NYASALAND PROTECTORATE

Annual Report

of the

Department

of

Game, Fish and Tsetse Control

for the

Year ended 31st December

1960

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begs to acknowledge with thanks receipt of the

GAME, FISH & TSETSE CONTROL

for the year 19 60 and requests that a copy of the Report for the following year be provided in due course.

G.P. 3813/5M/9.60

Annual Report of the Department of Game, Fish and Tsetse Control for the Year 1960

(a) Staff and General

The position with respect to Senior Division staff was a little better than in 1959. Mr. D. H. Eccles was recruited to the Fishery Research Organization in February, the Fish Ranger (Rivers) returned from vacation leave in March, the Tsetse Ranger was released from security duties in April and the Fisheries Officer returned from sick leave in the same month.

2. The improvement was slight, however, as the Director, Senior Fishery Research Officer, Tsetse Ranger and Senior Ranger were all on leave for part of the year. The game section also suffered a set back with the abrupt resignation and departure of one of the Game Rangers, though this was fairly rapidly overcome with the recruitment of Mr. L. T. Kettle to the vacant post. Appendix I sets out the staff position in detail as at 31st December, 1960.

3. With the return of the Fish Ranger (Rivers) excellent progress was made with the Southern Province Fish Farm unit and, with the Fisheries Staff in general more nearly up to strength, fisheries work as a whole made some useful advances.

4. Game conservation little more than held its own in the face of indifferent rains, political pressures, hasty staff changes in the Central Province and the absence of the Senior Ranger from the Southern Province, but there was some progress in the provision of facilities for visitors in the game reserves.

5. The Department had two important visitors during the year, in the persons of Dr. C. F. Hickling, Fisheries Adviser to the Secretary of State, and Sir Julian Huxley, visiting as a representative of UNESCO in connection with wild life conservation and utilization.

(b) Game

6. There is little of exceptional importance to report concerning crop protection activities, which proceeded in a normal way as far as this was possible in view of changes in the Ranger staff and the absence of the Senior Ranger on leave.

7. As in previous years the efforts of the centrally controlled teams were directed mainly against crop-raiding elephant and hippo, with occasional sorties against stock-raiding carnivora.

8. Efforts to protect rice lands from hippo by the erection of electric fences, in substitution for the shooting of large numbers of these valuable animals, have, regrettably, not yet been successful.

9. As reported in 1959 a fence was established on the eastern shore of Lake Malombe and worked very well for a time, but it proved too much trouble for the local rice growers to patrol the line occasionally and keep it clear of grass stems, shrubs, etc., which put it out of action by short circuiting the current, and early in 1960 it was decided to dismantle it. A second trial was to have been made at the southern end of Kota Kota District towards the end of 1960 but, after all material had been brought to the site political agitators persuaded the people that the fence was "Federal" and they changed their minds and refused to have anything to do with it. Since the equipment was all purchased with African Development and Welfare Fund money this seems a very great pity, but perhaps they may be persuaded to change their minds again when political tensions ease.

10. Despite these set-backs, there is every intention to continue the endeavour to get fences into action. If they could be properly maintained they would be very much more effective than hunters, whose numbers must necessarily be limited, and fences are obviously less wasteful.

11. The destruction of vermin under stimulus of a bounty system went well in some districts, if the bounties claimed are a genuine reflection of the vermin killed, but showed signs of losing its impetus in others. It is, however, proving very difficult to get proper reports of progress from the various extra-Departmental local authorities responsible for the scheme in the districts and, in spite of enormous numbers of vermin killed over a period in some districts, disappointingly little impression seems to have been made on the vermin population.

12. There appears, in general, too much tendency to regard the scheme as a convenient goodwill gesture rather than a serious attempt to control the vermin population in the attempt to increase crop production, and little effort seems to be made to exhort the cultivators to try to achieve decisive numbers in any one season. The result is a moderately conservative cropping of the vermin population, at considerable expense to the African Development and Welfare Fund and to local Treasuries, instead of a decisive reduction of it.

13. Details of animals killed and value of ivory collected as a result of crop protection activities are set out at Appendix II. A small proportion of the meat of the slaughtered animals was sold and the proceeds credited to the African Development and Welfare Fund, but the bulk was distributed to the local people or handed over to the Native Treasuries for sale.

CROCODILE HUNTING

14. Three non-African licensees were in very intermittent action during the year and accounted for a total of only 590 reptiles. A further 172 skins were exported by a number of independent Africans.

15. Mr. Gurney, who may be said to have pioneered the crocodile skin industry in Nyasaland, was tragically drowned early in the year and another licensee, who has been a steady operator over the last three or four years, left the country in August. The disappearance of these two people from the industry accounts, to some extent, for the sharp decline in catches and, judging by complaints from the gill-netters, crocodiles are by no means extinct.

16. The size distribution of the catch was a little better than in 1959, immature specimens amounting to 40 per cent. of the total as against 64 per cent. in the previous year. This was largely due to the African catch which was nearly all of the larger sized specimens.

GAME CONSERVATION

17. Game observation camps were open at Lifupa in the Kasungu Reserve and Chipata in Kota Kota Reserve, but the camp in the Mwabvi Reserve, though otherwise ready for opening, could not be put in action because after the poor rains little water was available in the nearby river. A borehole was put down to solve the problem but could not be completed until too late in the season.

18. Work was started on a second camp in the Kota Kota Reserve and a second hut was added to the Lifupa camp.

19. The camps attracted disappointingly few people due to the temporary disorganization in the Central Province as a result of the abrupt resignation and departure of the Game Ranger just at the beginning of the season which made it difficult to put out any publicity about them. Moreover what visitors went to the camps mostly visited at high noon and for a few hours only and, not unnaturally, saw very little. Such few as stayed the night and went out early in the morning fared better.

20. A party of African Specialist Rural Science Teachers from the Colby School of Agriculture, who visited the Lifupa camp in October at the Department's invitation and stayed the night there, saw some eighty head of game in the course of an early morning and late afternoon walk, which is not unreasonable for Nyasaland. The interest shown by Africans on sponsored visits has continued to be encouraging.

21. The Game Reserve Guards continued to make systematic records of game seen during patrols and the results are given at Table IA to IF of Appendix III.

22. The situation they suggest is a variable one. The figures for the Nyika point to an encouraging increase in most of the larger animals while those for Kota Kota and Kasungu suggest small increases for most animals except sable, but no great change in the situation as a whole. The Mwabvi Reserve in the Southern Province also shows increases, particularly in the buffalo population, but the data for Majete and Lengwe suggest a considerable decline.

23. The figures in general reflect, of course, not only variations in the game populations, but also variations in the vigour, care, and locality of the patrols. Records of animals with a very restricted habitat, such as nyala, will be particularly affected by the latter consideration and it is very possible that much of the fall in the Lengwe figures is attributable to this factor.

24. Nevertheless there is no doubt that increased poaching, partly as a by-product of political pressures, poor rains and the lack of a Game Officer in the field in the Southern Province during the second half of the year, have combined to make a difficult situation particularly in the Lower River Reserves. It is only too probable, therefore, that there has been a real decline in their game populations.

25. It should be appreciated that even in normal circumstances the position of the game section of the Department is an extremely difficult one. There are only three Senior Division Game Officers, one for each Province, so that there is an automatic removal of supervision for six or eight months in each Province once in every three years. The course of events in the Southern Province this year is merely an illustration of the effects of this. It is difficult to make real progress in the building up of game stocks against this background.

26. Assistant Rangers and more active support from local authorities are badly needed. In connection with this latter point mention should again be made of the support given by Chief Katumbi. As a result of his active measures to suppress poaching in the Vwaza Marsh Controlled Area game is definitely on the increase. The Ranger reports that for the first time for many years elephant have dropped their calves there. Very possibly some of the increase in the Nyika game partly results from its protection in the Vwaza Marsh during the cold weather. It is encouraging to learn that Chief Chikulamayembe is seriously considering asking for a Controlled Area in his lands, which also border the Nyika Grasslands.

