NYASALAND PROTECTORATE

Annual Report

of the

Department

of

Game, Fish and Tsetse Control

for the

Year ended 31st December 1956

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Fort Johnston

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 1956

(a) Staff and General

1. During the year the Director attended the Fauna Conference of British East and Central Africa at Entebbe and a meeting of the heads of the three Central African Game Departments to discuss the question of legislation on the import and export of game trophies and related subjects. Dr. Steele, Tsetse Botanist, attended the Salisbury meeting of the International Scientific Committee for Trypanosomiasis Research as one of the two Nyasaland observers. The Director also served as a member of the Commission of Enquiry into the Fishing Industry.

2. Mr. Muldoon, Game Control Officer, returned from leave on 1st June and was posted to the Central Province.

3. Mr. Gifkins was on leave from mid-January till mid-June. Mr. Iles left on vacation leave at the end of July and Mr. Borley at the beginning of December. Dr. Steele assumed charge of the Department as Acting Director in Mr. Borley's absence.

4. In September, Mr. A. D. Sanson, Fisheries Officer, left on leave pending retirement. Mr. Sanson had been in charge of the Fishery Section of the Department since its inception in 1947, had built up a very comprehensive statistical recording system and had established a valuable understanding with the fishing fraternity, particularly the newly arising class of African " commercial " fishermen. His services, particularly in this latter respect, will be much missed.

5. Unfortunately, no replacement had been found for the Fisheries Officer by the end of the year so that, the Scientific Officer (Joint Fisheries Research Organization) also being on leave, fishery work was handicapped during the closing months.

6. Fishery work was also severely handicapped by the fishery launch *Gigipat* being laid up for repairs during most of the first half of the year.

7. This craft was taken over from the Research Organization in November, 1955, and was forthwith put in for what was expected to be a minor routine overhaul. Dry-dock inspection, however, showed that most of the bottom plates, forward of the engine room, were very badly corroded and in a poor condition and that extensive reconditioning was essential.

8. Repairs were carried out by Nyasaland Railways, and thanks are due to the Company, and the Monkey Bay staff in particular, for undertaking the work in addition to their ordinary programme.

9. The marine engineers at Monkey Bay considered that the corrosion long preceeded the arrival of the ship in Nyasaland.

10. The Staff position as at 31st December is set out at Appendix I.

(b) Game

Crop Protection

11. There is little of particular moment to report in the field of crop protection, in which normal routine work continued. For the most part attention was directed to the vicinity of the major Game Reserves, in the effort to discourage heavy game, particularly elephant and buffalo, from emerging to attack crops in the neighbourhood. Such raids continue to decline in frequency and determination and actual killing, as distinct from merely driving back, is becoming progressively less necessary.

12. Outside the neighbourhood of the Reserves small-scale attacks were made on hippo in defence of the rice crops, particularly in the Domira Bay area of Dowa District and the Fort Johnston area of Fort Johnston District, and against sundry stock raiding carnivora in various parts of the Central Province. The killing of a rogue elephant, which was terrorizing the new settlements in the Chingali area of Zomba District, is also worthy of mention, it being some considerable time since elephant of any sort, let alone troublesome ones, were last seen in this area.

13. Housing difficulties in the Northern Province necessitated moving the Tsetse Ranger to the Southern Province in May and organized crop protection work in the North suffered thereby.

14. Destruction of vermin by private effort in return for bounty payments continued to be disappointing and it is apparent that a propaganda drive is necessary to prevent this form of control failing through apathy on the part of the general public and local authorities.

15. Details of animals shot, etc., are set out in Appendices II and III.

16. During the year the continuance of a plague of rats in the Karonga District led to the Department assisting in the conduct of experiments in rat destruction.

17. The method chosen involved the use of a new proprietary type of poison, harmless to humans and stock. Unfortunately, delays in arrival of material prevented the experiments being started till rather late in the year, but so far as they went they gave encouraging results.

18. The poison was laid over part of a small estate near Karonga and its effects recorded by the catches at pot traps scattered over the estate. In the month before poisoning the average catch was 56 rats per day. After the poisoning the average catch per day dropped to 12. These figures do not themselves conclusively show any effect of the poison since there is reason to believe that the rat population was generally declining. The effect of the poison was, however, decisively shown by the fact that within the estate, catches on the pot traps in the baited area dropped to nil after a few days. Nil catches were also recorded all round the baited area and it was obvious from the pattern of catches that most of the rats caught were round the edge of the estate and coming in from the surrounding bush. It was therefore concluded that the poison was effective whilst in use but the effects of subsequent reinvasion were not studied.

