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Fruit and shade tree losses in the United States from field mice amount to several million dollars annually. There are records of such losses amounting to \$10,000 on a single farm and to \$100,000 in a single county, while a loss of \$500,000 is the estimated loss to fruit trees in the State of Connecticut alone during a recent "mouse year." When a well-known mammalogist found no justification for the destruction of meadow mice it is evident that he had a different point of view from that of the Maine pomologist who found that, with the possible exception of winter killing, meadow mice were the greatest cause of mortality among young fruit trees of the state.

Biological Survey, Washington, D. C.

THREATENED EXTINCTION OF THE WHITE RHINOCEROS (CERATOTHERIUM SIMUM)

BY HERBERT LANG

The widespread indignation caused a few years ago by the tragic slaughter in South Africa of the Addo Bush elephants appears to have taught the local farmer elements a lesson in cunning deception. The disquieting reports about the present status of the square-lipped or white rhinoceros in the Umfolosi Reserve in Zululand show how successful these men have been in their unwise efforts to wipe out one of the most important remnants of the unique Ethiopian fauna.

Instead of starting an open campaign to enlist public support and fighting for legal sanction they took care not to herald their intentions. Even the South African champions of game protection have been taken entirely unawares by recent developments, as it appears from extracts from correspondence just published by Dr. W. T. Hornaday (p. 13).

We are far more justified in becoming alarmed than at any time previous. The only South African square-lipped rhinoceroses still alive are roaming about in a 90,000 acre reserve, for the greater part situated between the Black and White Umfolosi Rivers in Zululand. Their habits and the conditions under which they are living were admirably described in 1920 by Vaughan-Kirby. The Natal administration had given assurances of keeping this sanctuary free from disturbance. From time to time there have been encouraging rumors of the increase of these square-lipped rhinoceroses. The original colony of ten was said to have multiplied to thirty or even fifty. Everything seemed

to point toward their having gained a new foothold, and there was hope that they might be able to recover under proper protective measures in the same degree as the American buffalo, but events lately have taken a tragic turn. Maj. J. Stevenson-Hamilton, warden of Government Game Reserves, Province of Transvaal, now places the number of these rhinoceroses at sixteen or less.

In a recent article (Lang, 1923, p. 155) I pointed out that permission for collecting two specimens had evidently been extended to representatives of the Cape Town Museum, and Henry A. Snow also received a permit to kill three specimens for the Oakland Museum of California, but according to Hornaday (p. 12) slaughtered four. At least two more have been unlawfully shot by a young man who was fined the ridiculously low sum of £25.

In addition some of the neighboring farmers have been making a point of sniping off the few surviving South African rhinoceroses in order to grab for their own purposes the land set aside for these remaining troops. They wage this war of extermination merely in the greedy hope that as soon as they are able to "finish the lot" they can transform into ranches some of the land of the reserve. From their point of view it is monstrous that a few "brutes" should be given preference in a stretch of land of which they covet some parts. For some time past there has been going on in large areas in Zululand "wholesale and indiscriminate slaughter of the game animals" (Haagner, p. xviii). In these raids (Buxton, p. 281) an organized band destroyed over 3,000 head of large game, leaving an unknown number of wounded to die. Not even the small remnant of white rhinoceroses, which Buxton estimated at ten at most, was spared.

In contradiction to the above statements about the immediate extinction of the white rhinoceros are the remarks of Mr. Wynant Davis Hubbard (p. 229) in his recent article on 'Big Game in Rhodesia.' He writes from Tara, Northern Rhodesia, a station on the railroad at about 16° 50' S., 26° 45' E. Until there is definite confirmation of his statements we must feel he is mistaken in saying that "there are quite a few [square-lipped rhinoceroses] at present living not far from here [Tara] I know. Just how many there are it is impossible to say. In comparison with the black rhinoceros the white is not uncommon in certain places. In others, however, it is totally lacking."

If he could actually prove the occurrence of the square-lipped rhinoceros in that region, Mr. Hubbard would make a great contribution to our knowledge about its present range. Fitzsimons (vol. III, p. 207)

indeed states that "it is possible one or two may still exist in the remoter parts of Southern Rhodesia." But not one of the well-known South African champions of big game or writers on this subject, like Stevenson-Hamilton, A. K. Haagner, Vaughan-Kirby, or Heller have ever indicated the presence of white rhinoceros in *Northern Rhodesia*, although the parts east of the Zambesi, that is, Southern Rhodesia, were formerly its favorite haunts (Vaughan-Kirby, p. 224). In fact, as my maps of distribution of this form clearly show (Lang, 1920, p. 77; 1923, p. 156), there is no authentic record that the southern square-lipped rhinoceros (*Ceratotherium s. simum*) ever occurred within the memory of man further north than the southern bank of the Zambesi—while Tara lies 60 miles northwest of that river and about 750 miles from the Umfolosi Reserve—and the northern form has never been known south of the northern end of Lake Albert.

