

C56.35-

NYASALAND PROTECTORATE



Annual Report
of the
Department
of
Game, Fish and Tsetse Control
for the
Year ended 31st December
1959

PRICE 4s-0d

1960

PRINTED AND PUBLISHED BY THE GOVERNMENT PRINTER
ZOMBA, NYASALAND

G.F.T. 2103/250/6.60



Limbe
Nyasaland

*With the Compliments
of the
Director, Game, Fish and Tsetse Control*

Annual Report of the Department of Game, Fish and Tsetse Control for the Year 1959

(a) Staff and General

The staff position, set out in detail in Appendix I, remained nominally the same as at the close of 1958, but in actual fact it was very different. The whole of the Senior Division staff, with the exception of the Fisheries Officer and Fishery Research Officer, was seconded full time to security work for considerable periods and even the two exceptions performed a number of part-time duties. Most of the Central and Southern Province African game staff were similarly requisitioned.

2. The Director, Game Ranger, Central Province, Fish Ranger (Rivers) and Tsetse Ranger were away from their normal work from the end of February to nearly the end of April. Tsetse Botanist and Senior Ranger were on secondment from the beginning of March to the end of May. Game Ranger, Northern Province, was similarly engaged from early March to the end of May, though allowed time to contact his field staff during this period, while the Fish Ranger was requisitioned from early March to the end of July. After a period of normal duties the Tsetse Ranger was again seconded to special duty from the beginning of October to the end of the year.

3. Considerable credit is due to the African staff for carrying on as normally as possible during this period; particularly the headquarters staff, who kept routine matters moving for some two months, virtually without direction or supervision from any Senior Division Officer.

4. To add to the difficulties caused, directly or indirectly, by the disturbances, the Fisheries Officer suffered from indifferent health which hampered his movements from April onwards and eventually caused his admission to hospital in October. At the end of the year he still had not returned to duty.

5. Mr. A. V. Gifkins, Fish Ranger (Rivers), departed on vacation leave in mid-August so that, all things considered, the staff was extremely depleted during 1959.

6. In the face of the disorganization caused by secondments, illness, and the generally difficult working conditions, no great progress could be made and the Department was hard put to it to do much more than deal with routine matters. Nevertheless some forward moves were made. Two more observation camps were erected in the Game Reserves and there were small extensions of the road system. A start was made in the establishment of a fish farming unit in the Southern Province, further useful experiments on gill-netting techniques were carried out by the Fisheries Officer and his staff and there was some excellent work by the Fishery Research Officer on the population dynamics of *Labeo mesops*, probably the most important commercial fish in Lake Nyasa after the *Tilapia*.

(b) Game

CROP PROTECTION

7. Crop protection activities were naturally very disorganized by the secondment of both Senior and Junior Division game staff to security duties for much of the main growing season. Matters did not really return to normal until the dry season was well advanced, by which time the Game Rangers were largely concentrated on work in relation to conservation and the Game Reserves.

8. In the Northern Province the small force of hunters was frequently in action against hippo on the Lake-shore in protection of the rice lands, and two hunters were stationed permanently on the Nkamanga plains to turn back the elephant, which are apt to raid from the Vwaza Marsh area.
9. In the Central Province hunters were maintained along the Lake-shore in Kota Kota District and Domira Bay and also along the eastern edge of the Kasungu Reserve, with an occasional visit to Fort Manning District to drive off raiding elephant. In the temporary absence of more important targets, part of the Central Province team made one or two organized and concerted efforts against vermin in Kota Kota District.
10. In the Southern Province hunters were maintained in the lower Mwanza Valley in protection of the cotton lands and there were occasional visits to the area north of the Majete Reserve to turn back elephant raiding into Mwanza District. There were also sorties along the Port Herald stretches of the Shire River, the central Shire in the vicinity of Liwonde, and the Fort Johnston Lake-shore, chiefly against elephant and hippo.
11. In the Southern Province also, an electric fence was successfully put in action by the Senior Ranger in Chief Chimwala's area on the shore of Lake Malombe, in protection of the rice lands against hippo. It worked very satisfactorily for a time but, in the absence of Senior Division staff on security duties, was allowed to fall into disrepair and ceased to function. The Senior Ranger repaired it on return to normal duty in June. In his absence on work in the Lower River, and in the absence of both Fisheries Officer and Tsetse Ranger from the Fort Johnston station owing to sickness and further secondment, it fell into disrepair again by the end of the year.
12. For the months in which it was in action it appeared to achieve its purpose very well and to be welcomed by the people who enjoyed its protection. It seems a great pity that the local authorities could not, in the unavoidable absence of all Game Department staff, stir themselves to carry out the elementary maintenance operations necessary to keep it in action. The fence will be put in order again as soon as possible and renewed attempts made to get the local people to play their part.
13. Some trials of "cartridge ropes" against raiding animals were also made. These devices, consisting of a length of slow burning fuse with a number of small charges attached at intervals, producing a succession of detonations, were tried against pig and baboon and, on one occasion, elephant. They were successful in driving these animals out of the crops, at least for a time, but whether the effect is of sufficient duration to make their use economically practicable is not yet known.
14. The system of bounty payments for vermin trophies was also continued, with the aid of both local authority funds and African Development and Welfare funds. Judging by reports, which admittedly are not absolutely complete, it did not produce such good results as in former years, partly no doubt, because of difficulties over ammunition in the disturbed periods.
15. Details of animals destroyed in crop protection activities are shown in Appendix II.

CROCODILE HUNTING

16. Four licensees were in rather sporadic action during the year, also a few professional African hunters from Tanganyika.
17. A total of 1,088 reptiles was reported as captured, which was less of a decline from the 1,821 of 1958 than might have been expected, considering the difficulties that circumstances must have imposed on the operators.



18. Some 64 per cent. of the skins were of 6 foot or under, that is of immature specimens, and although the removal of the larger crocodiles may have led to a higher survival rate amongst small crocodiles and hence to a greater proportion of small specimens in the population as a whole, the apparent reliance on small specimens is not a very healthy augury for the continuation of the industry.

GAME CONSERVATION

19. The Lifupa observation camp in the Kasungu Reserve was opened for the second year in July. There were a number of day visitors but it is apparent that accommodation for more than two people needs to be provided before the camp will attract people to stay. Financial provision for this exists, and it is hoped to extend the camp slightly before next dry season.

20. Observation camps were established on the shoulder of Chipata Mountain in the Kota Kota Reserve and on the bank of the Mwabvi River in the Mwabvi Reserve, but were not completed until the close of the dry season, too late for opening. These camps will both accommodate four people and are on self-service lines. In the Kota Kota Reserve a road was made from the main Lilongwe-Kota Kota road to Tongole on the Bua River, where it is hoped to erect another camp next year.

21. Members of the Fauna Preservation Society co-operated with officers of the Department in fauna counts over portions of the Kasungu and Mwabvi Reserves and details of the observations made are set out in Appendix III, Table I. The Kasungu count in particular showed, for Nyasaland, a reasonably good variety and quantity of game. Particular thanks are due to District Commissioner, Kasungu, for his help in organizing the expedition to this Reserve.

22. Once again the Department sponsored visits by African schoolboys to the Mwabvi and Kasungu Reserves. Owing to the disorganization of work resulting from the disturbances it was comparatively late in the season before these could be attempted, but such visits as could be arranged produced encouraging responses.

23. A Controlled Area was proclaimed on the southern part of the Vipya in February and offers good prospects. Observations of game in it included both buffalo and elephant and the comparatively rare red duiker. This area is to be managed in close co-operation with the Native Administration of Chief Kabunduli.

24. Inspections of the Vwaza Marsh area rather late in the dry season did not show any very large concentrations of game and it is suspected that this area represents a seasonal rather than permanent habitat for many species. There is some evidence of a connection between this area and the Nyika grasslands and it seems likely that its chief importance may be as a cold season habitat for some of the Nyika herds.

25. Attacks on the inoffensive hippo in Lake Kazuni, which in former years have by common consent of both African and non-African been left virtually unmolested, made it necessary to prohibit the shooting of them in this very confined and accessible habitat. This was almost as much in protection of the local fishing interests as of the hippo themselves, for these animals add a great deal to the fertility of the water by manuring it, and moreover fishing would become a somewhat dangerous business if they were frightened into abandoning their usually tolerant attitude to fishing canoes.

26. During the year attempts were made to train the Game Reserve Guards to make more systematic and standardized records of their observations of game in the Reserves, so that observations over various periods could be readily compared. The attempts met with some measure of success and the observations are tabulated in Appendix III, Table II.

