(Figure4) which has total contact with its calf, whereas the black rhinoceros calf follows the mother with very little contact and therefore less protection (Figure 5). Both these relationships are related to the different habitat requirements of these two species.

THE WARNING:

In 1977 a black rhinoceros male lacking one pinna was introduced to the Addo Elephant National Park from Hluhluwe Game Reserve. It was later successfully castrated to prevent the possibility of an earless inducing gene being introduced into the Addo population (de Vos and Braack, 1980). Subsequently it has been destroyed as it no longer served a reproductive function in the park (J. Flamand, pers. comm.). The animal had been a familiar resident of Hluhluwe Game Reserve prior to its translocation and was known to have been born with both pinnae. Scars that were subsequently seen around its ear opening indicated that the animal was no exception to the general rule that earlessness in the Natal black rhinoceros is due to hyaena predation. The castration exercise was clearly ill-considered and the presumption that rhinoceros earlessness is necessarily a genetic condition is to be avoided in future.

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Re-Establishment of Elephant in the Hluhluwe and Umfolozi Game Reserves, Natal, South Africa

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Prior to the advent of European influence in Southern Africa, elephant were widely distributed throughout Natal and Zululand. The elephant populations in this area were decimated during the "Great White Hunter" era and the last elephant in the Hlabisa district of Zululand was reputedly shot in 1890. It is only in the unspoilt Mozi swamps and Sihangwane forests in the very northern part of Zululand that a remnant population of elephant survives. This population numbers between 75-150 and moves back amid forth across the international boundary between Mocambique and South Africa. Fortunately, the elephants are now protected on the South African side of the border with the recent proclamation of the Tembe Elephant Reserve, which falls under the control of the KwaZulu Legislative Assembly.

Tine Natal Parks, Game and Fish Preservation Board (henceforth termed the Board) controls a number of conservation areas in Zululand, the largest being the Hluhluwe and Umfolozi Game Reserves; these are joined by a corridor of state land (the whole area being approximately 900 square kilometres). The Board's primary objectives for these areas are to conserve a wide variety of habitat types and their associated indigenous species and to allow ecological processes to operate without interference (except where these processes have been impaired in some way). In line with these objectives it is the Board's policy to re-establish species in conservation areas where they have been eradicated.

Three major factors motivated the Board to re-establish elephant in the Hluhluwe and Umfolozi Game Reserves. (1) Elephant occurred naturally in the reserves and have been locally extinct for just under 100 years. (2) Since the reserves were proclaimed in 1985, the tree and shrub component of the vegetation has increased to the extent that the thicket, woodland and forest habitats are encroaching severely upon the more open savanna, grassland and wetland habitats. One of the major ecological factors that was removed from the area is the destructive feeding habit of elephant, and it is thought that the increased woody component is due, at least im part, to their absence. (3) Since elephant are classified asa special caseof threatened species by IUCN, the establishment of two interlinked populations of elephant in Natal would improve the status of this species in Africa. Furthermore, this would add considerably to the biological and conservation status of the reserves.

POTENTIAL PROBLEMS

During the planning of the re-establishment programme three potential problems were identified:

1. Would elephant break through die reserves' boundary fence?
   In some parts of Africa elephants move over large distances. If the re-introduced elephant were to exhibit this type of movement pattern and break through the fence they might cause socio-political problems by: (i) damaging the property of the adjacent subsistence farming community, or (ii) allowing other animals (particularly large carnivores such as lion, leopard, hyaena and cheetah) to leave the reserves.
2. Would the elephant damage the reserves' vegetation to an unacceptable level?
   This question may seem contradictory to one of the motivations for re-establishing elephant in the reserve, but it refers specifically to the possibility of the elephant selecting strongly for endangered or endemnic plant species which have higher priority for conservation than elephant.

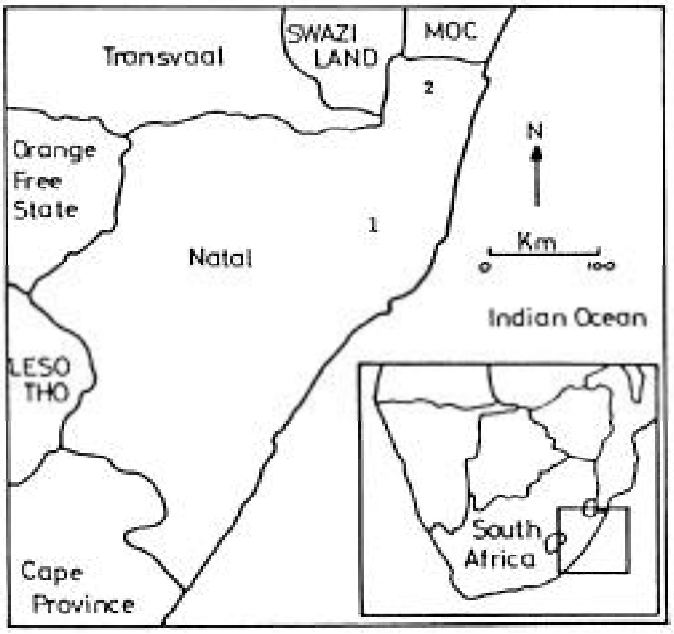

Figure 1. Location of Hlabisa District (1) within which Hluhluwe and Umfolozi Game Reserves lie; and the Sihangwane Forest and Mozi Swamps (2), now proclaimed as the Tembe Elephant Reserve.

