THE ROYAL NATURAL HISTORY

EDITED BY

RICHARD LYDEKKER, B.A., F.R.S., ETC.

WITH PREFACE BY

P. L. SCLATER, M.A., PH.D., F.R.S., ETC
SECRETARY OF THE ZOOLOGICAL SOCIETY OF LONDON

ILLUSTRATED WITH

Seventy-two Coloured Plates and Sixteen Hundred Engravings

BY

W. KUHNERT, F. SPECHT, P. J. SMIT, G. MÜTZEL, A. T. ELWES, J. WOLF,
GAMBIER BOLTON, F.Z.S.; AND MANY OTHERS

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It is further reported that the tapir is not unfrequently successful; and, in any case, many of these animals are killed with the marks of jaguar's claws on their backs.

Succession of Teeth.

Before leaving these animals, it may be mentioned that the whole of the four premolar teeth on each side of the upper jaw are preceded by milk-teeth, whereas in the pig and other Even-toed Ungulates the first of these teeth never has a deciduous predecessor, as, indeed, is the case with other groups of Mammals. Some rhinoceroses, however, resemble the tapirs in having the first premolar preceded by a milk-tooth, although this seems to be merely an individual, and not a specific peculiarity.

The Rhinoceroses.

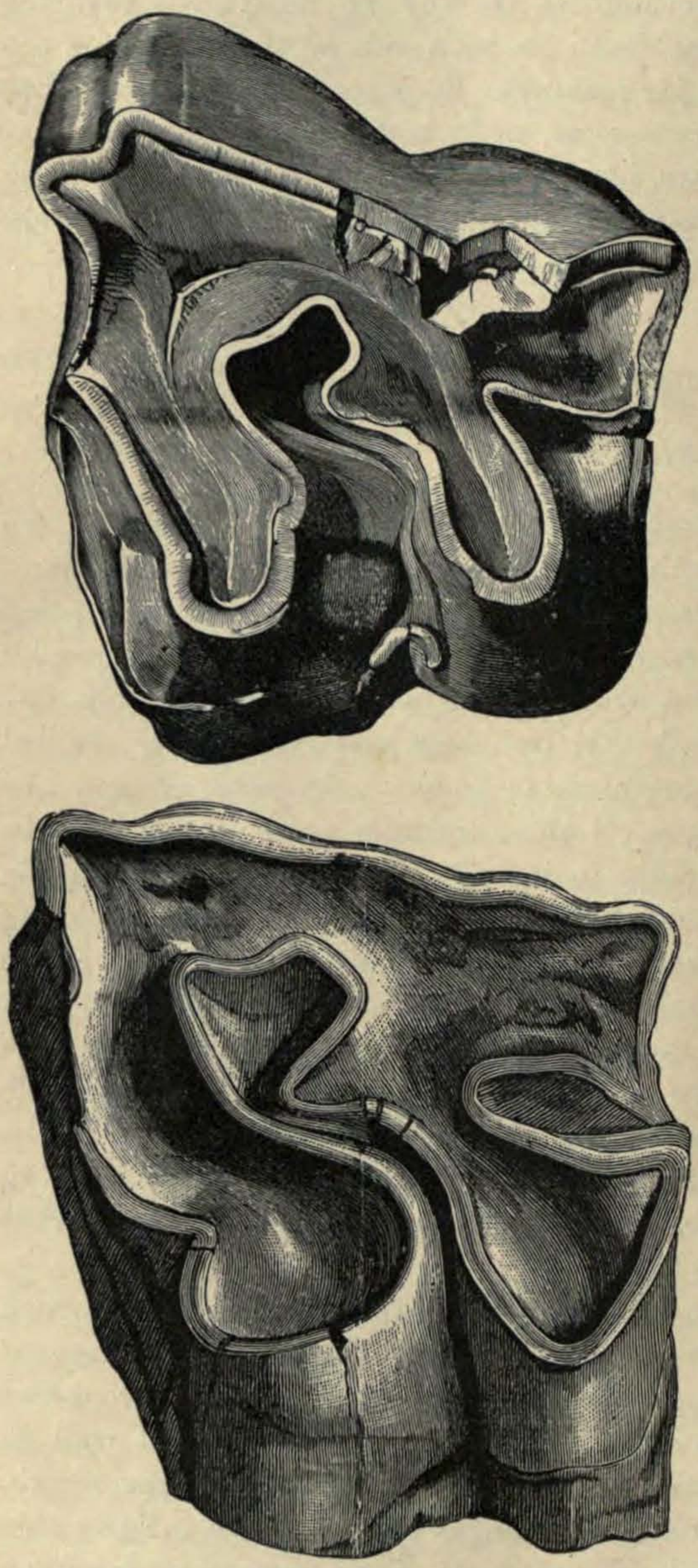
Family *Rhinocerotidæ.*

Although inferior in length of body, and probably also in weight, to the hippopotamus, the larger species of rhinoceros exceed it in height, and, therefore, vie with it in claiming the position of being the Mammals next in point of size to the elephants. Unlike the tapirs, the various species of rhinoceros, all of which are now confined to the Old World, differ very markedly from one another in structure—so much so, indeed, that by many writers they are divided into several genera; and there is also considerable disparity in point of size. In spite, however, of these minor differences, all these animals are so much alike in general appearance, that it seems preferable to include the whole of them in the single genus *Rhinoceros.* All the existing rhinoceroses differ from tapirs in having but three toes on both fore and hind-feet, but since there are some extinct species with four toes to the front limbs, this point of distinction cannot be regarded as a very important one. The presence of one or two horns in the middle line of the front of the head might at first sight be regarded as a more valuable diagnostic character, but since these appendages are always or frequently absent in the female of one of the living Indian rhinoceroses, and are invariably wanting in certain extinct kinds, it will be obvious that other features must be sought that will distinguish these animals from the tapirs.

Teeth.

Such characteristics are to be found in the cheek-teeth, of which two from the upper jaws of certain extinct species are represented in the figures on next page. In the molar teeth of the upper jaw the two outer columns have completely coalesced so as to form a continuous external wall to the crown; this wall being sinuous, and in some cases (as in the upper figure) forming a prominent buttress at the front outer angle of the crown. From this outer wall proceed two continuous oblique transverse ridges, separated from one another by a deep valley, interrupted by projecting processes from one or both ridges, and sometimes also from the outer wall. This middle valley is usually quite free from cement; and its form, as likewise the relative height of the whole crown, varies considerably in the different species. Instead of having the simple transverse ridges found in those of the tapirs, the lower cheek-teeth of the rhinoceroses have a pair of crescents, placed one in front of the other. On each

side of both the upper and lower jaw there are seven cheek-teeth; but the last molar in the upper jaw differs from the rest in having its hinder ridge more or less aborted, so that the form of the crown is generally triangular.



LEFT UPPER MOLAR TEETH OF TWO EXTINCT SPECIES OF RHINOCEROS.

Both considerably worn by use.

As regards their front teeth, the different species of rhinoceros present a considerable amount of variation, some of them having such teeth in both jaws, while in others they are totally absent; but there are never any canine teeth or tusks in the upper jaw, and the number of upper incisor teeth never exceeds two pairs. In the lower jaw there may be a pair of large pointed and nearly horizontal tusks, and between them a small pair of incisor teeth.

Form. All the living rhinoceroses are animals of large size and heavy build, with the legs comparatively short and stout, although less so than in the hippopotamus. Each of the toes is furnished with a relatively small, but broad and well-defined hoof-like nail. The head is large and elongated, with a concave profile; and the erect oval ears placed very far back. The eyes are very small in proportion to the size of the head; and the upper lip is generally, although not invariably, prehensile, and prolonged beyond the extremity of the lower one. The thick skin is either naked, or but sparsely clad with hair, and may be thrown in certain parts of the body into a series of deep folds. The tail is thin and of moderate length.

Horns. The horns, which form the characteristic feature of the physiognomy of the living species, are composed of a closely-packed mass of horny fibres, growing from the skin, and having no connection with the bones of the skull, although there are prominences on the latter beneath each horn. The skull, as shown in the figure of that of an extinct species given in the sequel, is characterised by its elevated occipital region, long curved profile, the absence of

INDIAN RHINOCEROS.

any bony bar at the hinder part of the socket of the eye, and the large size of the nasal bones, which are completely fused together. In those species with but one horn this is carried upon the nasal bones, and the front horn of those with two of these appendages has a similar situation; but the second horn, when present, is placed on the frontal bones.

Habits.

Rhinoceroses are stupid and somewhat timorous beasts, generally striving to escape from man, although when brought to bay exceedingly fierce, and consequently from their great size very dangerous. Although the African species are entirely dependent on their enormous horns, as weapons of offence and defence, the Asiatic kinds, in which the horns are smaller, seem to rely chiefly upon their sharply-pointed lower tusks, which are capable of inflicting terrific gashes. All are mainly nocturnal; and while some resemble the tapirs in frequenting tall grass-jungles and swampy districts, others seem to prefer more or less open plains. Their food is entirely vegetable; but whereas some species subsist almost exclusively on grass, the food of others consists mainly of twigs and small boughs of trees; this difference in diet being correlated with a difference in the structure of the molar teeth. At the present day these animals are restricted to South-Eastern Asia and Africa; and they may be divided into two main groups according to their geographical distribution, the Asiatic group being again subdivided into two minor groups.

The Asiatic Rhinoceroses.

The whole of the three species of rhinoceroses inhabiting Asia are characterised by the skin being thrown in places into thick folds, and by the presence of teeth in the front of the jaws; the horns being either one or two in number.

