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MOUNT ROYAL AND GUILFORD AVENUES

BALTIMORE, MARYLAND

It is astonishing that the question of periodic fluctuations in the numbers of small mammals has been so neglected by mammalogists, when it merits much study. I would suggest that those who can do so select a locality which is especially suitable for several species of rodents, and as free from unnatural disturbances, such as intermittent cultivation and the proximity of foraging house cats, as possible. A fairly long line of traps—say 75—should then be set over as nearly the same ground as possible for several consecutive nights during the same month, preferably in the fall, of each year. If adequate notes be kept regarding the numbers of each species obtained and their ages, facts of the greatest value should be learned.

Pasadena, California.

RECENT AND HISTORICAL NOTES ON THE SQUARE-LIPPED RHINOCEROS (*CERATOTHERIUM SIMUM*)

BY HERBERT LANG

[*Plate 16*]

According to authentic reports the last South African square-lipped or white rhinoceros of the open veldt was shot in Rhodesia in the year 1895.¹ For a certain time thereafter numerous articles appeared either speaking of the square-lipped rhinoceros as one of the recently exterminated large mammals or at least considering it to be on the verge of extinction. Through Vaughan-Kirby's² interesting article we were informed about the few remaining white rhinoceroses protected in the Zululand Game Reserve between the Black and White Umfolosi Rivers (fig. 1), the conditions under which they live there, and their habits. Vaughan-Kirby had then (1920) secured two picked specimens, male and female, one for the Natal Museum at Pietermaritzburg, and one for the Durban Museum.

Dr. F. A. Lucas has kindly called my attention to the last Report of the South African Museum in which Peringuey³ announces that that institution "has after several attempts succeeded in obtaining the skin and skeleton of two examples of the Square-lipped White Rhino-

¹ Fitzsimons. *Nat. Hist. South Africa*, vol. 3, p. 209. 1920.

² *Ann. Durban Mus.*, vol. 2, pp. 223-242, pl. XXVII. 1920.

³ *Cape Town*, p. 2. (1922) 1923.

ceros" (*Ceratotherium simum simum*). The Cape Town Museum authorities are to be congratulated upon these valuable additions, for good representatives of this form ought to be in the natural history museums of South Africa. The measurements of the new male give the shoulder height as five feet eight inches and the length as fourteen feet seven inches from tip of nose to root of tail. The tail length is



FIG. 1. Map of Africa showing distribution of square-lipped rhinoceros of recent and Quaternary times. The South African race is now extinct except for a few individuals still living in the Umfolosi Reserve in Zululand. The West Nile race is also threatened with extinction due to its destruction by natives for food purposes and also on account of the easy access to its range by way of the Nile. The North African, or Quaternary Algerian, race undoubtedly lived contemporaneously with Paleolithic man. It probably had a much wider distribution than that indicated on the map, which merely includes localities from which fossil remains or rock engravings of it have been recorded. The dot in this latter range marks Ksar el Ahmar, the locality where the petroglyph (fig. 2) of *C. s. mauritanicum* was found.

not mentioned but from similar specimens of the northern race the writer measured it might be given as about twenty-nine inches, so that the total length of the animal would reach fifteen feet. No measurements of the horns of these specimens are given. Nor is it stated where these rhinoceroses were secured, but the Umfolosi Reserve in Zululand is the only known locality where they have been recorded of late years. Apparently this reserve has now been opened, since the recently exhibited moving pictures made by H. Snow clearly show the white rhinoceros, this being so far as I know; the first film of the South African form ever taken. There was no mistaking the characteristic longer skull and great hump on the shoulder. According to the captions it appears that specimens for the Oakland Museum of California were secured by Snow there and then. We can only hope that the Umfolosi Reserve proves to be so excellent a breeding ground that such permission may be extended to museums without in the least jeopardizing the admirable work of protection by former Natal Governments and the succeeding Provincial Administrations of the Union. The extinction of so unique a representative of Africa's big game fauna would be a real calamity. Through the efforts of A. K. Haagner, director of the National Zoological Gardens of South Africa, it is well known that policing such reserves is a difficult problem especially since most of the natives are certainly not keen about the preservation of the country's game. It will be most gratifying if the authorities responsible are able to maintain this heritage to posterity in fair numbers.

