

spruce which consist of trees of greatly different sizes. It takes into account the observation that white spruce appears to be unable to reproduce itself under its own cover. It explains the mosaic pattern of the taiga vegetation.

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#### SUMMARY

1. Because of the paucity of English-language terms for snow conditions, biologists studying the vertebrates of the north are urged to draw upon the rich source of snow terms found in the languages of the peoples of northern Eurasia and North America.

2. The ecological importance of one taiga snow formation (*qali*—the snow that collects on trees) and its role in controlling one of the vegetational associations of interior Alaska are discussed.

3. A method for standardizing *qali* observations is described.

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### OCCURRENCE OF *LIMNORIA TRIPUNCTATA* AT THE CAPE COD PENINSULA

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Prior to the monograph by Menzies (1957), there had been no verified records of *Limnoria tripunctata* Menzies north of Providence, Rhode Island.

Menzies (1957) recorded one specimen collected from Boston by the William F. Clapp Laboratories. This record might be subject to question because the majority of specimens collected from Boston consisted of *Limnoria lignorum* (Rathke). On July 6, 1957, Miss Carolyn Beckman collected a large sample of *L. tripunctata* from a locality north of Woods Hole, Mass., between East Falmouth and South Mashpee. This establishes beyond

doubt the occurrence of the species in the Cape Cod region.

This is a matter of some economic importance because of the ability of the species to penetrate creosoted wood. It is a matter of academic importance because this locality probably represents what must be close to the northernmost limits of the range of this species. It is probable that the species occurs at Woods Hole. It has not, to our knowledge, been reported in any faunal list from that locality.

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### COMMENTS ON THE BLACK AND SQUARE-LIPPED RHINOCEROS SPECIES IN AFRICA

During the latter part of July, 1957, my wife and I were fortunate enough to be able to spend a short time at the two reserves in Zululand, Hluhluwe and Umfolozi, which are still the home of the Black Rhinoceros, *Diceros bicornis bicornis* and the Square-lipped (formerly called White) Rhinoceros, *Diceros (Ceratotherium) simus simus*. I was most interested in assembling any observations on the behavior of these species which might supplement previous observations made on the Great Indian Rhinoceros, *R. unicornis* (Ripley 1952) or comments on the population structure made by Hutchinson and Ripley (1954). During our stay we were given every assistance and aid by Mr. C. J. Ward, resident ecologist for the Natal Parks, Game and Fish Preservation Board in Zululand. Mr. Ward has made many interesting obser-

vations and it is to be hoped that he will publish them in the future. Meanwhile, he is making an important study of the food preferences of these two species, which as Attwell (1948) has pointed out are not in competition, the Black being a browser, feeding on the tips of the branches of euphorbias, *Acacia*, and *Spirastachys* species, while the Square-lipped grazes on grasses and small shrubs.

The Hluhluwe and Umfolozi Reserves are situated about twelve miles apart, some twenty miles inland from the coastal highway of Natal not far from the small towns of Mtubatuba and Hluhluwe. Both reserves are somewhat small, nearly fifteen thousand, and somewhat over thirty thousand acres respectively, and it is to be hoped that additional lands adjoining them can be secured in

order to prevent overcrowding of the resident game, a considerable potential problem in view of the lack of predators.

Shortridge (1934) quotes a 1929 estimate of 120-150 Square-lipped Rhinos in the Umfolozi Reserve, whereas current estimates are in the neighborhood of 500 animals. There is thus a serious potential conservation problem for the authorities in the large-scale increase in numbers of this rare species on its restricted range.

The Black Rhinoceros, which is more common in the smaller reserve of Hluhluwe, probably now numbers over 200 individuals.

#### BREEDING

Evidence is somewhat circumstantial, but both Black and Square-lipped Rhinos appear to mate in the Zululand Reserves at almost any time of year. Mr. Ward reports that calves appear approximately twice a year as "winter calves" or "summer calves." We observed a very small Square-lipped calf, perhaps two weeks old, on July 26, and two calves on the same day, aged between one and two months. The Black rhino has bred in captivity recently at the Rio de Janeiro Zoo, Brazil, where we observed two young in May, 1956, one aged two months, the other two years. The Director, Mr. Baretto, told us that the pair were placed together when secretion from the female was noticed, and that coupling went on for nearly the full term, or seventeen months. The cow carried her calves for eighteen months in each case. The bull was very aggressive and had to be separated from the cow before the birth of the young. In addition to these records at Rio de Janeiro, the Black Rhino has bred in captivity at Chicago, Illinois, and, in 1957, a calf was born at Frankfurt, Germany. Recently, an Indian Rhino calf was born at Basel, Switzerland, in September, 1956. (Lang 1957.)

#### TERRITORY

In my discussion of the Indian Rhinoceros (1952) I suggested that these animals maintain a territory during part of the year. That such a territory is capable of compression, and may indeed fluctuate, and that the aggressive behavior of the animals themselves may alter with the seasons has been indicated by Gee (1953a, b). It does seem appropriate, however, to assume from the evidence that the Indian rhinoceros holds a territory during part of the year, which does not appear to be a breeding station.

In the case of the Black Rhinoceros, such evidence as exists points to the assumption of a territory which is defended by the male, and in which the female and young may also occur. The Black Rhinoceros seems more sociable in this sense than the Indian species, although solitary animals also are seen commonly. Individuals of this species have a notoriously uncertain temper.

