicornis* some fifty years earlier. The Berlin zoo exhibited between 1874 and 1884 a young female rhinoceros caught for WILLIAM JAMRACH in Manipur (11) in 1874. Its specific identity is much discussed, but from the little available evidence I have tried to show that it was a *R. unicornis* (ROOKMAAKER 1977 a). The conclusion from this can only be provisional. I suggest that *R. unicornis* lived locally in the lowlands of Nasirabad, Sylhet, Cachar and western Manipur. The hills of Meghalaya were inhabited by *D. sumatrensis*. The presence of *R. sondaicus* is possible, although the evidence could have been based on wrong identifications, or on a few wandering individuals.

The reports of rhinoceroses in India and Bangladesh are too few to establish the boundaries of the 19th century ranges of the three species with much hope of accuracy. I shall suggest one possible interpretation of the available evidence. The historical distribution of *R. unicornis* only differs slightly from the present, but for its (possible) reduction in number and present confinement to protected areas. It lived in the valley of the Bramapootra river of Assam, in the North-Western part of Bangladesh, the districts of Cooch Behar and Jalpaiguri, the foothills of Bhutan and Sikkim extending westward into the terai of Nepal and the part of Bihar north of the Ganges. It is unknown in the mountains of Meghalaya, but reported just south of them in the districts of Nasirabad, Sylhet, Cachar and into Manipur. Its presence in the Tirap Frontier Tract was asserted by Gee, but it is more likely that *D. sumatrensis* is the species that lived there. The western boundary of the distribution of *R. unicornis* is outside the present investigation. In the 16th century it was known as far west as Peshawar in northern Pakistan. There is pictorial and sub-fossil evidence of its earlier occurrence in the Indus valley and the western Indian states of Rajasthan, Gujarat, Uttar Pradesh and Himachal Pradesh. BLYTH (1872) suggested that it was *R. sondaicus* and not its larger congeneric that lived there. This seems to be disproved by the fossil remains although normally only their relation to *R. unicornis* is investigated.

Rhinoceros sondaicus was known with certainty from the Sundarbans and the adjoining districts of Bangladesh; and in the north from the Jalpaiguri district of Bengal, and from Sikkim and Bhutan. There are several reports from Chittagong, Tripura, Mizo and Manipur. Although none of them is based on personal observation (possibly caused by early extermination or great rarity), its former presence beside *D. sumatrensis* may well be possible.

Dicerorhinus sumatrensis was not only known from Chittagong, but also from Tripura, Mizo, Manipur and the Tirap Frontier Tract (no records from Nagaland). Its former presence in the hills of Meghalaya is a possibility, as it is in northern Bengal and Assam. The few reports from the latter localities may relate to some wandering individuals. If not, the species had certainly become a great rarity in those areas by 1850.

There are few historical records of the rhinoceros south of the Ganges. The petroglyph in the Rajmahal hills shows a one-horned animal and could belong to

either species of the genus *Rhinoceros* (COCKBURN 1883). *R. unicornis* would be the more likely one, but there can be no certainty. WILLIAMSON (1807) relates that in 1788 some officers hunting at Derriapore (near Patna?) saw a rhinoceros attacking their horses. Both the incident and locality seems strange, though neither is necessarily unreliable. WILLIAMSON's plate shows a *R. unicornis*, and he thought this species was involved. Of course, he was writing at a time when the other two Asiatic species were not yet described scientifically and only very imperfectly known.