27. Outside the Reserves there was no great change in the situation. Figures for game licences issued are not available beyond 30th October at the time of writing, but unless large numbers of licences were taken out in the last two months of the year, which is unlikely, issues for 1960 will have been considerably below those for 1959. They still fall far short of firearms (shotguns, rifles, and muzzle loaders) registered.

28. There were, however, very few prosecutions for offences under the Game Ordinance. Evidence in these cases is extremely difficult to obtain, especially under the state of political tension that pertains at present. The only hope is the imposition of a heavy sentence when a case is brought home, and more especially the confiscation of the firearm with which the offence was committed. Such punishments are,

however, very rarely inflicted in practice. The heaviest, almost the only, fine of the year was one of £10 for shooting a roan antelope without a licence. This would probably represent about the value of the meat from the animal so that the accused was not out of pocket more than the cost of his cartridge.

29. One cannot close the game section without mentioning the extraordinary appearance of a fully grown female chimpanzee in the Limpasa *dambo*, in close proximity to the main road bridge about twelve miles out of Nkata Bay.

30. The animal actually made its first appearance at the end of 1959 but was not properly identified until early 1960, when it proved to be a chimpanzee, probably var. *schweinfurthei*, not less than 12 years old.

31. How it got there is still a mystery. The obvious explanation is that it is an escaped or released captive, but so far enquiries have failed to find anyone who has kept such an animal in Nyasaland, let alone Nkata Bay District, certainly not within the last twenty-five years. Indeed it is difficult to see how such an animal could have been kept by one of the handful of Europeans living north of Lilongwe without the fact being widely and generally known. An African might conceivably have done so, without knowledge of the European community, but not without the knowledge of his fellow Africans and so far no one has been found to admit to knowing anything about it. Nor does the importation of such an animal, which could not but be a difficult exercise, and subsequent release without obvious point or profit, seem to be a proceeding likely to appeal to the average person, African or European.

32. It may be the bush-bred offspring of a chimpanzee released in the really distant past, but if so it is remarkable that it has stayed hidden so long and should now appear so completely unperturbed at the proximity of human beings.

33. The possibility of its being part of a hitherto unknown relic population was also considered. Some searches have been made in the few uninhabitated areas of the District which also seemed possible habitats, botanically speaking, but though these have not been nearly exhaustive enough, in themselves, to rule out this possibility they have served to show that such areas are by no means unvisited. It is extremely difficult to believe that any relic population could exist in them without being known to the Africans, even if only by tradition. The fact of the animal being a lone female, apparently in good health, also militates strongly against the likelihood of it being part of a local population.

(c) Fishery

THE STATE OF THE FISH STOCKS

34. The fishing statistics for 1960 relating to the ring-nets of the non-African fishing firms suggest a further small decline in the *Tilapia* stocks available to these nets. The catch per single haul of the net was lower in 1960 than in 1959 but the total number of hauls was also lower, which appears to counter the argument that the lowered catch per pull was merely the effect of the great number of pulls being made; that is that the same number of fish were being shared amongst an increasing number of hauls. Thus 12,412 hauls in 1959 produced an average catch per haul of 35 dozen fish, taking all the firms together, while 9,007 pulls in 1960 produced an average of 32. A small decline, admittedly, but one would have expected some rise if the fishable stock, that is the stock of fish large enough to be caught, had remained precisely the same.

35. It is true that some of the decline in the non-African catches may be due to increased competition from African owned nets, particularly gill-nets, which have increased enormously of late. The major part of their catch, however, is the inshore species *T. squamipinnis* whereas the ring-nets depend mainly on the off-shore species *T. lidole*.

36. In view of this apparent decline in the fishable stocks of *T. lidole* it was thought wise to extend the close season on the use of ring-nets in the south-east arm to include November as well as December. This was with the double object of decreasing the ring-net effort slightly, to try to bring it into a better balance with the rate of recruitment to the fishable stock, and of giving protection over a wider section of the *T. lidole* breeding season, in case there had been some depression of breeding potential. It seems most unlikely that stocks have been depressed enough to have any significant effect on recruitment to the stock as a whole, or that the problem involves more than "economic" overfishing, but it seemed as well to be on the safe side.

37. Non-African figures for *Labeo* also showed a very slight decline in catch, despite significantly increased yardage of gill-net set, the main difference from 1959 being the rather indifferent nature of the December run. The slight decline in non-African landings was, however, not reflected in the figures for the African fishery, many stations reporting considerably increased catches, though small falls in catch per unit effort occurred here and there.

38. There were five non-African concerns in operation at the beginning of the year, four being active in the south-east arm and one in the south-west, though the latter only sporadically. The licensee in the south-west arm ceased operations early in the year and one of the four in the south-east arm found it uneconomic to operate on the limited licence offered him for the 1960/61 season and withdrew in June. The season thus closed with three firms in operation, all confining their attentions to the south-east arm, though all also had fishing rights in the south-west as well.

39. Catches totalled 3,391 short tons from the south-east arm against 3,953 in the previous year and with no output from the south-west arm there was an overall drop of some 700 short tons in production by this section of the fishery. Most of the shortfall in the south-east arm was the result of lowered *Tilapia* catches.

40. The complete cessation of effort in the south-west arm is very regrettable but was the result of a combination of circumstances of which lack of road communications and political tensions were the most important.

41. There were no outstanding developments in the matter of installation of equipment by the non-African firms, but one firm made preparations for the establishment of an ice-plant at its Lake-shore depot. When this plant comes into action all three firms will be properly equipped for the transport of fresh fish.

42. Data on the non-African fishery are shown in Appendix IV.

THE AFRICAN FISHERY

43. The sale of nylon gill-nets continued to increase during the year and there are now two net-making firms in action in the country, in addition to the various importers. Both appear to be doing good business, and it is plain that a very big expansion in the African industry is going on.

44. Indeed it is clear that the African fishery in general begins to reach proportions where it will begin to be necessary to exercise a certain amount of control, at least in some areas, if fishing is to remain reasonably profitable. Nevertheless so far the African side of the fishery seems to be doing very well and most stations report increase in catches.

45. The Lake Chilwa fishery received a little more attention this year than in previous years and seems capable of being developed very considerably. It is hoped to station a Fish Ranger to cover this water in the course of 1961.

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46. Obviously there will be some problems in connection with development, one of which is the extreme differences in locality of the fishing areas and landing beaches which result from seasonal changes in water level in this shallow, very level bottomed, lake. This factor was somewhat emphasized in 1960 because the indifferent rains of the 1959/60 season led to a rather exaggerated drop in the lake level by the end of the 1960 dry season. The effect was that almost the whole area between the mainland and Chisi Island which was a flourishing fishing ground in August became too shallow for good fishing from mid-October onwards. The *Tilapia* all moved out, taking most of the fishermen with them, and from mid-October to the end of the year *Clarias* and small *Barbus* species were almost the only fish landed at Kachulu beach opposite the island, at the end of the main road from Zomba. The fishing emphasis shifted to the south end of the lake, on the borders of Mlanje District and Lake Chilwa *chambo* disappeared from the Limbe Market completely.

47. The number of Africans fishing on a more or less commercial basis has further increased. Three more fishermen received loans in Fort Johnston District, two in Kota Kota and one in Dowa District. There were also some applications for loans in respect of Chilwa fishermen pending at the end of the year.

48. Considering the financial position of the fishermen who have received loans the overall picture is not altogether satisfactory. The average margin of profit is small and large receipts in good months are not held to carry over the poor seasons or ploughed back into the business in the form of spare nets and gear. Secondly there is far too much tendency for the owner of the business to adopt the role of occasional supervisor, leaving all the actual work to his labourers, which gets neglected as a result. Thirdly there is a failure to realize that the higher price to be gained by taking fish to a distant market usually does not balance the cost of getting it there plus the loss of earnings resulting from the cessation of fishing while the fisherman himself is away.

49. These faults in application and management are constantly stressed by the fisheries staff and some improvement achieved here and there, but there is obviously a very long way to go.

50. Data on the African fishery are set out at Appendix V.

THE FISH TRADE

51. Export of fish to Southern Rhodesia by selected established fishermen, African and non-African, continued to be permitted and the total of exports rose to some 1,351 short tons expressed in terms of the original landed weight of the fish exported, compared with 800 short tons in 1959. Allowing for the very considerable purchases made from African fishermen by the non-African firms, who were the main exporters, this represented about 25 per cent. of the non-African catch. Details are shown at Appendix IV, Table VI.