The reports by Speke and Grant of the white rhinoceros in Uganda rest clearly upon misidentification, as shown by Heller (p. 36) and others. Heller stated (p. 39) that there "is no evidence, geological or otherwise, to show when this intermediate territory lost its square-nosed rhinoceroses." Since then Reck (p. 308) has provisionally referred the fossil remains of a rhinoceros from the Pleistocene of Oldoway, at the eastern Serengeti Plateau, Tanganyika Territory, to *Ceratotherium simum* (= *Rhinoceros simus*). This has later been cited by others (Schwarz, p. 848), but it remains to be seen whether subsequent study of this material will positively establish this record for *C. simum*. That the species must have lived in North Africa contemporaneously with man I have shown lately (Lang, 1923, p. 159); also that *C. s. mauritanicum* was common in the Algerian Pleistocene (Lang, 1923, p. 161).

Coincident with the disturbing news from South Africa about the Zululand square-lipped rhinoceros, Dr. Cuthbert Christy writes (p. 63) of an equally hopeless condition as regards the protection of the West Nile, or northern, race (*C. s. cottoni*). It is apparent that as a result of the World War the natives have become less heedful of the existing laws for game protection, which, like most such African ordinances, can only be enforced when adequate power is provided to carry them into effect. There are confiscations and fines where tax stations are maintained, but often tricky traders escape even this by smuggling.

Christy states that the "small region in the Congo in which the animal is commonest is almost uninhabited." I happened to spend nearly three years in that section of the Belgian Congo and found the natives

fairly numerous, much more so than just across the border in the Sudan. Travelers on the main roads, however, would meet few natives, who in order to avoid trouble place their villages out of reach of caravan traffic. But in this vast country there ought to be ample room for both natives and rhinoceroses.

The square-lipped form in the Belgian Congo occurs from a little north of Lake Albert all along the eastern border of the Belgian Congo to the Sudan and westward over a stretch of about 520 miles across the Uele district to the Bomu River. Its essentially nocturnal habits and the high grass savannah ordinarily protect it from view except when deliberately followed up or accidentally run across during its daytime sleep. Such excellent naturalists as Emin Pasha and Schweinfurth traveled extensively in these regions and never reported its presence.

There is little fear of the destruction of these rhinoceroses by natives armed with spears, as Christy supposes; the danger lies in gun and powder of which there is always an abundance, of either lawful or smuggled provenance. The few Azande hunters, justly famed among the tribes for dangerous exploits, are admired as much for killing a rhinoceros with a spear as an elephant or buffalo, which are acknowledged dangerous game. Anyone can understand that the spear, thrown only at close quarters, will not instantly despatch but only infuriate such huge monsters, no matter how tame they are otherwise. These rhinoceroses are of course attacked when sleeping. On such occasions they are but seldom alone,—two, three, or more generally resting in the same place. In the ensuing tussle the frightened comrades are just as apt to charge towards the hunter as into the jungle. This is exactly what happened to an Austrian hunter named Fleischer, who boasted he could lay his hand on any rhinoceros before it would even be aware of his presence. He shot a female rhinoceros and, just as he approached the prostrate animal, the male charged over the dead body and with the tip of its horn grazed his forehead above the eye. He was carried away unconscious by his porters and much to everyone's surprise was up and around a while afterward. But he really never recovered and soon after succumbed at Khartum as a result of this adventure.

There seems to be no effective means at present of stopping the wholesale slaughter of this northern form. Its meat is one of the important parts of the native diet, procurable at all times without much difficulty. Even though the principal chiefs were willing to enforce protection there would still be a great number of native poachers and such a law would

never be adequately respected. To properly police these vast areas is practically impossible.

The situation would be helped in part by the more drastic enforcement as regards confiscations and fines for the transportation, sale and exportation of the horns and pieces of hide. Khartum is a great center at present for the exportation of horns to the Orient and for the manufacture therefrom of articles sought alike by sportsmen and curio collectors. What complicates matters is that the horns and hide of the black rhinoceros, so common to the south of Khartum and on the east bank of the Nile, are lawful articles of trade. There are no positive marks to distinguish the horns of the two kinds of rhinoceroses, except that on the whole the horns of the square-lipped form are heavier and the anterior horn has a squarish base and more flattened front.

How the coöperation of the Ubangi-Shari officials, advocated by Christy, would help I fail to see as the traffic in white rhinoceros trophies does not go in that direction. No square-lipped rhinoceros is known from the Ubangi-Shari region. From that section authentic data are only available of the occurrence of the black rhinoceros (*Diceros bicornis*), which Nachtigal in 1872 found was as common there as in Wadai. It occurs in numbers again on the eastern bank of the Nile (Heller, p. 38), although it has never been observed in the northern range of the square-lipped rhinoceros.

To return to the problem in South Africa, a monumental issue is at stake. Historically it is of interest to consider the great abundance of the square-lipped rhinoceros at the time when, in 1817, Burchell gave the first account of them. It makes the blood boil to read how some famous game butchers "during one short hunting trip, killed ninety Rhinoceroses, the majority of which were of the square-lipped species. Another hunter killed sixty in a single season" (Fitzsimons, III, p. 209).