27. Observations in previous years, though agreeing in respect of the types of game seen in various localities, unfortunately do not provide data for comparison with 1959 on a numerical basis, so that there is, as yet, no very good ground for comment. Nevertheless the figures do suggest some sort of pattern in some cases. Thus the Lengwe, Kota Kota and Kasungu records indicate a moderately static game population, perhaps moving within the Reserve area, but not withdrawing from it. A hint of internal migration is given in the Kasungu figures for buffalo, which fit the hypothesis of a cyclic movement over a settled range within this very considerable area, the herd or herds coming within the orbit of the routine patrols every other month. The Nyika grassland observations sketch the gradual immigration of the zebra, roan and eland as the season moves from winter to summer, while those for Majete indicate a contrary movement, perhaps in search of grazing or water on the lowlands. Some such movement onto the plains lands is similarly suggested by the Mwabvi figures, which show a marked increase for sable, kudu and impala in the last two months of the year.

28. There was a fall in the number of game licences taken out, probably partly a reflection of the difficult and troubled times, and it is certain that much shooting without licence went on. There were also signs of increased poaching in the Game Reserves, no doubt as an effect of the withdrawal of game staff for other duties during the disturbances, and though no extravagant inroads seem to have been made on the game stocks, a good deal of ground was lost in the struggle to establish the prestige of the laws connected with the Reserves.

29. There were some successful prosecutions for offences both inside and outside Reserves. The extreme difficulty of getting incontrovertible evidence in game cases was, however, once again plain, and a number of cases were lost for lack of evidence sufficient to satisfy the Magistrates, or on legal technicalities. Skilled legal assistance in preparing and presenting these cases is very badly needed.

(c) Fishery

THE STATE OF THE FISH STOCKS

30. The catch per unit effort in the ring-net fishery declined perceptibly, taking the year as a whole. In spite of the introduction of a fourth licensee for some months of the year and a rise in total number of ring-net pulls from 9,325 in 1958 to 12,412 in 1959, total ring-net landings fell from approximately 466,000 dozen in 1958 to 423,500 dozen in 1959. This represents a fall in catch of approximately 9 per cent. for a rise in effort of about 33 per cent. The calculation, moreover, ignores the fact that nets were, on the whole, larger than those in use in 1958.

31. The decline in catch per single pull has, of course, been taking place fairly steadily over the past two years, as inspection of Table II in Appendix IV shows.

32. The figures in this Table corrected for variations in net size are different from those published in 1958 because they have been worked out on a different and, it is believed, a more logical system. Instead of making a straight comparison on the basis of the comparative lengths of net only, the calculation is now based on the different volumes of water enclosed by nets of varying lengths and depths. This seems a more logical way of comparing the fishing effort of two ring-nets, but the comparison may not be completely valid.

33. Be that as it may and even ignoring the fact that net sizes have increased over the past few years, there is a decline in most cases. This can hardly, as has been alleged, be accounted for by increased competition between nets for this should not bring a progressive decline but only a decline when the new nets enter the field. This does not fit the picture here and it is difficult to account for the figures on any supposition other than a fall in stock density in south-east arm.

34. This, of course, may be the result of a variety of causes, of which too high a fishing rate is only one, and though it seems the most probable cause, it may well not be the correct one. It is also to be noted that the greater part of the fall in both 1958 and 1959 is caused by poor catches from about June, 1958, to July, 1959. The last four months of 1959 showed a slight increase over the 1958 figures, though they did not reach those of 1957, so there is perhaps a little hope that the recession was a temporary one.

35. A section of opinion is inclined to blame the whole of the deterioration, if deterioration there is, on the use of small-mesh shore seines by the inshore fishermen. There is no doubt of course, as the figures in the various Annual Reports show, that a number of immature *Tilapia* are landed by this section of the industry, chiefly by means of these nets. There is, however, equally no doubt, as the Annual Reports also show, that these same nets land a great quantity of the *Haplochromis* group, which are mature at a small size and which would therefore be lost to the fishery if the small-meshed shore seines were abandoned.

36. Thus during the eleven years ending on 31st December, 1958, records of small-meshed shore seine catches kept at four of the major fishing beaches in the south-east arm, which are well distributed about the shore line, show a total catch of some 3,178,000 immature *Tilapia* against 28,031,000 Haplochromids. The proportion of the catch made up by immature *Tilapia* thus amounted to no more than approximately 10 per cent., and the actual number, on the average, works out at 288,909 per annum.

37. If one supposes, which it is scarcely reasonable to do, that all these small *Tilapia* would have survived to maturity had the small-meshed shore seines not been in use, and if one supposes that they were all immature specimens of the species of *Tilapia* which make up the bulk of the ring-net catches, which is not the case, and if one supposes that they were all caught at maturity, then they would have added 288,909 to the average *Tilapia* landings by ring-nets.

38. Since these, over the past eleven years, amount to an average 28,111,936 fish this addition would have amounted to an increase of 1 per cent. Suppose one multiplies this by ten to allow for unrecorded catches and unrecorded beaches, which is a fairly liberal allowance, it still does not represent a very decisive contribution.

39. Thus, though the small-meshed shore seines undoubtedly present a problem, it does not appear likely that their abandonment would solve everything.

40. Investigations into the population dynamics of *Labeo*, probably the second most important commercial fish in Lake Nyasa, suggest that there is room for a considerable expansion in the fishery for this species.

THE NON-AFRICAN FISHERY

41. There were five commercial licensees fishing during the year, of which three fished consistently in the south-east arm, one for ten months in the south-east and two months in the south-west arm, while one fished in the south-west arm except for the last three months, when he is reported as having suspended operations.

42. Catches totalled 145 short tons in the south-west arm and 3,963 in the south-east, an overall decline of 500 tons since 1958 for the non-African section of the industry. The decline of 152 short tons in the south-west arm catches is easily understandable in view of the great reduction in effort there, while the decline of 348 tons in the south-east arm was due to a fall in *Tilapia* catches. The gill-net fishery yielded about the same quantity of *Labeo* and catfish, with a perceptibly lower total yardage of netting.

43. The experiment in the use of a small-meshed ring-net in the south-west arm was discontinued in June, as an analysis of the catches showed they contained some 56 per cent. of immature *Tilapia* and no more than 14 per cent. of the small Haplochromids the net was designed to catch. The actual number of immature *Tilapia* reported as landed in the ten months this net was in operation was about three times the total recorded catch in 1958 at five inshore stations where small-mesh shore seines are in use.

44. The great reduction of effort in the south-west arm is a most disappointing feature of the year's events, more especially as the south-east arm seems to show signs of overstrain, but is understandable under the circumstances. Clearly some sort of road system, and possibly a new fishing method as well, needs to be evolved if this arm is to be developed for large-scale open-water fishing. Even the African inshore fishing with its low overheads and small output can barely cope with the marketing problem posed by lack of communications.

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

THE AFRICAN FISHERY

45. The use of imported gill-nets by African fishermen continued to rise steeply and in many cases suppliers had great difficulty in keeping pace with the demand. This is a great change from seven or eight years ago, when imported nets were almost unknown to the African fishermen. It is a result, partly of the vision of a certain commercial firm in making supplies available before there was a proved demand for them, partly of the increased purchasing power of the general African public which has enabled the African fishermen to bear higher overheads, and partly of the evolution of the nylon net with its higher catching power and increased durability.

46. A less desirable development is a gradual but decided increase in the distribution and use of small-meshed netting for shore seines. As discussed above there is a legitimate use for these off beaches where the small growing Haplochromids occur, but there appears to be a tendency to extend their use to other parts of the Lake, where they will catch significant quantities of immature *Tilapia* without compensating benefit in the shape of big catches of *Haplochromis*. It seems very probable that some method of checking this improper use will have to be found. Although it is not believed that these small-mesh nets yet do great damage they clearly could and would do so if their use was extended indefinitely.

47. The introduction of a scheme of Government loans to Africans to finance business and agricultural ventures gave useful impetus to the evolution of a class of truly commercial African fishermen. By the end of the year some twelve loans of total value of £2,700 were in operation and a number of other fishermen were buying proper boats and engines from their own resources.

48. It is most unfortunate that delays in repairs to the Fisheries launch, which were the result of the disturbances early in the year, and the subsequent illness of the Fisheries Officer severely limited contact with these embryonic businesses. Data from the African fishery are shown at Appendix V.

THE FISH TRADE

49. Permission to export not having led to any disasters in 1958 it was continued, under a licensing system, in 1959.

50. The issue of licences was, by direction, confined to fishermen, both African and non-African, who had developed proper businesses and hence were responsible for the greater part of production.

51. It was felt that these major operators were in a better position than anyone else to judge what the local market would really absorb and they were individually warned that if it became apparent that the local markets were being deliberately and consistently starved Government would have to reconsider the situation. It was made plain that it was therefore in their long term interests to adjust the flow of their trade so as to keep the local market adequately supplied.

52. In the event some 800 short tons of fish, expressed in terms of its original landed weight, were exported during 1959 to other parts of the Federation, chiefly Southern Rhodesia. Of this, 150 short tons went out as fresh fish, and the remainder in the salted or smoked form.