52. The big development in marketing arrangements was this large-scale purchase of fish from African fishermen by the non-African firms, one of them buying something over 400 tons during the year. What used to be a big trade between the non-African firms and small-scale fish buyers at the beach stations has largely disappeared. The African fishermen have naturally benefited by this development and, in Fort Johnston District at least, there are now no complaints about difficulties in selling fish.

53. The new policy enabled the exporting firms to expand their exports without taking fish from the home market to any great extent, so the fishermen have gained without perceptible loss to the town dwelling consumer. One major firm still estimates its trade with African buyers at its Limbe depot as approximating to 70 per cent. of its total trade.

54. Another development which represented a great advance in the distribution side of the trade was the establishment of a cold storage plant at Blantyre by the Cold Storage Commission. The main through-put of this plant is, of course, meat but there are fish rooms as well, though so far only one of the two firms without its own cold storage plant has been taking advantage of them.

55. The main effect of the Commission's plant was probably felt in the export trade as the local market naturally prefers fresh caught fish to that which has been stored for prolonged periods at low temperatures. It seems very questionable whether the idea of stock-piling fish in the main fishing season against shortages later in the year, which was once proposed, would ever be a practicable proposition. As long as some fresh-caught fish was available it seems probable that stock-piled fish would have an indifferent sale.

DEVELOPMENT WORK

56. The Nkata Bay school for prospective commercial fishermen was maintained during the year and eight courses were held. Recruitment was from Karonga, Fort Johnston, Dowa and Kota Kota Districts.

57. The number of students numbered no more than twelve; far less than the school can handle in a year, but in these difficult times the acceptance of any form of help from Government can cause trouble for the fisherman concerned and many people cancelled their applications at the last moment for this reason. The general standard of those who did attend was, however, a high one.

58. In the course of tuition operations just under five short tons of fish were landed by the unit, and sold for some £128. The new *chilimila* net was fished during August, September and October but without much success. *Chilimila* fishing by local Africans was, however, non-existent and it appears that fishing generally is rather in the doldrums at Nkata Bay just at present.

59. Material and equipment for fishery demonstration units round the Lake, to be run by Fisheries Assistants, was purchased during the year and the Fisheries Assistants given extra training in preparation. It is hoped to put the units into action early in the coming year, but it is already apparent that political tensions, at least in the north, will severely restrict the scope of the unit there.

60. A new type of net modelled on the Tanganyika lift net, was made at Nkata Bay, but the catamaran from which to fish it was not completed when the year closed. It is hoped to use this to improve the fishery for *usipa* (*Engraulicypris*) which already supports a quite valuable, but rather haphazard, fishery.

61. The boat building unit at Fort Johnston made excellent progress and twelve boats were completed during the year as against six in 1959.

62. The important development in this scheme was the acceptance by the carpenter of a contract rate per boat in substitution for an ordinary monthly salary. Efforts in this direction have been made for some time but it was not until this year that he could be persuaded to make the change. As a result of it both his own earnings and the output of boats have increased very considerably and though the Fisheries Officer still acts as sales and materials agent it can be claimed that the unit is now three quarters independent of Government which is, of course, a very desirable development. Efforts are now being made to persuade a Lake Chilwa carpenter to work on similar lines.

63. After considerable delays in supply of equipment the long awaited ice-plant was established at Fort Johnston in May, finance being provided by the African Development and Welfare Fund. The object, of course, is to assist African buyers who wish to deal in the fresh fish trade.

64. For the first two months ice was given away free but thereafter sold, though still at a rate rather below production costs. Demand has been small so far, a total of 11,250 lb. being sold between 1st July and 31st December.

65. This is far less than the output of which the plant is capable but it became apparent that it was necessary to go further in the matter and introduce a simple form of insulated fish-carrying box before buyers really understood the point of using ice. One was duly produced towards the end of the year but there was not time to get results with it.

66. Nevertheless the plant now has an established group of customers who buy fish at Mtundu and other beaches along the river and bring their fish to Balaka, Lilongwe and Blantyre. It is hoped that some of these can be persuaded to make the next step and get the full advantage of the ice they buy.

67. Another small but useful contribution to fish trade problems concerned the matter of material for fish drying racks. The bamboos generally used for this purpose are liable to get extremely dirty in a short time, while expanded metal or wire netting is very expensive and rusts quickly, especially if used for drying salt fish. To endeavour to solve this problem a trial was made with old gill-netting stretched horizontally between two parallel poles. The results were most promising, the fish not showing the marks one often finds if the fish are laid on bamboo racks while the netting was still in satisfactory condition for this purpose after three months use.

68. Finally some progress was made in solving the problem of gill-net thefts, which has been assuming serious proportions. Gill-nets have to be left in the water for long periods unattended and are very vulnerable to theft. Moreover once removed from the mounting ropes they are indistinguishable from one another so that a thief can use them openly with impunity. It has therefore become a matter of some urgency to develop a method of putting recognition marks on a net which will establish ownership without question, but which cannot be easily removed by the simple expedient of cutting them away.

69. After some trials it was found that this could be done quite easily with ordinary paint, put on when the mesh is spread open over a board. A wide range of colour is available and these, plus the almost unlimited possibilities of designs each covering a few meshes only but well distributed over the whole net, should make it possible for fishermen generally to adopt this method, each fisherman using his own design.

70. This should go far towards cutting down gill-net thefts since the use of marked nets would be a risky proceeding and cutting out the designs would render the nets useless for fishing.

EXPERIMENTAL WORK

71. The Fisheries Officer at Fort Johnston and Fish Ranger at Nkata Bay both made trials with gill-nets of varying mesh depth, to try to solve the much debated point concerning the relative effectiveness of deep and shallow nets.

72. In both cases 4-inch mesh nets 54 meshes deep by 100 yards stretched length were fished against 4-inch nets 26 meshes deep and 200 yards stretched length. Both nets of a pair were mounted in an identical manner and both were of six ply nylon. The nets of each pair were thus virtually identical in area and other respects, except that the 26 mesh net was long and narrow while the 54 mesh net was, comparatively, short and deep. All sets were made on the bottom, in 6 fathoms at Fort Johnston and in 30 fathoms at Nkata Bay.

73. The Fort Johnston series ran to 80 settings over the period August to December, and the following table gives the totals of the comparative catches.

Species of Fish	*Number in 26 mesh net*	*Number in 54 mesh net*
T. squamipinnis	230	362
T. saka	35	12
T. shirana	1	9
T. lidole	62	44
Haplochromis spp.	9	5
Rhamphochromis spp.	1	—
Mormyridae	—	3
Labeo	58	87
Bagrus	13	49
Clarias spp.	7	27
TOTAL	416	598

74. An analysis of the zones of the 54 mesh net in which the fish were caught gave the following results. In these the figures of another 54 mesh net set simultaneously in the same place as part of another experiment, are added to give a wider range of data.

Species of fish	*Bottom 9 meshes*	*Mesh 10 to 19*	*Mesh 20 to 29*	*Mesh 30 to 39*	*Mesh 40 to top*
T. squamipinnis	259	144	88	138	258
T. saka	19	22	10	8	13
T. shirana	10	2	—	2	3
T. lidole	10	13	—	5	68
Haplochromis spp.	14	4	1	2	3
Labeo	103	42	33	36	60
Bagrus	100	13	8	7	10
Clarias spp.	28	10	3	8	13
TOTALS ..	543	250	143	206	428
PERCENTAGE ..	35%	16%	9%	13%	27%

75. The Nkata Bay series ran to 27 settings and results were as follows:

Species of Fish	*Number in 26 mesh net*	*Number in 54 mesh net*
Mormyridae	19	13
Bagrus	97	61
Rhamphochromis	1	15
Labeo	—	3
Clarias	4	2
Others	8	14
TOTAL NUMBER ..	129	108
TOTAL WEIGHT ..	352 lb.	283 lb.