Peringuey also mentions that the Cape Town Museum owns a "kerrie" or knobbed stick made from the front horn of a rhinoceros and that its length, making allowance for parts lost in carving, would have been sixty-one inches. Considering that the best record, credited to Col. W. Gordon Cumming, of a remarkably slim front horn, is sixty-two and one-half inches, the Cape Town Museum owns at least the best part of a horn that comes close second to the still unique record. We have thus an indication that such huge horns might have been as numerous as various reports from the palmy days of South African caravan life and hunting stated.

Peringuey's belief, however, that the horn from which the knobbed stick was fashioned belonged to the "*keitloa*" variety is undoubtedly erroneous. A. Smith⁴ was under the impression that rhinoceroses in

⁴ Illus. Zool. South Africa, pl. I and text. 1849.

which both horns attained the same height were worthy of specific distinction and named them *keitloa*. But Smith's figure and text clearly prove that he meant the black or hook-lipped rhinoceros, which is not known to have such long horns, the record held by East Africa being given as fifty-three and one-half inches.⁵ As regards length and shape of horns it is well known they are subject to great variation and the square-lipped rhinoceros may also have the two horns of equal length. Smith's name of *Rhinoceros keitloa* has long since been recognized as a synonym of the black form *Diceros bicornis*. Ever since F. C. Selous published his excellent paper,⁶ it has been generally accepted that there are only two true species of rhinoceroses in Africa—the square-lipped *Ceratotherium simum* and the hook-lipped *Diceros bicornis*. His views, based on long field experience in Africa, have subsequently been corroborated by all careful observers.

The best accounts about the West Nile race of square-lipped rhinoceros (*C. s. cottoni*) were furnished by Powell-Cotton,⁷ Winston Churchill,⁸ Theodore Roosevelt,⁹ and Edmund Heller.¹⁰ An excellent moving picture of this form has been secured by Eustace. The record length for the front horn of this race is still held by the bull (Plate 16) which the writer secured for the American Museum of Natural History during the Congo Expedition (1909–1915) in the Uele District, northeastern Belgian Congo (fig. 1). Yet since publishing my article about it,¹¹ I have found that von Heuglin¹² had measured horns of exactly the same length, forty-two inches. By his account published in 1869 von Heuglin was actually the first who recorded the presence of the West Nile race of square-lipped rhinoceros. Difficulties of transportation forced him to abandon his more bulky collection and the horns of which he speaks evidently never reached any museum. Major Gibbons¹³ was generally supposed to be the discoverer of this race of Nile white rhinoceros as he was indeed the first who in 1900 secured a complete specimen, now in the Carnegie Museum in Pittsburgh. As it

⁵ Ward, Roland. Records of Big Game, p. 443. 1903.

⁶ Proc. Zool. Soc. London, p. 725. 1881.

⁷ Geogr. Journ., London, vol. 20, pp. 371–384. 1907.

⁸ My African Journey, p. 186. 1908.

⁹ African Game Trails, pp. 400, 408, 412, 420, 428. 1910.

¹⁰ Smithsonian Misc. Coll., vol. 61, no. 1, pp. 1–77, pls. I–XXXI. 1913.

¹¹ Zool. Soc. Bull. New York, vol. 23, pp. 65–92, 32 illus., 1 map. 1920.

¹² Reise in das Gebiet des Weissen Nil und seiner westlichen Zuflüsse in den Jahren 1862–1864, p. 301. 1869.

¹³ Africa from South to North through Marotseland, vol. 2, p. 221. 1904.

is of some historical interest I translate the passage from von Heuglin's narrative: "Of Rhinoceroses there may occur in the region of the White River [Nile] two species: The one is the ordinary black *Rhinoceros africanus*, the other probably the lighter colored *Rhinoceros simus*. We have received horns of three and one-half feet in length, which really can belong only to the latter species. As regards the color of the Rhinoceros, one may be deceived about it not rarely, even at a short distance, since the animals, like the Elephant, during the hot, dry season love to cover themselves with mud that, once dry, adheres uniformly and gives to these pachyderms a light gray color." Von Heuglin thus also observed one of the most important points of distinction in the life history of the two African rhinoceroses—that is, frequent and daily wallowing is an absolute necessity to the white rhinoceros, though the black rhinoceros occasionally also indulges in it.

An historical point of great interest about the former distribution of the square-lipped rhinoceros is mentioned by Peringuey,¹⁴ who for many years has studied African rock engravings or petroglyphs such as are found in Northwest Africa, and South Africa, especially in Transvaal, Cape Colony, Kalahari and other parts, as well as in the Congo.¹⁵ His two well illustrated notes on South African art of unknown men of the Stone Age show the undoubted skill of these people in permanently recording mammal life with such crude tools as splintered or sharpened stones with which they cut grooves five to twelve millimeters deep and partly polished. These graffiti are much deeper and coarser than those of the South European Paleolithic art in Spain and France, of which Osborn¹⁶ reproduces fine examples.