53. This represents a rise of 410 short tons over the 390 short tons exported in 1958, and Nyasaland fish is obviously becoming better established on the Southern Rhodesian market. Nevertheless the amount exported represented only about 20 per cent. of the non-African catch by itself and, of course, a much smaller proportion of the total catch from all sources. There were some African export licensees but they appeared to take little advantage of the opportunity to export and the overwhelming proportion was exported by three of the five non-African firms.

54. The effect on the home market did not appear to be severe. There was a rise in the price of fish on the major markets; but some rise is, of course, to be expected anyway, in concert with gradual price rise of all commodities, and there seems little reason to believe that the comparatively small proportion of the catch exported had a decisive effect on legitimate consumer interests. Nor indeed were these local prices plainly exorbitant and the exporters state that the landed price in Salisbury is very little, if anything, above the price which can be obtained here when the market is not oversupplied.

55. Details of the export trade are shown at Appendix IV, Table VI.

DEVELOPMENT WORK

56. The stress of the disturbances and the illness of the Fisheries Officer severely limited the possibilities of progress on the development side.

57. The Nkata Bay school for prospective commercial fishermen commenced its 1959 courses on 11th January with four trainees, and continued until mid-March, when courses were suspended because of the disturbances. The Fish Ranger was not available for supervision for the last few weeks of this period, but routine fishing was carried on by the African school staff as far as possible and continued until the school reopened. Courses recommenced on 4th August, when the situation had quietened and the Fish Ranger was released for normal duties. In all, a total of four courses were held during the year and eleven trainees attended.

58. Proceeds of the sale of fish caught in the nets belonging to the school amounted to £96 up to the end of November and a good deal of fish was also supplied free to security forces.

59. The boat building scheme was continued at Fort Johnston and seven boats were completed during the year. At Nkata Bay the Department discontinued building as the African carpenter who had been employed for this purpose decided to take a Government loan to open his own business, using the Departmental design. This, of course, is the sort of development which has been aimed at from the beginning of the scheme and it is to be hoped that someone in the Southern Province will soon follow suit. The granting of loans to African fishermen has, as foreseen, materially increased the demand for these boats and it would seem that there is a good opportunity for someone.

EXPERIMENTAL WORK

60. Some interesting experiments were made by the Fish Ranger, at Nkata Bay, with the help of the Fisheries Research Officer, in comparing the rates at which various types of corks and plastic floats lost buoyancy under the high pressure conditions developing in deep water gill-net setting. Experience had shown that collapse of corks and loss of buoyancy were a considerable problem in this fishery.

61. The experiment was carried out with six types of plastic float and two different sizes of natural cork.

62. The floats and corks were attached together and dropped to exactly twenty-five fathoms depth. They were set each evening on weekdays and raised the next morning, and tested for buoyancy immediately after being lifted.

63. The method for comparing buoyancy was as follows: The float or cork was placed in a vessel containing water, having first had weights attached which were just insufficient to submerge it. Smaller weights were then balanced on the upper surface until this also submerged and the total weight necessary to bring about sinking was thus ascertained. Measurement was to the nearest gram. The weight necessary to bring about submergence was then expressed as a percentage of that necessary when the cork or float was brand new. The figures obtained thus give an indication of the percentage of original buoyancy retained as the experiment proceeded.

64. There were fifty-nine sets and the results are set out in tabular form below. For the sake of brevity some of the sets are omitted after the first five.

Percentage of original buoyancy retained after each set

Set No.	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic	Cork 2½ × 1¼"	Cork 4 × 1¼"
	A	B	C	D	E	F		
1.	100	100	100	100	100	100	100	100
2.	100	100	100	100	100	100	92.8	100
3.	100	96.6	100	100	100	82.9	82.9	100
4.	100	85.5	100	84.4	100	73.6	90.7	100
5.	91.8	84.7	100	79.7	100	72.1	82.8	90.2
10.	93.0	87.2	100	81.2	100	71.3	77.8	84.4
15.	87.4	81.3	100	70.3	100	65.1	70.7	75.3
20.	84.0	77.1	100	70.3	100	61.4	61.4	64.3
25.	84.0	73.7	100	64.1	98.9	70.5	57.1	56.9
30.	79.5	72.0	100	64.1	97.7	62.0	50.0	49.0
35.	72.9	61.2	100	58.4	97.7	52.7	48.6	46.7
40.	66.3	63.6	99	58.4	97.7	48.8	42.3	37.7
45.	63.0	63.6	98	54.6	97.0	36.5	38.1	23.9
50.	63.0	51.6	98	60.2	97.0	36.5	35.3	20.3
59.	65.2	46.8	98	54.6	97.0	46.5	36.7	17.9
Wt. originally required to im- merse specimen when new ..	114 gm	118 gm	145 gm	64 gm	177 gm	129 gm	140 gm	255 gm

65. On the first day of submersion the two plastic floats "A" and "B" had collapsed badly and there were signs of shrinkage in "D" and "F". After this rapid deterioration no more was noticed until the sixteenth setting when the four plastic floats mentioned above showed a marked shrinkage, while the natural corks showed a distortion of shape and developed deep cracks on their surface. Up to this time these natural corks had retained shape but lost 40 per cent. of their original buoyancy. After this no more visual deterioration was noted but there was a steady loss of buoyancy in four of the plastic float and the natural corks. It is to be noted

that there was some small recovery of buoyancy over the week-ends, when no immersions were made and the floats had an opportunity to dry out. Some of the buoyancy loss was therefore due to water-logging.

66. At Fort Johnston the Fisheries staff made a number of experiments in various gill-netting techniques, under the direction and supervision of the Fisheries Officer.

67. The first was another series of coloured net experiments, in continuation of those begun in 1958. A total of forty-one settings were made between 15.12.58 and 20.3.59 but owing to net damage not all the nets were set every time. Dark blue, brown and light green were set 39 times, dark green was set 38 times, and dark blue and white 37 times. Sets were in the south-east arm in about 6 fathoms of water and the nets were 4" mesh.

68. The results, not corrected for the slight differences in numbers of sets, were as follows:

	Total fish	Percentage of total catch	Nos. of fish by genera				
			Tilapia	Labeo	Bagrus	Clarias	Other
Light green	258	21%	49	161	20	24	4
White	220	18%	37	144	17	17	5
Dark green	180	14%	39	93	12	25	11
Light blue	191	15%	27	135	5	23	1
Dark blue	145	11%	29	82	11	16	7
Brown	253	21%	70	140	10	28	5
TOTAL	1,247		251	755	75	133	33

69. Ignoring the slight differences which would in any case have resulted from the slight differences in numbers of sets, the catches suggest that some advantage is to be gained by using light green or brown nets. The brown used was a very red brown.

70. In the first of the 1958 experiments, in which brown was not used, light green also took first place, with white a close second. In the second 1958 experiment white came top with light green a close second and brown equal third with light blue. The 1959 experiment thus shows light green as giving the most consistent results but the difference from plain white is not very marked.

71. The next experiment in 1959 was with varying methods of mounting. Two nets, each of stretched length of 100 yards, were mounted "by the half", as is the normal commercial practice, to a total set length of 100 yards. These were fished against a pair of identical nets mounted "by the third" to a total set length of 132 yards. Both series were 4" mesh.

72. There were 41 settings in all but the nets mounted by the half were reduced to half length for two settings and those by the third for one setting. The period of setting was 15.12.58 to 20.3.59 and the nets were set in about six fathoms.

73. The results, again not corrected for the small difference in the number of sets, were as follows:

Numbers of fish and average weight, in grams, of single fish

Net	Total Number fish	Percentage of catch	Tilapia lidole		Other Tilapia		Labco		Clarias		Bagrus		Other
			No.	Av. wt.	No.	Av. wt.	No.	Av. wt.	No.	Av. wt.	No.	Av. wt.	
By $\frac{1}{2}$	497	47%	22	533	62	422	308	763	32	1,061	60	1,351	13
By $\frac{2}{3}$	566	53%	5	473	75	418	373	798	37	1,392	58	1,306	18
TOTAL NOS.	1,063		27		137		681		69		118		31

74. On the average the nets mounted by the third thus caught rather more and slightly larger fish than those mounted by the half, except in the case of *T. lidole* where the numbers were too small for a very useful comparison to be made.

75. The Fisheries Research Organization, on the basis of experience at Nkata Bay, recommend a method of mounting slightly more extended than by the third, giving 70 yards set length for a 100 yards stretched length net. If this method had been followed the difference between the catch and that obtained by the normal commercial practice of mounting by the half might be expected to have been larger, but even the 9 per cent. increase in the *Labeo* catch achieved by extending the individual net to 61 yards, instead of the usual 50, might be significant if applied to commercial scale fishing.