2.3. A taxonomic corollary

When THOMAS (1911) tried to fix the types and type localities of the genera and species in the *Systema Naturae* by Linnaeus, he unfortunately chose "Bengal" as the terra typica of "*Rhinoceros unicornis*." It is shown above that the Great Indian rhinoceros only occurs in the most northern part of Bengal. To state that THOMAS meant this region, would be an inadmissible ad hoc explanation. If Linnaeus really referred to the Bengalese one-horned rhinoceros with this name, it must indicate the species now called *R. sondaicus*. This conclusion, however, clashes with the understanding of every taxonomic writer both before and after LINNAEUS. POCOCK (1944) discusses the problem and contends that Bengal is not the only possible choice of type locality when using LINNAEUS' sources and that, even technically, *unicornis* can be applied to the Great Indian rhinoceros. An analysis of the works cited by LINNAEUS on the rhinoceros and a study of the 18th century knowledge of the animal would lead us too far from our theme. Like his contemporaries, LINNAEUS in this instance, to put it bluntly, did not know what he was talking about. His *R. unicornis* is certainly a mixture of all Asiatic and possibly parts of the African species. The Indian rhinoceros was in his time by far the best known species. When more information became available on the Javan and Sumatran rhinoceroses, all authors agreed that they were quite distinct from the Indian rhinoceros called *R. unicornis*. There is no reason today to deviate from this tradition. Instead, we may accept the terra typica of *R. unicornis* as fixed by ELLERMAN and MORRISON-SCOTT (1951), following LYDEKKER (?), being "the sub-Himalayan terai of Assam."

3. The presence of *Rhinoceros unicornis* in Burma

During the 19th century the occurrence of *R. unicornis* in the southern parts of Burma (Arakan, Tenasserim) and in Malaya was occasionally asserted (ROOKMAAKER 1977 c). The different opinions about this can be followed through the successive publications of EDWARD BLYTH. Around 1840, BLYTH received four rhinoceros skulls from Tenasserim, presented by T. H. MADDOCK, "two of them belonging to the common Indian species (*Rh. Indicus*), the two others to . . . *Rh. sumatrensis*" (BLYTH 1842). Later, BLYTH studied the rhinos more closely and in his important paper of 1862 he confesses to have "only recently discriminated the two one-horned species" (BLYTH 1862 a). Accordingly, the two one-horned Tenasserim skulls are re-identified as *R. sondaicus* (BLYTH 1862 a). In his posthumous catalogue of Burmese mammals, BLYTH (1875) merely hesitates "upon present evidence, to admit the Great Indian rhinoceros into the list of Burmese animals." The most important reason for this unexpected caution probably was Mason's remark "that a single-horned Rhinoceros from the Arakan jungles was purchased by the London Zoological Society, the species in that case being unquestionably *R. indicus*" (BLYTH 1875). As far as I am aware, none of the five *R. unicornis* and the single *R. sondaicus* that lived in the London zoo during the 19th century were ever said to originate from Arakan. In 1879, POLLOK still echoes the older ideas. Although he never saw a

R. unicornis in Burma, he confidently states its existence, beside *R. sondaicus* and *D. sumatrensis*, in the "Yonzaleen and Arakan range and perhaps in the Yomahs in Burma" (POLLOK 1879).

There are more recent reports from northern Burma. The inhabitants of the Singpho area (ca. 27° N. 96° 10' E.) recognise three different kinds of rhinoceros, one of which would be larger than either *R. sondaicus* or *D. sumatrensis* (LYDEKKER 1905). C. A. ELLIOT bought a horn from Singpho at the end of the last century. While first identified as *R. unicornis*, it doubtlessly belonged to a two-horned specimen (LYDEKKER 1905). In 1955, rhinos were recorded (not seen) in the Namlang valley and on the boundary of the Putao sub-division and the Hukawng valley (TUN YIN 1956). The last rhinoceros shot in the Namlang valley, in 1942, perhaps was one-horned. TUN YIN (1956) takes this to indicate *R. unicornis*, because—according to PEACOCK (1933)—*R. sondaicus* would only occur in lower Burma. A group of 6 to 8 rhinos was reported from the Bumpha Bum, district Myitkyina (26° 42' N. 97° 15' E.) in February 1962. TUN YIN (1967) considers these to have been "Great Indian Rhinos" having "wandered east from India." Evidently this cannot be proved wrong. Yet, TUN YIN's reasons for the identification are insufficient. Any of the three species could have been involved, and *R. unicornis* is not the most likely competitor.

