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**BEHAVIOUR OF LARGE MAMMALS
DURING THE FORMATION OF
LAKE KARIBA**

by

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KARIBA STUDIES

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lived and fed individually or in small groups. These were the weakest animals on the island and their carcasses were the only ones found, although some juveniles probably died earlier. The last portion of the population to survive in three troops consisted of animals just reaching physical maturity, and at least one group remained gregarious for 11 months after the adults began breaking away. These animals had completed the period of maximum growth, assuming baboons follow a normal growth curve, but probably had not yet bred which is a severe strain on the individual, judging from the cessation of breeding among older animals.

2. BLACK RHINOCEROS

The rescuing of black rhinoceros, *Diceros bicornis* Linn. from islands in the Lake was a priority for the Rhodesian Rescue Unit and, as they had to be drugged and handled individually, their capture was better documented than that of any other species. This enabled Roth and Child (in press) to supplement personal observations with Rescue Reports and so describe in some detail the distribution of the whole population from the area affected by the Lake. They also deal with some of the characteristics of the population's structure and dynamics and some of the behaviour of rhino on islands so that it is now necessary only to summarise their findings and to mention some of the behaviour they did not cover.

The distribution of rhino was limited to areas on the south bank where human settlement had been sparse and where there had been no previous Tsetse Control hunting operations (page 32). Roth and Child attribute this to the sensitivity of the rhino populations to hunting. A total of 62 were recorded between the Umniati and Mwenda rivers and probably represented the bulk of the population resident in this area as, although rhino frequently wallow, they avoid deep water and were, therefore, readily trapped on islands. The only reference found in the literature to their swimming is the description by Haarthoorn and Lock (1960) of one which had to swim at Kariba. Here, there were several additional records of rhino swimming up to 20 or 25 yards, which was approaching the limit of their endurance, as black rhino are poor swimmers and, unlike the Asiatic species, do not like deep water. Mr. N. Dean (pers. comm.), senior warden in Hluhluwe Game Reserve, Zululand, which has a dense black rhino population, is of the opinion that this species will not cross a rapidly flowing stream if it is over 15 inches deep. He also found they preferred wallows with more mud than water, although they continued to use them after rain with water up to 18 inches deep. This is in contrast to the three Asiatic forms. Barbour and Allen (1932) note that the Javan rhino, *Rhinoceros sondaicus* Desmarest, is partial to entering streams, and Hubback (1939) records the same for the Sumatran species, *Didermoceros sumatranensis* Fischer, which frequently goes into clear streams up to three feet deep, while Ripley (1952) found that the Indian rhino, *Rhinoceros unicornis* Linn. is an accomplished swimmer with, among others, a record of one which swam the Brahmaputra river.

The fact that some black rhino went into deep water at Kariba was, therefore, unusual. Rescue Reports describe spoor leading from one island to another through water up to three feet deep, and a family party was observed feeding in about this depth of water on Island 17, but charged back on to the island as soon as they were disturbed. The male of this group hid in the water on three occasions after the female and calf had been rescued. During pauses while attempting to drug it, it waded 50 to 100 yards into the shallows and stood motionless in thickets with only its head above the surface, but bolted back on to the island as soon as men gathered on the shore. It also crossed 150 yards of water up to three feet deep at least five times, but, as when hiding, never did so while being chased. This was the animal Haarthoorn and Lock described swimming about 25 yards and was the only one reported to have done so before being darted with drugs, although a number entered the water afterwards and some drowned when they collapsed in the shallows under the influence of the drug.

Rhino are weak swimmers which experience difficulty in holding their heads above the surface. Like elephant, they appear to realise how vulnerable they are in the water, which accounts for the fact that they could seldom be driven into the shallows and explains the behaviour of the

male on Island 17, which charged back on to the island as soon as men threatened to block it off from land.

Localised habits also contributed to their being marooned on islands. Six marked individuals were contacted after release, and all were within four miles of the release point. An adult male seen at the north eastern corner of the Umniati West bush clearing, had been noted in this area on several occasions by Mr. Stokes, the Ranger in charge of the area. It was then 3.5 miles from where it had been released six months before, which probably represented its maximum movements in 11 months, as it became marooned for a second time when Island 100 formed between this locality and the release point, in March, 1961.

In this general area, two marked rhino were seen after "a couple of months" within "a few miles" of the release point. One of these animals was later contacted one and a half miles from the release point a year after release, but the other died in the area in the meantime (Dr. H. Roth, pers. comm.).

An adult female was retaken on Ukubula Island, which formed nine months after its release. The break through giving rise to this island was four miles from the release point. An adult male from this island has remained within "about five miles" for several months since its release (Warden P. Coetsee, pers. comm.) and another, liberated on the east bank of the Sengwa River, was contacted five months after release when it had moved less than three miles into the nearest suitable habitat.

On 16 April, 1961, an adult rhino was disturbed by a boat and ran about a mile into a bush clearing, but then slowed down and circled round, so that it headed back in the direction whence it came. When lost from sight, it was almost back in the same clump of trees from which it had been disturbed.

