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EARLY RHINOCEROS SYSTEMATICS

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This paper describes discussions about the number of rhinoceros species in the period between 1500 and 1800. People in Europe from the start were familiar with the single-horned Indian rhinoceros, which was exhibited alive on six occasions before 1780. Information on the double-horned rhinoceros(es) of Africa increased more gradually and the new evidence had to be integrated with existing views. In general, arguments about the significance of differences between specimens were marked by great individuality of the authors concerned. It is possible to recognize groups of people with similar ideas, as I have done, but the results certainly are somewhat artificial.

DÜRER'S RHINOCEROS

On 20 May 1515, Lisbon witnessed the arrival of a rhinoceros presented by an Indian ruler to Manuel I of Portugal. This animal inspired the famous German artist Albrecht Dürer (1471–1528) to illustrate it in a drawing and a subsequent woodcut. The drawing shows a rhinoceros clothed in heavy armour, with one horn on the nose and a short, twisted horn on the shoulders (the 'Dürer-hornlet'). The woodcut was copied numerous times until well into the 18th century in all possible works of art (Clarke, 1973); for a long time (nearly two centuries) it had no serious rivals as the embodiment of what everybody thought to be "the rhinoceros". It is almost impossible to overestimate the popularity and impact of Dürer's interpretation.

THE EPIGRAM BY MARTIAL

The Renaissance commentators on the classical authors soon found a reference to a rhinoceros, which seemed different from the animal depicted by Dürer. The anomaly was encountered in the penultimate line of Epigram XXII in the *Liber de Spectaculis* by Martial (40–102), who sketched the performance of a rhinoceros in the Roman circus of 80 AD:

Sollicitant pavidi dum rhinocerota magistri
seque diu magnae colligit ira ferae,
desperabantur promissi proelia Martis,
sed tamen is rediit cognitus ante furor,
namque gravem gemino cornu sic extulit ursum
iactat ut impositas taurus in astra pilas.

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While in fear the trainers were goading a rhinoceros,
and long was the great beast's wrath gathering strength,
all despaired of the conflict of the promised war;
yet at length the fury, known erewhile, returned.
For a heavy bear he tossed with his double horn,
even as a bull hurls dummies heavenwards.

(Translation from Ker, 1947)

How could the double horn (gemino cornu) be explained? This question was debated for some 150 years without acceptable answer. Two classes of answers can be distinguished. One group accepted the passage as cited and tried to explain the double horn. The other suggested that the transmitted text was adulterated and consequently open for an emendation which would remove the contradiction.

The group adopting the former explanation was the larger and included authors like Politianus (1524), Cardanus (1559), Scaliger (1576), Camerarius (1595), Pare (1604), Franzius (1643), Deusingius (1659), and Grew (1681). They usually used Dürer's woodcut as evidence, suggesting that Martial had referred to the small hornlet shown on the shoulders of that specimen. Although this would seem an obvious (and justified) solution to the dilemma, one can almost feel a silent dissatisfaction with it. Camerarius (1595) expressed these doubts about its validity when he stated that the hornlet on the back was a mere knob, a protuberance, rather than a true horn. Martial, therefore, had written with poetic licence about a double-horned rhinoceros. The possible existence of a rhinoceros with two nasal horns was rarely mentioned in this context (e.g. Raderus, 1611), although such an animal was clearly depicted on coins struck during the reign of Domitian (illustrated by Augustin, 1587: tab.63).

I shall not consider in detail the subtle textual changes proposed mainly during the 17th century. Some Dutch authors like Scriverius (1629) and Vossius (1642) advocated the simple change of bear (ursum) into aurochs (urum), the latter of course having two horns. Samuel Bochart (1663), an authority on such philological matters, reviewed the whole discussion and presented the most intricate emendation with a rather gratifying result: "namque *gravi geminum* cornu sic extulit ursum", i.e. the rhinoceros with a short horn tossed up two bears; either simultaneously, or one after the other. Bochart was one of the last authors to consider the matter critically.