Peringuey's researches and ability to interpret similar works of art made it possible for him to determine a rock drawing found in Algeria as that of a square-lipped rhinoceros. Pomel, who was not acquainted with any beast resembling the outlines of the petroglyph, considered it a warthog (*Phacochoerus*). It is important to state that on the same rock was a practically life size figure of the bull of a Quaternary buffalo now extinct,¹⁷ with horns so gigantic that the distance between the tips

¹⁴ Trans. South African Philos. Soc., vol. 16, pp. 401-412, pls. XII-XIV. 1906. *Ibid.*, vol. 18, pp. 401-419, pls. VII-XV. 1909.

¹⁵ de Calonne-Beaufaict. Rev. Ethnogr. et Sociol., V, pp. 109-117, 8 figs. 1914.

¹⁶ Men of the Old Stone Age. New York. 3d ed., pp. 305-446, 514. 1921.

¹⁷ Pomel, A. Carte Géol. Algérie, Paléontologie (*Bubalus antiquus*), pl. X. 1893.

was seven feet, nine and three-quarters inches. Flamand,¹⁸ then geologist of the Algerian Survey and describer of a large series of such petroglyphs, photographed this graffiti at Ksar el Ahmar, southwest Algeria. Pomel's¹⁹ thorough studies of a complete skeleton resulted in his monograph on that very buffalo (*Bubalus antiquus*). Considering the difficulties of cutting the deep outlines with a stone not much harder than the surface engraved, Pomel was astonished at the great accuracy of the general proportions of the animals delineated, in which such details as eyes and ears had received considerable attention. The pictures in question belong to a series of "old," strongly patinated drawings which figured forms apparently extinct previous to the subsequent set of "new" drawings which recorded in the same