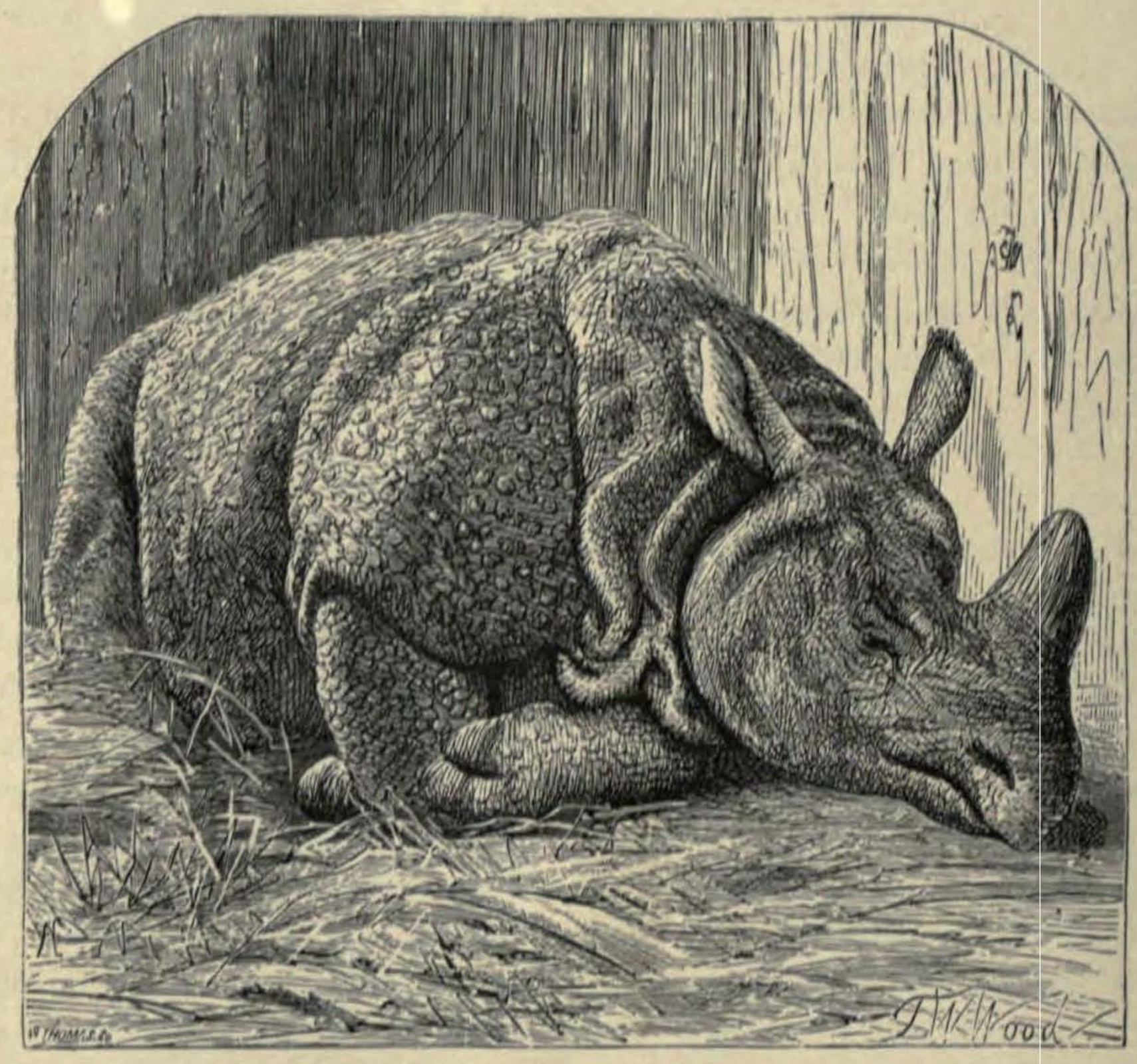
Indian Rhinoceros.

By far the largest of these three is the great one-horned Indian rhinoceros (*R. unicornis*), which may be conveniently designated as the Indian rhinoceros *par excellence*, and is the one which has been longest known in Europe from living examples, a specimen having been sent to Portugal as long ago as the year 1513. In this species there is but a single nasal horn; and the skin, with the exception of that of the tail and ears, is naked, and on the sides of the body studded with a number of large convex tubercles, reminding one of the rivets in an iron boiler, which are largest on the fore and hind-quarters, where they may be as much as an inch in diameter. The skin of the body is divided into a number of shield-like pieces by the aforesaid folds. Thus there is a fold before and behind each shoulder, marking off a large triangular shield covering the shoulder; and another in front of each thigh dividing the large saddle-shaped body-shield from the one on the hind-quarters. The folds behind the shoulder and in front of the hind-quarters continue completely across the back, but the one in front of the shoulder inclines backwards and dies out close to the second great fold. Other folds form great rolls of skin on the neck, while there are others below the shields on the fore and hind-quarters and one situated behind the buttocks which forms a groove for the reception of the tail. The head is very large in proportion to the body, with the occipital region of the skull very much elevated; and the ears are large, with their tips fringed with hairs. The horns are large in

both sexes; and the colour of the skin is a uniform blackish grey. In height the Indian rhinoceros stands from 5 feet to 5¾ feet at the shoulder. In a male standing 5 feet 9 inches at the shoulder, measured by General Kinloch, the length from the tip of the snout to the root of the tail was 10 feet 6 inches, the length of the tail 2 feet 5 inches, and the girth of the body 9 feet 8 inches. The length of the horn is seldom more than a foot, although Jerdon says that there are instances on record of horns of 2 feet in length, and one in the British Museum measures 19 inches.

Teeth.

The Indian rhinoceros is further characterised by its teeth. As a rule, there is but a single pair of broad incisors in the upper jaw, although in some cases there may be a smaller pair behind them. In the lower



GREAT INDIAN RHINOCEROS IN THE ZOOLOGICAL GARDENS.

jaw there is one pair of long, triangular, pointed tusks, and between them a pair of small cylindrical incisors which can be of no functional importance. The upper molar teeth have tall crowns, and in the absence of a buttress at their front outer angle, and the flat plane formed by their worn surface, resemble the one represented in the lower figure on p. 464. They are, however, distinguished from the latter by the presence of a small vertical plate, projecting from the outer wall into the extremity of the middle valley. It will be obvious that this flat plane of wear of the cheek-teeth implies that the jaws have a backwards-and-forwards grinding motion, and not a champing action; such a mode of mastication being similar to that existing in horses and cattle.

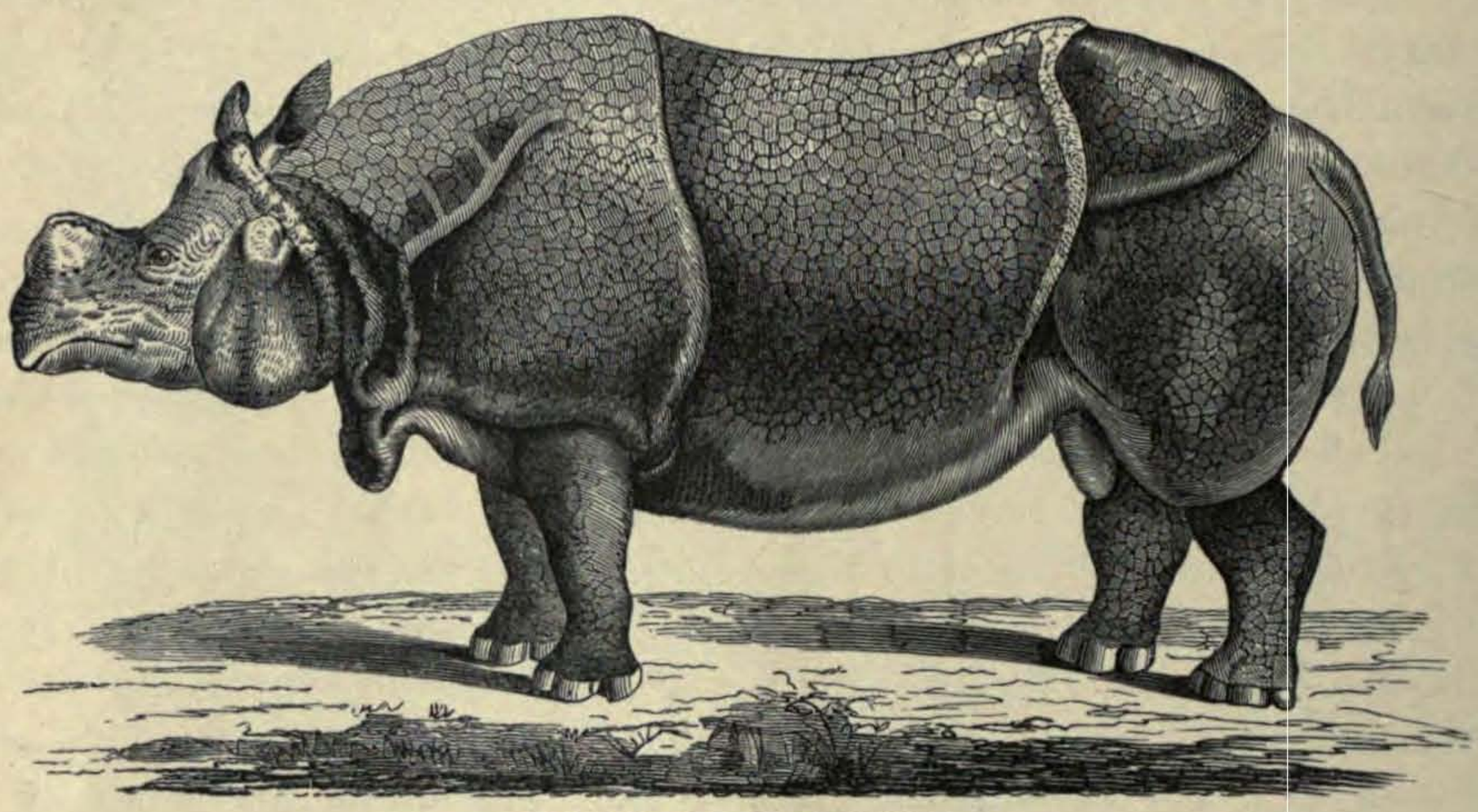
Distribution. This rhinoceros is exclusively confined to India, and at the present day, according to Mr. Blanford, is almost restricted to the Assam plain, being rarely, if ever, found to the westward of the Tista River. Twenty or thirty years ago, it was, however, still common in the so-called terai country at the foot of the Sikhim Himalaya, while some years earlier it frequented the sub-Himalayan districts of Nipal, and ranged as far west as Rohilcund; while the writer last quoted believes that, about the year 1850, it also occurred in the grass-jungles of the Ganges valley at the north end of the Rahmahal Hills in Bengal. In the early part of the sixteenth century it ranged over the Punjab as far westwards as Peshawur; and since its fossilised remains are found in the North-West Provinces, the Narbada valley, and Madras, it may be inferred that the Indian rhinoceros formerly ranged over the greater part of Peninsular India, in localities suited to its habits.

Habits. The Indian rhinoceros is a denizen of the great grass-jungles that cover such a large portion of the plains of India, and from this circumstance, coupled with the general resemblance of its molar teeth to those of the African Burchell's rhinoceros, which is known to be a grass-eater, it may be assumed that its food is chiefly grass. Regarding the density and height of these jungles, General Kinloch writes that, "year after year, in the short space of two or three months, these giant grasses shoot up to a height of from twenty to thirty feet, forming, with the wild cardamum, various other broad-leaved plants, and numerous creepers, a tangled cover which shelters the elephant, the rhinoceros, and the buffalo, as effectually as a field of standing corn affords concealment to the partridge or the quail. I have seen a line of about fifteen elephants beating a strip of reeds not more than two hundred yards in width, and I could hardly see the grass shake. There was not as much commotion or indication of what was going on, as would be caused by a pack of beagles drawing a gorse-cover. Runs or tunnels among the high reeds, like magnified 'meuses' of hares and rabbits, show that the same paths through the thick jungle are generally made use of."