4. The distribution in China

When studying the Chinese rhinoceros, a non-sinologist is severely hampered by his unfamiliarity with the language, thereby being restricted to the sources which for some reason were chosen for translation. Furthermore, there seems to be more dispute than certainty about the name of the rhinoceros in Chinese. The best and most recent introduction to the Chinese writings about the animal is the paper by JENYNS (1955). Starting from his conclusions, it becomes possible to evaluate the data in the older secondary literature, especially the long and informative, but chaotically formulated, contribution by LAUFER (1914). There are two characters which have been used to denote a rhinoceros: *ssu* (*se*) and *hsi* (*si*). According to LAUFER (1914), both have always been used for the rhinoceros, characterizing a one-horned and a two-horned species respectively. HERBERT GILES, and later his son LIONEL GILES, maintained that the characters were applied to bovine animals in the earlier texts (see for instance GILES and GILES 1915). Happily, JENYNS (1955) ascertains "that both these characters have from post-Han times been applied to the rhinoceros", i.e. after 220 A.D. For the earlier periods, JENYNS follows the exposition of BISHOP (1933), giving *hsi* the meaning of rhinoceros and *ssu* that of a bovine animal. To avoid confusion, I have limited myself in the following notes about the rhinoceros distribution in China to the period following the Han dynasty, which yields at least a little information.

One would expect the occurrence of the rhinoceros in the regions of southern China bordering on Burma and Indo-China, that is the province of Yunnan, and possibly part of Kwangsi. It is strange, therefore, that LAUFER (1914) only cites two records for Yunnan, one dating from the 6th, the other from the 16th century. Kwangsi even merely figures in two relatively recent books by European compilers: DAPPER (1670) and DUHALDE (1736). Concerning the province of Hunan, the rhinoceros is stated to exist in the mountains near Ch'ang te (29° 03' N. 111° 35' E.) by a writer of the early 6th century (LAUFER 1914). Besides, many places in Hunan furnished rhinoceros horns to the court in the dynasties of T'ang (LAUFER 1914) and Sung (CHANG 1926). The occurrence of the rhinoceros in Kweichow province is mentioned by two authors, one of the SUNG dynasty (960–1263) and another of the

16th century (LAUFER 1914). The province of Szechwan, especially the western and southwestern parts, has a surprisingly large number of records of the rhinoceros. These accounts range in date from at least the 3rd until the 16th century (LAUFER 1914). The latest reports of the Chinese rhinoceros, those by DAPPER (1670) and NIEUHOF (1693), still mention it for Suchuen (= Szechwan). In an earlier period, the animal may have occurred further to the north. According to CHANG (1926), the last records of the northern regions date from the late CHOU dynasty (ending 256 B.C.).

The paucity of records makes it useless to try to reach sensible conclusions. One could at most infer the one-time existence of the rhinoceros in the provinces mentioned. When the animal became extinct in the different regions is a second question. Earlier, I followed SOWERBY (1939) in dating the extermination around 300 A.D. (ROOKMAAKER 1977 b). I am now inclined to subscribe to a somewhat later date, even though several of the more recent sources may refer solely to the trade of the horn, or to older books. LAUFER (1914), however, probably stretches the point by assuming that "even at the present time the rhinoceros may still exist in isolated spots on Chinese territory." The rhinoceros in China possibly was rare for a long time (JENYNS 1955) before being exterminated between the 10th and the 16th century.