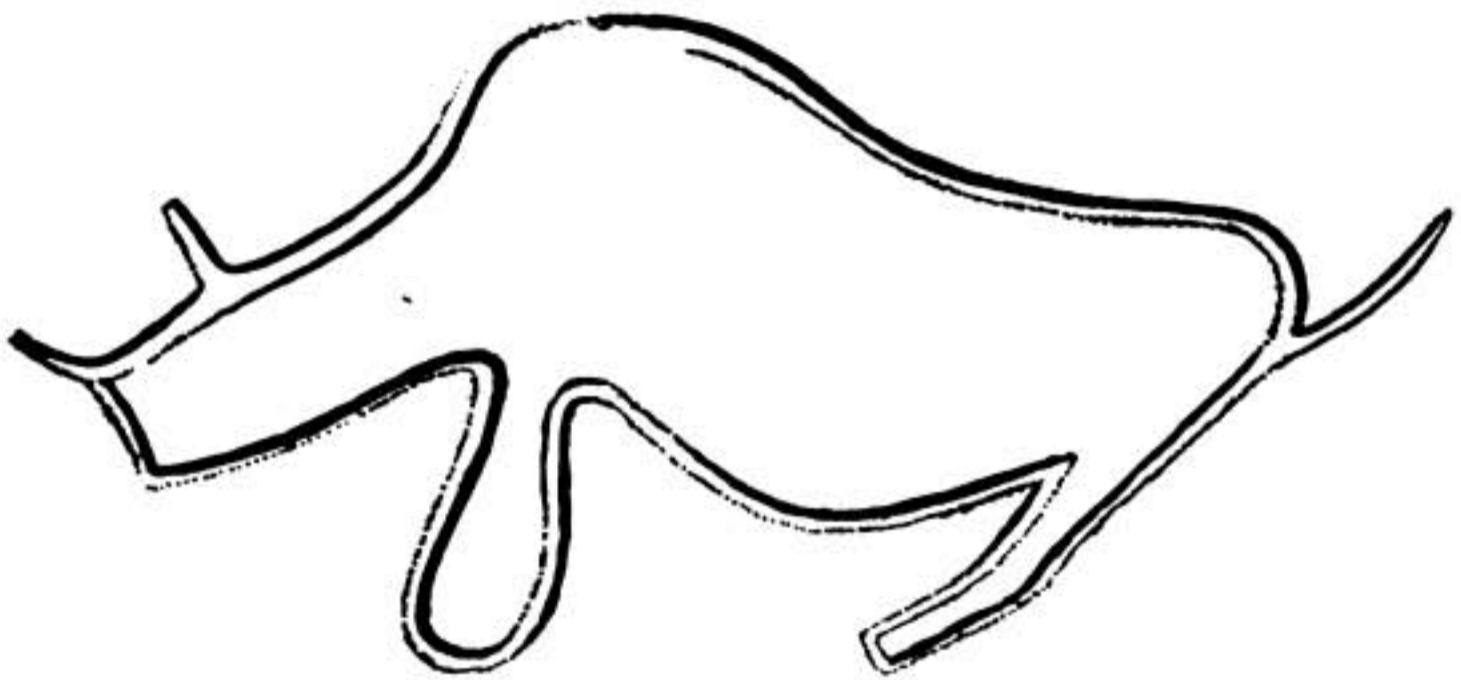


FIG. 2. Petroglyph representing *Ceratotherium simum mauritanicum* originally photographed at Ksar el Ahmar, southwest Algeria, by Flamand (after Pomel).

localities more recent forms of animal life. In this case the rhinoceros (fig. 2, copied from Pomel's plate) assumes a curious position of the hindfeet, that probably is accounted for by the fact that the artist fitted the sketch of his rhinoceros into a limited space between the tip of the horn and the shoulder of the more carefully drawn buffalo. Yet the two horns, the long head, the high nuchal hump are characteristic points and leave little doubt that the artist, whose fine execution of other drawings denotes a very keen observer, recorded a rhinoceros living then in these regions contemporaneously with the buffalo (*Bubalus antiquus*) and the ostrich. It is also certain that the picture really

¹⁸ L'Anthropologie, vol. 3, pp. 145-156, figs. 1 and 2. 1892.

¹⁹ Loc. cit., pp. 1-94, pls. I-X. 1893.

is that of the Quaternary Algerian form of rhinoceros which Pomel²⁰ two years later described as *Rhinoceros (Atelodus) mauritanicus* and *Rhinoceros (Atelodus) subinermis*. According to Pomel's own conclusions²¹ the difference between these two forms consists merely in the slighter development of the horns in *R. (A.) subinermis*. Horn characters in this type of rhinoceros have proved to be of no systematic value and the drawings of his specimens show no other specific difference. This latter form would therefore be a synonym of his *mauritanicus*. So far as can be judged from a general comparison of the carefully drawn hypsodont molars and numerous bones, they agree closely with those of *Ceratotherium simum cottoni* of which ample material is at hand. Pomel's contrary opinion in this respect is surely due to his having no adequate material of *C. simum* for comparison at his disposal. Boule²² feels inclined to ascribe the fossil remains of *Rhinoceros* found at Lake Karar, southwest of Oran, to *Rhinoceros simus*. He also attributes Pomel's *Rhinoceros mauritanicus* from the beds at Palikao and Ternifine and a number of other localities in Algeria to the same species. As no comparison is possible at the present time it might be appropriate to indicate the close relationship of these Quaternary rhinoceroses with living square-lipped forms by placing them in the genus *Ceratotherium*, retaining, however, Pomel's specific for the subspecific name. The designation of these Quaternary north-west African rhinoceroses would therefore be *Ceratotherium simum mauritanicum* (Pomel) (fig. 1).

It is through Peringuey's insight that we have a fairly good case showing that the present genus *Ceratotherium* was living in Quaternary times contemporary with men. Peringuey believes that men having similar traditions have fashioned comparable records of the animal life of South Africa, including the white rhinoceros.²³ He states²⁴ that the discovery in Nyasaland of rock paintings of apparently Bushman technique would seem to indicate that the gap between South and North African petroglyphs might thereby be spanned. Another point of particular interest is that according to Osborn²⁵ we are driven

²⁰ Carte Géol. Algérie, Paléontologie (Rhinocéros quaternaires), pp. 1-49, 12 pls. 1895.

²¹ *Loc. cit.*, p. 47.

²² L'Anthropologie, vol. 11, p. 8. 1900.

²³ *Loc. cit.*, pl. XV, fig. 2. 1909.

²⁴ Report South African Mus., p. 7. (1922) 1923.