The rhinoceros chiefly frequents such portions of these grass-jungles as are on swampy ground; and although it is in general a solitary animal, the writer just quoted states that he has known half a dozen individuals roused from a belt of not more than half a mile in length by three hundred or four hundred yards in width. Like tapirs, the Indian rhinoceros is fond of a mud-bath. Although there are many stories extant as to its ferocity, and more especially its enmity to the elephant, it appears that this animal is generally quiet and harmless. Even when wounded, according to Mr. Blanford, it is but seldom that it charges home; but when it does attack, the sharp lower tusks are used much after the same manner as those of a wild boar. The only sound that this rhinoceros utters is a peculiar grunt, which is repeated at frequent intervals during excitement. The usual gait of this rhinoceros is a long swinging trot, but when disturbed, it can break into an awkward but very rapid gallop. Only a single calf is produced at a birth, but there is some uncertainty as to the length of the period of gestation, an old writer stating that it is nine months, while a more recent authority affirms that it is nearly or quite double as long. Since rhinoceroses, so far as we are aware, have

not bred in captivity in Europe, the point is one not likely to be soon cleared up. The Indian rhinoceros thrives well in confinement, and frequently lives in that state for a long period. One specimen acquired by the London Zoological Gardens in 1834 lived till 1849, while a second, purchased in 1850, died in 1874, and a third presented in 1864 is still (1894) flourishing. Mr. Blanford states that he has heard of captive specimens living fifty or sixty years, and Mr. Brian Hodgson was of opinion that the natural term of this animal's life is upwards of a century.

From the immense thickness and apparent toughness of its enormous folds, it was long considered that the hide of the Indian rhinoceros was bullet-proof, and that the only places where the animal was vulnerable were the joints of the armour. General Kinloch relates an amusing story of a soldier in India, who had heard of this legend, firing point-blank at a tame rhinoceros which had been captured by his regiment during the Mutiny, in order to obtain ocular proof of its



GREAT INDIAN RHINOCEROS.

truth. Needless to say, as the shot was well aimed, the unfortunate animal fell dead, which meant a considerable loss to the regimental prize-fund. And we may mention here that the Indian rhinoceros, like all its kindred, when shot sinks down in its tracks, and lies as if asleep, instead of falling over on its side like most other mammals.

As a matter of fact, the skin of the living animal is quite soft, and can readily be penetrated in any place by a bullet, or easily pierced by a hunting-knife. When dried it becomes, however, exceedingly hard; and it was formerly employed by the Indian princes in the manufacture of shields for their soldiery. General Kinloch states that if polished the hide "is very handsome and semi-transparent, and when held up to the light looks exactly like tortoise-shell, the tubercles giving it a beautiful mottled appearance."

The horn is used by the Hindus (to whom in common with the natives of most parts of India, the animal is known by the name of *gainda*) in some of their religious ceremonies; when manufactured into cups it is considered by the Chinese to possess the property of indicating the presence of poison.

Hunting. There are two modes, according to General Kinloch, of hunting the Indian rhinoceros—"one by quietly tracking up the animal on a single elephant until he is at last found in his lair, or perhaps standing quite unconscious of danger; the other, by beating him out of jungle with a line of elephants, the guns being stationed at the points where he is most likely to break cover. In the latter case it is necessary to have reliable men with the beaters, who can exercise authority and keep them in order, for both mahouts and elephants have the greatest dread of the huge brute, who appears to be much more formidable than he really is."

The same writer gives his experience of rhinoceros-hunting as follows. On a certain occasion the General and his party "had tracked a wounded buffalo into a large and very thick cover, into which it was useless to follow him with any chance of getting a shot. The three guns, therefore, went on ahead, and took up their positions at the other end of the cover, while the pad-elephants were ordered to form line and beat steadily through the jungle. After waiting a long time at my post I heard some large animal crashing through the reeds, and as the line of beaters advanced the waving of the grass betrayed its movements. It came on very slowly, occasionally stopping for some time to listen, and again making a cautious advance. I remained still as death, but I was in a great state of anxiety lest my elephant should become uneasy and give the alarm. Fortunately, he remained silent, and at length the rhinoceros, anticipating no danger ahead, and pressed by the steadily advancing line of elephants behind him, poked his ugly head out of the reeds within twenty yards of me. I could only see his snout and his horn, and aimed above the latter for his forehead. I either took a bad aim, or my elephant moved slightly as I fired, for, as I afterwards found, my bullet merely grazed the snout, cutting a deep furrow along the base of the horn. As the rhinoceros wheeled round, I gave him another bullet in the centre of his ribs, and he rushed back into the reeds and through the beaters with an angry grunt." On search being made in the jungle, it was found that the second bullet had done its work, the huge animal lying dead with its legs folded beneath the body in the usual recumbent posture.

Javan Rhinoceros. The Javan, or lesser one-horned rhinoceros (*R. sondaicus*), is an altogether smaller animal than the preceding, with the head relatively less large in proportion to the body, although its height at the shoulder is scarcely, if at all, inferior. The skin, which is nearly or quite naked, lacks the large tubercles of the Indian rhinoceros; while the fold in front of the shoulder, instead of inclining backwards, is continued right across the body like the other two main folds. Superficially, the skin is divided by a network of cracks into a number of small mosaic-like discs. The great folds of skin which are so conspicuous in the neck of the Indian rhinoceros are in this species much less strongly developed. The general colour is a uniform dusky grey. The skull is less elevated than in the larger species in the occipital region; but there are the same number of front teeth. In structure the upper molar teeth are, however, simpler, resembling the lower of the two figured on p. 464; and their crowns are not so tall. Measurements of wild individuals appear to be very few; but in a large female the height at the shoulder was $5\frac{1}{2}$ feet. The female is generally or invariably hornless.

Distribution. This species has a much more extensive distribution than its larger cousin. There is no evidence that it ever occurred in Peninsular India, but it is found in the Bengal sundarbans and portions of Eastern Bengal, while it has been met with in the Sikhim "terai." From the valley of Assam it ranges eastwards through Burma and the Malay Peninsula to Sumatra, Java, and Borneo; its partially fossilised remains occurring in the latter island.

Habits. Mr. Blanford observes that this species "is more an inhabitant of the forest than of grass, and although it is found in the alluvial swamps of the sundarbans, its usual habitat appears to be in hilly countries. It has been observed at considerable elevations both in Burma and Java." Indeed, there is evidence that it probably ascends occasionally to as much as seven thousand feet above the sea-level. This species being a forest-dwelling one, while its molar teeth are of the same pattern as those of the leaf and branch-eating common African rhinoceros, it is pretty certain that its food must be of the same general nature as that of the latter. In disposition the Javan rhinoceros is said to be more gentle than the large Indian species, and it is not unfrequently tamed by the Malays. The horns are never large, and afford but poor trophies to the sportsman.

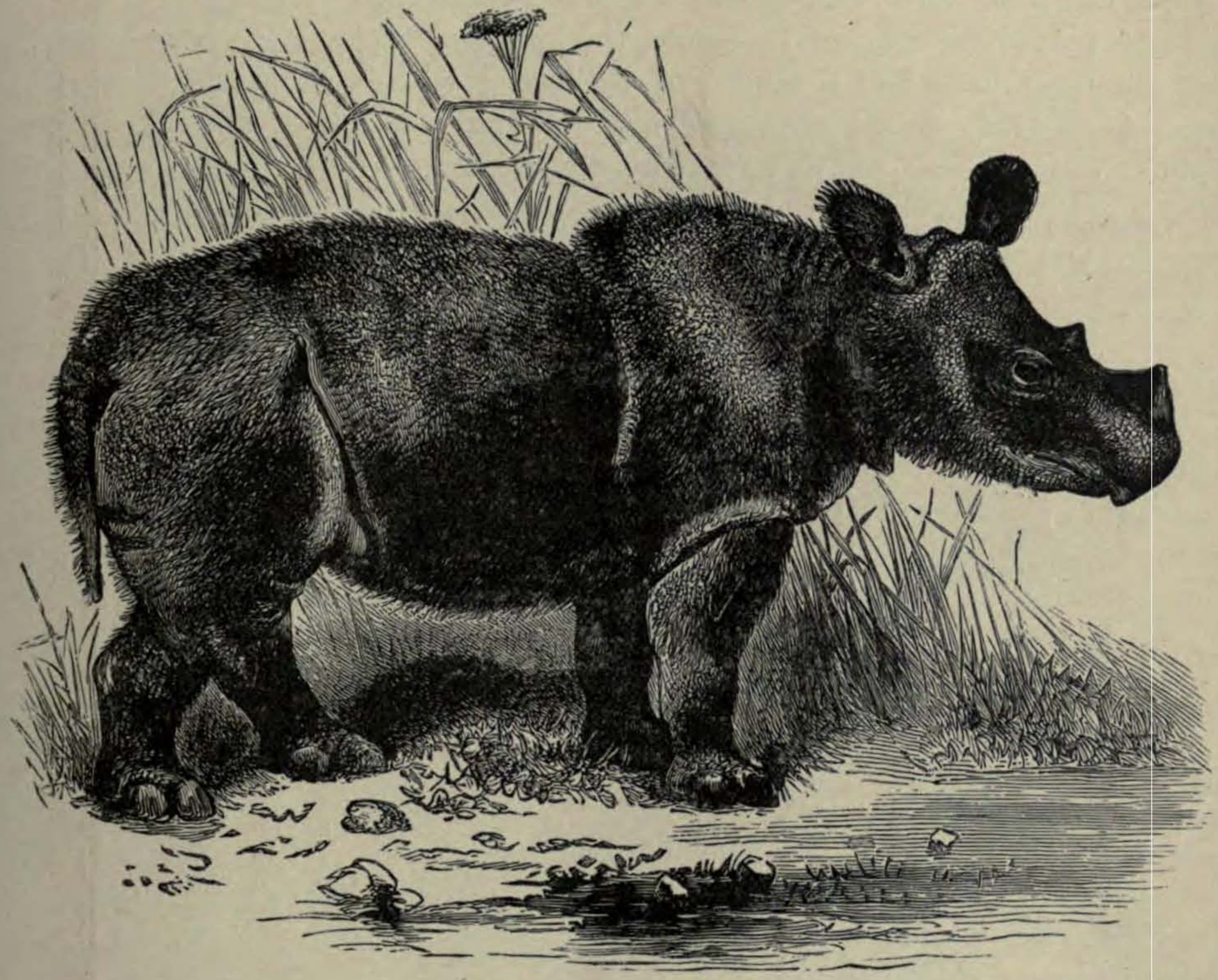
Allied Siwalik Rhinoceroses. In the Pliocene rocks of the Siwalik Hills at the foot of the Himalaya there occur remains of a single-horned rhinoceros (*R. sivalensis*), which appears to have been closely allied to the Javan species, of which the original home may accordingly have been India. More remarkable, however, is the occurrence of a fossil rhinoceros in the interior of the Himalaya, at an elevation of about sixteen thousand feet above the sea-level, which likewise seems to have been related to the same species. It may be added that another fossil Indian rhinoceros (*R. palæindicus*), of which an upper molar teeth is represented in the lower figure on p. 464, appears to have been the forerunner of the living great Indian rhinoceros; its molar teeth approximating to those of the latter, although of a rather less complex structure.