76. An analysis of the zones in which the fish were caught gave the following results.

Species of Fish	26 *mesh net*		54 *mesh net*			
	Bottom 13 *meshes*	*Top* 13 *meshes*	*Bottom* 13 *meshes*	*Mesh* 14 *to* 26	*Mesh* 27 *to* 39	*Mesh* 40 *to top*
Mormyridae	5	14	8	1	1	3
Bagrus	45	52	29	11	8	13
Rhamphochromis	1	—	5	—	4	6
Labeo	—	—	2	—	1	—
Clarias	1	3	1	—	1	—
Others	2	6	5	4	1	4
TOTAL NUMBERS ..	54	75	50	16	16	26
PERCENTAGE NOS. ..	42%	54%	46%	15%	15%	24%
TOTAL WEIGHTS LB. ..	167	185	129.1	38.7	45.6	69.6

77. The results in general echo those obtained in a similar experiment at Fort Johnston in 1956, namely that there is no great difference between the catch of a long narrow net and a comparatively short deep one. In that experiment 594 fish were caught in a 27 mesh×100 yard net and 612 fish were caught in the 54×50 yard net. As these results were rather contrary to the findings of the Research Unit (*see* J.F.R.O. Annual Report, 1959, pp. 14–15) it was decided to repeat the experiment under rather closer supervision than was possible in 1956.

78. At first sight it would appear, from these three experiments, that the deeper net must be the better economic proposition, for though the cost of the actual netting for the 200 yard×26 mesh net is not very different from that for the 100 yard×54 the cost of the mounting rope, floats, etc., is considerably more. Thus the overall mounted cost of the 200 yard×26 net was £14–10s as again £10–10s for the 100 yard×54 (Nkata Bay) and even at Nkata Bay the difference in cost is not nearly covered by the small difference in value of fish caught.

79. It must be remembered, however, that the mounting ropes and floats usually have a much longer life than the netting and can be used for more than one strip of netting in succession. It is probable therefore that the replacement costs of a 200 yard×26 mesh net would be little different from those for a 100 yard×54 so that, at Nkata Bay, a settled policy of using 26 mesh nets might, in the long run, just possibly pay dividends.

80. At Fort Johnston nevertheless, and by analogy anywhere in the southern half of the Lake, the 54 mesh net is, on this evidence, undoubtedly the better proposition.

81. The zoning of the catch in the deeper nets at both Nkata Bay and Fort Johnston is of interest. In both the bulk of the catch tended to be in to edges of the net and one gets the impression of the fish seeing the net and attempting either to climb above it or dive below it. It should be noted that this apparent effect is observable not only at Fort Johnston or only with *Tilapia*, but is evident at Nkata Bay and with both *Bagrus* and *Labeo*.

82. It is not easy to account for the difference between the results now obtained and the conclusion reached by the Research Organization in 1959. The latter appears to have been reached on a rather smaller set of data but emerges clearly enough from what data there was. It seems possible that there may be seasonal differences in depth distribution of the major species making the 26 mesh better at one time and the 54 mesh at another. Pending further consideration and investigation, however, the 54 mesh seems the better for general purposes.

83. At Fort Johnston a comparison was made between 3 ply and 6 ply nylon nets, it having been suggested that 3 ply would catch as well or better and cost appreciably less.

84. In this experiment two nylon nets of $3\frac{3}{4}$-inch mesh, 200 yards stretched length and 26 meshes depth, the one of 6 and the other of 3 ply, were fished alongside one another over the period July to December, a total of 96 sets being made. Figures are as follows:

Species of fish	*Number of fish in 3 ply*	*Number of fish in 6 ply*
Tilapia spp.	518	782
Haplochromis spp.	17	24
Ramphochromis spp.	1	2
Labeo	153	228
Bagrus	30	84
Clarias spp.	25	36
Barbus eurystomus	3	1
Mormyridae	—	2
TOTAL NUMBERS	747	1,160
TOTAL WEIGHT CATCH	730 lb.	1,266 lb.

85. Considering the economic angle, the profit on the 3 ply net (estimated value of fish less cost of mounted net) would have been £3–15s–2d and that on the 6 ply £12–15s–3d. It should also be recognized that this difference appeared against a background of rather sparse catches because the station net testing ground, though conveniently accessible, is not a particularly good fishing ground. A commercial fisherman would move his nets from place to place and take care to choose the best fishing ground and the higher catch rate to be expected under such conditions might be expected to accentuate the difference.

86. It therefore seems clear that under south-east arm conditions the 6 ply is the more economic net, though the reason for the different catching ability cannot yet be explained.

87. Perhaps the most striking experiment conducted at Fort Johnston was a comparison between an ordinary 6 ply nylon net and two types of monofilament net.

88. In the first a standard 6 ply nylon net of 4-inch mesh, 54 meshes deep, was fished 80 times against a net of identical mesh and dimensions made from a proprietary brand of 0/30 mm. monofilament nylon (platyl) manufactured in West Europe. The figures are as follows:

Species of fish	*Number in 6 ply nylon net*	*Number in monofilament net*
Tilapia	427	725
Haplochromis spp.	5	22
Rhamphochromis spp.	—	3
Labeo	87	182
Bagrus	49	116
Clarias spp.	27	43
Barbus eurystomus	—	1
Mormyridae	3	4
TOTAL NUMBERS	598	1,096
TOTAL WEIGHT	711 lb.	1,268 lb.

89. The superiority of the monofilament nylon in relation to catches of *Tilapia, Labeo, Bagrus* and *Clarias,* which are the most important economic species, was thus very clearly marked. On the 80 sets made the profit (estimated selling price of fish less cost of mounted net) would have been £17–14s–5d from the platyl net and £3–5s–0d from the 6 ply nylon. Once again choosing the best fishing grounds for setting the nets would probably have accentuated the difference.

90. It has to be pointed out, however, that the platyl net was in very poor condition by the time the experiment ended, while the nylon net was still reasonably well preserved, and had both nets been fished " to destruction " the nylon net might well have overhauled the platyl.

91. Nevertheless, for use against a " run " of fish which is bound to be of limited duration, when catching the largest number in the shortest possible time is of paramount importance, the platyl net undoubtedly offers very great promise.

92. The experiment was repeated with another brand of monofilament net over the period 26th October to 15th December. Here a 4-inch net 26 meshes deep by 100 yards long made from another brand of monofilament nylon of 0/20 mm. was fished against a 4-inch net 26 meshes deep by 200 yards long made from 6 ply nylon.

93. The results of this experiment were very different from the other monofilament trial. After 24 settings the 0/20 mm. net was so badly torn that repairs were impossible and it was taken out of the experiment. A second new net of the same type only stood 13 settings. Moreover the actual catch, set for set, was very poor.

94. Figures are tabulated below, the catch from the monofilament net being doubled to compensate for its being half the length of the 6 ply.

Period	*Total catch 6 ply nylon*	*Monofilament*	
		I	*II*
26.10 to 26.11	208	180	—
29.11 to 15.12	146	—	44

95. The results of this experiment show quite clearly that 0/20 mm. monofilament, at least of this particular brand, is not strong enough, but one is at a loss to understand why the catch was so low even when the nets were new. Clearly there are rather sharp differences between one brand of monofilament net and another.

96. At Nkata Bay further experiments with net floats were conducted by the Fish Ranger to test the degree of which they retained buoyancy. In this experiment wooden floats made from local trees, such as are traditionally used in the African fishery, were tested to enable a comparison to be made with the imported plastic floats tested in 1959.