Crocodile Hunting

19. Six licences were issued during 1956 but concrete action was rather sporadic and only one licensee was in really continuous action. A total of 2,042 reptiles killed was reported.

20. There seems little doubt that the crocodile population has declined considerably since hunting began in 1951, especially when one takes into consideration the fact that the drying-up of the Shire below Liwonde, as a result of the erection of the Liwonde Bund, made the reptiles in this section of the river exceptionally vulnerable this year.

21. Despite the decline in numbers it is not thought that the reptiles are yet in real danger of extinction. Average size of adult crocodiles has remained fairly constant since about 1951, instead of steadily declining as one would expect if the population was being persistently over-hunted, and it is apparent that the activity is self-balancing to a large extent, scarcity of reptiles leading fairly quickly to an abandonment of hunting by many of those engaged in it. The activity does not involve a really heavy capital commitment by modern standards, so that when

catches fall operators are more inclined to reduce their efforts and supplement their incomes by other activities than to try to make up their totals by yet more capital investment and increased effort, as they tend to do in the more developed fishing industry. The crocodile population therefore gets opportunities to recover.

22. The situation requires to be kept under review.

Game Conservation

23. New boundaries for Kasungu Game Reserve were approved during the year and the south-western corner of Kasungu District, between the southern edge of the Reserve and the Fort Manning–Northern Rhodesian boundary, was declared a controlled area.

24. A controlled area was also declared round the Vwaza Marsh in Rumpi District. Chief Katumbi of that locality was a moving spirit in getting the measure approved. The area is comparatively sparsely inhabited and can carry a respectable game population though this has been somewhat depleted by excessive hunting by visitors from the Copper Belt.

25. If hunting possibilities can be re-established there it will form a valuable tourist attraction in support of the Nyika trout streams and the present *de facto* game sanctuary on the Nyika.

26. The hunting of hippopotamus in the Shire River from Lake Nyasa to Matope was prohibited by a Proclamation made in October. This local protection was given, partly with the object of combating the danger of obstruction by accumulations of sudd growth consequent on the cessation of flow in the section above the newly erected Liwonde Bund, and partly to assist the animals living below the Bund, which were rendered very vulnerable with the drying of the river.

27. In the Kasungu Reserve, work went forward on the establishment of the Rest Camp at the Lifupa–Lingadzi junction. Unfortunately, road transport delays, beyond the control of the Department held up delivery of material until late in the dry season and though the camp was virtually complete by the end of the season there was not time to open it.

28. The locality has a reasonable elephant population, at least in the dry season, and some 30 head in five separate herds were seen in the course of a few hours walk round the camp site in mid-October. Roan and hartebeeste were also seen in reasonable numbers.

29. During the year it was decided to make an investigation of the situation with respect to the Nyala in the Lengwe Game Reserve and also to make a more comprehensive search for these antelope in the Mwabvi Game Reserve.

30. The Nyasaland Fauna Preservation Society was asked to put out a call for volunteers to supplement the slender staff of Game Control Officers. Messrs. G. D. Hayes, J. Reid Henry and R. B. Usher having responded, the operation was carried out early in September, two Game Control Officers making up the party.

31. The search resulted in the verification of Nyala in the Mwabvi Reserve, a total of fourteen, including five bulls, eight cows and one calf in separate groups, being observed by one of the Game Control Officers in the course of two days. From the relative position of the various groups, when seen by him, there is reason to believe that when observed they were in process of moving to the Mwabvi thickets from the west, i.e. Portuguese Territory. If the Mwabvi is, in fact, one end of a migratory route it would, of course, explain previous failures to find them.

32. The investigation in the Lengwe which, owing to the very thick bush, really called for more observers than were available, showed a considerable population of Nyala, with the bigger concentration at the western end of the Lengwe thicket, but the animals appeared considerably more shy than they were some years ago. They were all well inside the thicket by 8 o'clock in the morning and were not again seen outside during daylight hours, though the weather at the time was overcast and cool. Some years ago they were quite easily observable up to quite late in the morning and comparatively early in the afternoon.