Sumatran Rhinoceros. Reverting to the living Asiatic species, the last of all is the Sumatran rhinoceros (*R. sumatrensis*), which is mainly characteristic of the countries to the eastward of the Bay of Bengal, occurring but rarely in Assam, although a single example has been obtained from Bhutan. From Assam it ranges through Burma and the Malay Peninsula to Siam, Sumatra, and Borneo; but it is quite unknown in Java.

Characters. This is the smallest of all the living species of rhinoceros, and differs from the preceding kinds in carrying two horns. It is further distinguished by its hairiness, although there is a certain amount of individual variation in this respect. As a rule, the greater part of the body is thinly covered with brown or black hair of considerable length, while there are larger or smaller fringes of hair on the ears and tail. The skin, which is rough and granular, and varies in colour from earthy brown almost to black, has the folds much less developed than in the single-horned species, and only the one behind the shoulders is continuing right across the back. The two horns are placed some distance apart, and when fully developed are thick and massive at the base, but very slender above, the front and longer one sweeping backwards in a graceful curve. In

many specimens the horns are, however, very short, and in examples kept in confinement like the one from which our figure is taken, they become worn down to mere stumps. The Sumatran rhinoceros differs from its two Asiatic cousins in having lost the pair of small incisor teeth in the lower jaw, in the front of which only the tusks remain, and even these are sometimes shed in old age. In these respects, therefore, this species, concomitantly with the presence of two horns, shows an indication of approximating to the African rhinoceroses.

In addition to the variation in the degrees of development of the hair, this species



THE SUMATRAN RHINOCEROS.[1]

The horns, as in most captive specimens, are abnormally short.

shows considerable individual differences in colour, and also in the relative breadth of the skull. A specimen purchased in 1872 by the Zoological Society of London for over a £1000, and exhibited in their gardens, differed from the ordinary form by its superior size, paler and browner colour, smoother skin, shorter and more thickly-tufted tail, and the longer, finer, and more reddish-coloured hair; the latter forming a long fringe on the ears, of which the insides were naked. This animal had also a much wider head than ordinary. It was accordingly regarded as a distinct species, under the name of the hairy-eared rhinoceros (*R. lasiotis*); but there is little doubt that it cannot be considered as anything more than a well-marked variety of the Sumatran species.

There is considerable variation in regard to the dimensions of this species, but

[1] Messrs. Macmillan & Co. have favoured the Editor with this figure.

Mr. Blanford considers that from 4 feet to 4½ feet will represent about the average height at the shoulder. In the above-mentioned specimen the height at the shoulder was 4 feet 4 inches, and the length from the tip of the snout to the root of the tail 8 feet; the weight of the animal being about 2000 lbs. On the other hand, in an adult female from the Malay Peninsula, the shoulder-height was only 3 feet 8 inches. There is also great variation in regard to the length of the horns, the hinder one being in some cases reduced to an almost invisible knob. Mr. E. Bartlett gives the following particulars of Bornean specimens. In one example the front horn was 4½ and the second 2 inches in length; in a second, while the front horn measured 5 inches, the hind one was a mere knob; and in a third, the front horn had a length of 19 inches with a girth of 16 inches, the second horn being fairly developed, although not more than about 3 inches in height. A single specimen of a front horn had a length of 11 inches, with a basal girth of 11½ inches; but the maximum recorded length is upwards of 32 inches along the curve.

Habits. The molar teeth of this species are almost indistinguishable from those of the Javan rhinoceros, and as its habits appear to be very much the same as those of the latter, the diet of the two is probably also similar. The Sumatran rhinoceros inhabits hilly forest-districts, and it has been observed in Tenasserim at an elevation of four thousand feet above the sea. It is a good swimmer, and is reported to have been seen swimming in the sea in the Mergui Archipelago. Although shy and timid in the wild state, in captivity it soon becomes tame.

Mr. E. Bartlett states that in Borneo the dyaks are very partial to the flesh of this species as an article of diet. And he adds that the kyans—a race very distinct from the dyaks—procure the horns for barter, for which they receive a high price from the Chinese, who import them to China for medicine. The horns are ground into powder for some diseases, while others are cut into minute fragments to carry about the person. The same writer further states that this rhinoceros is becoming extremely rare in the province of Sarawak, on account of the value set upon its horns, but in Central and North Borneo in the very old jungle it is more plentiful.

In 1872 a Sumatran rhinoceros, recently imported into London, gave birth to a calf; and this event afforded Mr. A. D. Bartlett data for considering that the period of gestation was a little over seven months. This however, as Mr. Blanford points out, seems a very short period for such a large animal, and contrasts very markedly with the length of time assigned by Hodgson to the great Indian rhinoceros.

Allied Extinct Species. No fossil species allied to the Sumatran rhinoceros has hitherto been obtained from the Tertiary deposits of India, whence we may conclude that the latter is probably a comparatively recent immigrant into North-Eastern India. Schleiermacher's rhinoceros (*R. schleiermacheri*) of the Miocene and lower Pliocene deposits of France and Germany appears, however, to have been very closely allied to the Sumatran species; and thus affords, in common with some other fossil mammals, evidence of an eastward migration of types formerly inhabiting Western Europe.

African Rhinoceroses.

Although it is commonly reported by hunters, who in many cases derive their information from native sources, that there are several kinds of rhinoceros inhabiting Africa, we have at present definite acquaintance with only two species, namely, the common African rhinoceros, frequently spoken of as the black

THE COMMON AFRICAN RHINOCEROS ($\frac{1}{29}$ nat. size).

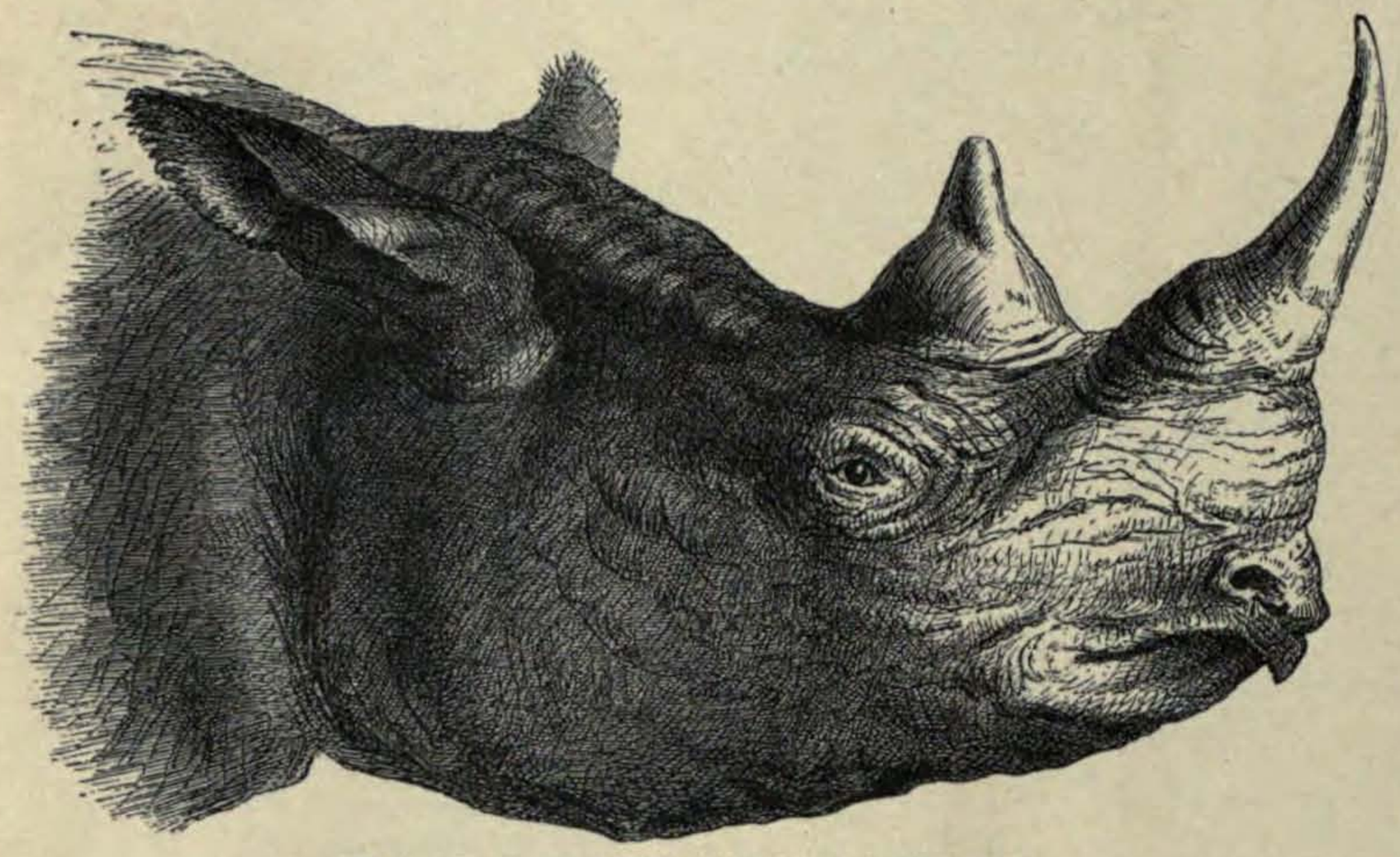
rhinoceros, and the square-mouthed, or Burchell's rhinoceros, commonly termed the white rhinoceros. Since there is but little, if any, marked difference in the colour of the two animals, the names founded on this character are best discarded. It is possible, however, that a third species may inhabit East Africa.

Characters. Both species are furnished with two horns, which attain a greater development than in either of their Asiatic relatives. From

all the latter the African rhinoceroses are distinguished by the absence of any permanent folds in the skin, and also by the want of both incisor teeth and tusks in the adult state; such teeth if they occur even in the young being rudimentary and functionless. In consequence of this want of front teeth, the extremities of both the upper and lower jaws are much shorter than in the Asiatic species. Moreover, whereas in the latter the nasal bones are narrow and terminate in a point, in the African rhinoceroses they are rounded and truncated in front. In both kinds the skin of the body is almost entirely naked and comparatively smooth; but there is generally a little fringe or tuft of hairs on the ears and tail.