76. A third experiment concerned the comparison of catches from a net which was meticulously mended between sets and one which was merely roughly "cobbled" as quickly as possible. This was a very relevant experiment, particularly from the point of view of the African fishermen. A great deal of labour, and therefore money, is spent on the very careful repair of gill-nets and it seemed likely that much of this expenditure might be unproductive.

77. The nets were identical 4" mesh nylon nets, set together in about six fathoms of water. They were set 40 times between 11th May and 21st August, when the experiment was interfered with by the theft of the mended net of the pair.

78. Over this period the results were as follows:

Net	Total number fish	Total Wt.	Percentage of total catch by Nos.	Hours repair work	Nos. of fish by genera				
					Tilapia	Labeo	Clarias	Bagrus	Other
Mended ..	128	106 kg	44%	20	35	16	45	27	5
Unmended	164	127 kg	56%	6½	37	21	65	22	19
	292	233 kg			72	37	110	49	24

79. The result to this point strongly suggests that only a very limited amount of mending is really worth while.

80. The experiment was continued to the end of the year for another nineteen sets, the stolen "mended" net being replaced by a new net. A comparison of 59 settings of the unmended net with 40 of one mended net and 19 settings of another, are as follows:

Net	Total Number fish	Percentage of total catch by Nos.	Hours repair work	Nos. of fish by genera				
				Tilapia	Labeo	Clarias	Bagrus	Other
Mended ..	308	52%	51½	122	61	66	49	10
Unmended ..	290	48%	15½	98	43	85	42	22
	598			220	104	151	91	32

81. Thus the final result leads to much the same conclusion as the first half of the experiment. The "unmended" net was not only competing against a net which was carefully mended but two thirds of the way through the series a brand new net was introduced on the "mended" side of the experiment. In spite of being at this extra disadvantage the "unmended" net caught very nearly as much fish as did the other.

82. During the latter part of the experiment referred to above, further comparisons were introduced with the mended and unmended nets. A net made of 3-ply twine as against the usual 6-ply was introduced for comparison. It was intended that this should be a mended net, but lack of mending twine supplies made it more comparable with the unmended 6-ply net. The 3-ply net can be bought for about half the price of the 6-ply. This was combined also with an experiment in which the effect of baiting a net was tried. A further mended 6-ply net was introduced and bags of fish fragments were tied to the foot-rope. Thus the mended 6-ply net could be compared with a similar baited net and the unmended 6-ply net compared with an "unmended" 3-ply net, although in the latter case the 6-ply net had already been set for some 40 times, whereas the 3-ply net was new. All the nets were 4-inch mesh, mounted in the same way, and were fished together in about 6 fathoms of water. Results of 38 sets over the period 9th October, 1959, to 15th January, 1960, were as follows:

Net	Total number fish	% Total catch by Nos.	Hours repair work	Nos. of fish by genera				
				<i>Tilapia</i>	<i>Labeo</i>	<i>Clarias</i>	<i>Bagrus</i>	Other
Mended 6 ply ..	383	32%	81½	153	137	38	35	20
Baited 6 ply ..	357	30%	61¼	150	108	46	38	15
Unmended 6 ply ..	250	21%	27½	126	54	42	24	4
Unmended 3 ply ..	205	17%	24	107	45	16	31	6
	1,195			536	344	142	128	45

83. The results of the baiting do not, so far, suggest that there would be any advantage in following the practice, at least in the south-east arm waters where the non-predatory *Labeo* and *Tilapia* make up such a large proportion of the catches. During the first six weeks the 3-ply unmended net caught almost as well as the 6-ply mended net (155 fish and 180 fish respectively). The catches of the 3-ply net, however, deteriorated fairly rapidly so that its overall performance during the whole period was less good than the unmended 6-ply net which had seen considerable service before the experiment began. The 3-ply net had, however, caught about half as much fish as the mended 6-ply net which had cost twice as much and on which over three times as much labour and twine had been spent in repairs. Further experiment may still show that the 3-ply net is the more economical. It is interesting to note that there are signs in the results of this part of the experiment as well as that in para. 80 above that the deterioration in the catch is mainly amongst *Tilapia* and *Labeo*, whereas *Clarias* and *Bagrus* catches are maintained with the unmended nets. These results, when a comparison is made between the mended and unmended 6-ply nets, represent a later stage of the same experiment referred to in para. 80. Although the total catch of fish is now reduced to two-thirds by lack of mending, it seems likely that the saving of time and expense will outweigh the reduction in catch when the experiment is complete and the economic aspects are fully considered.

84. Another gill-net series concerned a trial of a net on which the foot-rope itself was made of specially heavy material, against an identical net weighted in the normal way, with clay weights attached at intervals along a normal foot-rope. Both were 4 inch nylon nets set in about 6 fathoms of water over the period 4th May to 15th January, 1960, there being 94 sets in all. Results were as follows:

Net	Total No. fish	Percentage total catch by Nos.	Hours repair work	Nos. of fish by genera				
				Tilapia	Labeo	Clarias	Bagrus	Other
Heavy foot-rope (10 kg. per 100 m.)	619	55%	43½	285	125	92	82	35
Normal foot-rope (clay wts)	512	45%	79½	190	87	113	76	46
	1,131			475	212	205	158	81

85. The advantage of the heavy foot-rope is most obvious in the considerable reduction in mending time which comes with its use. The normal weights set at intervals along the foot-rope frequently tangle in the meshes and tears are caused in handling and setting. Similarly setting is much easier and more rapid.

86. A conclusion as to whether the heavy foot-rope gives any increase in the actual catching power must await the results of statistical analysis, but clearly it gives no decrease. The overall economics of using the heavy foot-rope, taking into consideration the costs of the special rope, etc., have still to be worked out.

FISHERIES RESEARCH ORGANIZATION

87. Work was severely hampered by the disturbances and also by the lack of a launch for all but a few weeks of the year. This again was, in part, an indirect result of the disturbances.

88. No second Research Officer could be found by the end of the year though an offer of appointment had been made by the end of it.

89. During the brief period in which a launch was available some most interesting and informative work was done on the population dynamics of *Labeo mesops*, using fleets of gill-nets with mesh varying by small increments.

90. The experiment is not yet complete but much interim information was gathered on the selectivity of gill-nets for *Labeo mesops*, on the major aspects of its life history and on feeding cycles, and the work also gave the basis for a tentative estimate of growth and mortality rates.

91. Some progress was also made in the *Engraulicypris* investigation and while this is far from complete the picture of its life history is beginning to emerge with some approach to clarity.

92. A full report of the activities of the research unit is to be published by the Joint Fisheries Research Organization.

TROUT FISHING

93. Returns for the 1958/59 season show that a total of 42 licences were taken out for the North Rumpi stream, net value being £22-10s. Most were daily or weekly licences. Some 73 fish were taken in 71 rod days, the sizes ranging from 12 inches to 17¾ inches and 27 fish under 12 inches were returned, including one of only 4 inches.

94. Opinions have been expressed on the basis of fishing during the 1959/60 season which is not yet completed, that the fish in this stream are not breeding. If this is true there can be no fish younger than six years in the stream, for the last stocking was in 1953. This seems rather unlikely, nor is it easy to account for the 4 inch fish referred to above, for nothing as small as this was stocked originally.

95. The neighbouring stream, the Kaziwiziwi, does, however, seem to suffer from this defect, no small fish having been recorded from it and fish in general being scarce. The 1958/59 season showed 19 rod days and 6 fish only landed, at sizes ranging from 12 to 17½ inches.

96. Only seven licences, valued at £4-15s, were taken out for the 1958/59 season on Mlanje. A total of 54 fish were taken in 21 rod days at sizes varying from 8½ inches to 14 inches, the majority being in the 8½ to 10 inch range. Some 198 fish under 8½ inches were returned.

97. Licences for the Zomba Mountain fishing in 1958/59 totalled 52 with a value of £37-5s. The rod days on this stream amounted to 141 with 169 fish taken at sizes varying from 8½ inches to 17½ inches. Most were in the 9 inch range, while 269 fish of 8½ inches and under were returned.

98. The stretch between the upper limits of the Reservoir fishing and the Williams Falls, closed since the end of the 1955/56 season, was reopened to fishing for 1959/60. Returns of fishing for this season are not complete but inspection of the stretch does not suggest that closure has led to much increase in the average size of the fish in it, as it was hoped it would do.

99. The Reservoir fishing suffered a rather severe set-back during the latter part of 1959 when the Reservoir was drained, without warning to the Department, in connection with electricity supply investigations. Some 19 dead trout were found below the dam wall after the operation and many more must have gone downstream to unfavourable levels. The Trout Guard, warned of the operation at the last minute, nevertheless succeeded in rescuing some 40 fish from amongst those which were floundering in the turbid water, and transferred them upstream. A good effort under the circumstances.