This extended debate shows that the early scholars tried to accommodate all available evidence into their idea of what a rhinoceros looked like, which usually coincided with the figure drawn by Dürer. Whatever they thought about the appearance of the rhinoceros, there was never even the slightest suggestion that there would occur more than one kind of rhinoceros. At the end of the 17th century, after the review by Bochart (1663), the discussion on the meaning of Martial's Epigram subsided. Books published between 1680 and 1740 do not present any new insight or ideas to supplement earlier theories on the number of horns in the rhinoceros.

NEW EVIDENCE

Throughout the 16th and 17th centuries, new information about distant countries in general, and about the rhinoceros in particular, was gathered by all kinds of

travellers. Some of them published their adventures and observations, usually in small books written in the vernacular and printed in limited editions. For these two reasons, the influence of these travel accounts on scientific ideas was rather slight. For instance, books published before 1700 had reported the occurrence of the rhinoceros from Ethiopia, the Cape of Good Hope, India including Bengal, Thailand, Malaya, Indo-China, Sumatra, and Java. Much of this information remained hidden in the printed pages of the travel reports. A late 17th century synopsis by John Ray (1693), to name just one of the better, merely mentioned the animal from India, Malaya, Ethiopia and remote regions of Africa. The early travellers also collected all kinds of curiosities, including single and double horns of rhinoceroses, many of which were incorporated in private collections throughout Europe. Only a few horns were mentioned in contemporary catalogues, like the double horns owned by the Norwegian king Christian V (Jacobaeus, 1696) or the Dutch naturalist Jan Swammerdam (1679). A specimen in an Augsburg apothecary was described in a separate paper (Schroeckius, 1686).

One book of this period helped to make the African rhinoceros with two nasal horns better known. It was written by the German Peter Kolb (1675–1726), who from 1705 to 1715 resided at the Cape of Good Hope. During this time he collected all kinds of facts about southern Africa and he made many notes on its flora and fauna. He presented this information in a heavy folio volume, first published in German in 1719, and later translated into Dutch (1727), English (1731), and French (1741–43). His description of the rhinoceros was largely traditional, but the animal unmistakably is provided with two nasal horns. In the first German edition, these notes are illustrated with a plate showing a rhinoceros, which is clearly copied from Dürer. This unfortunate mistake was corrected by the publishers of the Dutch edition, which contained the first acceptable drawing of an African rhinoceros (Rookmaaker, 1976). Certainly, the existence of a double-horned rhinoceros could hardly be denied after the appearance of Kolb's book on the Cape of Good Hope.

JAMES PARSONS

In 1739, the fourth live rhinoceros in Europe arrived in London. This event created a renewed interest in the animal, which led to the "discovery" of the simultaneous occurrence of both single-horned and double-horned rhinoceroses. The London specimen was examined by the physician James Parsons (1705–1770), who then studied the older literature and illustrations, as well as the specimens in some London collections (Rookmaaker, 1978). He presented his findings in a lecture on the rhinoceros, delivered to the Royal Society of London on 9 June 1743 (Parsons, 1743). In this lecture, he described the animal which he had seen, but also commented on the distinction between the rhinoceros with one horn and that with two. He concluded: "we may venture to assert, that all those of Asia have really but one horn upon the nose. . ." and "now we do not want sufficient proofs to shew, that there is a species of those animals in Africa, having two horns on the nose" (Parsons, 1743: 538). Parsons thus implicitly introduced a specific distinction related to geographic separation. His lecture, published in a well-known journal (and translated into German in 1747), is a major event in rhinoceros history, not primarily because it presents a description of the Indian rhinoceros which would be accept-

able today, but because here Parsons advanced a clear opinion about the number of rhinoceros species. This at least provided a basis for further research.

The paper by Parsons marks the beginning of a new period in the history of rhinoceros systematics which lasted some 40 years, until 1780. During this time, the existence of both single-horned and double-horned rhinoceroses was generally acknowledged, while their relation to each other remained a matter of opinion. Two groups of interpretations can roughly be distinguished; these existed more or less side by side. Some people maintained that the two forms were two distinct species, often supposed to be geographically separated. Others thought that both were merely varieties of a single species, the number of horns varying with sex, age or environment.