33. There was no evidence of actual game poaching in the main part of the Reserve, though a number of wire noose traps were found in the Pwazi thickets on the extreme south-eastern corner. There is, however, a good deal of illegal disturbance of the area in the course of palm wine tapping and activities of that nature. A number of tappers were discovered and prosecuted by the Department but with a heavy population on three sides only great vigilance and the active support of local authorities will suffice to keep the Reserve reasonably inviolate.

34. Outside the Game Reserves and controlled areas there was little change in the general situation. Rapidly expanding settlement and mounting population pressures steadily reduce the effect of restrictions on hunting. In general it seems increasingly clear that the long term future of wild life conservation in Nyasaland lies in concentrating on selected areas, where there is little or no human competition for the use of the land, rather than in relying on measures of general application.

35. In the field of wild bird protection a Bill to amend the present Ordinance was put forward by Government. This sought to provide for the imposition of licence fees and bag limits in certain defined areas, to retain the present prohibition on the taking of certain non-game birds, known to be rare or likely to be the subject of special attack, but to withdraw the rather nominal protection at present afforded to a number of other species not thought to be in any significant danger of frequent or concerted attack. In short the Bill attempted to concentrate protective activity.

36. The Bill was, however, withdrawn for further consideration, largely at the instance of the Nyasaland Fauna Preservation Society, which favoured a more widespread and generalized protection than the Bill provided for.

(c) Fishery

The State of the Fish Stocks

37. The *Tilapia* stocks appear to be holding their own, despite the greatly increased landings of the past two years. Catch per unit effort in the ring nets shows a perceptible increase over previous years while that in the inshore seine nets was, considering the records as a whole, fairly level, though there were the usual local variations from last year's figures.

38. The catch of *Labeo* per unit effort showed a fall for the second year running in both the non-African catches in the south-east arm and at the majority of the African fishery recording stations, but showed a compensating rise in the south-west arm non-African fishery. This rise may be no more than a reflection of increased technical efficiency of the firm concerned. Taken as a whole the figures for 1956 tend to support last year's impression that there is some small recession in this stock.

39. Figures for unit catch of " barbel " or " catfish " (*Clarias* and *Bagrus*) showed a slight rise in the non-African gill net fishery though this is not reflected in the inshore African seine net fishery. It seems probable that the stock is, at the moment, reasonably steady.

40. The *utaka* did not seem to be quite so abundant as in 1955 and the catch per unit pull of the small-meshed seine was down at most stations, though taking the records as a whole, not much lower than it had been in years previous to that.

41. Data on the fish and fishing are shown at Appendices V and VI.

The Non-African Fishery

42. Four commercial licences were in force at the beginning of the year, though only three of the licencees were really in action. A fifth licence was issued during July and a sixth in December.

43. Both the two old-established firms in the south-east arm continued to improve their equipment, new craft being received during the year and the single active fishery in the south-west arm further consolidated its position.

44. One new firm, which intends to try to exploit the more open waters of the Lake, devoted most of its attention to investigations, in particular the exploration of fish movements in the deeper water and some interesting and encouraging information was collected. Delays in delivery of equipment, particularly nets and boats, prevented any full-scale attempt at commercial fishing but a ponderable amount of gill-netted fish was landed in the course of investigations and this is mostly responsible for the increase in gill-net effort shown in Table I, Appendix V.

45. This firm is very much alive to the distribution difficulties attending the fish trade in Nyasaland and is taking steps to provide for cold rooms and ice carriage.

46. Tonnage landed by the non-African fishery as a whole totalled 2,894 short tons against 2,536 short tons in 1955. In this connection it should be noted that both the major contributors, namely the two old-established firms in the south-east arm, voluntarily limited their catches to some extent in January and February because of marketing and transport difficulties at this season.

The African Fishery

47. The African fishery continued much as before, with the majority of the fishermen working on a subsistence basis but the new class of " commercial " African gradually emerging.

48. Most of these latter are finding it hard to make a financial success of their ventures unless they possess their own motor transport to cover transport of fish during the wet season when the ordinary buyers hesitate to risk their vehicles on the Lake-shore roads. This difficulty may, however, be expected to disappear gradually as the road system improves.

49. Authority for a small Government loan to one of these progressive fishermen was given towards the end of the year—the first loan of its kind. The progress of this venture will be watched with interest. If successful, it might open a new door to progress in the African section of the industry.

