

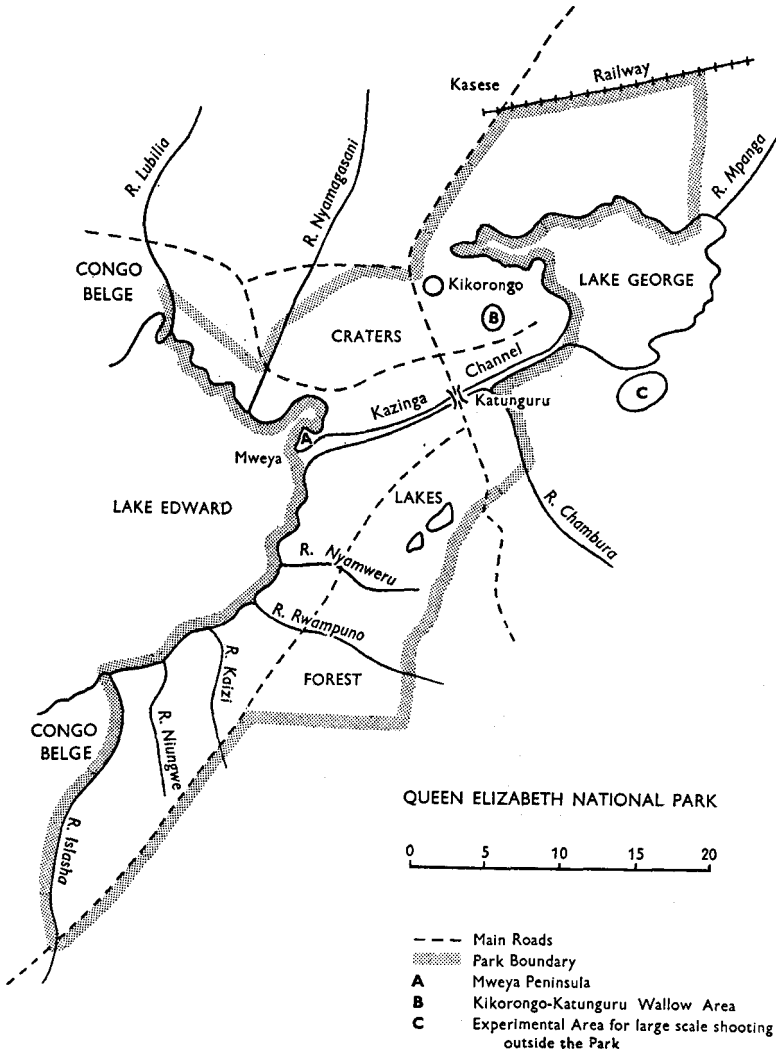
## QUEEN ELIZABETH NATIONAL PARK : UGANDA THE HIPPOPOTAMUS PROBLEM AND EXPERIMENT

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The Queen Elizabeth National Park includes more than half the Uganda coastline of the great lakes Edward and George, as well as the 20-mile-long Kazinga Channel which connects the two. Large schools of hippo are present throughout the length of this coast, and they graze inland each night to a steadily increasing degree. The land area of the park is some 760 square miles, of which at the most 400 can be utilized by the hippo. A careful and conservative estimate gives the population of these animals at not less than 14,000, so that each is restricted to a maximum of 16 acres of grazing. In fact, of course, the hippos graze as near as possible to the waters in which they spend the day, making the actual concentration near the lake shore much higher than this. And there is a large number of other grass-eating animals competing for the same grazing: buffalo, kob, waterbuck and other ungulates as well as elephants, all in large numbers. These, however, are not tied to one particular habitat as are the hippos, and are therefore less likely to be the cause of the overgrazing and beginnings of erosion which are evident.

This is the background to a problem which has been much discussed and written about during the past two or three years. If nothing is done about it, a situation detrimental to the hippos themselves, as well as to the other grass-eating animals of the area, can easily develop. Clearly overpopulation in relation to the available food supply can result when any species is freed from the natural factors controlling its increase, e.g. by excessive destruction of predators, particularly when the species has no opportunity to extend its range. The resulting starvation can decimate numbers and do untold harm, as has been found more than once. It should be explained that the effective land area of the Queen Elizabeth Park is strictly limited by the pressure of a rapidly developing African farming community along its boundaries.