3. Would the elephant survive the translocation exercise?
   This question arose from the fact that only juveniles (approximately 3-4 years old) could be translocated, due to the difficulties in handling and transporting wild adult elephant. At the commencement of the elephant re-establishment programme in 1981 all previous attempts to translocate juvenile elephant in Southern Africa had experienced extremely high mortality rates. Reasons put forward for this were based on the fact that young elephant spend most of their formative years learning which plants are palatable and where food and water may be found at different times of the year, from older members of the herd. Therefore, a high mortality rate is to be expected as the translocated juveniles have not had the opportunity to complete their education and are consequently ill-equipped to survive on their own in a new environment.

In order to establish whether or not these potential problems would present insurmountable obstacles an experimental phase was initiated, with a limit of 20 animals being set for each reserve.

MONITORING THE INITIAL PHASE OF THE PROGRAMME

Initially the Board resolved to monitor the movement patterns, feeding behaviour and mortality rate of the juvenile elephant re-introduced into Hluhluwe Game Reserve. Only when preliminary results from Hluhluwe indicated that translocation could be successful would the experimental phase be extended to Umfolozi Game Reserve.

1. Movement patterns

Two groups of 8 and one group of l0 juvenile elephant have been translocated from Kruger National Park to Hluhluwe Game Reserve since September 1981. Each group had radio collars fitted on at least two of the largest animals so that their movement patterns over time could be established. On translocation, there was an initial period of one to two weeks during which the elephant were highly disturbed and agitated. During this stage a loose group structure was formed, with the larger animals establishing leadership. Sometimes the groups split up, re-formed and /or one or two elephant would join up with an older group of elephant (which had already been established). Thereafter, they settled into a small home-range (between 25-50 ha) which gradually expanded and stabilized. At present, the three groups have home-ranges which overlap considerably, with a combined area of approximately 6 000 ha (about 20% of Hluhluwe Game Reserve).

Since the elephant in Hluhluwe Game Reserve did not attempt to break out of the reserve over the four year period from 1981-1985, two groups of elephant were released into Umfolozi Game Reserve in 1985. No radio collars were fitted on these animals (as experience from Hluhluwe showed that whenever their collars had to be changed they became highly disturbed causing the group structure to break down). Therefore movement patterns could not be monitored as closely as those in Hluhluwe. However, from sightings of these elephant they appeared to exhibit the same pattern of movement as the Hluhluwe elephant, being initially disturbed, then settling down in a small home-range which gradually expanded. Their home-range at present appears to be approximately 3% of Umfolozi Game Reserve.

2. Feeding behaviour

Feeding behaviour of the first group of young elephant released in Hluhluwe was studied intensively before and after they were released. This study tailed off after a few months as these young elephant were very susceptible to disturbance by humans on foot. Feeding behaviour since then has been monitored by analysing their faeces periodically (using a scanning electron microscope). The composition of their diet to date has been approximately 50% grass (particularly Durban grass **Dactyloctenium australe)** and 50% browse, which is the same ratio as has been recorded for elephant in the Kruger National Park. It was interesting to find that while the elephant were held in pens and their diet was supplemented with high protein cubes, they did not appear to be specific in their choice of plant species to eat. But after the elephant were released they showed positive selection for some of the more palatable woody plant species and rejected unpalatable species.

Despite this selection, the elephant have shown no particular preference for any endangered or endemic plant species and to date the possibility that the elephant may damage plant species which have been identified for special protection has not materialised.

3. Mortality rates

Of the 26 animals introduced to the Hluhluwe Game Reserve, eight have died which represents a 31% mortality rate. Of the 30 elephant released in Umfolozi there have been four confirmed deaths and possibly more (as only 20 animals cam be accounted for at present). However, this mortality rate is quite low compared to the levels experienced in translocations elsewhere in Southern Africa prior to 1981; the Board regards a mortality rate of up to 33% as unavoidable.

IN CONCLUSION

To date, the re-establishment of elephant into Hluhluwe and Umfolozi Game Reserves has been a success and the Natal Parks Board is mow considering detailed plans for the second phase of the operation. These plans revolve around, firstly, the question of how many animals would have to be introduced to form baseline breeding populations which will be genetically viable in the long term; secondly, what time intervals should elapse between the release of groups of juvenile elephant to produce a demographically stable baseline population; and thirdly, what is the maximum number of elephant that the reserves can support over the long term?

It is only with bold moves, such as this exercise to re-establish elephant into parts of their former range, that conservationists will be able to achieve their ideals.