TWO DISTINCT SPECIES

The view expressed by Parsons (1743) was not immediately accepted by the London community except by a few persons like Richard Mead (cf. Parsons, 1766). Others, like Sloane (1749), hesitated to fix the relation between the two forms in this way. On the continent, a few writers independently arrived at conclusions similar to those of Parsons. Theodor Klein (1751) saw some double horns in Dresden and in his home town Danzig; he related some first-hand experience of a man called Biebering who had visited the Cape of Good Hope and had heard only about the rhinoceros with two horns. Klein concluded that there were two species of rhinoceros, one in Asia with a single horn, another in Africa with two horns. But he had some doubts concerning the exact status of the two forms, possibly just varieties, because he could not assess how much they differed in general appearance. This reserve is understandable when we remember that the only realistic figure of an African rhinoceros available had been published in Kolb (1727), and Klein may not have consulted this edition.

The specific distinction is also found in the 10th edition of the *Systema Naturae* by Linnaeus (1758). He characterized his genus *Rhinoceros* as a whole by the presence of one or more nasal horns and by the presence of two front teeth. He then recognised two species:

Rhinoceros unicornis with one horn, found in Africa and India; with reference to Jonston (1655), Bontius (in Piso, 1658), Bergen (1746), Gessner (1551) and Aldrovandi (1621):

Rhinoceros bicornis, an obscure species with two horns, found in India; with reference to Kolb (1719), Jacobaeus (1696) and Schroeckius (1686).

This classification by Linnaeus probably reflects the confused understanding by his contemporaries of the geographic distribution. However, he could have been better informed. He quoted eight sources, only two of which were 18th century ones, i.e. Bergen (1746) on the visit of a rhinoceros to Frankfurt (Oder) in 1746, and Kolb (1719) on the African rhinoceros. In view of the last authority, it is surprising that the double-horned species is not mentioned from Africa.

Most later authors disagreed with the classification of Linnaeus (1758), probably for two main reasons. Firstly, an alternative theory was favoured by Buffon (1764), as elucidated below; secondly, the presentation of the facts by Linnaeus was not found satisfactory. The latter point may be clarified by looking at the elaborate

description of the rhinoceros included in the "natural history . . . according to the system of Linnaeus" by Houttuyn (1761). He agreed with Parsons (1743) concerning the distribution of the animals, which, added to the ideas of Linnaeus, resulted in the recognition of two species inhabiting both Africa and Asia. The two forms therefore were either sympatric species or possibly individual variants. Both views seemed equally justified in the light of the available evidence. If then the variation in the number of horns could be explained, there would be no reason to recognise two distinct species.

TWO VARIETIES

The second theory, that the two forms of rhinoceros belong to a single species, became prevalent after 1764 when Buffon's comments on the question were published. In general, there were three different ways to attribute different numbers of horns to specimens of the same species.

The first suggestion is found in a literature survey by Ladvocat (1749). He argued that Pausanias (who wrote about an "Ethiopian ox") proved the reality of the double-horned rhinoceros. In 1749, a female rhinoceros was shown in Paris and this animal only had one horn on the nose and none elsewhere on the body. Therefore, females carry one horn, while males have two: one on the nose and another on the shoulders. This still refers to Dürer's rhinoceros, which at least according to tradition was a male. Later, Ladvocat (1749) discovered Kolb and he modified his view slightly, at the same time adding a geographic dimension. Females in both Africa and Asia would have a single horn, males in Asia would carry an additional horn on the shoulders (Dürer), while males in Africa have the second horn on the forehead. This artificial hypothesis failed to explain why African females differ from African males, something absent from the description in Kolb.