100. Wild fish were again collected and artificially fed in the rearing pond during the year and made good growth. Partly owing to doubts about the Reservoir, where further draining operations were forecast, and partly owing to lack of staff to supervise operations, they were not released by the end of the year, and no details of growth are yet known.

FISH FARMING

101. There is very little to report under this head, in respect of 1959. By the end of February the rising political tension and onset of violence in the north made it administratively undesirable for the Fish Ranger (Rivers) and his family to remain at the isolated station of Nchenachena, and they were evacuated. The Fish Ranger was seconded to security work, a number of the ponds at the fish farm were drained and their fish distributed, the farm was put on a care and maintenance basis in the charge of the African Supervisor and all development work had to cease.

102. The Fish Ranger was released in April and, conditions being still unsettled in the north, he was posted to Domasi. Here, prior to his departure on leave in mid-August, he made a start on the construction of a new fish farm unit, which is to become the main experimental and demonstration farm for the Protectorate.

103. Work was continued on this project after his departure by the African Fisheries Assistant under direction from Departmental Headquarters. By the end of the year three quarter-acre ponds were ready for filling and work had been begun on others. Unfortunately the long delay in the onset of the rains made it very difficult to make a start at filling the ponds and this was, in fact, not begun until after the turn of the year. It was not therefore possible to do any actual stocking.

(d) Tsetse Control

GENERAL

104. Establishment of a settled programme for the tsetse section was again disrupted by staff difficulties. Both the Tsetse Botanist and Tsetse Ranger were on special duties for the period immediately after the Emergency and the services of the Tsetse Ranger were again requisitioned from October until after the end of the year.

105. No material progress was made during the year in implementing the policy of integration of the tsetse programme with agricultural expansion. Arrangements for mapping the agricultural position in each District were approved early in the year but no results were to hand by December.

106. Training of tsetse staff was continued with a course on vegetation arranged by the Tsetse Botanist in June. Three of the more senior Tsetse Scouts accompanied the Tsetse Botanist and Tsetse Ranger on a tour of Southern and Northern Rhodesia in August and September and shared the valuable opportunity kindly afforded by the Northern Rhodesian Government to inspect a number of tsetse eradication schemes. A small beginning was made in promoting tsetse staff who have benefited from recent training and one surveying team now operates independently with a Tsetse Scout in charge.

107. The Tsetse Botanist had the advantage of spending two weeks in the field with a visiting Botanist, Dr. N. K. Robson from Kew, who is engaged on the *Flora Zambesiaca*.

108. Considerable progress was made during the year in the recording of tsetse observations on maps. This has so far been done as a part-time task but a tracer is now engaged full-time in recording all observations as they are made.

SURVEY WORK (*Glossina morsitans*)

109. Observations were made during the year in the following areas: Toleza, Fort Johnston-Monkey Bay and Chiuzi (Fort Johnston District); Chapanganga, Ndakwera and Nyanthana (Chikwawa District); Liwonde, Chipoka, Kota Kota and Kasungu.

110. These surveys were aimed mainly at identifying changes in tsetse areas since the time of the Tsetse Survey. At Liwonde and Chiuzi, however, more intensive observations are being made with a view to identifying more exactly the source of flies carried to the Kasupe and Fort Johnston fly posts respectively. It is now apparent that the relatively small number of tsetse flies carried to Kasupe are collected from a wide area and in the main are carried secondarily from Liwonde ferry which is a focus for traffic of all kinds.

111. A number of the surveys revealed a decrease in tsetse infested areas or diminished fly populations. In a brief visit no sign of the former pocket of fly in the Kasungu Game Reserve could be found. The tsetse infested area has retreated northward between Mua and Chipoka. There is a general decrease in the northern fly sector in Chikwawa District (Mwanza-Nkombedzi). In general it may be said that at present the fly population in Nyasaland is static or decreasing.

DECONTAMINATION POSTS

112. The same posts were operated as in 1958 and were little affected by the Emergency. Summaries of the post records are to be found in Appendix VI. The Fungo post continued to operate on an open-air temporary basis on the road to Malomo. Plans for the Mbobo post to cover traffic to Malomo as well as Visanza have been made but not yet put into effect.

113. Fly catches at decontamination posts were about the same as in 1958 except at Fort Johnston where the fly population failed to build up in the late dry season as in previous years and the resultant total catch is only about half that in 1958.

114. The accumulated records of seasonal changes in numbers of flies caught in the past few years are beginning to show very interesting features which may show correlation with weather conditions. In most cases there is a very marked drop in catches during November after an increase during the previous months. This collapse of populations of *G. morsitans* with the onset of the rains is well known and is particularly marked at lower altitudes in Nyasaland. It is hoped that the accumulated data will soon permit a closer correlation of this and other seasonal changes with meteorological information so as to give useful information on the ecology of this tsetse fly. It is evident, however, that the delayed onset of the rains in recent years has affected the fly population at a critical period and is responsible for keeping the fly population low.

115. Offences by vehicles by-passing Kasupe decontamination post continued to be numerous in spite of improved and very prominent sign-posting. Numbers of offences at other posts are negligible.

KARONGA RECLAMATION SCHEME (*Glossina brevipalpis*)

116. The scheme suffered severely from effects of the Emergency, including complete loss of field staff housing and tools stocks as well as loss of supervisory staff. Regular patrols were, however, maintained on all but a few days by the loyalty of the local staff, in spite of considerable hardship.

117. No start could be made on the programme of minor clearings aimed at isolating the Mweningorongo area and attention had to be paid mainly to renewal of housing. This did, however, provide the opportunity to reorganize regular patrols to exclude Ngerenge and Mweningorongo, which are now of little interest, but to include the areas between Yembe and Mweningorongo which have not been regularly patrolled in recent years.

118. At the beginning of the year the Provincial Natural Resources Board approved the relaxation of the restriction on cultivation in a further stretch of hillside between Yembe and Mweningorongo the object being to reinforce the isolation of these two areas. There were further encouraging signs of occupation of areas which have been partially cleared for tsetse purposes, notably in the Nkhavankande area where flies have proved very persistent in the past few years.

119. Two small trials of insecticide were made, spraying the sides of patrol paths with 4 per cent. dieldrin from a "Motoblo" machine in sectors of persistent fly catches. The result was disappointing in that there was little effect, either immediate or long-term, on the fly catches. This is in contrast to previous trials of non-residual applications of gammexane with "Swingfog" machines, which produced at least a very obvious short-term reduction in flies. The clue may lie in the location of the resting sites of *G. brevipalpis* at a higher level than was reached by the heavier dieldrin spray. The unexpected result, however, emphasizes the empirical nature of the work on this tsetse fly.

Senior Staff as at 31st December, 1959

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. LEWELLYN
Fish Ranger	K. T. HOWARD
Fish Ranger (Rivers)	A. V. GIFKINS
Game Rangers	O. J. CAREY C. W. S. BROWN
Tsetse Ranger	C. H. E. RICKMAN

FISHERY RESEARCH ORGANIZATION

(Nkata Bay Station)

Fishery Research Officer	T. D. ILES, B.SC.
----------------------------------	-------------------

APPENDIX II

Table I

Animals killed and Staff employed 1st January, 1959, to 31st December, 1959

	Totals 1958	Northern Province	Central Province	Southern Province	Totals 1959
Average No. Hunters	24	6	14	6	26
Average No. Netters	1	—	—	—	—
Average total men per month	25	6	14	6	26

ANIMALS KILLED:

Elephant	59	2	26	22	50
Hippo	60	7	22	35	64
Buffalo	—	—	—	—	—
Carnivora	18	1	6	1	8
Antelope	1	2	—	—	2
Baboon	171	61	203	20	284
Pig	19	10	—	1	11
Vermin netted	75	—	—	—	—
Vermin killed under bounty system:					
A.D.W. Finance	23,833	4,187	8,501	1,500	14,188
Local Treasury Finance	22,236	7,998	5,401	7,169	20,568

APPENDIX II

Table II

Revenue accruing from Crop Protection Activities

	£	s	d
Value of ivory	886	16	9
Value of meat and skin sales	149	3	6

APPENDIX III

Table I. Fauna Counts

KASUNGU GAME RESERVE. October, 1959

Patrol Routes.	1.	Lifupa <i>dambo</i> to Cifununu and return	..	..	..	..	..	10-10-59
	2.	Lingadzi <i>dambo</i> to Kakuyu and return	..	..	..	..	..	10-10-59
	3.	Lingadzi <i>dambo</i> to Kacence and return	..	..	..	..	..	10-10-59
	4.	North bank Dwangwa River	..	..	..	..	..	10-10-59
	5.	South bank Dwangwa River	..	..	..	..	..	10-10-59
	6.	Lingadzi to Kachitandu and return	..	..	..	..	..	11-10-59