Mr. Ward showed us an area in the Hluhluwe Reserve which he said had formerly been occupied by a rather small old bull, a cow, and a calf, the territory centering around a small pool or pan. He had become accustomed over a period of several months to seeing this family in this area, which appeared to be their home range. On one occasion while watching the cow and calf at the pan, Mr. Ward had seen a large, strange bull approach. In appearance he noted at once that this bull seemed, as he put it, "uncertain." After a short time, the smaller, old bull came into view, and the stranger either saw him or caught his scent. The large stranger at once turned and made off rapidly. The old bull did not notice this,

but came up to the pan, rubbed noses with the cow, then appeared to patrol the area deliberately scenting. At the point where the stranger had made off he appeared to catch the scent of the intruder, for he immediately turned and followed at a trot, apparently in pursuit. Mr. Ward was unable to see whether the two bulls encountered each other. This territory then may be a breeding station for the male, or indeed it may be a home range for this pair with young. The evidence seems inconclusive on this point.

The Square-lipped Rhinoceros has a far greater threshold of tolerance for individuals of the same species. We commonly saw groups ranging from a pair to four animals together, and five or six at one time have been seen commonly, although there is no evidence that larger groups may not simply have made a temporary aggregation in a favorable feeding area.

On one occasion we observed what appeared to be a family party consisting of a bull and large cow Square-lipped Rhino accompanied by a smaller cow. Our impression, in which Mr. Ward concurred, was that the second cow was a daughter. It appeared from its size, the size of the horn and the condition of the skin to be a young animal. In addition to this trio, who seemed completely at ease and representing a family unit, there was a young bull of perhaps four to five years in attendance. This animal was not allowed to graze closer than about 100 yards from the trio, at which point it would be chased with a short rush or series of snorts and a shooing motion of the head by the bull principally, aided to a lesser extent by the two cows. No physical violence accompanied these demonstrations. The young bull never turned and disputed the ground. Without being certain, of course, it appeared to us that the younger bull was a grown-up calf being encouraged to leave the family. The threshold between tolerance or playfulness and antagonism seemed to be too low to permit an assumption that the younger bull was a stranger or a challenger. Beyond this, we could make no concrete estimate of territory in the Square-lipped Rhino. Mr. Ward reported that he was accustomed to seeing certain family parties including recognizable individuals, known by the size or shape of the horn, in certain areas for periods of time. However, some sort of color banding or marking would be needed to be able to trace the movements of individuals accurately.

#### DUNG HEAPS

Both the Square-lipped and the Black Rhino defecate in special places thereby making heaps of dung. These dung heaps can be readily distinguished as to species as Shortridge (1934, *tom. cit.*) and others have noted, as the diet of the two species affects the character of the dung itself. The dung heap is in general rather similar to that of the Indian Rhino, near a trail, and often, in the case of the Square-lipped, of similar dimensions, a conical heap several feet in height. The dung heap of the Black Rhino is always smaller and more scattered. In both species there is usually a depression in the ground to one side, or near the center of the heap. The defecating animal places its back legs in this depression and often stretches and kicks out with its legs alternately as it defecates, rather as a dog does. This depression then seems to be partly created by the animals, the ground perhaps being softened by their urinating at the same time. However, I believe it is often created secondarily by the visits of birds such as francolins and guinea fowl, mongoose, and large lizards, *Varanus* sp., all of which dig in the ground for seeds and beetle

larvae. With regard to the Black Rhino it seems that these spots as well as the habit of urinating along the trails are methods of marking a territory. I am inclined to think such a territory represents both a breeding station and a home range. Rubbing sticks, which are frequent, presumably serve the same purpose and additionally may carry the scent of the secretion of the characteristic sores which the Black Rhinos possess on the anterior median portion of the flanks, just posterior to the heavy shoulder fold. These sores have been described, although the physiology of the condition is not understood, by Attwell (1948, *tom. cit.*) and others.

In the case of the Square-lipped Rhino, the dung may serve to identify the presence of individual animals, although there is only the vaguest evidence that the species has anything more than a broadly-defined home range. Rubbing sticks, often tree trunks, are also used in this species, but sores are not noted. Mr. Ward feels that in the Square-lipped species, but not in the Black, the dung heaps may be visited by several individuals for the following reasons:

(1) An animal comes upon a dung heap and by association, decides to utilize it.

(2) Dung heaps are often on ridges. Their use comes then after a long hard climb when the exercise makes the animal feel like using it.

(3) Some sort of traditional spot for a resident animal to defecate at.

There is thus an indication that a dung heap in the Square-lipped species may serve as a sort of family bulletin board, chronicling the news of the whereabouts of the group. In a more loosely-knit way, it may also serve as a territorial marker.

#### SUMMARY

A discussion of the Zululand Reserves, last home in southern Africa of the Black Rhinoceros, *Diceros bicornis*,

and the Square-lipped (formerly White) species, *D. sinuatus sinuatus*, gives some idea of the numbers and status of these species. Evidence of the breeding cycle and the possession of territory is given, especially in the light of a previous study of the Great Indian Rhinoceros, *Rhinoceros unicornis*. In these species, as in the Indian one, considerable importance is given to the creation of dung heaps, used presumably as some sort of territorial marker.

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