The significant contribution by Buffon (1764) introduces another solution. His extensive description of the external appearance of the rhinoceros is essentially copied from Parsons (1743) since "tout ce qu'écrit M. Parsons, me paroît mériter plus d'attention & de confiance" (p. 178). Buffon found no fault with the existence of the two kinds of rhinoceros, but "il n'est pas également certain que cette variété soit constante, toujours dépendante du climat de l'Afrique ou des Indes, & qu'en conséquence de cette seule différence on puisse établir deux espèces distinctes dans le genre de cet animal" (Buffon, 1764: 186–7). Buffon classified the two forms as different variants, or subspecies, of one species and the distinction was caused by the prominent effects of climate, and possibly other environmental conditions. Buffon's judgement, of course, carried great weight and caused even Linnaeus to change his first classification. Linnaeus (1766) in the twelfth edition of the *Systema Naturae* placed the entire diagnosis of the rhinoceros and its distribution (India, Africa) under the heading of *R. unicornis,* while appending *R. bicornis* as a subspecies (Hopwood, 1939). It is not clear if the two subspecies of Linnaeus (1766) would be geographically separated, a point implied by Buffon (1764) and stated explicitly on a later occasion (Buffon, 1778).

The variation in the number of horns was also linked with age. Gmelin (1769) stated that "until now, only one species of Rhinoceros is known, and the Asian does not differ from the African. The animal, progressing in age, always has two horns, being younger one, and at birth no horn" (my translation). In this concept, the occurrence of specimens with three or more horns could easily be accomodated.

MORE NEW EVIDENCE (1770s)

All theories up to this point were hypotheses, theories, on a very slim basis. The 1770s were characterized by the practical absence of further speculation, and by the large number of new observations. The appearance of the single-horned rhinoceros was rather well-known and another living specimen arrived in Versailles in 1770 (Buffon, 1778; Sander, 1779). Thoughts about the double horned rhinoceros were still confused, as may be seen from two communications reported by Buffon (1778). James Bruce wrote that rhinoceroses in Abyssinia were always provided with two horns which started to grow together. J. N. S. Allamand, on the other hand, wrote to Daubenton (on 31 October 1766), that he had received double horns only from Bengal and India, and single horns only from Africa. According to Buffon (1778), this confirmed his 1764 opinion that the double-horned rhinoceros was a variety ("variété dans l'espèce, une race particulière") occurring both in Asia and Africa. A few years later, Allamand (1781) corrected his letter saying that the localities may have been confused, which may in fact have been quite common.

Allamand's complete reversal was due to new information received from the Cape of Good Hope. After 1760, and especially after 1770, the interior of southern Africa was explored by several travellers. Some of their observations on the rhinoceros were quickly published (Sparrman, 1778; Brink, 1778); these referred only to specimens with two nasal horns. The fullest notes, including some drawings, about the Cape rhinoceros were sent to Allamand by Robert Jacob Gordon (1743–1795). This information, published by Allamand (1781), showed that all rhinoceroses at the Cape, young and old, male or female, always had two horns.

PETRUS CAMPER

Obviously, the time had come to review the information assembled during the latter years. This task was accomplished by the Dutch professor of anatomy Petrus Camper. About 1771, he received the head and skull of a double-horned rhinoceros from the Cape of Good Hope. On 6 February 1772, he assessed the importance of this specimen in a public lecture at the University of Gröningen (Camper, 1782: 129–145). A few years later, a full description in Latin was sent to St Petersburg (Camper, 1780). The fullest account, incorporating the most recent sources, was published in Dutch in 1782. Considering all information at his disposal, Camper (1782: 158) argued that the number of horns "is a real species determining character" and that "all African rhinoceroses, none excluded, have two horns, and the Asians only one" (my translation). Parsons (1743) had already suggested exactly the same, but Camper had examined many localised specimens and his judgements therefore were more valuable. Besides the number of horns, Camper discussed a second differentiating characteristic, the number of teeth. He observed in his material 28 molars (7 on each side of the lower and upper jaws), which agreed with the number found by Pallas (1769). This differed from the arrangement in the single-horned rhinoceros which had six molars instead of seven but showed a tooth (incisor) in the front part of each side of the jaws.

Camper made much better known the appearance of the double-horned rhinoceros of the Cape. It was realised that this animal differed from the Indian specimens in the number of horns, in the dentition, and in other morphological characteristics. It also became possible to compare the published information with specimens from

other parts of the world, which eventually would lead to the recognition of other species of rhinoceros.

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