Common African Rhinoceros.

The common African rhinoceros (*R. bicornis*) is the smaller of the two species, and is also the one which has by far the wider distribution, extending, in suitable districts, through Eastern and Central Africa, from Abyssinia in the north to the Cape Colony in the south. From the character of the upper lip this species is sometimes spoken of as the prehensile-lipped rhinoceros, while in Southern and Eastern Africa it is variously termed the boreli or upetyani, the keitloa, and the kulumani; these different native names, as we shall notice later, referring to differences in the relative proportions of the two horns. This species is best characterised by the pointed and slightly prehensile upper lip, the small and rounded nostrils, and the position of the eyes being a little behind the continuation of the axis of the second horn. The ears are of moderate length, and furnished with a fringe of hair along the upper edge, while in some cases they are rounded above, although in others more pointed. There is a considerable amount of individual variation as to the length and amount of the fringe of hairs on the margins of the ears. The molar teeth of this rhinoceros are of the type of the uppermost of the two represented on p. 464. That is to say, they have comparatively low crowns, a well-marked buttress at their front outer angle, the middle valley not divided into two moieties by a cross-partition, and the surface of the crown when worn raised into two distinct ridges. The latter feature shows that the jaws have a somewhat champing, instead of a completely grinding action; and since we know that this species feeds almost exclusively on twigs and leaves, it may be assumed that molar teeth of this pattern always indicate a similar diet for their owners. The horns are well developed in both sexes.



HEAD OF THE COMMON AFRICAN RHINOCEROS.

As regards dimensions, in an adult female from Abyssinia described by Mr.

Blanford, the length of the tip of the snout to the end of the tail measured along the curves was 6 feet 9 inches, of which 1 foot 9½ inches was occupied by the tail, and the height at the shoulder 4 feet 8½ inches. These dimensions are, however, exceeded by males, which, according to Sir S. Baker, may stand from 5 feet 6 inches to 5 feet 8 inches at the shoulder.

The proportions of the two horns to one another vary greatly, the front one being in some cases much longer than the hinder, while in others the two are nearly or quite equal, and, more rarely, the second horn may be the longer of the two. The native name boreli is applied to those individuals in which the second horn is the shorter, while keitloa is restricted to such as have horns of equal length, or the second longer than the first. Mr. Selous has shown that there is a complete transition from the one to the other type, and consequently that such differences cannot have any specific value.

Size of Horns. In regard to the length attained by the horns of this species, it appears that in Abyssinia and other parts of North-East Africa, from Sir S. Baker's experience, the front horn rarely or never exceeds 23 or 24 inches, but much larger dimensions are recorded in South and East African specimens. Thus examples of the front horn are described as measuring 44, 43, 41, 40, and 38½ inches in length; but with the exception of the last, in which its length is 21 inches, in none of these examples are the dimensions of the second horn recorded. In one specimen the length of the first and second horns were respectively 31 and 19½ inches, in another 28¾ and 15¼, in a third 28¼ and 8⅜, in a fourth 27 and 16½, in a fifth 21½ and 18¾, and in a sixth 14⅝ and 14¾ inches. The front horn is generally nearly circular in section and slightly curved backwards, while the second is nearly straight, much compressed, and with its hinder edge often sharper than the front one. Sir J. Willoughby killed in East Africa an example of this rhinoceros having a small rudimental third horn behind the normal pair.

Habits. In Abyssinia Mr. Blanford states that this rhinoceros is confined to the lower elevations, not ascending above some five thousand feet. In the valley of the Anseba he writes that it "inhabits the dense thickets on the bank of the stream, which are intersected in all directions by the paths made by these animals. In the densest parts, where roots and stems render the jungle almost impervious, there are places known by the inhabitants as rhinoceros-houses. The stems and branches have generally been broken away or pushed back, so as to leave a clear space, about fifteen or twenty feet in diameter, at the bottom of which the ground has been worn into a hollow by the trampling and rolling of the animal in wet weather. These houses are used as retreats during the heat of the day. On two or three occasions we disturbed a rhinoceros from one of these, and he rushed off with much noise and loud snorts through the bushes. So far as we could learn from our observations, these animals enter the thick jungle early in the morning and rest until one or two o'clock in the day, then they leave their thickets and go out to feed, usually remaining, however, amongst high bushes. At the time of year in which we visited the country, rain generally set in in the afternoon, and, even if it did not rain, the sky was overcast. In the clear weather the rhinoceroses are said never to appear before evening. They are great browsers, feeding chiefly on the young shoots and branches of acacia and other trees, or on fruits; so far as I

could see, they do not generally eat grass. Their movements are very quick, their usual pace being a smart trot, and the numerous tracks show that they move about a good deal." After expressing his doubts as to the statements of the natives that a man on horse cannot escape from one of these animals, Mr. Blanford adds that "they are easily eluded by turning, as they are not quick of sight, and, like most mammals, they never look for enemies in trees; consequently, a man two or three feet from the ground will remain unnoticed by them if he keeps quiet. They are said to be extremely savage, and unquestionably the first one killed by us charged most viciously. . . . I cannot help thinking, however, that their savage disposition has been somewhat exaggerated." Most of these animals seen by the members of the Abyssinian Expedition were in pairs,—an old female with a nearly full-grown calf,—but on one occasion four were observed. Mr. Blanford compares the snort of alarm or rage uttered by these animals when disturbed to the noise of a locomotive rather than to the sound of any other animal.

The foregoing account is confirmed in all essential particulars by the observations of Mr. Selous in South-Eastern Africa, who writes that this species of rhinoceros "lives exclusively upon bush and roots, eating not only the young leaves as they sprout from the end of a twig, but also chewing up a good deal of the twig itself. It is owing to the fact that this species lives upon bush that its range is very much more extended than that of the square-mouthed rhinoceros; for there are many large districts of country in the neighbourhood of the Zambesi to the eastward of the Victoria Falls covered almost entirely with an endless succession of rugged hills, almost devoid of grass, though well wooded, in all of which districts the prehensile-lipped rhinoceros is numerous, as it thrives well upon the scrubby bush with which the hillsides and valleys are covered; whereas the square-mouthed species, though common in the forest-clad sand-belts and broad grassy valleys which always skirt the hills, is seldom or never found among the hills themselves, which is doubtless because the pasturage is too scanty to enable it to exist."

The same writer also tells us that this rhinoceros, like the larger African species, exhibits extraordinary activity in getting over hilly and rocky ground, and that it can traverse places which at first sight appear utterly impracticable for an animal of its bulky and apparently clumsy build. We also learn from the same observer that while the present species of rhinoceros always walks with its nose carried high in the air, the other kind walks with its muzzle close to the ground. Again, whereas in the common species the calf invariably follows its mother, the offspring of Burchell's rhinoceros as constantly precedes its parent.

Mr. Selous agrees with Mr. Blanford that the ferocity of the prehensile-lipped rhinoceros has been much exaggerated, and he is, indeed, inclined to regard it as an animal of a rather cowardly, if not exactly peaceable, disposition. It must, however, be borne in mind that those sportsmen who have attributed a ferocious disposition to this species, always make a distinction in this respect between the boreli and the keitloa, and give to the latter a much better character than they assign to the former. Whether any difference in this respect is really associated with the variations to which these names refer, we are not prepared to say (although it seems most unlikely); but it is important to notice that even those who attribute extreme ferocity of disposition to some individuals of this species have never

asserted that this applies to all. Mr. Selous states that he was only once charged by a common rhinoceros, and this after strong provocation, and even then the animal did not charge home; and he considers that vicious individuals are comparatively few and far between. "These animals," writes the same observer, "are very quick and restless in their movements, and either very inquisitive or mistrustful of their eyesight, for usually, when disturbed by anyone approaching from below the wind, they will jump up with a snort, gaze fixedly at the intruder, then, with another snort, trot quickly a few steps nearer, stand again, move their heads with a quick motion, first to one side then to the other, advance again perhaps, and finally, when shouted at, whisk quickly round and trot away in grand style, with tail screwed up over their backs." Recounting his experiences in Mashonaland, where he sometimes met with five, six, or even eight in a day, Mr. Selous says that whenever these animals met his wind, they invariably made off at once, but when they only saw him, they acted in the manner above described. On occasions of the latter kind the Kaffirs would take refuge up the nearest tree, and would urge their master to do likewise. He, however, always stood his ground, and found that although the rhinoceroses would sometimes advance in his direction from about forty to twenty yards' distance, yet, that if he threw stones or assegais at them, or even simply shouted, they always eventually turned tail and fled. If, however, a rhinoceros is fired upon when thus facing a man, it will, after dropping upon its knees, very often spring up and rush straight forwards; but Mr. Selous attributes such action not to any intention of making a charge, but merely to the animal being maddened by the shock and rushing blindly ahead; and he considers that it is thus that many of the accounts of its fierceness and aggressiveness have originated. He adds, however, that one of these animals when in full career, and either wounded or tired, will not hesitate to charge any obstacle that may be in its path, even a waggon and a team of oxen. Finally, Mr. Selous states that he believes the pursuit of the common African rhinoceros to be attended with less danger than that of either the lion, elephant, or buffalo; and he supports this opinion by observing that both Kaffirs and Hottentots, who but seldom care to molest a lion, never have the slightest hesitation in attacking a rhinoceros. The foregoing account is confirmed in all essential particulars by Sir John Willoughby, who suggests, however, that the rhinoceros is apt to be dangerous at certain seasons.

In South-Eastern Africa Mr. Drummond states that both species of rhinoceros generally leave their lairs about four o'clock in the afternoon, or, in districts where there are many human beings, somewhat later. They commence feeding in the direction of their drinking-places, to which they travel by regular beaten paths, and arrive at the same somewhere about dark. If the drinking-place is a mud-hole they frequently refresh themselves with a roll, after drinking their fill. They then start for their favourite thorn feeding-grounds, where they remain till day-break, when they generally again drink. At an earlier or later hour after this, the time being to some extent dependent on the freedom of the district from human intrusion, they retire to their sleeping-places, which they reach at any rate before the heat of the day. The lair is always in an extremely sheltered and deeply-shaded spot, and so heavily do they slumber that a practised stalker could almost touch them with the muzzle of a gun, unless they are awakened by the birds which

accompany them in search of the ticks with which they are infested. Mr. Hunter states, however, that in the Kilima-Njaro district rhinoceroses lie out in the open plain during the day.

