KARIBA STUDIES

'Kariba' not only signifies an immense feat of engineering and the bringing of industrial potential to a relatively undeveloped region, it also marks a sudden change in the conditions of life for human beings, and for the flora and fauna of the area. Three institutes of the Rhodesias felt that here was a unique opportunity to study scientifically the effect of these changes. They took steps, therefore, before the inundation to make a series of investigations. Their findings are to be issued as books, and as papers which might be collected later into bound volumes. Details of the publications are given below.

1. *The Social Organization of the Gwembe Tonga* (Published)
   BY E. COLSON. 35*s. net*
2. *The ~~Human~~ Ecology of the Gwembe Tonga* (Autumn 1961)
   BY T. SCUDDER.

In preparation

3. *The Material Culture of the Gwembe Tonga*
   BY B. G. R. REYNOLDS.

The Human Biology of the Gwembe Tonga
BY P. V. TOBIAS.

The Archaeology of the Gwembe Valley
BY J. DESMOND CLARK, R. R. INSKEEP, R. SUMMERS, *et al.*

The Geology of Lake Kariba
BY G. BOND.

* *The Zoology of the Area Scheduled for Inundation*, a series of papers, including *Ichthyology*, BY P. B. N. JACKSON, and *Ornithology* BY R. H. N. SMITHERS.

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KARIBA STUDIES

Techniques used to rescue Black Rhinoceros
(Diceros bicornis)
on Lake Kariba, Southern Rhodesia

by

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and

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TECHNIQUES USED TO RESCUE BLACK RHINOCEROS *(Diceros bicornis)* ON LAKE KARIBA SOUTHERN RHODESIA

by

GRAHAM CHILD AND RUPERT FOTHERGILL

CONTENTS

1. AIMS

A number of black rhinoceros, *Diceros bicornis*, became trapped on temporary islands during the filling of the artificial Lake which resulted from the damming of the Zambesi river at Kariba. The islands were in the process of being submerged by the waters of the forming Lake and these rhinoceros would have perished had they not been removed to the safety of the mainland.

The basic technique used for their capture was developed by Buechner, Harthoorn & Lock (1960*a*, *b*, *c*) for the live-trapping of several species of large African mammals and involved the use of an immobilising drug. The present paper reports the application of this technique to the practical problem of capturing rhinoceros on islands, to effect their transport and liberation on the mainland.

2. PROCEDURE AND RESULTS

Sixteen black rhinoceros, eight males and eight, including two juvenile, females, were captured with immobilising drugs on temporary islands on the Lake. Thirteen of these were transported and successfully released on the mainland.

After location on an island, an assessment of the body weight of the rhinoceros was necessary for calculating the doses of drugs to be used. It will be seen from Table 1 that all animals caught in 1961 were placed at 2000 lb. weight, as they were all average-sized adults, and experience in 1960 indicated that more or less fixed doses of drugs were suitable for animals between 1700 and 2200 lb. The three casualties were weighed using a spring balance on which the juvenile was placed whole and the adults in sections. In dissecting the adults some blood was lost, but this source of error was minimised by trapping most of it in the skin. A comparison of these actual weights with the previously assessed weights indicated that average adults were about 2000 lb. and that it was possible to estimate the weight of a juvenile satisfactorily.

Table 1. *Details of the capture of black rhinoceros*

				Immobilising drug		Antidote				
									Fate of rhinoc	
Date of capture	Sex	Estimated body weight (lb.)	Actual body weight (lb.)	Gallamine administered (mg.)	Time for immobility (min.)	Neostigmine administered (mg.)	Time lag. Neostigmine given after darting (min.)	Tranquilliser. Largactil administered (mg.)	Lived	Died
9. v. 60	M.	2000	—	1250	15	27·5	?	750	×	—
29. vi. 60	F.	1850	—	1300	6·5	30	9·5	8·25	×	—
30. vi. 60	F.	900		750	11	0	—	500	×	—
3. vii. 60	M.	1800	—	1400	8	20	35	1500	×	—
20. viii. 60	F.	2000		1350	18	25	34	1000 + 500	×	—
8. ix. 60	M.	2100	—	1575	16	25	28	1000 + 500	×	—
14. ix. 60	F.	2000	—	1500	139	12·5	178	—	×	—
14. ix. 60	F.	400	378	1500	0·5	25	6	—	—	×
26. iv. 61	M.	2000	1787	1500	14	2500	21	—	—	×
26. iv. 61	M.	2000	—	1250	10	2800	12	—	×	—
15. v. 61	F.	2000	—	1500	11	20	17	—	×	—
16. v. 61	F.	2000	—	1500	40	30	45	—	×	—
2. vi. 61	M.	2000	—	1500	20	40	24	—	×	—
4. vi. 61	M.	2000	2049	1500	16	40	18	—	—	×
4. vi. 61	M.	2000	—	1375	15	40	17	—	×	—
5. vi. 61	F.	2000	—	1500	27	40	29	—	×	—

The immobilising drug was administered with Palmer Projectile syringes, described by Buechner *et al.* (1960*a*), projected from a 'Cap-chur' gun, or cross-bow designed by Lock for this purpose. It was usually found most practical to stalk animals, as attempts to drive them past a concealed firing point proved time-consuming and often failed altogether. Of the two weapons, the gun was found most suitable in dense vegetation, where animals could be approached to within 20 ft., although it was used at ranges of up to 60 ft. In more open country the bow was useful for ranges of up to about 120 ft.