Game seen

Patrol route	1	2	3	4	5	6	Totals
Patrol time (hours)	6 $\frac{3}{4}$	9	8 $\frac{1}{2}$	8 $\frac{1}{2}$	9	3 $\frac{1}{2}$	45 $\frac{1}{4}$
Elephant	..	67	..	..	..	..	67
Buffalo
Eland	56	..	..	..	..	..	56
Sable	42	..	..	..	42
Hartebeeste	1	..	..	..	1
Reedbuck	..	17	23	..	..	..	40
Waterbuck	8	1	7	10	8	..	34
Kudu	5	29	..	..	34
Klipspringer	10	10
Roan	1	..	1
Bushbuck	2	15	..	..	17
Oribi	1	..	..	1
Steinbuck	..	8	..	5	2	..	15
Duiker	1	2	..	3
Zebra	..	2	2	2	..	..	6
Lion	9	..	..	..	9
	3	..	..	..	3

339

MWABVI GAME RESERVE. September, 1959

Patrol Routes.	1.	Southern edge Malemia thicket and middle Tangadzi Valley	26-	9-59
	2.	Mwabvi camp to Mwabvi-Tangadzi confluence and return	26-	9-59
	3.	Mwabvi camp to western edge of Malemia thicket and southern end Phudu <i>dambo</i>	..	..
	4.	Mwabvi camp and circle inside Malemia thicket	27-	9-59
	5.	Lower Dandi Valley	..	..
			27-	9-59

Game seen

Patrol route	1	2	3	4	5	Totals
Patrol time (hours)	6 $\frac{1}{2}$	6 $\frac{1}{2}$	6 $\frac{3}{4}$	6 $\frac{1}{2}$	3	29 $\frac{1}{4}$
Sable	..	..	..	..	..	..
Kudu	14	..	..	3	..	17
Duiker	..	..	..	9	3	12
Suni	3	..	..	..	..	3
Rhinoceros	1	..	..	..	..	1
Reedbuck	..	..	..	1	..	1
	..	..	..	..	1	1

35

APPENDIX III

Table IIA. Average Numbers Game seen per 10 Patrol Days
MWABVI GAME RESERVE

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant				—	—	—	—	—
Rhinoceros .. ..				.25	.33	.70	.30	.25
Hippopotamus				—	—	—	—	—
Zebra				—	—	—	—	2.18
Lion				—	—	—	—	—
Leopard				—	—	—	—	—
Buffalo				8.75	4.00	3.62	2.80	—
Sable				3.50	4.66	6.21	15.60	16.40
Roan				—	—	—	—	—
Kudu				8.75	2.00	6.36	11.70	27.00
Eland				—	—	—	—	.12
Hartebeeste				—	—	—	—	—
Waterbuck				—	—	—	—	—
Nyala	No Record	No Record	No Record	—	—	2.50	2.00	.25
Impala	No Record	No Record	No Record	1.85	5.00	5.65	12.80	28.07
Reedbuck	No Record	No Record	No Record	.13	—	—	.30	—
Bushbuck				1.00	—	2.50	.60	.38
Duiker				1.50	.66	3.02	2.00	3.97
Klipspringer				—	—	4.30	2.00	1.66
Oribi				—	—	—	—	—
Liv. Suni .. ..				.50	—	.10	1.50	.51
S. Steinbuck				—	—	—	—	—
Pig				—	—	—	1.50	1.54
Warthog				—	.66	1.60	1.00	9.23
Wild Dog				—	.33	1.60	—	—
TOTAL PATROL DAYS ..				40	30	69	68	78
DO. NO GAME SEEN ..				20	10	13	14	12

APPENDIX III

Table IIB. Average Numbers Game seen per 10 Patrol Days
LENGWE GAME RESERVE

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant				—	—	—	—	—
Rhinoceros				—	—	—	—	—
Hippopotamus				—	—	—	—	—
Zebra				—	—	—	1.23	—
Lion				—	—	—	—	—
Leopard				—	—	—	—	—
Buffalo				—	4.79	—	—	—
Sable				—	—	—	—	—
Roan				—	—	—	—	—
Kudu				—	.99	4.40	3.45	5.00
Eland				—	—	—	—	—
Hartebeeste				—	—	.80	1.77	1.62
Waterbuck				—	—	—	—	—
Nyala	No Record	No Record	No Record	9.00	5.47	3.10	2.84	2.12
Impala	No Record	No Record	No Record	—	—	—	3.95	.37
Reedbuck				—	.47	—	.82	.62
Bushbuck				2.66	1.42	.68	—	.75
Duiker				2.33	1.19	.80	1.77	1.12
Klipspringer				—	—	—	—	—
Oribi				—	—	—	—	—
Liv. Suni				—	—	—	—	—
S. Steinbuck				—	—	—	.20	.25
Pig				—	—	—	—	—
Warthog				2.00	.99	1.34	.41	.25
Wild Dog				3.33	1.89	1.34	.89	1.74
TOTAL PATROL DAYS ..				—	—	—	—	—
Do. NO GAME SEEN ..				30	42	87	81	80
				19	12	31	51	33

APPENDIX III

Table IIC. Average Numbers Game seen per 10 Patrol Days
MAJETE GAME RESERVE

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant				30.50	23.21	4.66	7.69	—
Rhinoceros				—	—	—	—	—
Hippopotamus				—	—	—	—	—
Zebra				27.41	9.10	11.11	7.49	10.55
Lion				—	—	—	—	.55
Leopard				—	—	—	—	—
Buffalo .. ..				.74	—	—	—	—
Sable				18.50	1.96	3.11	8.45	4.81
Roan				—	—	—	—	—
Kudu				7.05	6.07	4.88	4.23	6.29
Eland				30.50	16.62	10.44	4.80	5.18
Hartebeeste				15.00	7.14	3.77	2.88	4.07
Waterbuck				—	—	—	—	—
Nyala	No Record	No Record	No Record	—	—	—	—	—
Impala	No Record	No Record	No Record	—	—	—	—	—
Reedbuck				5.92	8.93	1.99	1.34	1.29
Bushbuck				1.29	5.69	1.99	.48	5.74
Duiker .. ..				.37	.89	1.55	.48	1.85
Klipspringer				—	—	—	.76	.73
Oribi				—	—	—	—	—
Liv. Suni				—	—	—	—	—
S. Steinbuck				—	—	—	—	—
Pig .. ..				.37	2.32	1.99	—	1.29
Warthog				1.11	2.67	2.22	1.34	2.22
Wild Dog				2.22	—	—	—	—
TOTAL PATROL DAYS ..				54	56	45	52	54
DO. NO GAME SEEN ..				5	12	8	21	13

APPENDIX III

Table IID. Average Numbers Game seen per 10 Patrol Days
KOTA KOTA GAME RESERVE

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant		13.78	14.56	22.50	15.91	15.46	15.10	14.02
Rhinoceros .. ..		.17	.03	.23	.33	.18	.20	1.40
Hippopotamus		—	—	—	—	—	—	.14
Zebra		3.58	3.02	8.73	3.72	3.75	3.66	7.25
Lion		—	—	—	.22	—	—	—
Leopard		—	—	—	—	—	—	—
Buffalo		14.26	14.43	9.64	11.50	14.09	11.99	11.70
Sable		4.30	5.69	6.47	3.87	5.94	3.73	4.71
Roan		2.73	2.25	1.81	1.99	1.22	2.80	4.64
Kudu		1.12	1.31	.23	.29	.55	.20	1.90
Eland		4.84	5.33	3.88	7.15	6.80	6.23	3.73
Hartebeeste		1.36	3.47	.80	3.39	4.12	3.39	7.46
Waterbuck		2.11	2.05	.79	2.62	3.12	5.13	1.16
Nyala	No Record	—	—	—	—	—	—	—
Impala		—	—	—	—	—	—	—
Reedbuck		—	—	—	—	—	—	3.16
Bushbuck		—	—	—	—	—	—	—
Duiker		—	—	—	—	—	—	—
Klipspringer		—	—	—	—	—	—	—
Oribi		—	—	—	—	—	—	—
Liv. Suni		—	—	—	—	—	—	—
S. Steinbuck		—	—	—	—	—	—	—
Pig		—	—	—	—	—	—	—
Warthog		—	—	—	—	—	—	2.25
Wild Dog		—	—	—	—	—	—	—
TOTAL PATROL DAYS ..		294	312	252	271	269	292	142
DO. NO GAME SEEN ..		131	149	144	130	131	152	41