LAUFER'S distinction between a one-horned and a two-horned rhinoceros introduces the question about the specific identity of the animals living in China. In my view, there is insufficient information to attempt an answer without speculation. I tentatively agree with the suggestion of JENYNS (1955) that, judging "from Chinese representations of the rhinoceros", a one-horned as well as a two-horned species occurred in China. Maybe *R. sondaicus* and *D. sumatrensis* would be most likely (BLYTH 1862 a, 1872). LAUFER (1914), uneducated in zoological taxonomy, names them respectively "*Rhinoceros unicornis* var. *sinensis*" (Chinese: ssu) and "*Rhinoceros bicornis* var. *sinensis*" (Chinese: hsi). Perhaps, these haphazard names are preoccupied by the fossil *Rhinoceros sinensis* Owen, 1870.

5. The distribution in Indo-China

5.1. The presence of *Rhinoceros unicornis* in Indo-China

The Great Indian rhinoceros never inhabited Vietnam, Laos or Cambodia. Yet, the animal is sometimes said to live in the Indo-Chinese region. ROUSSEL (1913) witnessed the hunting of a "rhinocéros unicorne" and his figure shows a *R. unicornis*. In 1899, BORDENEUVE (1925) saw a group of three animals which he said were *R. unicornis*. This is indeed the species depicted in a drawing. Neither author gives any reason why these one-horned rhinos should have been this species and not *R. sondaicus*. The drawings certainly are not portraits of the specimens they observed and were probably added later to the books. HARPER (1945) refrains from rejecting the presence of *R. unicornis* in Indo-China on account of MILLET (1930). That is a misunderstanding. MILLET (1930) knows two Indo-Chinese species of rhinoceros: "*R. unicornis*" and "*R. bicornis*". He obviously recognised a one-horned and a two-horned rhinoceros and named them accordingly without paying attention to the normal usage of these terms. As his "*R. bicornis*" must certainly be *D. sumatrensis* (*Diceros bicornis* being an African species), his "*unicornis*" could well denote *R. sondaicus*.

The soundest reason yet presented to accept the presence of *R. unicornis* in Laos is the existence of a special name. Old hunters apply the name 'to het sou' to a large one-horned rhinoceros, while a small one-horned is indicated by 'to het' (DEUVE and DEUVE 1962). It must remain an open question what the hunters meant by these two terms.

5.2. Records (Fig. 2)

A) Cambodia

1. Chaîne de l'Éléphant (HARPER 1945) or region of Sre Umbell 11° 08' N. 103° 46' E. (HARPER 1945). 2. Chaîne des Cardamomes (HARPER 1945), possibly still extant (MCNEELY and LAURIE 1977). 3. prov. Kompong Cham 11° 59' N. 105° 26' E., one killed ca. 1930 (HARPER