²⁵ *Loc. cit.*, p. 516.

to the conclusion that Paleolithic industry came to France and England not from the east but from the south, or Africa. But the rhinoceros hunted and figured by Paleolithic man in Europe as far south as the Pyrenees was the woolly rhinoceros²⁶ (*Coelodonta antiquitatis*), related to the living white square-lipped rhinoceros, but which branched off from it at an earlier date. It, too, was a dweller of the plains, and, Osborn states,²⁷ made its first appearance in western Europe after wandering along the southern borders of the Scandinavian ice-sheet from the tundras of northern Russia and Siberia.

About the woolly rhinoceros much has been added to our knowledge by the recent researches upon the well preserved portions of a carcass found in a pit of mineral wax at Starunia (Galicia, Poland).²⁸ The strong ossification of the internasal septum, connecting nasals, premaxillæ and maxillæ, the much extended and broadened naso-frontal boss and its abrupt downward slope furnish indications of a relative reduction of the flappiness of the fleshy part of the snout and of course of the mobility of the lips, such as is observed in the square-lipped living form, in which the naso-frontal boss is the sole support of the horns, there being no internasal septum to connect it with the premaxillæ. Although the woolly rhinoceros had about the same kind of small mouth and square lips²⁹ the edge of its lips were studded with short hairs³⁰ and probably had more the general characteristics of a muskox (*Ovibos*) than the smoothness and extensibility of those of *C. simum*.

From the much broadened base of the horn the snout narrowed towards the firmly set mouth. There is little doubt that the broad and extended front horn also functioned as a fender as in the living square-lipped rhinoceros. But apparently not to make a road for the bulky body, but rather to push aside obstacles preventing access to its favored food. The increasing density of the vegetation towards the ground in a cold climate and perhaps an occasional covering of snow would offer a satisfactory explanation for the presence of so wide a base of the horn and the strongly reinforced anterior bony portion

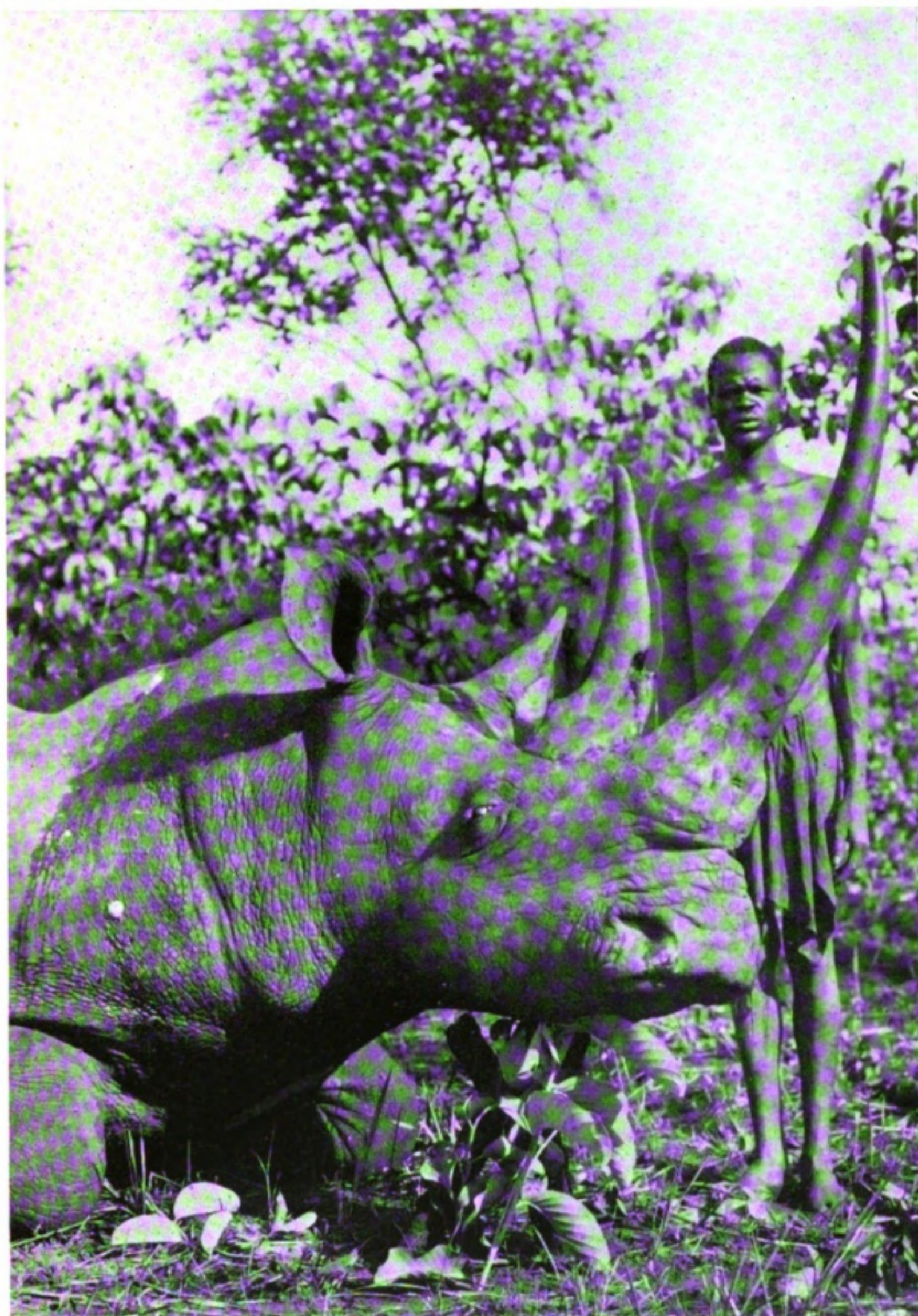
²⁶ *Loc. cit.*, p. 319, fig. 157, and p. 324, fig. 161.