The common rhinoceros is met with in Southern Africa generally either solitary or in family-parties of two or three. In the latter case it is usually a female accompanied by her calf; but Sir J. Willoughby met a male, female, and half-grown calf together, and as in this instance the horns of the male were much shorter than those of the female, it may be that the longer horns generally belong to the latter sex. Occasionally several full-grown individuals are seen together, Mr. Drummond stating that on one occasion he met with a party of six or seven. Sir J. Willoughby relates that once he shot one of a pair of these rhinoceroses, which was immediately fiercely attacked and rolled over by its companion. When a cow rhinoceros is killed, the calf generally remains by the dead body of its parent, from which it can with difficulty be dragged away.

Hunting.

Like most other large African animals, the common rhinoceros is rapidly decreasing in numbers from the incessant pursuit to which it is subjected in the southern and eastern portion of the continent. Writing in 1881, Mr. Selous said that it was still fairly common in South-Eastern Africa, although it had been nearly exterminated in the regions to the westward. Only a few then remained on the Chobi, while between that river and the Zambesi there were none, and the natives said that there never had been any in that district. Northwards of the Zambesi they were, however, again met with, and from thence they doubtless extend through the whole of Central Africa to Abyssinia and the Sudan. In the Kilima-Njaro district Sir J. Willoughby's party found these rhinoceroses very plentiful in 1886, having on one occasion seen as many as sixteen head during a single day's march.

In Southern Africa the common rhinoceros is hunted either by being followed up when out feeding on the plains, or by the hunter lying in wait at its drinking-places. In the Sudan the Hamram Arabs are, however, in the habit of chasing the rhinoceros on horseback, and of ham-stringing it by a dexterous stroke of a long two-handed sword. This sport, according to Sir S. Baker, tries the speed of the best horses, and that writer's account of the chase of a couple of these animals, which, after running more than two miles, defied further pursuit by escaping into thick cover, is probably known to many of our readers. An Arab hunter explained to Sir S. Baker, "that at all times the rhinoceros was the most difficult animal to sabre, on account of his extraordinary swiftness, and, although he had killed many with the sword, it was always after a long and fatiguing hunt, at the close of which the animal becoming tired generally turned to bay, in which case one hunter occupied his attention, while another galloped up behind and severed the hamstring. The rhinoceros, unlike the elephant, can go very well upon three legs, which enhances the danger, as one cut will not disable him." A less sporting method adopted by the Arabs of the same regions is to dig a hole about two feet deep by fifteen inches in diameter in the animal's run, and to place in the centre a rather elaborately-constructed snare, to which is attached a rope with a heavy log of wood at the other end. When the rhinoceros steps on the pit, one of its feet is caught in the running noose. When caught, the first effort of the rhinoceros is to

escape, and he forthwith pulls the log from the trench in which it was buried. This log, writes Sir S. Baker, "acts as a drag, and, by catching in the jungle and the protruding roots of trees, it quickly fatigues him. On the following morning the hunters discover the rhinoceros by the track of the log that has ploughed along the ground, and the animal is killed by lances or by the sword."

The same writer adds that the hide of a rhinoceros will produce seven shields; these being worth about two dollars each, as simple hide before manufacture. The horn is sold in Abyssinia for about two dollars per pound, for the manufacture of sword-hilts, which are much esteemed if of this material. In South Africa the flesh of the common rhinoceros is much appreciated by the natives as food; but as the animal never has any fat, the meat is somewhat dry.

Like other members of the genus, this rhinoceros appears to be long-lived even in captivity, a specimen from Nubia, acquired by the Zoological Society of London in 1868, having lived in the menagerie till 1891.

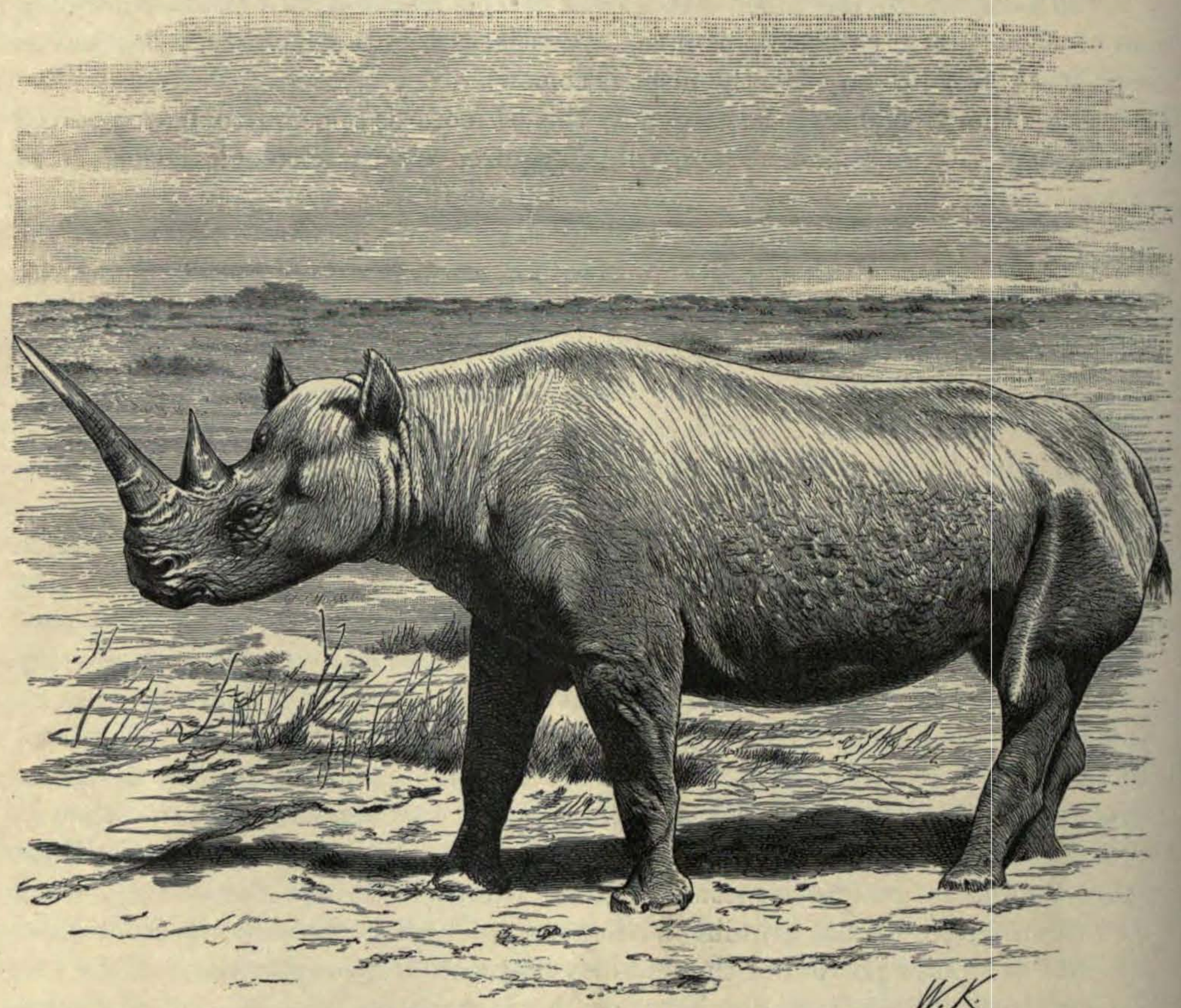
Extinct Ally. The immediate ancestor of this species appears to have been the extinct thick-jawed rhinoceros (*R. pachygnathus*), of which a series of finely-preserved remains have been obtained from the well-known fresh-water deposits of Pikermi, near Attica, belonging to the Pliocene period.

Burchell's Rhinoceros. The largest of the group is the square-mouthed, or Burchell's, rhinoceros (*R. simus*), commonly known as the white rhinoceros, which is now, alas, practically exterminated. In addition to its great size, this species is characterised by its bluntly-truncated muzzle and the absence of a prehensile extremity to the upper lip, as well as by the great proportionate length of the head, which in large specimens is more than a foot longer than in the common species. Moreover, the nostrils form long narrow slits; the eye is placed entirely behind the line of the second horn; and the ear is very long, sharply pointed at the extremity, where it has but a very small tuft of hairs, and has its lower portion completely closed for some distance, so as to form a tube. The front horn attains a greater length than in the common species. In the skull the extremity of the lower jaw forms a much wider and shallower channel than in the *R. bicornis*, and the structure of the upper cheek-teeth is different. These teeth resemble in general structure those of the great Indian rhinoceros, having very tall crowns, with flat grinding surfaces, no distinct buttress at the front outer angle, and the outer portion of the middle valley cut off by a partition. They are, however, quite peculiar among existing species, in having a large amount of cement investing the interior and filling up the valleys of the crown. Moreover, the third molar in the upper jaw, instead of being triangular in shape, closely resembles the tooth in front of it; a peculiarity found elsewhere only among certain extinct hornless species. In colour Burchell's rhinoceros differs but little from the common species, the general hue of both being a slaty grey.

Dimensions. In height this rhinoceros is known to reach $6\frac{1}{2}$ feet at the shoulder, and it is said that specimens were formerly obtained which slightly exceeded these dimensions. As regards length, our information is far from satisfactory. It has been stated that the length may be something between 18 and 19 feet; but this seems quite incredible, more especially as the proportions of our figure indicate that the length was rather more than double the height, which

would make it about 14 feet. One of the specimens referred to below has a length of 12 feet 1 inch, and a height at the shoulder of 6 feet 2 inches.

There is fully as much variation in the relative length of the horns as in the common species, the second horn being sometimes a mere stump, and at others attaining a length of 2 feet, while in some instances both are comparatively short. The front horn is, moreover, liable to considerable variation in shape. Thus, in the typical form of the species, it curves backwards in a more or less bold sweep, as shown in our figure of the head, the individuals exhibiting this form being



BURCHELL'S RHINOCEROS ($\frac{1}{30}$ nat. size).

known to the Bechuanas by the name of mohohu. In other cases, as shown in our illustration of the entire animal, the front horn is nearly straight, with a forward inclination, specimens with this type of horn being designated by the natives as the kabaoba. When the anterior horn is straight and attains the length of about a yard, the point touches the ground as the animal walks along when feeding, and such horns consequently always show a flat surface on the front of the tip produced by friction. It was at one time considered that the mohohu and the kabaoba were distinct species, but Mr. Selous has shown not only that they consort together, but that there is a complete transition from the one type of horn to the other. As a rule, the horns of females are longer and more slender than those of males.