50. On the purely technical side of the African industry the fairly steady increase in use of the gill-net is to be noted. This is, to a large extent, a reflection of the rise of the " commercial " fishery as the gill-net with its comparatively low labour costs is favoured by the man with small capital. There is no doubt that the advent of the nylon net, with superior durability, has been an enormous benefit to this type of fishery.

The Fish Trade

51. Conditions remained much the same as during the last few years. There was some over-supplying of the more accessible markets at the height of the fishing season and under-supplying, at least with respect to fresh fish, during the months of scarcity.

52. One feature of the trade which is worthy of note is the development of bulk buying from the non-African fishing firms at the beaches or Limbe depots by Africans and Indians, for subsequent distribution and retailing. This development seems to

have absorbed the greater part of the increased catches of the last few years and now takes more than half of the total catch from the two old-established firms in the south-east arm. Supplies to the retail markets of Limbe and Blantyre, where sales are often slow and uncertain, have not greatly increased, nor has there been much effort to improve quality.

53. Continued complaints concerning marketing difficulties and renewed requests for export permits led to the appointment of a Commission of Enquiry, on which the Director served. The report of this Commission was submitted to Government towards the end of the year.

Development Work

54. Boat-building continued at both the Fort Johnston and Nkata Bay stations. Demand for boats continued reasonably large in total but sporadic in timing.

55. Thus in August there were two or three boats on hand at the Fort Johnston station waiting for delivery to those who had ordered them but who had failed, in the event, to claim them. After some weeks of waiting they had to be disposed of as best they could be and, there being no new orders on the books, the unit was closed down and the staff dispersed when the Fisheries Officer went on leave.

56. No sooner had this been done, however, than a small spate of new orders began again and the organization had to be reconstructed and material collected for further work.

57. Such an irregular demand makes it difficult to maintain an organization on a truly economic basis, but it is apparent that the approach this year was rather overcautious.

58. The big expansion of gill-netting and extension of African fishing to the deeper water is beginning to lead to incidents where gill-net fleets which are fished at night get damaged by the anchors or nets of other fishermen, who fail to realize their presence. Accordingly some experiments in inexpensive light buoys, largely made from local material, were put in hand by the Department late in the year.

59. Over and above the boat-building activities referred to above, the Fish Ranger was much occupied in erecting the buildings and collecting the equipment for a training school for African fishermen which is to be established at Nkata Bay.

60. The object of this school is to offer training in new methods to the African fisherman, more especially the would-be commercial fishermen, and will lay emphasis on matters such as elementary accounting and costing systems and the care and maintenance of boat engines, as well as actual fishing practices. Courses for fishermen will start early in 1957.

Experimental Work

61. Work continued on testing the efficacy of various types of gill net.

62. A 4-inch mesh Terylene net 54 meshes deep was set alongside a 4-inch mesh nylon net of the same length and comparable size of twine but 27 meshes deep. Sets were made in eight fathoms of water off the Fort Johnston Fishery station on 31 occasions during the period July to November. Catches were as follows:—

	Tilapia	*Labeo*	*Kampango*	*Clarias*	*Other*	*Weight*
Nylon	177(65%)	40(15%)	34(12%)	12(4%)	11(4%)	398 lb.
Terylene	203(56%)	64(18%)	52(14%)	23(6%)	21(6%)	486 lb.

63. By the end of the series the Terylene net had become very severely torn compared with the nylon net and the durability of this fibre does not seem to be on a level with that of nylon in Lake Nyasa waters.

64. The apparently more rapid decline in the Terylene net, as indicated by inspection, was to some extent reflected in a decline in comparative catching efficiency, at least as determined by weight. Thus the ratio of Terylene catch to nylon through progress of the experiment was as follows:—

	1st five sets		*2nd five sets*		*3rd five sets*		*4th five sets*		*5th five sets*		*Last six sets*	
	Fish	*Wt.*	*Fish*	*Wt.*	*Fish*	*Wt.*	*Fish*	*Wt.*	*Fish*	*Wt.*	*Fish*	*Wt.*
Terylene catch / Nylon catch	1.4	1.4	1.6	1.4	3.4	2.7	1.5	0.9	1.1	1.2	1.3	0.9

65. The original cost of the Terylene nets was about the same as that of the nylon, whereas over the 31 sets, discussed above, the catch was 1.3. times in numbers of fish and 1.2 times in weight. This advantage was completely offset by the fact that the nylon net obviously had a much longer useful life.