Some overgrazing, near waters occupied by large numbers of hippo, is almost inevitable and, provided this does not extend too far inland, can probably be accepted with equanimity. But here in the Queen Elizabeth Park the problem is complicated by the fact that a number of hippos have established themselves



in inland pools and wallows away from the main waters and are creating patches of over-grazing in otherwise good grassland. In 1957 a recommendation was made that the problem could be solved by reducing the hippos to approximately 50 per cent of their present numbers and by removing the annual increase thereafter. Even excluding all other aspects of the question, this would be a formidable and drastic undertaking, involving

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the immediate shooting of some 7,000 hippos—and disposing of the remains—and perhaps 700 hippos every year for ever after.

There are also ancillary problems which can be but briefly mentioned: little is as yet known of the nature of the soil, vegetation and distribution of rainfall in different parts of the park—work on these subjects is now beginning—although there is a marked variation in the effect of a given number of hippos. Practically nothing is known of the biology of the hippo, including its longevity and fecundity, major factors governing natural adjustment of numbers.

That the hippo population has increased considerably during the past twenty years is evident, but the rate of increase is entirely unknown. Another obscure factor is the effect of disease on hippo numbers and the relationship of diseases such as anthrax in hippo, to those affecting humans or cattle. Anthrax is known to affect hippo and to occur sporadically in the area, although the rate of mortality is not high. The whole problem is complicated by our lack of knowledge as to the degree in which the hippo population has changed during the last fifty years and the extent to which man, in his rôle of one of nature's predators, controlled the hippo numbers before preservation was established. Hippos have few other natural enemies, although they often fight amongst themselves, but hyenas, as well as occasional lions, take a small number of young calves. Amongst major practical problems to be considered if the hippo were to be reduced was the possible disturbance to other animals of a large-scale shooting campaign, as well as lack of understanding of our motives by the local people.

Faced with these problems, the desirability for experiment was obvious. But before any drastic action could be taken the National Parks Trustees had clearly to decide upon their interpretation of the term national park. In the end it was agreed that in Uganda a national park must be considered as an area controlled by the Trustees for the general benefit; and that it must be managed in the best interests of its wild life and the people of the country. The policy of *laissez-faire* and the absolute paramountcy of untouched nature was thus discarded. There is, of course, no suggestion of irresponsible or unnecessary interference with the natural order of things.

This was the stage reached early in 1958. Shooting of hippos to reduce numbers was not the only possibility. There were alternatives such as restricting access to damaged areas in the park and inland pools, or ploughing and planting to encourage

the limited rainfall to penetrate the soil, and so to discourage run-off. All these possibilities had to be investigated by experiment.

The first phase of the experiments was biological examination of a certain number of hippos. For this purpose Dr. Longhurst (wild life biologist from California, who was working in the park on a Fulbright research grant) was permitted to take specimens. At the same time a move was made to stop hippos using certain selected wallows, with a minimum of shooting. One wallow was drained, and another which provided a home for over 100 hippos, was cleared, using various means of disturbance such as thunder-flashes and the throwing of stones. It was then fenced. Although these wallows were dealt with successfully the results were, on balance, negative, for such operations were altogether too complicated and costly. They might also be undesirable for these pools not only act as dormitories for the hippos; they are the natural drinking places for other animals.

The comparative failure of these experiments indicated that more active experiments would have to be carried out and they were embarked upon in May and June of 1958. Two areas were selected for experimental elimination of hippos by shooting, while other control areas (with their full complement of hippos) were chosen for independent study. It was also decided that the maximum use should be made of the carcasses for food and scientific study, and that full opportunity for participation should be given to interested scientific bodies. In the event Makerere University College, the Virus and Trypanosomiasis Research Institutes and two veterinary research organizations took advantage of this, as well as Dr. Longhurst and Mr. Allan Brooks, the Game Department biologist who assisted him in biological examination.

At the same time the experimental areas were examined by a pasture agronomist, who established a number of transects by which to study future vegetation change. Careful animal censuses were taken and we were fortunate that Dr. Longhurst was not only a biologist but an experienced air pilot as well, so that a series of counts could be made from the air. The shooting, which involved the killing of between 400 and 500 animals, was concentrated into as short a time, four weeks, as was compatible with the scientific aspects of the operation and successful disposal of the meat. In this way, disturbance of other animals was limited as far as possible. In fact as soon as they discovered that the shooting, the scientists and the other

manifold activities of the operation held no terrors for them, the elephants, buffalo and buck appeared to become interested spectators. Subsequently hippos returning to the experimental areas have been shot on one or two days each month and this has meant between ten and twenty animals monthly. Only in this way could the true effect on the hippo be ascertained.

The two experimental areas are the Mweya Peninsula, where the Safari Lodge and park headquarters are situated, and the Kikorongo-Katunguru wallow area. From the first all hippos were shot and all, or almost all, those which subsequently returned have since been shot. The extent of the peninsula is roughly two square miles.