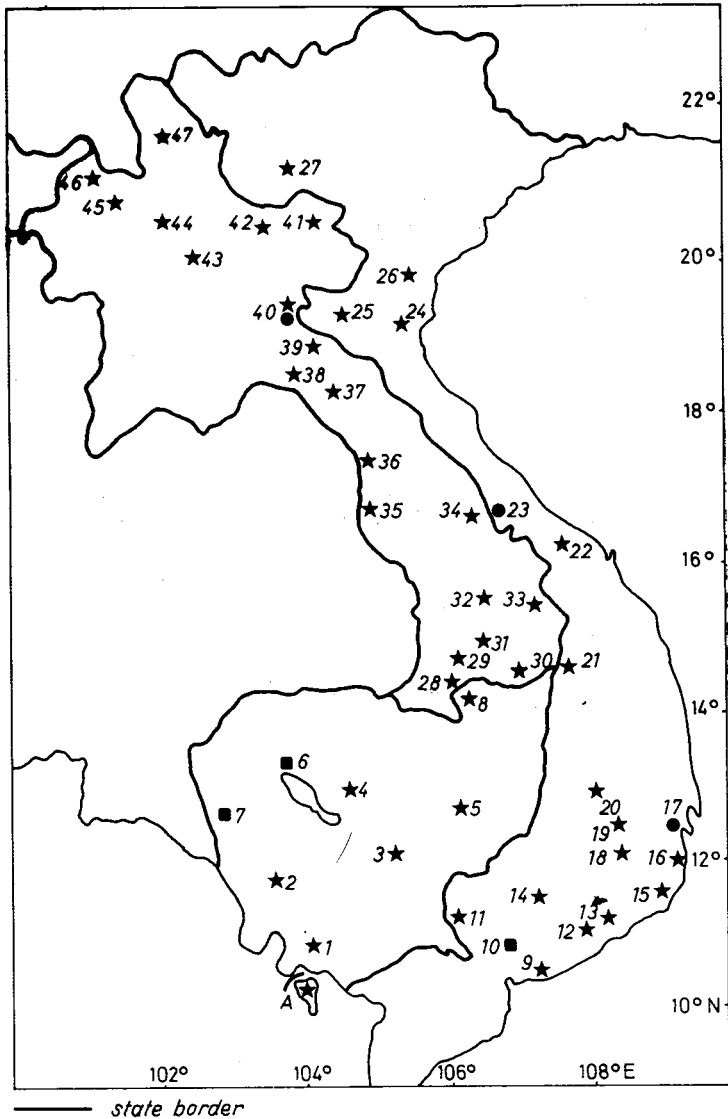


Fig. 2. Records of the occurrence of the rhinoceros in Cambodia, Laos, South and North-Vietnam (see text). The symbols of the different species are given in the legend of Fig. 1

1945) 4. Kompong-Thom region $12^{\circ} 42' N$. $104^{\circ} 52' E$., two seen in 1930s (Résident-supérieur au Cambodge, in LOCH 1937). 5. between Kratie $12^{\circ} 30' N$. $106^{\circ} 03' E$. and Stung Treng $13^{\circ} 31' N$. $105^{\circ} 59' E$. (de Villa, in LOCH 1937); prov. Stung Treng (HARPER 1945). 6. Angkor Vat $13^{\circ} 26' N$. $103^{\circ} 50' E$., relief of *R. sondaicus* 13th century (STÖNNER 1925; BRENTJES 1978). 7. (fossil *R. sondaicus*) Phnom Teak Trang, prov. Battambang $13^{\circ} 06' N$. $103^{\circ} 13' E$. (GUERIN and MOURER 1969). 8. area in North-East Cambodia (NEESE 1975, 1976 a, b on map).