66. Further attempts were made to determine the relative efficiency of the nets of 27 and 54 meshes width. A 50-yard nylon net of 54 meshes width and 4-inch mesh was set 38 times alongside a 100-yard net of the same mesh size and 27 meshes width, so that the two were of equal area. Sets were made at various times from January to June in eight fathoms of water off the Fort Johnston station. Catches were as follows:—

	Tilapia	*Labeo*	*Kampango*	*Clarias*	*Other*	*Weight*
54 mesh	380(62%)	65(11%)	113(18%)	37(6%)	17(3%)	1,134 lb.
27 mesh	339(57%)	76(13%)	121(20%)	46(8%)	12(2%)	1,117 lb.

67. The catch in the bottom 27 meshes of the wider net, representing an area of 27 meshes by 50 yards, was 383 fish or 947 lb. against 594 fish or 1,117 lb. in the narrower net, representing an area 27 meshes by 100 yards. The result tends to reinforce earlier indications to the effect that though the upper half of a wide net does not itself catch more than about 37 per cent. of the total catch of the net it exercises some influence on the amount of fish caught by the lower half.

68. An attempt was made to see if this influence of the upper half of a wide net could be observed if the upper half was made of some less costly material than actual gill netting.

69. A 60-yard nylon net of 4-inch mesh and 54 meshes deep was set alongside another net of the same length and depth, of which the upper half was formed of old 4-inch seine netting and the lower half of 4-inch nylon gill netting of weight equivalent to that of the 54-mesh net. A third net, 27 meshes deep and 4-inch mesh, was set alongside the first pair with the foot rope level with the foot rope of the 54-mesh nets, the head rope level with the half way mark of this net, and a second " false " headrope level with the head rope of the 54-mesh nets and connected to the real headrope by white twine lacings about a foot apart. The effect was of a wall in three sections, of equivalent height and length, one section being composed entirely of gill netting, one of half old discarded seine netting and half gill netting and one of half gill netting and half line lacing.

70. The arrangement was set on the bottom in eight fathoms of water during the latter part of 1956. The results of the first thirteen sets are as follows:—

	Tilapia	*Labeo*	*Kampango*	*Clarias*	*Other*	*Weight*
54 mesh nylon ..	150(67%)	28(13%)	34(15%)	8(4%)	3(1%)	421 lb.
27 mesh nylon and seine netting ..	55(65%)	12(14%)	13(14%)	4(4%)	1(1%)	142 lb.
27 mesh nylon and line lacing ..	78(82%)	2(2%)	12(13%)	2(2%)	1(1%)	127 lb.

71. It should be noted that over this series the catch in the complete 54-mesh net was approximately equally distributed between the upper and lower halves, instead of the more usual 30–70 per cent. proportion as between upper and lower halves, and it would seem that the series is, as yet, too short to form a proper basis for conclusions.

72. The delay in transport of material for the small-scale fish meal experiments persisted into 1956. In the event there was only time for two experiments before the departure of the Fisheries Officer, on leave pending retirement, necessarily put a stop to them.

73. In the first experiment 42 lb. 8 oz. of fish, mixed *Tilapia* and *Labeo*, produced 6 lb. 11 oz. of meal and in the second, 22 lb. of *Tilapia* produced 4 lb. 12 oz. of meal.

74. The Veterinary Department kindly arranged for analysis of the meal from the second experiment, which yielded the following results for percentage composition:

	Protein	*Fat*	*Moisture*	*P*	*Ca*	*NaCl*
Sample 1	55.3	15.1	5.2	3.4	7.4	trace
Sample 2	59.1	14.3	6.0	3.45	7.3	trace
Approximate levels commercial fish meal	63.0	6.8	—	2.67	4.14	—

75. These experiments, which were very much in the nature of preliminary trials to see how the apparatus worked, served to show that, in the broad sense, the apparatus worked well enough but emphasised the necessity for modifying it to enable a higher percentage of oil to be removed and also the advisability of developing heating apparatus that would be more economic in its use of fuel.

76. Nevertheless, as a first attempt, the results were moderately encouraging and the experiment will be proceeded with when there is a new Fisheries Officer to supervise them.