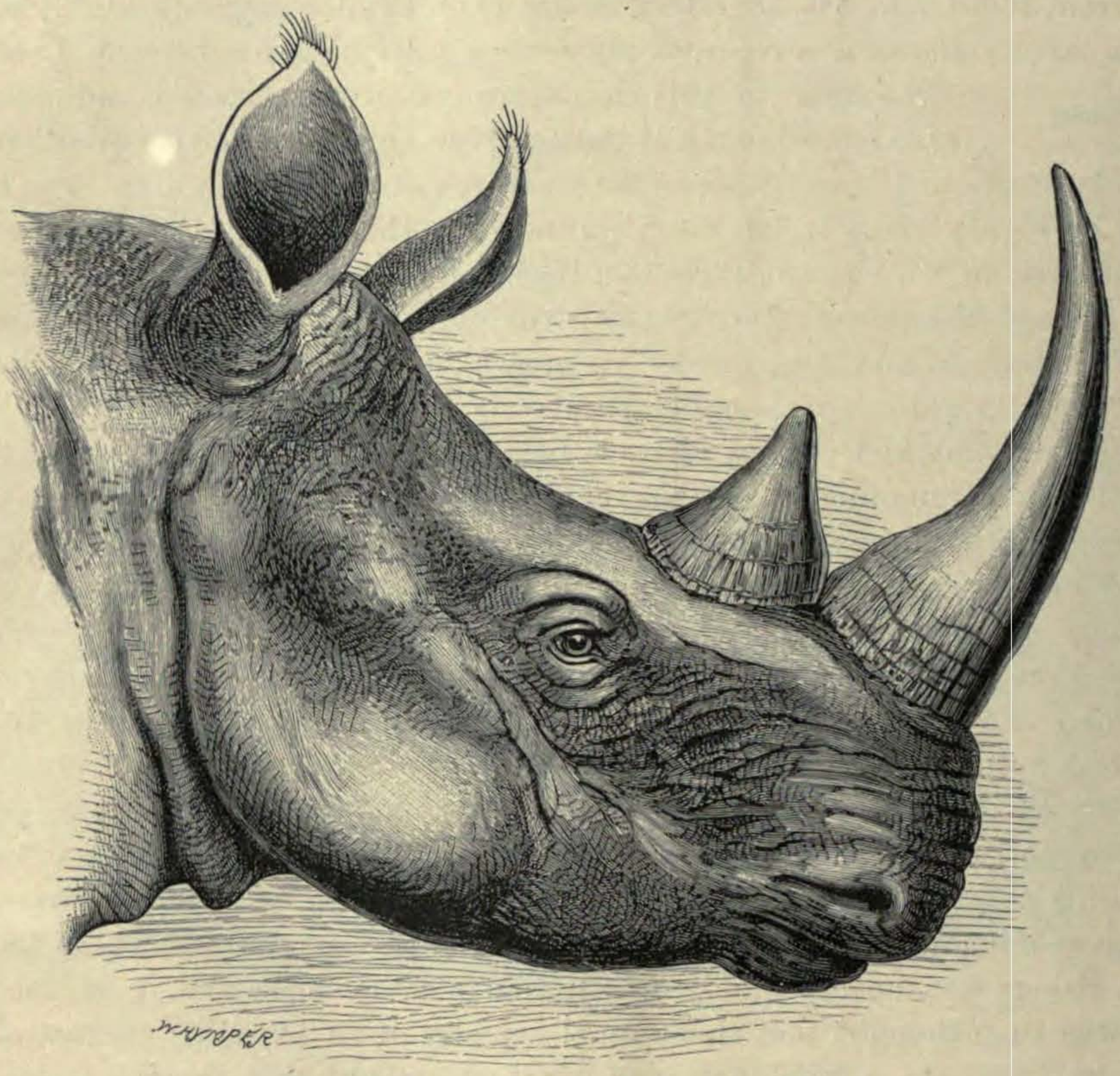
The longest known horn is one of the kabaoba type in the British Museum, of which the total length is 56½ inches. The history of this specimen is unknown, but it has been in the collection for a very long period. Next to this is an example of the mohohu type recorded by Mr. Selous, of which the length is given as 54 inches. Other fine specimens of the front horn measure 44, 42¾, 40, and 38½ inches. In examples where both horns have been preserved, the length of the front one in one case is 37⅜ and that of the hinder 17⅞ inches, while in another these dimensions are 33 and 13 inches. At the time when these rhinoceroses were abundant it was the ambition of every South African chief to possess a long staff, or *kerrie*, made from a front horn; and it is, therefore, as Mr. H. A. Bryden suggests, highly probable that the largest dimensions recorded above may have been considerably exceeded.

Distribution. The range of this rhinoceros was always limited, and apparently never extended north of the Zambesi; this restricted distribution being, as already mentioned, largely due to the creature's grass-eating habits. For the last seventy or eighty years it has been unknown to the south of the Orange River, but, according to Mr. Bryden, there is a tradition that it formerly roamed over the greater part of the Cape Colony. About the middle of the present century, when Gordon Cumming, and afterwards Andersson, made their well-known hunting-tours, Burchell's rhinoceros was comparatively common in parts of the Kalahari Desert, Ngamiland, and various districts between the Orange and Zambesi Rivers. Indeed, Gordon Cumming states that on one occasion he saw upwards of twelve of these magnificent animals together in long grass, while Andersson and Chapman speak of having shot as many as eight in a single night, while they were drinking at a water-hole during the dry season. Mr. Selous remarks, however, that the numbers thus met with were probably drawn together from over a large tract of country, as at such times drinking-places are few and far between. In 1874 Mr. Selous met with a considerable number of these rhinoceroses on the Chobi, but on again visiting the same district in 1877 he only came across traces of two, while in 1879 they had completely disappeared. In North Mashonaland there were, however, still a considerable number between 1878 and 1880, while others were to be met with in a small tract on the Sabi River in South-East Africa. About ten years ago Mr. Selous was, however, only able to find a single specimen in Mashonaland, and it was then thought that this animal, which fell to his rifle, was actually the last of its race. In a remote corner of Mashonaland this indefatigable hunter found, however, some half-dozen individuals still living in 1892, two of which were subsequently shot by Mr. R. T. Coryndon. In the north Kalahari Desert the species had been completely exterminated some years previously to 1890.

The extirpation of this rhinoceros is the more to be regretted since our museums are very badly off for specimens. It is, however, fortunate that Mr. Coryndon has succeeded in bringing home the skeletons and skins of two adult examples, which are preserved in the British Museum and the Rothschild Museum at Tring; while there is also a stuffed specimen in the Museum at Leyden. In addition to a magnificent skull, with horns, the British Museum likewise possesses a fine series of detached horns.

Habits. In treating of the common African rhinoceros, we have already had occasion to refer to the exclusively grass-eating habits of this

species, and the consequent restriction of its habitat to open grassy plains. We have also alluded to its habit of walking with its head carried close to the ground; and likewise to the circumstance that the calf always precedes its mother when walking. It may be added that the mother appears to direct the course of her offspring with her long front horn. As regards its time of feeding and taking repose, the animals of this species closely resemble those of the ordinary kind. Mr. Selous states that "their sight is very bad, but they are quick of hearing and their scent is very keen; they are, too, often accompanied by rhinoceros-birds, which, by running about their heads, flapping their wings, and screeching at the



HEAD OF BURCHELL'S RHINOCEROS.—After Sclater.

same time, frequently give them notice of the approach of danger. When disturbed, they go off at a swift trot, which soon leaves all pursuit from a man on foot far behind; but if chased by a horseman they break into a gallop, which they can keep up for some distance. However, although they run very swiftly, when their size and heavy build are considered, they are no match for an average good horse. They are, as a rule, very easy to shoot on horseback, as, if one gallops a little in front of and on one side of them, they will hold their course, and come sailing past, offering a magnificent broadside shot, while under similar circumstances a prehensile-lipped rhinoceros will usually swerve away in such a manner as only to present his hind-quarters for a shot."

These animals were generally found in pairs or in parties of three, although,

as already mentioned, sometimes considerably more were seen together. Although, as we have seen, there is some difference of opinion as to the temper and disposition of the other species, all sportsmen agree that Burchell's rhinoceros was generally a harmless and inoffensive creature. Still, sometimes it would when wounded make a charge; and from the enormous size of the animal such a charge was a serious matter for those against whom it was directed. On one occasion Mr. Oswell caught sight of one of these rhinoceroses, and, putting spurs to his horse, soon came up alongside. He fired with good effect, but the animal, instead of attempting to escape, eyed its adversary for a moment, and then deliberately advancing, made a sudden rush at his horse, thrusting the long front horn completely through the animal's body, so that the point of the weapon struck the rider's leg through the flap of the saddle on the other side. Fortunately, Mr. Oswell was so little injured, that he was enabled to disengage himself from the body of his dead horse, and kill his formidable opponent.

When shot through the heart or both lungs this rhinoceros, like the other species, Mr. Selous tells us, is quickly killed. If, however, the bullet penetrates but one lung, they will go on for miles, although blood may be streaming from their mouth and nose. Similarly, they will hold on their course, at first at a gallop and then at a trot, with a broken shoulder, for more than a mile; but a broken hind-leg brings them immediately to a stop. The latter circumstance is somewhat at variance with Sir S. Baker's account of hunting the common rhinoceros in the Sudan, referred to on p. 478.

Burchell's rhinoceros differed from the other African species in that during the autumn and winter months, that is to say from March till August, it accumulated an enormous quantity of fat; and at such times its flesh is stated to have been of excellent quality, somewhat resembling beef, but with a peculiar and characteristic flavour of its own. The favourite dish was the hump on the withers, which was cut out and cooked with the skin on in a hole in the ground. The flesh of the calf was excellent at any season, and has been compared to very tender veal.

Holmwood's Rhinoceros.