The immobilising drug used was a mixture of twenty-five parts of Gallamine triethiodide to one part by weight of Atropine sulphate. Harthoorn & Lock (1960), present for the rescue of the first four rhinoceros, recommended the mixture be administered at the rate of 0·75 mg. of Gallamine per lb. estimated body weight. The doses given the rhinoceros at

Kariba, summarised in Table 1, suggested that between 1250 and 1575 mg. was suitable for average adults. Adjustments within this range were made according to the relative size of an animal when compared with others successfully handled, but were lowered for animals unsuccessfully darted a short time before, in case they suffered residual effects of the first dose. This was apparently the reason for the female's breathing being very shallow after she became immobile in only 6½ minutes on 29 June 1960. She was darted with a similar dose of drug, 1300 mg., 150 minutes before the successful attempt. This female went down more quickly than any other animal, except the 378 lb. calf that died on 14 September 1960, probably from an overdose of Gallamine solution, received when it came between its 2000 lb. mother and the man firing a dart intended for her. Most animals became immobile in from 10 to 20 minutes, but there was one striking exception of an animal which took 139 minutes to go down. The long delay was attributed to a failure of the syringe to operate at impact: the animal's movements caused the drug to eject some time later.

Once a rhinoceros became immobile its feet were tied together. If necessary, it was injected with Neostigmine methylsulphate, usually in amounts of 2–4 mg. per 100 lb. estimated body weight, to counteract severe respiratory paralysis due to the Gallamine. In addition, when paralysis was very severe the rhinoceros received artificial respiration until shallow breathing improved. The artificial respiration was administered by rhythmically depressing an animal's abdomen about forty times a minute, so as to drive air from its lungs.

The young female rescued on 30 June 1960 received no antidote as at no time did its breathing become particularly shallow, but both males caught on 26 April 1961 received exceptionally high doses of 2500 and 2800 mg.

Both males were extremely thin, the first, which later died, was in worst condition. When autopsied, no fat was visible beneath the skin or in the thoracic or abdominal cavities and the femur marrow was very red and liquid. In red deer femur marrow without fat was red and watery in appearance and was associated with very poor physical condition generally (Riney, 1954), and this seemed to be the association between the femur marrow and the physical condition of the dead rhinoceros, which appeared to be in very poor condition. Shortly after immobilisation the breathing of both animals became very shallow and mucus escaped in a steady stream from the mouth. Rough dissection of the dead animal's lungs showed many of the major air tubes to be blocked or partially blocked with mucus. A fact which may have contributed to the survival of the second animal was that during transportation its head was slightly lower than its body, thus allowing mucus to flow freely from the mouth. It was also encouraged, by periodic prodding, to get rid of mucus by tossing its head.

As soon as possible the trussed up rhinoceros were rolled on to a wooden sledge and lashed in position. The sledge was dragged by about forty men down a prepared path to the water's edge, and there on to a raft on which it was towed to the mainland.

The tranquilliser Largactil was used for the transport of the first six rhinoceros. However, it did not appear to reduce their struggles and its use was discontinued following the

slow recovery of a male liberated on 8 September 1960. This male did not leave the release point until 11½ hours after being darted and was one of only two which did not charge when released. Even a further 10½ hours later it still seemed partially drugged and lay down in the close presence of unconcealed humans. The only other rhinoceros not to charge after release was the female given an overdose of Atropine sulphate (210 mg. instead of about 60 mg.) on 5 June 1961, although otherwise it behaved normally during its rescue.

On reaching the mainland and before being set free rhinoceros were marked for future recognition.

During the release great care was taken while removing the ropes binding the feet in the belief that by slipping them off gently the animal would not realise it was being freed. This proved successful and only one animal tried to rise with ropes still attached. Usually they did not get up until doused with cold water.

3. DISCUSSION AND CONCLUSION

Modified, the technique of Buechner *et al.* (1960*a*, *b*, *c*) was a relatively safe and easy method of capturing black rhinoceros prior to their translocation to the mainland from temporary islands in Lake Kariba. Thirteen out of sixteen were successfully liberated and subsequent contacts of four of these marked animals showed that: one had survived for about 10 months, one 5 months and two for 2 weeks. This suggested that rescued rhinoceros lived for at least these periods and was consistent with a failure to find any carcasses near release points on later visits.

A mortality of three out of sixteen (18·75 per cent) may appear high, but as already noted two of the deaths were probably due to overdoses of drugs. However, the reason for the death of the average-sized adult on 4 June 1961, was not so obvious. It received 1500 mg. of Gallamine and did not become immobile unduly soon, taking 16 minutes to go down, but when given the antidote it was clear that death was imminent. It was in very poor physical condition and it is possible that this influenced its tolerance for the immobilising drug, as may also have been the case for the male which died on 26 April 1961, after receiving 2500 mg. of antidote. It is clear from the table that average adult rhinoceros had a range of tolerance varying between 1250 and 1375 mg. of Gallamine, and 20–40 mg. of antidote was a safe dose. These ranges made the technique practicable.

The equipment used for administering the immobilising drugs was adequate if short ranges were used. At these distances difficulties associated with accurate range finding, the unpredictable differences in force with which the 'Cap-chur' gun ejected the syringe between successive shots, deflection of the dart by vegetation and failure on the part of the mechanism of the syringe, were minimised. Generally at short ranges animals were immobilised at the first, or at most second, attempt at darting them.

At Kariba it was necessary to transport animals lying on their sides, but they did not have

to be moved long distances and were usually freed within about 3 hours of being darted. Under these conditions the use of a tranquilliser seemed unnecessary and was discontinued after the release of the sixth rhinoceros. However, where animals have to be transported long distances and where motorised vehicles could be used, it would probably be preferable to allow the animals more freedom of movement, in a more natural position. Then the use of a tranquilliser, such as Largactile, may be an advantage.

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