97. The woods chosen were *Muwale* and *Mpepe,* not yet positively identified. The method of testing was as described for the 1959 experiment. The results are set out in the table below,

	Percentage of original buoyancy retained after each set					
	Mpepe			*Muwale*		
	Seine-net float	*Gill-net float A*	*Gill-net float B*	*Gill-net float C*	*Gill-net float D*	*Gill-net float E*
Original lifting power	263 gms	150 gms	23 gms	117 gms	119 gms	97 gms
Volume	580 cc.	370 cc.	66 cc.	175 cc.	185 cc.	140 cc.
Depth of set (fathoms)	25	25	25	25	25	7
Set No. 1	96.9	96.6	86.9	90	85	95
2	95.0	94.6	73.9	90	81	93
3	76.0	58.0	56.5	90	79	93
4	74.1	45.3	52.1	90	78	87
5	72.2	39.6	52.1	90	78	83
10	50.5	10.0	34.7	90	78	87
11	53.2	33.3	43.4	90	78	84
15	33.0	7.3	13.0	90	78	84
16	53.2	33.3	43.4	90	78	84
20	30.4	6.0	13.0	90	78	84
21	57.0	46.6	56.5	90	78	84
25	30.4	8.0	13.0	90	78	84
26	66.1	90.0	100.0	90	78	84
27	98.0	92.0	100.0	90	78	84
30	45.2	50.6	52.1	90	78	84

98. It will be noted that the *Mpepe* floats lost buoyancy very quickly and by the tenth set had reached a waterlogged state. They recovered some buoyancy over a week-end of drying out (e.g., between 10th and 11th sets and 15th and 16th sets) and after drying out for three days (between 25th and 26th sets) recovered buoyancy to a very marked extent. After resuming tests the return to a waterlogged state began to show after five sets.

99. These floats appeared to be effected by waterlogging alone and not by a structural collapse caused by pressure as did the plastic floats. Their original lifting power is not as high, volume for volume, as the plastic floats but they are a reasonably satisfactory shape for handling and, for the African subsistence fishery, where there is plenty of opportunity for drying out, would seem to be very adequate. The best of the plastic floats had a lifting power of 150 gms. for a volume of 180 cc. The *Muwale* floats retained a very satisfactory level of buoyancy and showed no sign of deterioration of structure or waterlogging. Unfortunately the material is irregular in shape, from the bark of a tree and cannot, it seems, be made into a shape for efficient handling.

100. It appears therefore that so far as the tests have gone the plastic float E of the 1959 series is best for regular commercial fishing.

FISHERIES RESEARCH ORGANIZATION

101. The Senior Research Officer was on leave from mid-March to the end of September, departing only a few weeks after the recruitment, following considerable delay, of a second Research Officer.

102. The stationing of M.L. *Search* and later M.L. *Edmund Rhoades* at Nkata Bay at last put a deep-water launch at the disposal of the Research Unit and permitted the resumption of hydrographic sampling in March. This was continued without a break until June, when part of the sampling apparatus was lost through the breakage of the suspension wire in deep water, and it was some two months before a replacement could be obtained and the series continued.

103. The second Research Officer, Mr. D. H. Eccles, worked on age determination techniques in *Labeo mesops* and *Tilapia* species. It was found that in *Labeo* a well marked annual ring is formed in the early part of the year and a ring is also formed at the onset of sexual activity. In *Tilapia*, however, the recognition and detection of annuli is somewhat more complex.

104. Work on the collection of data on gill-net selectivity, particularly in relation to *Labeo mesops*, continued under the Senior Fisheries Assistant, Mr. Mzumara, and a study of this additional data has enabled Mr. Iles to derive a length/weight relationship and growth coefficient for this species.

105. Further consideration of the data previously collected for *Engraulicypris sardella* plus new observations made in 1960 led to a preliminary sketch of the life history of this species. This, in turn, permitted the formulation of an outline plan for the fuller exploitation of this species.

106. The work of the Research Unit is reported in detail in the Annual Report of the Joint Fisheries Research Organization, published in concert with the Northern Rhodesia Research Unit.

107. During the year a most important development relating to Fisheries Research occurred in the form of a new grant under the Colonial Development and Welfare Fund to assist in the continuation of the Research Unit and the erection and staffing of a second laboratory at Monkey Bay, at the south end of the lake.

108. The development of this base will put the unit more closely in touch with the *Tilapia* fishery and the main fishing areas generally. The two bases together will also permit simultaneous hydrographic observations at the two ends of the Lake, which should be of great assistance in elucidating problems in this field.

109. In addition to the work of the Research Unit proper the Fisheries Officer and one of the Research Officers co-operated in a preliminary trial of *Tilapia* marking. It had been hoped to make use of material from the ring-nets but it soon became apparent that the fish did not arrive at the surface in a strong enough state to stand tagging and most of them were soon found floating on the surface after they had been released.

110. A second attempt was made by the Fisheries Officer, using specimens from shore seines, the fish being marked on shore and then taken out and released about three miles out in the Lake. Some 54 fish were marked in this manner.

111. So far one tag has been returned but the fisherman who returned it had, from the position of the tag and the size of the fish to which it was attached, obviously removed it from the fish on which it was recovered and placed it on another. Presumably this was done in order to be able to claim the reward for the return of tagged fish as distinct from the rather lower reward offered for return of the tag alone.

112. Despite this sort of thing, which must be expected in the early stages of the programme, tagging will be continued. If the fishermen will only co-operate the process could give very valuable information on growth rates and movements.

TROUT FISHING

113. A total of only 21 licences, valued at a total £35–10s, was taken out for the Mlunguzi stream in respect of the 1959/60 season, while similar figures for North Rumpi and Mlanje streams were 7 at £5–10s and 14 at £9–5s respectively.

114. The Mlunguzi and North Rumpi figures represent a considerable drop from the 1958/59 totals. No doubt the North Rumpi licences were depressed as a result of the political tensions in the locality, while Zomba Mountain fishermen were probably put off by the news of the loss of fish when the reservoir was drained in connection with electricity supply investigations early in the 1959/60 season.

115. With so few fishermen on the water very little was collected in the way of data except on the Mlunguzi. Here 97 rod days gave 147 fish killed, ranging from 8 inches to 14 inches in size, with 492 fish returned as undersized. The average size was 9.8 inches against the 10.5 inches of 1957/58, the last season with really complete data, but in actual fact the proportion of 10 inch fish was slightly larger than in that year. The average was brought down by a lack of 16 inch and 17 inch fish, a few of which figured in the 1957/58 returns, which was probably an effect of the draining of the reservoir referred to above.

116. The number returned as undersized, however, was much higher proportionally than in 1957/58 or 1958/59 and it seems as if the previous closure of the Reservoir–Williams Falls stretch, though it may have permitted the slightly larger accumulation of 10 inch fish as it was designed to do, was even more effective in promoting the development of a multitude of small trout.

FISH FARMING

117. Good progress was made with the construction of the new unit at Domasi. The main furrow from the Domasi river was repaired and improved by the Water Development Department as soon as the main rains were over and the three ponds constructed by the Fisheries Assistant during the absence of the Fish Ranger on leave, were duly filled.

118. On 12th May the first stock consisting of 18 *T. melanopleura* and 42 *T. shirana* obtained from the Imperial Tobacco Company dam in Limbe with the kind permission of the Company, were introduced to the larger pond, and a further 182 were added at the end of July.

119. The first signs of reproduction were evident in October and the pond is now well stocked with fry. Already a total of 1,252 *T. melanopleura* fingerlings have been distributed to four dams in the Southern Province, three private and one managed by the Department of Agriculture.

120. Meanwhile construction of further ponds continued and by the end of the year a total of 20 ponds comprising $5\frac{1}{4}$ acres were completed and filled. In addition two staff houses were erected, with the Senior Roads Supervisor, Domasi, Mr. McKay, lending an unofficial, spare time, very welcome, hand. Work was also begun on the foundations for a small office.

121. Shortly after the completion and filling of the main body of the ponds cormorants (*P. africanus*) started to appear and 22 were shot in the last two months of the year. Oddly enough their visitations ceased abruptly with the onset of the rains and it will be interesting to see whether their visits are confined to the dry season, as at present they appear to be.

122. The ponds at Nchenachena in the Northern Province were kept on a maintenance basis under the care of the Game Ranger, Rumpi. They were, however, kept in good order and fished at intervals and a total of 14 ponds in the Nkata Bay District were stocked with fish from them.

Tsetse Control

123. Supervision has again proved difficult with the Tsetse Botanist acting as Director for the first half of the year and the Tsetse Ranger on secondment or leave for almost the whole period. The junior staff are, however, to be congratulated on their increasing ability to carry out field work unaided. This ability has facilitated the continuation of routine work under the difficult circumstances.