The Kikorongo area is bounded by the main Fort Portal road, Lake George and the Kazinga Channel and is remarkable for the concentration of wallows and inland pools much favoured by the overflow hippo population from the open water. Its western half, about 20 square miles, was treated as the elimination area, the remainder as undisturbed control. From the elimination area all wallow hippo were shot, but no attempt has been made to prevent night grazing from the Kazinga Channel, where no shooting has taken place. The effect of this was to reduce the number of hippo throughout the elimination area by 50 per cent, for roughly half the hippos were in the wallows and half in the channel. The wallows are well concentrated, so that shooting has in fact been limited to an area of some 16 square miles. As with the peninsula, hippo returning to the wallows have been systematically eliminated.

It will thus be seen that the objective is one area with 100 per cent elimination, one with 50 per cent and a third with the full normal hippo population for study and comparison. The shooting has been successfully carried out, although the rate of return to the Mweya peninsula is such that 90 per cent elimination is all that has been achieved and it will be hard work to maintain this percentage. Immediately before the shooting ninety-seven hippo were counted round the shores of the peninsula. In fact, however, 128 had to be shot before the area was cleared. Over seventy more have been shot in the eight months following the major operation but others continue to return. These figures are expressive of the speed with which hippos infiltrate back into a specially favoured locality and there seems to be one point which the cows regularly visit to drop their young and suckle them. As yet there has been no effective change in the population of other grass-eating animals using the area.

Immediately before the shooting there were 334 hippos in inland pools throughout the wallow area (elimination) and 235 in that section of the Kazinga Channel by which it is bounded (north bank only). The total was thus 569. Two hundred and eighty-seven animals were shot and a further count made some six weeks later showed 336 hippo in the area, all but four in the Channel. Subsequently forty-odd have had to be shot and it appears that it may not be too difficult to prevent recolonization of the wallows. The considerable number of other animals, particularly elephant, buffalo, kob and waterbuck, using the area have shown no tendency to leave or move out of the small part of it in which most of the shooting takes place ; nor are they wilder than before.

The scientific results are not yet available but it is possible briefly to summarize data collected by Dr. Longhurst and recorded in his unpublished preliminary report. Four hundred and forty-four hippo carcasses were subjected to varying degrees of examination and their jaw bones were retained for age determination and the study of tooth replacement. The animals were grouped into twenty different age-categories, which cannot yet be assessed in terms of years. The largest number come into the adult male groups, owing to the predominately male population in the wallows. Thus 273 males were examined, compared with 171 females.

Throughout the operation efforts were made to gather information on disease and parasites. Ninety per cent of the carcasses were examined for anthrax and no single instance of the disease was found, although anthrax had occurred recently amongst hippos elsewhere in the region. Indications thus are that the incidence of anthrax amongst hippo is not higher than that found amongst livestock. Parasites included liver flukes, stomach and intestinal worms, stomach flukes, protozoan parasites and such external forms as ticks and leeches.

The largest hippo weighed was a female of 4,454 lb. ; the largest male reached 4,184 lb. The average weight within the groups, however, showed the males to be slightly the heavier. The mean weight of adults was 3,256 lb. and 3,002 lb. respectively. Accurate comparative weights of hippos from other parts of Africa are not available to me, but the Queen Elizabeth Park hippos may well be lighter than average, a circumstance resulting from the poor grazing. Very few of the animals examined carried much sub-cutaneous fat.

Stomach samples were saved from 122 specimens and all were found to contain 100 per cent grass. There was no evidence

of browse or of any forage being obtained from aquatic vegetation ; they were shown also to be highly selective grazers. The average weight of the stomach contents in adult hippos was 343 lb., with a moisture content of 75 per cent. The actual average of dry food consumed daily thus works out at 86 lb.

One hundred and seventy-nine female hippos, of which 169 were adult, were examined for reproductive data. Twenty-two per cent were found to be pregnant and 41 per cent were lactating. Five per cent were both pregnant and lactating. Forty-one per cent were neither pregnant nor lactating. Of foetuses examined, 45 per cent were male, 47 per cent female with the balance of uncertain sex. The heaviest foetus weighed was 137 lb., whilst one newly-born calf was found to weigh only 118 lb.