Fisheries Research Organization

77. The Scientific Officer continued his work on the *utaka* group in the intervals of writing up his section of the main report on the Lake Nyasa Survey. He also started some preliminary observations on the *usipa* (*Engraulicypris sardella*) which has been unusually widely distributed this year.

78. The Scientific Officer went on leave at the end of July and in his absence the research work at Nkata Bay was necessarily reduced to routine hydrological observations and further experiments with gill nets in the attempt to gain information on the direction of movement of various fish species in relation to the coast-line. The work was under the supervision of the Fish Ranger, but largely carried out by the African staff of the organization.

79. All work was handicapped during the first five months of the year by the fact that the launch *Gigipat* was out of commission.

Trout Fishing

80. The most important single activity of the year was the stocking of the head waters of the Wamkurumadzi River on the Kirk Range with alevins hatched *in situ* from ova imported from South African hatcheries. This operation was carried out in July by Mr. Gifkins, Fish Ranger (Rivers).

81. A total of 15,000 ova was imported but a very large number of these died *en route*, which has not been the case with previous consignments, and in the event only some two thousand fish were actually released into the stream. It is thought, however, that this introduction should be enough to establish the stock in the river, though it will take some time for the population to grow large enough to permit fishing.

82. The Northern Rumpi continued to yield some excellent trout but was again not heavily fished. Thirteen-inch fish were not infrequent and others up to 18 inches were caught. The building of the Rest Camp necessary to make it practicable to fish this stream properly was approved late in the year and it will be possible to make a start on it when the 1956–57 rains are over.

83. The Southern Rumpi or Chelinda again proved disappointing with regard to trout fishing but it has been found that the stream carries a heavy and very voracious population of large *Barbus* for a month or so in the spring of the year. It seems possible that it was these fish, and not large trout, which were observed last year, and it may be that the trout stock is unable to establish itself in competition with these predators. Be that as it may the big *Barbus* provide good sport.

84. The Chapeluka Stream on Mlanje Plateau was reopened to fishing after four seasons' closure, and some good fish were taken. The new regulations, however, provided for a close season, bag limits and minimum sizes in place of the complete lack of restriction which had existed previous to closure.

85. With regard to the Mlunguzi Stream on Zomba Mountain it was decided to apply much more rigorous size limits than have been in action for the previous four seasons. The theory behind the more stringent regulations is that the laxer regulations of the last four years have permitted a considerable degree of thinning-out of the stock and that the existence of a high proportion of undersized fish cannot now be put down to overpopulation. Judging by the apparent age distribution in the population it seems that it is now time to halt the thinning-out process and impose size limits which will give young fish an adequate opportunity to grow. Fishing returns are still far from complete and in general the data supporting the argument are not very comprehensive but there is enough support to make the new policy worth a trial.

86. During the year work was started on digging out a trout feeding and rearing pond in some marshy ground lying in a bend of the river. The work was done under the supervision of the Principal Forest Assistant, Zomba Plateau, who volunteered his services and thanks are due to him and to the Forestry Department for this assistance.

Fish Farming

87. The farm in Tipwiri Valley, near Nchenachena, was kept running on a care and maintenance basis during the absence on leave of the Fish Ranger (Rivers). On his return he proceeded to get everything ready for the training courses for African fish farmers. These began at the end of October with a first class of six.

88. Some fishing of the Tipwiri ponds was carried out towards the end of the year and £25 worth of fish sold locally. A number of fish was also supplied free for stocking ponds and dams. It was estimated that the total crop would reach a value of £100 early in 1957. The ponds are mainly experimental and one of the three is an unfed control.

89. Preliminary indications of the results of the experiment have revealed a very interesting contrast between *Tilapia shirana* and *T. melanopleura*. The ponds were initially stocked with the two fish in a ratio of 4:1. It is now apparent that *T. melanopleura* is the more successful fish under these conditions and in final numbers of fish it is showing signs of overtaking *T. shirana*. The former also produces a larger number of good-sized fish. Its success appears to be related to its ability to utilize vegetable matter as a foodstuff since it will feed avidly on most submerged plants and on a large variety of leafy and waste vegetable materials thrown into the pond. These conclusions will be reported in more detail when final results are available.