SURVEYS

124. Routine surveys of the Liwonde and Chiuzi Dambo areas continued, aimed at elucidation of the position with respect to the Kasupe and Fort Johnston fly posts respectively. A detailed report of the former appears below. At Chiuzi the general features of the tsetse distribution are now well known and an experiment for detailed study of behaviour and relation to vegetation was being laid out at the end of the year with a view to eventual formation of a scheme of eradication.

125. Special surveys were made of parts of the Lake-shore in Kota Kota District, namely at N.A. Kanyenda in the north and at Chia in the south. The position with regard to *G. morsitans* remains much the same as at the time of the Tsetse Survey in 1953, with heavy infestations immediately behind the Lake plain. Cattle are kept near the shore in the Chia area without trouble from trypanosomiasis and it is forecast that they could be kept similarly at Kanyenda. A single specimen of *G. brevipalpis* was captured to the south of Kota Kota during the 1960 survey, confirming its continued presence in that area.

126. Further surveys were carried out in the Lower River in connection with the Department of Veterinary Services' drug campaign against trypanosomiasis. This has achieved its immediate objective of removing the reservoir of disease in the cattle themselves (except at Makwira where injections were not acceptable). The original intention was to study the return of the disease due to tsetse, but the surveys have confirmed a simultaneous recession of the *G. morsitans* infestation along the Mozambique border, particularly in the central sector around Ndakwera and the Lengwe Game Reserve. This is presumably a natural decline due to the climatic conditions, since there has been no evident change in either settlement or game populations in this area since the previous survey.

127. The position with regard to carriage of tsetse on trains from Beira was again checked in February. Only one specimen of *G. pallidipes* was found in two weeks, as compared with 12–15 in similar previous inspections. These inspections are not, however, sufficiently consistent to be certain that this represents a real decline. From the results of the Veterinary drug campaign, however, it is apparent that flies from this direction are not a source of trypanosomiasis at this time.

KARONGA RECLAMATION SCHEME

128. No further direct action was taken against *G. brevipalpis* during 1960. Routine patrols continued and showed that the fly population remained at a low level in the previously cleared sectors. This is due, in part, to the very slow recovery of the vegetation from the more thorough methods of clearance and burning adopted in the later years of the clearance campaign. There is also an encouraging continuation of interest in utilization of the cleared areas for gardens by the local inhabitants.

129. Consultation with the Tanganyika authorities on the question of combined action for elimination of the whole infestation was resumed on a much more hopeful note. Successful use of dieldrin in part of the fly area in Tanganyika was accomplished during the year and it was agreed that this was the most promising method for complete elimination. A small beginning in practical co-operation was made in the supervision by Tanganyika officers of the spraying of a rather remote section of the Nyasaland fly belt in the Mweningorongo sector. Observations on whether this action was successful are not yet complete.

TSETSE CONTROL POSTS

130. The six posts continued to operate smoothly in 1960, the only difficulty being the perennial problem of motorists by-passing the Kasupe post. Fungo post continued to operate on a temporary open air basis for the protection of the Malomo

area on the Kota Kota–Kasungu road. Catches at this post have increased in common with the neighbouring Mbobo post and it would obviously be more economical to combine the activities of these two posts. Plans for this have been made and will be carried out when finance is available.

131. Details of traffic and fly catches for all posts are shown in Appendix VII. These continue to throw an interesting light on the general trends of *G. morsitans* populations in Nyasaland. The three main posts (apart from Chota) in Kota Kota District continue to show an increase in fly, particularly the inland ones of Mbobo and Fungo. In contrast, the Fort Johnston figures show a further decline particularly in the last few months of the year. This is believed to reflect the poor rainy season and late start to the rains, which were more marked in the Southern than the Central Province in 1959–60, but attempts at more exact correlation with meteorological records have not yet proved fruitful. No obvious changes in settlement or animal population have taken place to cause the Fort Johnston decrease.

LIWONDE–KASUPE INVESTIGATIONS

132. Results of the seasonal surveys and picketing around Liwonde in 1959–60 are shown in the map accompanying this report. They show that *G. morsitans* is carried from most sectors of the bush around to the Liwonde Ferry and thence picked up and carried on to Kasupe. Flies may also be carried more directly by traffic on the road from Chingale and the extraction road for the Liwonde Forest Reserve. Flies are not at present picked up from the bush on either side of the road from Liwonde to Kasupe, although they doubtless were in the past. During the two years of observation there was a slight increase in fly and it is not considered impossible for a future large-scale increase to carry them across the Liwonde–Kasupe road again.

133. It has been concluded from the survey that it would not at present be economically justifiable to attempt to clear tsetse from the very extensive areas forming the source of flies carried to Kasupe. The original hope that decontamination might be carried out at the Liwonde Ferry with less inconvenience to traffic than at Kasupe has not been fulfilled. The ferry is unsuitable, being in the centre of the focus from which flies are picked up, apart from the separate sources of flies nearer to Kasupe. It is further concluded that, although numbers of flies arriving at Kasupe are at present very small, it would be wise to await confirmation of the trend of fly populations before abandoning the post. It would be extremely difficult to re-establish it should a subsequent increase of fly occur.

134. Eighty-one cases of motor vehicles or motor cycles by-passing the post were reported by the Picket Orderlies to the Police during the year.

H. J. H. BORLEY
Director
Game, Fish and Tsetse Control

APPENDIX I

Senior Staff as at 31st December, 1960

Director	H. J. H. Borley, M.A.
Tsetse Botanist	B. Steele, B.Sc., Ph.D.
Fisheries Officer	E. C. L. Birkenmeier, D.Phil.
Senior Ranger	E. T. Llewellyn
Fish Ranger	K. T. Howard
Fish Ranger (Rivers)	A. V. Gifkins
Game Ranger	O. J. Carey L. T. Kettle
Tsetse Ranger	C. H. E. Rickman

FISHERY RESEARCH ORGANIZATION

(Nkata Bay Station)

Fishery Research Officer (in charge)	T. D. Iles, B.Sc.
Fishery Research Officer	D. H. Eccles, B.Sc.

APPENDIX II

Table I

Animals killed and staff employed 1st January, 1960, to 31st December, 1960

	Totals 1959	*Northern Province*	*Central Province*	*Southern Province*	*Totals* 1960
Average No. Hunters	26	5	15	8	28
ANIMALS KILLED:					
Elephant	50	1	44	12	57
Hippo	64	4	33	11	48
Buffalo	—	3	—	—	3
Carnivora	8	3	4	4	11
Antelope	2	—	—	—	—
Baboon	284	98	218	4	320
Pig	11	14	—	—	14
*Vermin killed under bounty system:					
A.D.W. Finance	14,188	10,238	9,085	5,625	24,948
Local Treasury Finance	20,568	10,801	4,666	4,228	19,695

* Reports from several Districts not complete.

Table II

Revenue accruing from Crop Protection activities

Value of ivory	£1,143
Value of meat and skin sales	£225

APPENDIX III

Average Numbers of Game seen per 10 Patrol Days

Type	Table IA Mwabvi				Table IB Lengwe			
	1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter
Elephant	—	—	—	—	—	—	—	—
Rhinoceros	—	1.5	3.7	0.4	—	—	—	—
Hippopotamus	—	—	—	—	—	—	—	—
Zebra	—	1.9	1.6	0.3	0.2	0.1	—	—
Lion	—	—	—	—	—	—	—	—
Leopard	—	0.1	—	0.1	0.1	—	—	seen
Buffalo	12.3	10.9	37.2	24.0	—	0.1	—	—
Sable	25.7	33.2	50.0	39.4	—	—	—	—
Roan	—	—	—	—	—	—	—	—
Kudu	26.1	31.1	42.9	31.0	3.4	3.4	3.6	5.1
Eland	—	—	—	—	—	—	—	—
Hartebeeste	—	—	—	—	0.4	0.7	3.3	0.3
Waterbuck	1.2	3.6	4.6	0.7	—	—	—	—
Nyala	0.4	1.1	14.9	2.0	1.1	1.8	1.7	0.6
Impala	27.3	31.0	22.0	19.7	0.9	1.0	3.2	2.2
Reedbuck	0.5	2.1	4.1	2.2	0.7	0.4	0.7	2.7
Bushbuck	seen	0.8	3.5	1.4	1.6	0.9	1.8	1.4
Duiker	2.5	3.0	8.0	4.0	1.6	2.4	0.9	1.6
Klipspringer	1.9	1.2	3.6	5.7	—	—	—	—
Oribi	—	—	—	—	—	—	—	—
L. Suni	0.7	0.5	2.0	0.3	—	—	—	—
S. Steinbuck	—	—	—	—	—	seen	—	—
Pig	12.4	6.1	28.4	20.8	2.8	2.2	4.3	3.3
Warthog	16.3	12.9	0.9	—	1.2	seen	—	—
Wild Dog	—	—	—	—	—	—	—	—
Total Days Patrol	154	169	134	171	161	226	231	204
Total Days No Game Seen	40	87	?	53	80	138	73	60