B) South Vietnam

9. Cap. St. Jacques (= Vung Tau) $10^{\circ} 21' N$. $107^{\circ} 04' E$. (Bourret, in LOCH 1937). 10. Bien Hoa $10^{\circ} 58' N$. $106^{\circ} 50' E$., two skulls of *R. sondaicus* in Muséum d'histoire naturelle, Paris, donated by mr. Chénieux in 1896 (MILNE EDWARDS 1896, PAVIE 1904, LOCH 1937); hunted near Saigon in 1920s (HARPER 1945; TALBOT 1960). 11. near Tay Ninh $11^{\circ} 21' N$. $106^{\circ} 07' E$. (MORICE 1875 as *R. sondaicus*; MORICE 1876); between Song Dinh (= ? Song Vam Co Dong) and Song Ray (= ? Song May), three rhinos in 1899 (BORDENEUVE 1925) and one killed in 1925 (Gouverneur Général, in LOCH 1937). 12. "right bank of Song-Phan, from the Nui-Visong to Nui-Bê" (DE LA CHÉVASNÉRIE 1936, cited in HARPER 1945), or mountains of the Nui-Bê, between Langi and the mouth of the Song Phan (MILLET 1930) (locality uncertain). 13. "between the river Song-Quao and the road from Phantiet to Djiring, region of Catot" (DE LA CHÉVASNÉRIE 1936, in HARPER 1945): Phan Thiet $10^{\circ} 56' N$. $108^{\circ} 06' E$., Djiring = ? Di Linh $11^{\circ} 38' N$. $108^{\circ} 07' E$. 14. near Dong Nai, 1909–1911 (MAITRE 1912). 15. Laos hunters "even drive the animals down to the sea, particularly in the Phan Rang [$11^{\circ} 34' N$. $109^{\circ} 00' E$.], Cam Ranh [$11^{\circ} 54' N$. $109^{\circ} 14' E$.] and Phan Thiet [$10^{\circ} 56' N$. $108^{\circ} 06' E$.] areas" (P. VITRY in HARPER 1945). 16. near Cam Ranh, hunt in 1904 (SAUVAIRE 1930; HARPER 1945). 17. market of Nha Trang $12^{\circ} 15' N$. $109^{\circ} 10' E$., a *D. sumatrensis* trophy seen in 1902 (MILLET 1930); mountains above Nhatrang (TALBOT 1960). 18. near Da Lat $11^{\circ} 56' N$. $108^{\circ} 25' E$., tracks of ? *R. sondaicus* seen ca. 1958 (TALBOT 1960). 19. "left bank of Da Nhim above the post of Dran" in Lang Bian (mountains north of Da Lat); and in "region of Tutra (Lang-Bian)", as *R. unicornis* (DE LA CHÉVASNÉRIE 1936, cited in HARPER 1945). 20. Dar Lac plateau (N.W. of Da Lat) (M. DE VILLA, in LOCH 1937). 21. juncture of Laos, Cambodia and Vietnam, tracks 1955 (TALBOT 1960). 22. near Hue $16^{\circ} 28' N$. $107^{\circ} 35' E$., seen 1910 (CHOCHOD 1950; TALBOT 1960). 23. hills behind Quang Tri $16^{\circ} 46' N$. $107^{\circ} 11' E$., or near Lao-Dao (?), a two-horned rhinoceros seen at night (DELACOUR 1940, 1966). A. island Phuquoc (= Quan Phu Quoc), a legendary animal with a luminous horn that was never tracked (MORICE 1876).

C) North Vietnam

24. forest separating the provinces of Vinh $18^{\circ} 42' N$. $105^{\circ} 41' E$. and Thanh Hoa $19^{\circ} 49' N$. $105^{\circ} 48' E$. (A. LAGREZE, in LOCH 1937). 25. Cua Rao $19^{\circ} 18' N$. $104^{\circ} 30' E$. (DE VILLA, in LOCH 1937). 26. (fossil) Dong Son, prov. Thanh Hoa (PATTE 1934). 27. Son La $21^{\circ} 20' N$. $103^{\circ} 55' E$., a one-horned seen (BOURRET, in LOCH 1937).

D) Laos

28. "slopes extending west to the Mekong on the boundary of Cambodia" (P. VITRY, in HARPER 1945). 29, 30. reports of one-horned rhinoceros in 1970s (map in NEESE 1975, 1976 a, b). 31. Bolovens plateau, tracks in 1911, possibly present in 1936 (P. VITRY, in HARPER 1945, NEESE 1975, 1976 a, b). 32. prov. Saravane $15^{\circ} 43' N$. $106^{\circ} 24' E$., before 1930, no records 1930–1937 (DEUVE and DEUVE 1962, 1964); recorded in 1970s (map in NEESE 1975, 1976 a, b). 33. mountains separating upper Se La Nong and Se Kong from Kontum (P. VITRY, in HARPER