APPENDIX III

Table IIE. Average Numbers Game seen per 10 Patrol Days
KASUNGU GAME RESERVE

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant		15.93	15.20	19.82	17.61	19.68	22.18	17.47
Rhinoceros .. ..		.37	.90	1.09	.31	.62	.47	.06
Hippopotamus .. ..		.28	.22	—	—	.24	—	—
Zebra		3.36	5.60	5.37	5.49	3.10	2.66	4.46
Lion		—	.11	—	.46	.06	.11	.40
Leopard		—	—	—	—	—	—	—
Buffalo		6.16	1.80	7.10	1.34	10.53	5.56	10.80
Sable		1.85	3.10	.30	8.10	5.96	5.32	4.93
Roan		2.80	3.10	6.81	3.00	1.56	1.59	2.86
Kudu		1.60	1.80	1.90	1.55	2.60	1.77	—
Eland		2.50	5.60	7.97	2.79	2.54	3.31	7.39
Hartebeeste		3.60	5.60	5.37	5.29	5.21	12.01	5.20
Waterbuck .. ..		.09	1.70	.95	.72	—	1.00	3.40
Nyala	No Record	—	—	—	—	—	—	—
Impala		—	—	—	—	—	—	—
Reedbuck .. ..		.61	1.59	1.38	1.44	3.41	3.16	—
Bushbuck		—	—	—	—	—	—	—
Duiker		—	—	—	—	—	—	—
Klipspringer		—	—	—	—	—	—	—
Oribi		—	—	—	—	.20	.24	.12
Liv. Suni		—	—	—	—	—	—	—
S. Steinbuck		—	—	—	—	—	—	—
Pig		—	—	—	—	—	—	—
Warthog .. ..		.80	1.36	1.36	.82	2.91	1.42	—
Wild Dog		—	—	—	—	—	—	—
TOTAL PATROL DAYS ..		211	176	173	193	161	169	150
Do. NO GAME SEEN ..		99	49	52	76	73	38	59

APPENDIX III
Table III. Average Numbers Game seen per 10 Patrol Days

LUWAWA AREA

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant			—	—	—	—	—	—
Rhinoceros			—	—	—	—	—	—
Hippopotamus			—	—	—	—	—	—
Zebra			4.63	1.23	3.00	4.23	2.92	.86
Lion .. .. .			.86	.46	—	—	—	—
Leopard			—	—	—	—	—	—
Buffalo			—	—	—	—	—	—
Sable			—	—	—	—	.84	—
Roan			3.33	1.07	3.06	3.03	2.38	4.43
Kudu			—	—	—	—	—	—
Eland			14.64	2.92	2.57	6.51	10.16	4.68
Hartebeeste			—	—	—	—	—	—
Waterbuck			—	—	—	—	—	—
Nyala	No Record	No Record	—	—	—	—	—	—
Impala	No Record	No Record	—	—	—	—	—	—
Reedbuck	No Record	No Record	22.76	30.24	21.86	15.78	21.93	26.17
Bushbuck			2.75	.69	2.71	2.51	1.71	1.74
Duiker			14.06	7.92	8.28	17.93	3.69	1.39
Klipspringer			—	—	—	—	.23	—
Oribi			—	—	—	—	—	—
Liv. Suni			—	—	—	—	—	—
S. Steinbuck			1.00	.38	—	—	—	—
Pig			—	—	—	—	—	—
Warthog			1.59	.69	1.85	3.77	1.23	2.26
Wild Dog			—	—	—	—	—	—
TOTAL PATROL DAYS ..			69	130	140	135	130	155
Do. NO GAME SEEN ..			0	0	0	0	0	0

APPENDIX III

Table IIG. Average Numbers Game seen per 10 Patrol Days

CHIKANGAWA

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant			—	.19	.84	—	—	—
Rhinoceros			—	—	—	—	—	—
Hippopotamus		—	—	—	—	—	—	—
Zebra			—	.19	.64	.54	—	.21
Lion .. ..			.19	.19	.28	.18	.09	.21
Leopard			—	.76	.76	.18	—	2.38
Buffalo			—	—	—	—	—	—
Sable			—	—	—	—	—	—
Roan .. ..			.57	.96	3.46	4.53	5.77	5.65
Kudu .. ..			.38	—	—	—	—	—
Eland			—	.87	.57	.92	.95	5.21
Hartebeeste			—	—	—	—	—	—
Waterbuck			—	—	.76	—	—	—
Nyala	No Record	No Record	—	—	—	—	—	—
Impala	No Record	No Record	—	—	—	—	—	—
Reedbuck			4.56	5.78	2.77	5.45	8.07	8.26
Bushbuck			1.25	4.32	1.46	4.26	4.90	3.80
Duiker .. ..			.29	.38	—	.09	.38	.21
Klipspringer			—	—	—	—	—	—
Oribi			—	—	—	—	—	—
Liv. Suni			—	—	—	—	—	—
S. Steinbuck			—	—	—	—	—	—
Pig			1.14	6.05	2.77	3.14	2.30	10.67
Warthog			—	.57	.53	.27	.57	2.28
Wild Dog			—	—	—	—	—	—
TOTAL PATROL DAYS ..			104	104	130	108	104	92
Do. NO GAME SEEN ..			39	11	6	4	4	8

APPENDIX III

Table III. Average Numbers Game seen per 10 Patrol Days

NYIKA GRASSLAND

Type	Jan.-May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Elephant			—	—	—	.18	—	2.69
Rhinoceros			—	—	—	—	—	—
Hippopotamus			—	—	—	—	—	—
Zebra			16.00	13.51	17.56	34.35	31.85	38.52
Lion .. ..			.15	.5	.25	.25	.13	.34
Leopard .. ..			.05	—	.12	—	—	—
Buffalo			—	—	—	—	—	—
Sable			—	—	—	—	—	—
Roan			17.34	14.65	19.48	25.35	50.10	57.99
Kudu			—	—	—	—	—	—
Eland			13.33	11.73	34.23	67.48	119.80	108.24
Hartebeeste			—	—	—	—	—	—
Waterbuck			—	—	—	—	—	—
Nyala	No Record	No Record	—	—	—	—	—	—
Impala	No Record	No Record	—	—	—	—	—	—
Reedbuck			5.45	5.00	5.00	4.84	5.91	7.30
Bushbuck			—	—	.31	.85	.85	1.30
Duiker			3.33	3.60	3.39	.69	1.31	2.60
Klipspringer .. ..			.30	—	—	—	—	—
Oribi			—	—	—	—	—	—
Liv. Suni			—	—	—	—	—	—
S. Steinbuck			—	—	—	—	—	—
Pig			—	—	—	.61	.19	1.21
Warthog			2.32	2.08	2.75	1.04	1.97	1.56
Wild Dog			—	—	—	.30	—	—
TOTAL PATROL DAYS ..			189	144	156	163	156	115
Do. NO GAME SEEN ..			0	0	0	0	0	0

APPENDIX III

Table III
Game Licences Issued During 1959

Type	No. Issued	Value £
Residents	2,231	2,231
Protectorate Full	100	500
Visitors Full	1	10
Elephant	22	220
Temporary	11	31
Licences for sale and export of game meat	9	27
		<u>£3,019</u>

APPENDIX IV

Non-African Fishery

Table I. Total hauls of each type per annum in south-east arm

Type of Net	1955	1956	1957	1958	1959
Ring-net	4,215	3,728	6,803	9,325	12,412
Gill-net	Presentation method not comparable			3,271,760 yards	3,040,220 yards

APPENDIX IV

Table II. Average catch per single haul of net
(Numbers represent dozens)

Firm and Net	Fish	1955	1956	1957	1958	1959
No. 1 Ring Net	<i>Tilapia</i>	88	121	127(105)*	59(32)*	42(23)*
No. 2 Ring Net	<i>Tilapia</i>	48	53	51	55	22
No. 3 Ring Net	<i>Tilapia</i>	No fishing		41	38(21)*	42(23)*

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

APPENDIX IV

Table III. Total Catches of more important species

(Numbers represent dozens. Weight estimated in short tons)

Year	<i>Tilapia</i>	<i>Tilapia</i> (Immature)	<i>Labeo</i>	<i>Catfish</i>	<i>Other</i>	Weight
S.E. Arm						
1955	287,003	—	27,658	3,525	5	2,536
1956	304,660	—	23,094	6,192	—	2,680
1957	479,675	—	16,148	6,742	126	3,984
1958	482,730	—	41,229	10,654	1,226	4,311
1959	448,047	—	35,207	8,886	659	3,953
S.W. Arm						
1955	1,261	—	2,508	5,612	322	135
1956	2,802	—	9,977	5,367	912	213
1957	3,725	—	22,757	10,135	3,105	421
1958	4,730	9,175	10,836	5,568	10,034	297
1959	12,155	19,350	2,357	555	2,101	145

APPENDIX IV

Table IV. Landings per month (short tons)

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
397	342	377	551	455	404	209	248	247	364	339	166

APPENDIX IV

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

Type of net					Number	Fees paid
Ring net	..	..	..	..	8	£80
Gill net	..	..	..	..	21,200	£106