APPENDIX III

Average Numbers Game seen per 10 Patrol Days

Type	Table IC Majete				Table ID Nyika			
	1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter
Elephant	8.4	3.2	2.3	5.0	—	—	0.2	—
Rhinoceros	—	—	—	—	—	—	—	—
Hippopotamus	—	—	—	—	—	—	—	—
Zebra	8.5	8.8	11.5	11.3	41.6	57.5	92.9	82.5
Lion	0.8	0.4	2.3	2.1	0.3	0.7	1.7	0.4
Leopard	—	—	0.3	0.1	0.1	seen	0.4	0.3
Buffalo	—	—	—	—	—	—	—	—
Sable	3.5	6.5	7.8	9.1	—	—	—	—
Roan	—	—	—	—	76.5	61.1	50.7	57.5
Kudu	5.2	3.9	7.4	5.4	—	—	—	—
Eland	3.9	4.7	5.9	4.2	137.0	101.7	141.2	168.8
Hartebeest	2.3	0.5	5.2	1.6	0.2	0.5	—	seen
Waterbuck	—	—	—	—	—	—	—	—
Nyala	—	—	—	—	—	—	—	—
Impala	0.5	1.5	2.9	1.2	—	—	—	—
Reedbuck	1.9	0.9	1.3	3.9	13.1	18.7	21.7	20.5
Bushbuck	3.6	—	0.2	1.0	0.9	5.4	4.4	2.9
Duiker	0.4	0.5	0.9	1.5	5.5	4.7	5.0	6.9
Klipspringer	0.7	0.5	0.8	1.6	—	seen	0.2	0.2
Oribi	—	—	—	—	—	—	—	—
L. Suni	0.1	—	—	0.8	—	—	—	—
S. Steinbuck	—	—	—	—	—	—	—	0.2
Pig	2.3	0.7	5.2	8.0	3.5	10.5	14.1	14.1
Warthog	2.2	0.8	—	—	6.2	1.1	8.8	7.3
Wild Dog	—	—	—	—	—	—	—	—
Total Patrol Days ..	157	162	136	93	425	390	375	375
Total Days No Game Seen	51	68	17	20	—	—	—	—

APPENDIX III

Average Numbers of Game seen per 10 Patrol Days

	Table IE Kota Kota				Table IF Kasungu			
Type	*1st quarter*	*2nd quarter*	*3rd quarter*	*4th quarter*	*1st quarter*	*2nd quarter*	*3rd quarter*	*4th quarter*
Elephant	15.0	16.5	26.0	20.0	28.3	20.9	26.0	19.8
Rhinoceros	0.3	0.4	0.2	0.3	0.9	0.5	1.5	0.7
Hippopotamus	—	—	—	—	seen	—	seen	—
Zebra	5.9	5.3	4.5	6.0	6.6	6.1	7.5	5.6
Lion	0.2	seen	0.1	seen	0.1	0.1	0.4	0.6
Leopard	—	—	—	seen	—	seen	—	seen
Buffalo	13.3	10.7	15.6	15.0	27.6	6.3	10.3	9.2
Sable	6.1	4.1	3.6	3.8	5.8	4.1	2.4	2.3
Roan	2.2	4.0	6.1	4.3	4.0	5.5	7.4	8.5
Kudu	0.8	1.0	2.0	1.7	4.4	3.0	3.8	5.9
Eland	5.3	6.5	6.0	8.9	9.8	4.0	7.5	3.0
Hartebeeste	4.5	2.4	2.8	3.7	6.3	3.7	7.5	6.2
Waterbuck	3.0	1.7	2.3	3.5	0.6	0.9	0.9	1.3
Nyala	—	—	—	—	—	—	—	—
Impala	—	—	—	—	—	—	—	—
Reedbuck	—	—	0.2	0.1	1.9	1.6	2.8	2.8
Bushbuck	—	—	—	—	0.1	1.2	seen	seen
Duiker	—	—	—	—	—	—	—	—
Klipspringer	—	—	—	—	—	—	—	—
Oribi	—	—	—	—	—	—	0.1	0.4
L. Suni	—	—	—	—	—	—	—	—
S. Steinbuck	—	—	—	—	—	—	—	—
Pig	—	—	—	—	—	0.2	0.9	0.4
Warthog	—	—	—	—	1.0	0.3	0.2	1.2
Wild Dog	—	—	—	—	—	—	—	—
Total Patrol Days	532	849	632	838	281	580	587	618
Total Days No Game Seen	234	412	266	311	111	216	253	186

APPENDIX III

Table II. Game Licences Issued During 1960*

	No. Issued	Value £
Residents	2,005	2,005
Protectorate Full	125	625
Visitors Temporary	2	6
Elephant	17	170
Licences Sale Game Meat	20	30
		£2,836

*Figures to end of October only.

APPENDIX IV

Non-African Fishery

Table I. Total hauls of each type per annum in South East Arm

Type of Net	1956	1957	1958	1959	1960
Ring-net	3,728	6,803	9,325	12,412	9,007
Gill-net	Presentation method not comparable		3,271,760 yards	3,040,220 yards	3,792,400 yards

Table II. Average catch per single haul of net

(*Number represent dozens*)

Firm and Net	*Fish*	1956	1957	1958	1959	1960
No. 1 Ring-net	*Tilapia*	121	127(105)*	59(32)*	42(23)*	36(20)*
No. 2 Ring-net	*Tilapia*	53	51	55	22	27
No. 3 Ring-net	*Tilapia*		41	38(21)*	42(23)*	38(21)*

*Figures in brackets represent catch per single haul corrected to allow for alterations in net size since 1956. Figures without brackets represent actual catch per single haul.

Table III. Total catches of more important species

(*Numbers represent dozens. Weight estimated in short tons*)

Year	*Tilapia*	*Tilapia (Immature)*	*Labeo*	*Bagrus and Clarias*	*Other*	*Weight*
S.E. Arm						
1956	287,003	—	23,094	6,192	—	2,680
1957	304,600	—	16,148	6,742	126	3,984
1958	479,675	—	41,229	10,654	1,226	4,311
1959	482,730	—	35,207	8,886	659	3,953
1960	383,519	—	34,012	6,160	283	3,391
S.W. Arm						
1956	2,802	—	9,977	5,367	912	213
1957	3,725	—	22,757	10,135	3,705	421
1958	4,730	9,175	10,836	5,568	10,034	297
1959	12,155	19,350	2,357	555	2,101	145
1960	—	—	—	—	—	—

Table IV. Landings per month (short tons)

Jan.	*Feb.*	*March*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
431	510	613	385	405	203	74	128	188	254	123	77

APPENDIX IV

Table V. Number of nets registered by non-African firms

Type of net	*Number*	*Fees paid*
Ring-net	5	£50
Gill-net	22,000	£110

Table VI. Fish Exports

Month	*Weight fresh fish (lb.)*	*Weight smoked fish (lb.)*	*Weight salted fish (lb.)*
January	34,381	31,259	24,961
February	42,313	45,499	11,664
March	46,913	34,729	27,780
April	76,856	25,154	77,573
May	30,638	51,408	65,272
June	36,030	45,326	21,137
July	23,316	4,581	15,537
August	47,291	41,765	1,706
September	87,131	57,310	3,160
October	107,835	59,861	72,550
November	48,410	42,535	18,720
December	48,166	27,143	2,072
TOTALS	629,280	466,570	342,132
Estimated landed weight	629,280	1,399,710	684,264
Combined landed weight	1,351 short tons.		