Small home ranges seem to be normal for black rhino, which frequently defecate in the same place, as Dean (op. cit.), basing his conclusions on recognisable individuals in Hluhluwe, notes that "For the greater part (black) rhino have very definite home ranges in which they appear to spend the greater part of their lives. I do not consider the home range to be in excess of six square miles and often as little as four square miles. An important factor controlling the size of the home range here is probably the availability of water. In most parts of the reserve even in dry years, no great distance need be travelled to find it. I have only one record of a cow and calf leaving their normal home range for another area, eight miles away, crossing a river (presumably with little water) to do so where they have since remained permanently."

There were two male rhino in the Nagupande Tsetse Area and these remained in a small area of about 12 square miles for 12 months after selective, but intensive hunting (approximately one hunter per 3.5 square miles) began in the area. They then moved 13 miles and left the area, breaking through the game fence surrounding it, (Mr. J. Kerr, pers. comm.). A male with a peculiar kink in its tail was observed in July, 1963, and was reported to have remained within half a mile of the confluence of a small tributary and the Luangwa River, during the dry season, for at least two years, although during the rains it may have been forced a mile or so from the Luangwa by the inundation of the flood plain. This animal was seen by the author within one mile of the same locality 14 months later, in September, 1964.

This evidence indicates rhino are generally fairly localised although the availability of open water probably determines the size of the home range as Dean has suggested. Ritchie (1963) indicates they wander five to 15 miles from water to feed in parts of Kenya, as well defined rhino paths lead out this distance from water holes. Stockley (1950) and Ripley (1958) have gone as far as to describe them as territorial, on account of their defecating on middens and then scattering their dung with their feet. Although rhino do occasionally fight, the active defence of territories needs substantiating in view of the small amount of aggressive behaviour found by Roth and Child, when rhino populations became compressed on to islands at Kariba. Further, Ripley (1952) has suggested that the great Indian rhino are also territorial as they too have middens.

but Gee (1953) disagrees, as several animals may use the same dung heaps and this author suggests they may play a role in establishing social hierarchies within a group.

Black rhino are probably susceptible to abnormal floods where these affect the greater part of their home range, even if the water is only a foot or so deep. A female and calf drowned in this much water within a few days of an island submerging, indicating it is essential for rhino to lie down, as they often do, when sleeping.

A. Behaviour on Islands

Black rhino are generally accepted as browsers of a variety of trees, bushes and shrubs, although they seldom eat much grass. They experienced shortages of food as islands diminished in size, which may have led to the deaths of two very small calves and an adult, but Roth and Child have argued that this had little effect on the structure of the population, although most marooned rhino were thin.

The plants eaten by three rhino on Island 17, based on observations of undisturbed feeding and the obvious signs of browsing, included *Combretum apiculatum*, *Diospyros quiloensis*, *Holmskioldia spinescens*, *Dichrostachys cinerea*, and traces of mopane were found in a few droppings. These were similar to the plants taken by other browsers, especially impala, the most numerous species on the island, and suggest considerable competition for food. This may have caused the three rhino to feed in the shallows, where impala never went, and was substantiated by the following incident. One of the rhino had broken down a branch of *Combretum apiculatum* and was defending it from a grysbuck, an impala and a bushbuck. In this it was not very successful, as usually, when lunging after one of them, the other two were able to nip in and feed.

The breaking down of small trees or branches up to four and a half inches in diameter was more prevalent on this island than in any other area investigated on the Lake. It was done with the chin and meant rhino could obtain food from above the clear browse line left by impala (page 78). This behaviour in response to food shortages is common in Hluhluwe according to Dean, who describes areas of two or three acres in which most of the *Acacia karroo* is damaged.

Rhino populations withstood considerable compression into the small areas on islands, without the various smaller groups losing their identity (Roth and Child, op. cit.) and without inter-specific competition for food resulting in a heavy mortality. Obviously there is a level at which food supplies will limit further growth of a rhino population, but as a limiting factor it may be less significant than hunting, or the availability of water to this localised species, in extensive areas of otherwise suitable habitat. With the possible exception of the Somaliland race, *D. bicornis somaliensis* (Stockley, op. cit.), black rhino are generally agreed to be dependent on regular access to open water.

Roth and Child have explained the ease with which the species can be eliminated by hunting, as the replacement rate to the breeding herd is slow (7%—9% per annum) and the maintenance of the population relies largely on the survival and longevity of sexually active adults. This means that a population could only fluctuate slowly and sporadic food shortages would not affect numbers to the same extent as they may in rapidly breeding species, which can become numerous between successive periods of food scarcity, even if the intervals are fairly short. Further, on Island 17, rhino evaded the critical lack of food by obtaining food from a higher level than any other browsers, and the ability to eat twigs meant that they used food unsuited to most species except elephant. This, and the fact that rhino density is usually low in poorly watered areas, suggests that open water is the main limiting factor to this species, which lives in small groups in restricted home ranges.

3. BURCHELL'S ZEBRA

Zebra, *Equus burchelli* Gray, were only recorded between the Mwenda and Umniati rivers within Rhodesian portions of the Kariba Basin. This indicates the influence of human settlement on their distribution in the Zambezi Valley, where they are scarce compared with the southern