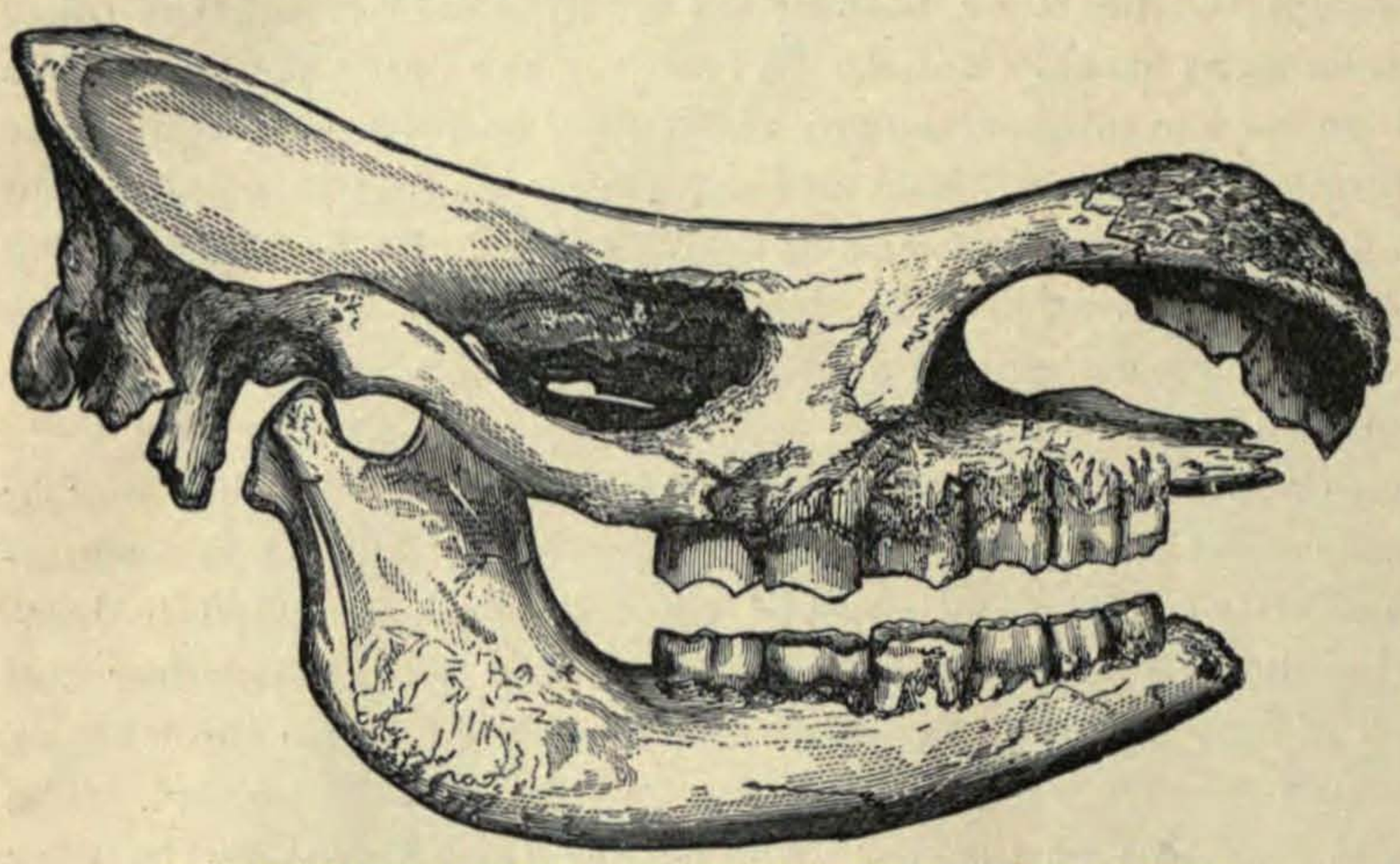
Certain very remarkable front horns of a rhinoceros obtained from traders at Zanzibar, and doubtless belonging to an East African form, may possibly indicate a third species, which may be known as Holmwood's rhinoceros. These horns, one of which measures 42 inches, are characterised by their great length and slenderness, coupled with the small size of the base. It has been suggested that they are abnormal horns of the female of the common species, but it is quite probable that they belong to a totally different animal, which may be more nearly allied to Burchell's rhinoceros.

Extinct Rhinoceroses.

In the course of the preceding paragraphs, some reference has been made to certain extinct species of rhinoceroses which approximate closely to some of the existing members of the group. Besides these, there are, however, a multitude of extinct species, which ranged not only over Europe and Asia, but likewise North America. It has, indeed, been suggested that America was the original home of

these animals, from whence they migrated to Asia and Europe; but it appears to us that the evidence is equally in favour of the migration having been in the opposite direction. These rhinoceroses occur throughout the Tertiary period as far down as the upper Eocene division; and even at that low horizon many of the species may be referred to the living genus, although in most cases they were unprovided with horns, while some of them had four toes to each fore-foot. Rhinoceroses are, therefore, even more ancient animals than tapirs.

Mention has already been made of a rhinoceros from Greece, which was closely allied to the common living African species; but there were also several other extinct Old World kinds resembling the existing African rhinoceroses in the presence of two horns and in the absence of front teeth, while in some cases there is evidence to prove that their skins were of the smooth type. One of the most remarkable of these species is the broad-nosed rhinoceros (*R. platyrhinus*) from the Siwalik Hills at the foot of the Himalaya, which was an enormous animal, with upper molar teeth resembling in structure those of Burchell's rhinoceros, although the last one was of the ordinary triangular shape. The other species, with molar teeth of similar type, is the woolly rhinoceros (*R. antiquitatis*), so called from the thick coat of woolly hair with which its body was covered. Skeletons, bones, and teeth of this species have been found in the cavern and other superficial deposits of the greater part of Europe, including England, while entire carcases occur frozen in the ice of the Siberian "tundra." From these frozen specimens it has been ascertained not only that the skin was covered with woolly hair, but likewise that it was devoid of the permanent folds characterising the Asiatic species. The horns of the woolly rhinoceros appear to have rivalled in size those of the living African Burchell's rhinoceros. From the structure of their upper molar teeth it may be inferred that both the broad-nosed and the woolly rhinoceros were grass-eaters. In Siberia, however, portions of needles of conifers and of twigs of other trees have been found in the interstices of the molar teeth of the latter; from which it has been assumed that the animal was a branch-eater. It is, however, quite probable that while in Siberia it may have been compelled from lack of its proper food to take to feeding upon leaves and twigs, yet that in the more southern portion of its range it resembled its allies in being entirely a grass-eater.



SKULL OF EXTINCT RHINOCEROS FROM THE BRICK-EARTH OF ESSEX.

During the Pleistocene period there were three other species of two-horned

rhinoceroses without front teeth, inhabiting England and other parts of Europe, which had upper molar teeth of the general type of those of the common African species, although their skulls were very different. Of these, the Leptorhine rhinoceros (*R. leptorhinus*) and the Megarhine rhinoceros (*R. megarhinus*) are found in the brick-earths of the Thames valley and other superficial deposits; while the Etruscan rhinoceros (*R. etruscus*) occurs in the somewhat older "forest-bed" of the Norfolk coast, and likewise in the upper Pliocene beds of Italy and France. The Leptorhine and Megarhine species have tall-crowned cheek-teeth, and (as shown in the accompanying figure) are characterised by the presence of a vertical bony partition in the skull dividing the two chambers of the cavity of the nose. In this respect they resemble the woolly rhinoceros; a rudiment of the same feature also occurring in the living Javan rhinoceros. The Etruscan rhinoceros, on the other hand, has shorter-crowned cheek-teeth, and no such bony septum in the nasal cavity. That all these three species browsed on leaves and twigs may be pretty confidently asserted from the structure of their upper molar teeth; while a carcase found embedded in the ice of Siberia belonging to either the Leptorhine or the Megarhine species, shows that these had smooth skins like the living rhinoceroses of Africa. The Deccan rhinoceros (*R. deccanensis*) and the Karnul rhinoceros (*R. karnuliensis*), from the superficial deposits of Southern India, indicate that smaller representatives of the two-horned branch-eating group likewise inhabited that country.

Reference has already been made to the occurrence in the Miocene deposits of Europe of an extinct two-horned rhinoceros provided with upper and lower front teeth, which was allied to the living Sumatran species. Throughout the middle Tertiary rocks of Europe, as well as in the Pliocene and Miocene of India, there are found, however, a number of rhinoceroses differing from any living species in the total absence of horns, while in those cases where their limbs are known the fore-feet were provided with four toes. Some of these animals were of very large size, and all of them had molar teeth of the type of that represented in the upper figure on p. 464 (which belongs to one of the Indian species), and their jaws were furnished with large front teeth. Moreover, in one of the Indian representatives of this hornless group, the last molar tooth was of nearly the same form as that in front of it, instead of being triangular. That all these species subsisted on leaves and boughs, may be inferred from the structure of their short-crowned molar teeth; and it may be observed here that all the older Ungulates had short-crowned cheek-teeth, adopted for champing twigs and leaves rather than for masticating grass; whence it may be concluded that grassy plains are probably a comparatively recent feature in the history of our globe. Hornless rhinoceroses also occur in the Tertiary deposits of North America, but at least the majority of these resembled existing types in having but three toes on each fore-foot; while their limbs were relatively shorter than in their Old World allies, and their bodies more elongated. Finally, there were certain other small rhinoceroses from the lower Miocene of both Europe and the United States, in which the front of the skull carried a very small pair of horns placed transversely instead of longitudinally.

The above are all the forms which can be included in the genus *Rhinoceros*.

There are, however, a number of allied extinct animals which connect the true rhinoceroses with more generalised extinct types of Odd-toed Ungulates. Such for instance is the Amynodon, from the Miocene Tertiary of North America, which was a rhinoceros-like animal with no horn, and the full typical number of forty-four teeth. That is to say, there were three incisors, a tusk, and seven cheek-teeth on each side of both jaws; the front teeth being like those of ordinary mammals, and not having the peculiarly modified form presented by those of the true rhinoceroses. Moreover, the whole of the three upper molar teeth were alike; and none of them had the processes projecting into the middle valley which are found in those of all true rhinoceroses. Probably the Amynodon also occurred in the lower Miocene and upper Eocene rocks of France. There were other allied types, but the above example is sufficient to show that the earlier rhinoceroses were far less different from tapirs and some extinct generalised forms to be noticed later on than are their modern representatives.

We must not, however, take leave of the rhinoceros family without referring to a most remarkable creature known as the elasmothere, which flourished during the Pleistocene period in Siberia. This creature was probably as large as Burchell's rhinoceros, and like that species had no teeth in the front of the jaws. The skull had a bony partition in the cavity of the nose, and carried on the forehead an enormous protuberance which, during life, doubtless supported a horn of very large size. The most remarkable feature about the elasmothere is, however, to be found in the structure of its cheek-teeth, which while formed on the type of those of the rhinoceroses, are greatly elongated, and have their enamel so much folded as to present some resemblance to those of the horse. Indeed, the elasmothere may be regarded as a highly-specialised grass-eating creature, presenting a relationship to an ordinary rhinoceros somewhat similar to that which the horse exhibits to certain extinct Ungulates noticed in the sequel.

The Horse Tribe.

Family *Equidæ*.

Under the general title of horses, zoologists include not only the animals to which that name is restricted in ordinary language, but likewise the asses, zebras, and quaggas, together with certain nearly-allied extinct animals. All these are characterised by having very high-crowned cheek-teeth, in which the enamel is thrown into a series of complicated foldings, and the deep valleys between the component columns completely filled up with cement. In the upper cheek-teeth, as shown in B and C of the accompanying figure, the outer columns (*pa*, *me*) of each tooth are flattened, and the premolars somewhat exceed the molars in size; while in the lower jaw the ridges are crescent-like, although much complicated by the foldings of the enamel. So different, indeed, are the molars of the horses from those of other Odd-toed Ungulates, that it is at first sight somewhat difficult to realise their fundamental unity of structure. A comparison of the three figures in the accompanying illustration will, however, clearly indicate how the structure of the tall-crowned molar of the horse is essentially the same as that of the low-