1945). 34. region of Tchepone (= Sepone 16° 41' N. 106° 14' E.), numerous in 1930–1937 (DEUVE and DEUVE 1962, 1964). 35. near Keng Kabao 16° 48' N. 104° 45' E., in 1954 (DEUVE and DEUVE, loc. cit.). 36. along Nampoun (= Nam Pung, river in prov. Sayaboury 19° 18' N. 101° 46' E.), in 1957 (DEUVE and DEUVE, loc. cit.). 38. region of Pacading (?), prov. Pak Sane, 1961 (DEUVE and DEUVE, loc. cit.). 39. Source area of Nam Muone (river in prov. Pak Sane), in 1945/46 and 1958 (DEUVE and DEUVE, loc. cit.). 40. Region of Nong Het and Sieng Khouang: skull of *D. sumatrensis* seen in Nong Het 19° 29' N. 104° 01' E. (DELACOUR 1940, 1966); mountains near Xieng Khouang 19° 21' N. 103° 23' E., tracks seen in 1896 (SAUVAIRE 1930); south of Nong Het, 1959 (DEUVE and DEUVE, loc. cit.); Phou Ke (?), prov. Xieng Khouang, two killed in 1940 (DEUVE and DEUVE, loc. cit.). 41. prov. Sam Neua 20° 25' N. 104° 04' E., reported 1930–1937 (DEUVE and DEUVE, loc. cit.); some seen in 1924 (A. LAGREZE, in LOCH 1937); Son La – Sam Neua region, ca. 1936 (P. VITRY, in HARPER 1945). 42. region of Muong Soi (= ? Muong Son 20° 27' N. 103° 20' E.), seen 1937 (DEUVE and DEUVE 1962, 1964). 43. Na, Lê (?), east of Luang Prabang 19° 53' N. 102° 10' E., hunt of one-horned rhinoceros (MOUHOT 1864). 44. northern part of Luang Prabang, 1900–1915 (DEUVE and DEUVE 1962, 1964); not seen in 1930s (J. LOUPY, in LOCH 1937). 45. near Nam Tha (Muong Luong Nam Tha 21° 02' N. 101° 27' E.), one reported in May 1961 (DEUVE and DEUVE 1962, 1964). 46. around Muong Sing 21° 10' N. 106° 06' E., 1900–1915 (DEUVE and DEUVE 1962, 1964). 47. Phong Saly 21° 40' N. 102° 06' E., in 1940 (DEUVE and DEUVE 1962, 1964).

E) Uncertain localities (not on map in Fig. 2)

I. one kilometer south of Sôui-Gia-Nhan, hunted ca. 1910 (ROUSSEL 1913). II. between the rivers Da R'Man and Krong khô, lower branch of the Srêpok (DE LA CHÉVASNÉRIE 1936, cited in HARPER 1945). III. La Nha (BOURRET, in LOCH 1937). IV. near Hanoi, mentioned in GROVES (1967), not found in literature.

5.3. Conclusions about Indo-China

Inevitably, the first question to answer when discussing the rhinoceros of the Indo-Chinese region, is which species occurred there. The alleged presence of *R. unicornis* has been refuted above. On the basis of a rather limited literature survey, GROVES (1967) realised "that *D. sumatrensis* is almost unknown" in the area. Later he had to adjust this view slightly in the light of further evidence (GROVES and KURT 1972), which merely illustrates the present uncertainty. Many accounts specify a one-horned animal, or *R. sondaicus*. MOUHOT (1864) published a sketch made soon after attending a rhinoceros hunt in Laos, clearly showing a *R. sondaicus*. More important are the *R. sondaicus* specimens preserved in the European museums: two skulls in the Paris natural history museum from Bien Hoa (10); a complete skeleton from 'Cochin-China' donated by Dr. TIRANT in 1871 to the Lyon Muséum d'Histoire Naturelle (no. 367); a hornless skull (no. EY 32) from Cochin-China in the same museum (MORICE 1875); and an old skull from Cochin-China given by Boucard to the British Museum (Natural History), London, no. 1861.6.30.9 (Pocock 1946). In view of these, there can be no doubt about the occurrence of *R. sondaicus* in at least some parts of the Indo-Chinese countries.

The presence of *D. sumatrensis* is often asserted without proof. There are no museum specimens. MAITRE (1912) met a hunter who shot a two-horned rhinoceros, but the trophy had been stolen. In 1902, MILLET (1930) saw a two-horned head in Nhatrang (17), presumably from Laos. An old woman in Nong Het (N.E. Laos) showed to DELACOUR (1940, 1966) in the 1930s "a fine skull, with the biggest double horn I have ever seen in the species." DELACOUR (1940, 1966) is one of the very few to claim a personal observation of a two-horned rhinoceros, near Quang Tri (23).