APPENDIX IV

Table VI. Fish Exports

Month	Weight fresh fish (lb.)	Weight cured fish (lb.)	Exports expressed as (1) percentage of total catch of all species, by non-African firms (2) percentage of total Tilapia catch by non-African firms	
			(1)	(2)
January	29,601	100,243	8%	16%
February	27,295	38,406	9%	10%
March	35,079	93,280	17%	18%
April	23,266	141,424	15%	16%
May	42,726	116,788	17%	18%
June	5,474	100,024	13%	16%
July	—	78,931	18%	64%
August	2,546	111,618	23%	33%
September	11,202	104,686	22%	24%
October	41,113	150,507	26%	27%
November	54,186	156,801	27%	31%
December	28,267	131,284	47%	96%
	<u>300,755</u>	<u>1,323,292</u>		

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-nets			Chitimila or Ring-net		
	1957	1958	1959	1957	1958	1959	1957	1958	1959	1957	1958	1959
Malindi	—	—	—	1,247	1,088	820	634	1,188	158,243	—	—	—
Matewere	141	173	—	244	296	137	97	53	11,640	—	—	—
Shire River	576	1,005	1,438	—	—	52	—	—	—	—	—	—
Mpamba	23	—	1	325	135	234	1,814	2,986	77,062	747	1,237	724
Monkey Bay	15	5	—	67	471	—	70	735	117,700	280	316	191
Kota Kota	29	14	31	207	152	16	790	818	120,800	—	—	—
Salima	460	328	273	121	164	243	94	619	116,195	—	—	—
Domira Bay	169	153	90	158	117	148	100	383	129,661	—	—	—
Chia	—	—	18	—	—	26	648	1,912	152,090	476	940	436
Lake Chilia	—	—	—	—	—	—	5,014	9,476	340,364	—	—	—
Lake Malombe	15	156	193	—	—	—	1,030	1,563	74,830	—	—	—
Mtundu	—	37	128	—	13	29	—	—	—	—	—	—
Likoma Island	—	—	—	—	—	—	—	—	—	—	—	—
Nkata Bay	—	—	—	—	—	—	—	—	—	—	—	—
Mpamba	—	—	15	—	—	19	—	—	—	—	—	—
									28,400			535
									87,680			
									24,712			

APPENDIX V

Table II. Average catch per single haul at Recording Stations

(Figures represent actual number of fish)

A. Large Meshed Seines

Period and Station	Tilapia (Adult)	Tilapia (Immature)	Labeo	Catfish	Haplochromids
Matewere	1957	33.54	—	1.30	0.55
	1958	114.32	—	0.44	1.96
	1959	45.64	—	0.70	0.67
Mpemba	1957	33.60	—	—	—
	1958	No hauls	—	0.26	1.39
	1959	No hauls	—	—	—
Shire River	1957	29.26	—	1.28	0.65
	1958	56.46	—	1.18	1.09
	1959	62.41	—	3.44	0.17
Monkey Bay	1957	11.87	0.105	1.73	2.46
	1958	35.00	50	11.20	1.00
	1959	—	—	—	—
Kota Kota	1957	10.17	—	43.41	29.28
	1958	70.50	—	42.07	18.14
	1959	89.13	—	71.64	21.51
Salima	1957	81.40	—	17.15	6.03
	1958	54.43	—	19.88	4.16
	1959	59.89	—	22.60	4.99
Domira Bay	1957	123.07	—	36.74	4.17
	1958	70.63	—	57.28	4.31
	1959	116.37	30	55.12	9.52
Chia Lagoon	1957	No hauls	—	—	—
	1958	No hauls	—	—	—
	1959	117.88	—	—	9.77
Mpemba	1957	141.81	—	55.81	31.96
	1958	14.83	—	30.00	19.50
	1959	65.60	—	137.53	5.66
Lake Malombe	1957	20.27	—	0.60	0.60
	1958	123.69	—	0.74	1.96
	1959	56.19	—	1.40	1.14
Mtundu	1957	No records	—	—	—
	1958	283.29	—	9.59	2.81
	1959	324.14	—	8.56	0.67
Malindi	1957	1.02	76	1.19	0.19
	1958	0.38	0.006	2.85	0.16
	1959	0.93	0.024	2.24	0.06
Matewere	1957	3.74	2.039	0.004	0.36
	1958	6.95	0.225	0.03	0.10
	1959	7.29	0.48	0.12	0.38
Shire River	1957	—	—	—	—
	1958	—	—	—	—
	1959	102.44	—	12.76	1.17
Mpemba	1957	0.30	85	—	0.007
	1958	0.20	100	6.05	0.13
	1959	3.11	0.018	0.01	0.02
Monkey Bay	1957	5.00	936	67.15	0.36
	1958	4.75	21	1.69	0.19
	1959	—	—	—	—
Kota Kota	1957	25.24	50	6.76	4.60
	1958	28.50	—	18.00	6.75
	1959	46.81	—	18.87	10.68
Salima	1957	43.53	—	43.09	5.06
	1958	22.06	—	29.47	3.75
	1959	7.95	—	5.97	1.80
Domira Bay	1957	79.76	10	19.41	9.24
	1958	51.56	95	20.82	3.30
	1959	25.20	100	12.17	1.75

APPENDIX V—(Continued)

B. Small meshed seines		Tilapia (Adult)		Tilapia (Immature)		Labeo	Catfish	Haplochromids	
Period and Station									
Chia Lagoon	1957	..	—	..	—	..	—	..	—
	1958	..	—	..	—	..	3.23	..	—
	1959	..	2.15	..	—	..	—	..	—
Mpamba	1957	..	—	..	—	..	—	..	—
	1958	..	—	..	—	178.94	2.00	..	—
	1959	..	7.57	..	—	..	—	..	—
Mtundu	1957	..	No records		..	—	0.092	..	825
	1958	..	8.23	..	—	2.31	0.44	..	1,555
	1959	..	47.13	..	—	..	—	..	—
C. Chilimila Nets									
Mpemba	1957	..	—	..	—	..	0.07	..	825
	1958	..	0.37	..	—	..	0.14	..	387
	1959	..	0.25	..	—	..	—	..	—
Monkey Bay	1957	..	—	..	—	..	—	..	688
	1958	..	—	..	0.06	0.02	..	..	4,752
	1959	..	0.02	..	—	..	—	..	—
Chia Lagoon	1957	..	—	..	—	..	—	..	—
	1958	..	—	..	—	0.42	0.91	..	—
	1959	..	18.62	..	—	..	—	..	—
Likoma Island	1957	..	—	..	—	..	—	..	—
	1958	..	—	..	—	0.002	0.28	..	300
	1959	..	—	..	—	..	—	..	—

APPENDIX V

Table III. Summary of catches by all methods observed at Recording Stations 1959
(Actual numbers of fish)

Station	Tilapia (Adult)	Tilapia (Immature)	Labeo	Catfish	Haplochromids
Malindi ..	7,399	2,175	9,163	2,693	384,450
Matewera ..	11,098	6,750	4,902	714	80,100
Shire River ..	102,065	—	5,851	1,708	12,150
Mpemba ..	3,510	450	1,261	533	334,575
Monkey Bay ..	753	1,200	1,054	1,137	84,875
Salima ..	22,203	—	22,627	4,368	273,725
Domira Bay ..	14,683	1,800	12,145	5,832	102,000
Chia Lagoon ..	38,465	—	3,357	7,512	3,125
Lake Chilwa ..	27,853	—	1	3,237	—
Mpamba ..	1,981	—	8,596	2,351	—
Lake Malombe ..	25,512	—	1,378	4,349	15,375
Kota Kota ..	8,642	—	9,741	8,354	45,375
Mtundu ..	42,858	—	1,163	99	162,250
Likoma Island ..	41	—	201	1,743	61,000
Nkata Bay ..	99	—	268	1,639	—

APPENDIX VI
Summary of Traffic and Flies Caught at Decontamination Posts 1959

Post	Position	Number of		Flies caught	Number of Cycles	Flies caught	Number Pedestrians	Flies caught	Total Flies
		Motor Vehicles	Cycles						
..	Outskirts Kota Kota Township (N) ..	4,857	42,255	57	..	43	43,941	13	113
..	Outskirts Kota Kota Township (S) ..	—	11,865	—	..	8	23,674	4	12
..	Approach to C.P. Highlands Kota Kota road ..	1,854	2,575	139	..	50	3,443	14	203
..	Outskirts of Fort Johnston Township East of Ferry crossing ..	4,318	99,270	39	..	960	183,545	788	1,787
..	Approach to Zomba highlands Liwonde, Zomba road ..	15,979	30,900	1	..	23	32,534	2	26
..	Approach to Malomo area Kota Kota road ..	243	197	5	..	26	67	3	34

Long Term Records from Deflying Posts

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