Overgrazing in the lake-shore areas and the neighbourhood of the larger wallows is evident and one can state with little fear of contradiction, that sheet erosion, where it occurs, is accelerated if not actually caused by this overgrazing. It had been assumed also that the spectacular gulleys, which are evident in certain places, were the result of surface run-off and were therefore due to the same cause. However, an independent geological examination of the park has also been carried out. Indications from this are that the gulleys are not caused by surface run-off, but are the result of water seeping through to the sub-surface clays. Increase in the growth of grass should have the effect of encouraging the absorption of water into the soil. It appears possible therefore that this could increase the speed of gully formation rather than the reverse. Such a possibility emphasizes the complexity of the problem and the peculiarities of this unique region, lying on the floor of the Western Rift Valley, with its remarkable explosion craters and salt lakes of high sulphur and phosphate content.

It is too early to make any positive comment on the changes taking place in the vegetation, although there is some obvious improvement in the grass throughout the experimental areas, particularly Mweya. But weather conditions have been favourable and there seems to be more grass in several other parts of the park as well, so this may be a fortuitous observation ; time alone will show. It does seem likely, however, that improvement will be slow, except where a very high percentage of the animals has been removed, unless other reclamation measures are also adopted. To this end, experimental plots have been ploughed with different types of instrument and regeneration is being watched.



The hippo is by no means the only factor involved, nor is its presence by any means entirely harmful. The fisheries of lakes Edward and George, particularly the latter, are amongst the most productive in the world and support a thriving and developing industry. The hippos provide a continuous application of organic manure to the lake bottoms and so encourage growth of the microscopic plant life upon which the fish feed, particularly the palatable *tilapia*. Moreover, the presence of the hippo schools near the shore serves to protect the *tilapia* breeding grounds and prevent their disturbance by over-eager fishermen. Indirectly, therefore, the grass torn from the banks by the hippos' demanding jaws reappears as a highly productive crop in the nets of the prosperous local fisherfolk. But probably half the hippo would do the job equally well.

The present position is that shooting continues in the experimental areas, which must be kept clear. All the meat is being sold to the best advantage of the park and of would-be consumers, for hippo meat is thoroughly wholesome. At the time of the main experiment, while much was sold a great deal was given away free (144 hippos) on a good neighbour basis; although costly, this undoubtedly had a beneficial result. The whole question of marketing wild game meat to the best advantage needs further study. But at least it has been shown that where for any reason wild animals have to be shot, it is possible under certain conditions to make good and proper use of the meat.

It is not only in the Queen Elizabeth Park that large numbers of hippos are to be found. There are concentrations elsewhere in the region particularly along those shores of Lake George which are outside the park. These hippos have been fully protected, and it seems illogical that a species should be given special protection outside a national park, within which its numbers are considered excessive. Arrangements are now being made by the Game Department for the shooting of a proportion of these hippos on a commercial scale. Details are being worked out most carefully and it is probable that the aim will be to reduce the hippo population by 50 per cent and market the proceeds through a contractor, who will have to handle about 100 animals per month. Undoubtedly this should have some effect in the park, for it has been clearly shown that hippos move back to an area from which their fellows have been driven away or shot. As a result, therefore, some relief should be afforded to the neighbouring areas of the park.

The future is uncertain and no hasty or premature decision



will be taken. Even if it is shown that reduction in hippo numbers to a point within the carrying capacity of the land, is the necessary and right solution to the overgrazing problem, the scope of the necessary reduction is still unknown. A great deal of information should be forthcoming from the operation designed to take place outside the park, particularly of the effect on the hippo population of large-scale shooting over a continuous period. This may increase the natural breeding rate, although the reverse effect could equally be produced. Meanwhile within the park, for some time at least, action is likely to be limited to the two experimental areas. This phase must clearly continue for as long as is needed to give a true picture of the changes taking place in the grassland. Meanwhile the full scientific results are being awaited.

While the ideal national park is an area in which nature can be left to work out its own salvation, this is perhaps an unattainable ideal, save in wild mountainous regions. Shooting is thoroughly distasteful but may be necessary and acceptable, provided it can be carried out humanely and under proper scientific direction. Experiments have got to be made and it would surely be wrong for the authorities wittingly to allow the land within their care to deteriorate to such a degree that it could seriously affect the animals themselves. Their survival is the first charge.

It is certainly not yet proven that an overall reduction of the hippos will benefit the land and animal populations of the Queen Elizabeth National Park or that this step is even necessary; but indications are pointing that way. It may, however, be said that when an animal with the peculiar habits of the hippo is involved, a great deal of shooting can be carried out without undue general disturbance. Away from the two elimination areas, the hippos are no wilder than before and, even within them, the other animals are as tame and trusting as ever. The pleasure of our many visitors is in no way interfered with. The writer of this article admits that there was a time when he had grave misgivings. In the event these have been proved groundless.