The officially organized killing of the Addo Bush elephants in 1919 was bad enough. Under Major Pretorius' leadership the members of the last vigorous herds of the fast disappearing South African elephant (*Loxodonta africana capensis*) were hunted down and mercilessly shot. In that case world-wide appeals managed to save from destruction but the few which fortunately had escaped the initial stages of the slaughter—sixteen from a herd of one hundred (Osborn, 1921, p. 244).

Fighting against tremendous odds, the South African game protectionists achieved a success in the last few years that offers encouragement in the present desperate case of the square-lipped rhinoceros. By tireless efforts these crusaders aroused more than mere interest and

sentiment. The enrollment of the government officials concerned, the winning over of so many bitter antagonists, and foremost of all the practical results are good signs. Through their efficient efforts many small troops of such game as mountain zebra (*Hippotigris zebra*), blesbok (*Damaliscus albifrons*), bontebuck (*Damaliscus pygargus*), and white-tailed gnu (*Connochætes gnou*) have been given a new lease on life. So long as Doctor Haagner, Major Stevenson-Hamilton, and Colonel Reitz, the minister of lands, are at the head of this undertaking there is still hope. A few select wardens placed at once in the greatest breach, with the able and influential backing of men at home and abroad, should be able to stave off further decimation. Recently Osborn and Anthony (1922, pp. 388-405) published extensive data serving as a convincing plea against the universal destruction of the larger mammals. During the annual meeting for 1922 of the American Society of Mammalogists the question of game protection was followed with eagerness by many.

As a solution of the problem of the permanent preservation of these rhinoceroses, their transportation into another region has been suggested. Before such a move is made, it might be best to try the experiment with a pair or two in the proposed new reserve. Should the venture prove successful there would be then another troop as a nucleus for further expansion.

In this connection it may be well to mention a few factors to be carefully considered in any intelligent scheme of conservation, such as the dependence of the square-lipped rhinoceroses upon suitable wallowing places and pastures throughout the year, their aversion to the proximity of settlements, and their fairly localized habits which make surveillance of them as easy as their destruction by poachers. Sometimes, of course, their nocturnal rambles lead them quite a distance, a ten mile tramp nightly being a conservative figure.

Fortunately the race seems to be very vigorous, as proved by various observations. During 1911-1913, while in the range of the northern form, I noticed that most troops were accompanied by two or three calves in successive stages of growth, the largest nearly equaling the parents in size. In rhinoceroses the period of gestation is generally estimated at seventeen or eighteen months. But in any case the rate of breeding is not as slow as believed. Reproduction apparently commences as early as about the tenth year and continues to a ripe old age. Another encouragement may be derived from the fact that rhinoceroses belong to a fairly long-lived race, as is corroborated in part by Blyth's

statement of a pair of Indian rhinoceroses (*Rhinoceros unicornis*) having lived for 45 years in captivity. It is true the square-lipped rhinoceros (*C. simum*) is the only one of the five known species which has never been brought into captivity, but it would be an experiment well worth while.

Those interested feel that it is the sacred duty of South Africa to make definite and satisfactory arrangements for the adequate protection in a secure refuge for the few remaining South African square-lipped rhinoceroses. Aside from the mere sentiment, in the long run it would pay economically. Big game has been one of the greatest resources of South Africa and in many regions it will remain one of the star attractions for many well-to-do travelers who supply a wholesome distribution of wealth.

As a first step Doctor Hornaday, director of the New York Zoological Park, announces (p. 15) the appropriation of \$1,000 by the Permanent Wild Life Protection Fund and now invites other subscriptions to make up the necessary amount of \$5,000 to carry on organized protection. Those having at heart the preservation of the surviving members of such a magnificent and practically bygone fauna have what looks like the last chance to come forward to the rescue until the government of the Union of South Africa has time to make arrangements for permanent protective measures.

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American Museum of Natural History, New York City.

OBSERVATIONS ON THE HABITS OF THE STRIPED SKUNK (MEPHITIS MESOMELAS VARIANS)¹

BY W. KENNETH CUYLER²

The writer of this communication has hunted the skunk for many years, during which time he has made the acquaintance, more or less intimately, of many individuals of several species. It is upon the suggestion of Prof. Carl Hartman that these notes have been prepared for publication.

I. GENERAL HABITS

The species of skunk found in the vicinity of Austin, Texas, where the observations were made, are *Mephitis mesomelas varians*, the striped skunk, and *Spilogale indianola*, the spotted skunk. It is to the former species that these notes refer unless otherwise stated.

¹ Contribution from the Department of Zoology, the University of Texas, No. 165.

² Note: For the purposes of this study the writer, Mr. Cuyler, is eminently endowed (?) by nature, for he has completely lost his sense of smell. If the skunk musk is present in the surrounding air in concentrated form, however, he may be conscious of it in a general way; hence the musk has some physiological effect aside from its powerful stimulation of the olfactory apparatus.—Carl Hartman.