APPENDIX V

AFRICAN FISHERY

Table I. Total number of hauls of main types of net observed at Recording Stations

Station	*Large meshed seines*		*Small meshed seines*		*Gill-net*		*Chilimila or Ring-net*	
	1959	1960	1959	1960	1959	1960	1959	1960
Malindi	—	—	820	749	158,243	686,540	—	—
Matewere	179	351	137	142	11,640	278,251	—	—
Shire River	1,438	1,824	52	—	—	31,050	—	—
Mpemba	1	—	234	117	77,062	37,807	724	324
Monkey Bay	—	—	—	—	117,700	46,700	194	269
Kota Kota	31	23	16	75	120,800	275,437	—	—
Salima	273	175	243	50	116,195	399,235	—	—
Domira Bay	90	98	148	183	129,661	188,570	—	—
Chia Lagoon	18	10	26	—	152,090	779,788	436	—
Lake Chilwa	—	—	—	—	340,364	214,403	—	—
Lake Malombe	193	108	—	—	74,830	138,740	—	—
Mtundu	128	87	29	11	—	—	—	—
Nkata Bay	—	—	—	—	28,400	102,330	—	—
Mpamba	15	14	19	7	24,712	9,000	—	—

APPENDIX V

Table II. Average catch per single haul at Recording Stations

(Figures represent actual numbers of fish)

A. Large Meshed Seines

Station	*Period*	*Tilapia (Adult)*	*Tilapia (Immature)*	*Labeo*	*Catfish*	*Haplochromids*
Matewere	1959	45.64	—	0.70	0.67	—
	1960	45.28	—	0.18	0.08	—
Shire River	1959	62.41	—	3.44	0.17	—
	1960	86.53	—	0.71	1.35	—
Kota Kota	1959	89.13	—	71.64	21.51	—
	1960	48.17	2,105	24.13	4.74	—
Salima	1959	59.89	—	22.60	4.99	—
	1960	57.51	—	12.49	2.59	—
Domira Bay	1959	116.37	—	55.12	9.52	—
	1960	97.23	25	50.02	8.54	55
Chia Lagoon	1959	117.88	—	—	9.77	—
	1960	35.50	—	5.30	21.40	—
Lake Malombe	1959	56.19	—	1.40	1.14	—
	1960	287.64	—	3.02	3.17	—
Mtundu	1959	324.14	—	8.56	0.67	—
	1960	250.02	—	27.13	4.46	—
Mpamba	1959	65.60	—	137.53	5.66	—
	1960	109.85	—	37.93	18.14	—

B. Small Meshed seines

Station	*Period*	*Tilapia (Adult)*	*Tilapia (Immature)*	*Labeo*	*Catfish*	*Haplochromids*
Malindi	1959	0.93	.024	2.24	0.06	144
	1960	0.25	—	0.16	0.59	333
Matewere	1959	7.29	0.48	0.12	0.38	582
	1960	40.93	—	0.04	0.12	9
Mpemba	1959	3.11	0.018	0.01	0.02	231
	1960	0.50	63	0.008	0.03	497
Kota Kota	1959	46.81	—	18.87	10.68	750
	1960	19.04	130	5.45	3.16	—
Salima	1959	7.95	—	5.97	1.80	1,070
	1960	12.22	—	3.68	1.26	480
Domira Bay	1959	25.20	100	12.17	1.75	610
	1960	32.81	60	36.66	3.45	860
Chia Lagoon	1959	2.15	—	—	3.23	—
	1960	14.00	—	—	3.40	—
Mtundu	1959	47.13	—	2.31	0.44	1,555
	1960	6.45	—	7.63	105.90	225
Mpamba	1959	7.57	—	178.94	2.00	—
	1960	119.85	—	41.85	4.28	—

C. Chilimila or Ring-Net

Mpemba	1959	0.25	—	—	0.14	387
	1960	0.59	—	0.30	0.22	374
Monkey Bay	1950	0.02	0.06	0.02	—	4,752
	1960	—	—	2.60	—	2,292

APPENDIX V

Table III. Summary of catches by all methods observed at Recording Stations, 1960

(Actual numbers of fish)

Station	*Tilapia (Adult)*	*Tilapia (Immature)*	*Labeo*	*Catfish*	*Haplochromids*
Malindi	45,949	—	8,280	2,333	251,475
Matewere	53,579	—	30,356	2,500	3,300
Shire River	157,978	—	2,166	1,576	—
Mpemba	3,181	7,350	6,711	440	179,475
Monkey Bay	1,900	—	1,058	1,779	618,825
Kota Kota	10,968	59,500	21,860	16,410	375
Salima	15,778	—	38,113	8,468	29,125
Domira Bay	17,081	11,125	37,639	5,894	158,575
Chia Lagoon	106,982	—	14,409	12,451	—
Lake Chilwa	24,052	—	2	16,428	—
Lake Malombe	82,843	—	1,003	8,280	—
Mtundu	21,823	—	2,445	1,553	2,500
Nkata Bay	43	—	42	1,877	300
Mpamba	2,566	—	2,911	1,712	—

APPENDIX VI

Trout Fishing 1959/60

Stream	*North Rumpi*	*Kaziwiziwi*	*Mlunguzi*	*Mlanje Streams*
No. Rod Days	18	2	97	19
No. Fish kept	25	1	147	29
Average Size	13.2″	—	9.8″	9.4″
No. fish at 8″	—	—	8	1
8½″	—	—	4	4
9″	—	—	43	11
9½″	—	—	16	2
10″	—	—	47	7
10½″	—	—	1	2
11″	—	—	7	1
11½″	—	—	9	—
12″	9	1	5	1
12½″	1	—	3	—
13″	7	—	1	—
13½″	—	—	1	—
14″	3	—	2	—
14½″	—	—	—	—
15″	3	—	—	—
16″	1	—	—	—
17″	—	—	—	—
18″	1	—	—	—
No. returned undersized	3	1	492	99
No. Licences	7		21	14

APPENDIX VII

Summary of Traffic and Flies Caught at Decontamination Posts, 1960

Post	*Position*	*Number of Motor Vehicles*	*Flies caught*	*Number of Cycles*	*Flies caught*	*Number of Pedestrians*	*Flies caught*	*Total Flies*
Kota Kota ..	Outskirts Kota Kota Township (N) ..	6,066 ..	115 ..	19,335 ..	66 ..	37,846 ..	13 ..	194
Chota	Outskirts Kota Kota Township (S) ..	3 ..	— ..	15,724 ..	5 ..	55,314 ..	5 ..	10
Mbobo	Approach to C.P. Highlands Kota Kota road	2,316 ..	268 ..	1,497 ..	56 ..	2,302 ..	34 ..	358
Fort Johnston ..	Outskirts of Fort Johnston Township East of Ferry crossing	5,267 ..	10 ..	84,476 ..	416 ..	190,040 ..	386 ..	812
Kasupe	Approach to Zomba highlands Liwonde, Zomba road	18,133 ..	— ..	22,788 ..	16 ..	24,073 ..	2 ..	18
Fungo	Approach to Malomo area Kota Kota road	511 ..	23 ..	481 ..	66 ..	164 ..	2 ..	91

Long Term Records from Deflying Posts

Post	*Total Flies* 1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Kota Kota	96 ..	113 ..	47 ..	34 ..	16 ..	28 ..	105 ..	181 ..	136 ..	113 ..	194
Chota	69 ..	34 ..	12 ..	16 ..	12 ..	7 ..	5 ..	10 ..	13 ..	12 ..	10
Mbobo	110 ..	179 ..	26 ..	45 ..	24 ..	50 ..	205 ..	266 ..	164 ..	203 ..	358
Fort Johnston ..	14,351 ..	14,521 ..	7,557 ..	11,750 ..	9,591 ..	2,652 ..	1,589 ..	3,736 ..	3,849 ..	1,787 ..	812
Kasupe	29 ..	207 ..	84 ..	88 ..	96 ..	46 ..	63 ..	104 ..	22 ..	26 ..	18
Fungo	— ..	— ..	— ..	— ..	— ..	— ..	— ..	— ..	29 ..	34 ..	91