²⁷ *Loc. cit.*, p. 106.

²⁸ Wykopaliska Staruńskie (Fossils of Starunia). Muzeum Imienia Dzieduszyckich Lemberg, XV, Krakow, pp. 1-7 (Lomnicki), pp. 181-339 (Niezabitowski), Atlas, pls. XXVI-LVI and frontispiece. 1914.

²⁹ Hoyer. Zeitschr. Morphol. Anthropol., Stuttgart, XLX, pp. 419-492, pls. IX-XI, 6 text-figs. 1915.

³⁰ Hoyer. *Ibid.*, XVIII, pp. 207-226, pl. XV. 1914.



RECORD BULL WHITE RHINOCEROS FROM THE UELE DISTRICT, BELGIAN CONGO

The front horn measures forty-two inches, the rear one twenty-two and one-half inches. From snout to tip of tail the animal measured fifteen feet five inches. The standing height at the shoulder was five feet eight inches. It has been mounted by James L. Clark and is on exhibition in the American Museum of Natural History.

(Lang: Square-lipped Rhinoceros.)

of the skull. The shape of the upper portion of the horns in this species, as in *C. simum*, is of slight importance considering the variety shown by records of other finds and also according to the previously mentioned drawings left by Paleolithic man in the caverns of France. The base of the front horn however has proved to furnish good specific characters. In *Diceros bicornis* it is rounded; in *C. simum* it is rather square; in *Coelodonta antiquitatis* it appears roughly elliptical and also relatively larger than in *C. simum*. Niezabitowski³¹ gives the measurements of the actual base of the front horn of the Starunia specimen as longitudinally 240 mm. and transversely 160 mm.

It is of great interest to correlate the bony structure of these rhinoceroses with their external morphological features and also with their feeding habits. In *C. simum* the heavy, fleshy upper lip forced against the horny edge of the lower lip facilitates the cropping of grass, which is its only food. The more firmly built hairy mouth of its northern relative *C. antiquitatis* could make its living on the heavy carpet of the tundras. But such highly specialized forms are bound to peculiar conditions. The square-lipped rhinoceros can not live in a country which lacks suitable wallowing places and also is undoubtedly subject to other influences restricting its range. In a very different class is the African elephant (*Loxodonta africana*), whose ideal home lies in the wooded and well watered Savannas. Yet being chiefly a browser it has been able to thrive in the moist Rain Forests and in fairly arid districts too. It can even brave the cold temperature of the snow fields of African mountains, where Dr. W. L. Abbott, who has evinced so keen an interest in tropical fauna, in 1890 observed its tracks on Mount Kilimanjaro at an altitude of 15,000 feet. From the same mountain Sir Harry Johnston³² records two females and a young elephant at an altitude of 13,000 feet. The elephant would be able to hold its own for many centuries were it not for the gain its destruction furnishes to the ivory trade and in taxes to the governments, but the square-lipped rhinoceros does not seem to be able to hold its own and is in need of organized protection.

American Museum of Natural History, New York.

³¹ Bull. Ac. Sci. Cracovie, (Série B) Sci. Nat., p. 243. 1911.

³² Proc. Zool. Soc. London, p. 217. 1885.