We can only hope that he actually saw the important characteristics, at night and from a car, and did not infer the identification from the Nong Het skull. GROVES (1967) and GROVES and KURT (1972) accept the presence of this species near Cam Ranh (16). I think it is a mistake to assume that this is a certain record of *D. sumatrensis*. It was mentioned by HARPER (1945) in his section on the Sumatran rhinoceros, but his source — SAUVAIRE (1930) — doesn't make any remark which would justify the conclusion that a two-horned specimen was involved. Having presented all these rather negative remarks, I still hesitate to rule out the possibility of the occurrence of *D. sumatrensis* in the Indo-Chinese area. Its presence may have been limited to sporadic wandering individuals, or perhaps it was rare, or very local, or early exterminated. In any case, *R. sondaicus* seems to have been the common and generally distributed species.

In 1975, H. NEESE (1975, 1976 a, b) discovered the survival of the rhinoceros in several parts of southern Laos. He identifies it as *R. sondaicus*, because most reports specify a one-horned animal, and because the villagers use the name 'het'. According to DEUVE and DEUVE (1964), the Lao name for *R. sondaicus* is 'het', while 'sou' indicates *D. sumatrensis*. The existence of a separate name for the two-horned species could support my refusal to delete the Sumatran rhinoceros from the list of Indo-Chinese fauna. On the other hand, DELACOUR saw his two-horned skull in the 'Hole of the (one-horned) rhinoceros' Nong Het, and not in "Nong sou"! A further investigation of this philological point would seem worthwhile. If NEESE's identification is correct, and it is the more likely alternative, there may still be a second viable population of *R. sondaicus* outside Java. This chance must be taken very seriously and full protection must be afforded as soon as possible.

The Indo-Chinese rhinoceros was already known to the early Chinese. Many old texts are quoted by IMBERT (1921) who promises to remove "toutes les doutes possibles sur l'existence du rhinocéros bicolore en Chine et en Indochine." In this, however, we are disappointed and he at most proves the former existence of a rhinoceros in the region. A relief in the temple complex of Angkor Vat (6) shows the god Agni being carried by a rhinoceros which can be identified as a *R. sondaicus* (BRENTJES 1978; STÖNNER 1925).

It is unnecessary to elaborate on the distribution of the rhinoceros in Indo-China. The reports listed above and the map (Fig. 2) show that the rhinoceros occurred in Cambodia (no records from the northern part); throughout South Vietnam except the area south of the Mekong delta; in parts of North Vietnam being absent from the north and north-east; and throughout Laos. As I have tried to show above, it would be premature to state which of the two species lived where. It needs further data to exclude *D. sumatrensis* from the Indo-Chinese fauna, or to state its restriction to a certain region.

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Zusammenfassung

Die frühere Distributionsgrenze von *Rhinoceros unicornis*, *R. sondaicus* und *Dicerorhinus sumatrensis* in Ost-Indien und Bangladesh sind angegeben. Diese drei Arten coexistierten wahrscheinlich in dem Jalpaiguri Distrikt (Indien) und in den Gebieten angrenzend an

N.O. Bangladesh. Das Vorkommen von *R. unicornis* in Burma und Indo-China wird abgelehnt. Die wenige alte Literatur über das Nashorn in Süd-China (ausgestorben ca. 1600) ist diskutiert; die Artzugehörigkeit bleibt unbekannt. Nashörner sind gemeldet aus fast ganz Kampuchea, Laos, Nord- und Süd-Vietnam. *R. sondaicus* war dort die gewöhnliche Art; die Anwesenheit von *D. sumatrensis* ist fragwürdig. Möglicherweise überlebt *R. sondaicus* noch im Süden von Laos.

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