90. Meanwhile a number of Africans, profiting by the lead given at Tipwiri, have started their own small-scale domestic ponds and there is every indication of considerable development in this line over the next few years. By the end of the year five farms were completed, four more were under construction and 20 were awaiting survey and layout instructions on new sites.

(d) Tsetse Control

General

91. The year was marked by the publication of the Report of the Tsetse Survey of Nyasaland, carried out with funds from a Colonial Development and Welfare Research Scheme. The Report gives the first comprehensive account of the distribution of tsetse flies in Nyasaland and shows *Glossina morsitans* to be the only widespread species. The only other species found by the survey was *G. brevipalpis* on the Lake-shore of the Central and Northern Provinces.

92. The Report also summarizes the position with regard to reclamation of these tsetse areas and recommends that, since there is no great urgency in the problem, a long term view should be taken and expansion of settlement used as the main means of eradicating the fly. The natural expansion of the population can thus be channelled to form an inexpensive and permanent method of tsetse reclamation.

93. This tsetse control policy having been accepted by Government after consideration of the Report, the pattern of the Department's future tsetse control activities becomes clear. Where any scheme for the expansion or consolidation of settlement can be made to effect tsetse eradication the Department will contribute its advice in the formulation of the scheme. It is anticipated that a considerable contribution to the elimination or splitting up of tsetse areas of Nyasaland can be made in this way, so avoiding future difficulties in the development of mixed farming. There will, of course, remain certain areas unsuitable for settlement, which will need to be dealt with by more expensive methods when economic conditions justify them.

Toleza Area

94. A small beginning to the implementation of the accepted policy was made in devising means for the protection of the area surrounding Toleza Farm, near Balaka on the borders of Fort Johnston and Zomba Districts. The farm stands on the western fringes of a *Glossina morsitans* area, based on the low hill range running north–south, parallel to the Shire River. Outbreaks of trypanosomiasis have, in the past, killed off pigs and although the disease has been in controllable proportions in the cattle, it has been a deterrent to expansion of the cattle population.

95. Detailed investigation of the area by regular fly patrols revealed that, of 81 flies captured, 51 were being carried by cyclists and pedestrians. The centre of infestation was a local track running north–south a few miles east of the farm, along the edge of the fly belt and connecting with the main road from Fort Johnston to Balaka which passes the farm.

96. The circumstances appeared ideal for the attempt to isolate the farm from the fly area by settlement along the road. There was already some slight influx of population in spite of a scarcity of water. In consultation with other Departments concerned, a plan for a line of boreholes was drawn up and drilling began before the end of the year. Plans were also under consideration for the proper layout of settlement, since it is known that the soils will require careful conservation. Once the country has been opened up, the degree of protection provided to the farm by this cultivated barrier will be further studied.

Other Minor Investigations

97. Concern was felt that the increase of *Glossina morsitans* in Kota-Kota District, as revealed by the catches at the control posts, might indicate a tendency to spread back into areas formerly occupied, such as the Bua Valley, leading into Kasungu District and southern Kota-Kota District towards Benga.

98. An investigation in July, although confirming the increase in fly numbers, showed no present increase in area as compared with the position in 1953 at the time of the tsetse survey. Many local people, who associate the presence of tsetse flies with the wandering of large game such as buffalo and elephant, suggested that the protection afforded to these animals by the Kota-Kota Game Reserve has kept the game within its boundaries and with the game, the tsetse flies. The position does, however, require vigilance whilst the increase of tsetse continues.

99. Outbreaks of trypanosomiasis at Chitala on the Salima Lake-shore were investigated, particularly in view of the fact that the Mvera fly post, controlling traffic out of the area, is now closed. No evidence was found of any increase of tsetse from the very low ebb revealed by the tsetse survey. It was concluded that, although occasional flies may reach Chitala, there is still no danger of flies being carried out on the main road to Lilongwe.

100. A similar investigation of the area north of the Lirangwe fly post revealed that flies had declined in numbers since the survey, which would explain the fact that no flies had reached Lirangwe for nearly two years. Two flies appeared at the post just as it was about to close, but in view of the intended realignment of the road, the closure was carried out.

Lower River Area

101. Scattered cases of trypanosomiasis continued in the Lower River area. There is now considerable evidence that those in the Port Herald District are due to tsetse carried on the railway from Beira in Mozambique. In addition to the specimen of *G. brevipalpis* found on a train in 1955, a number of *G. pallidipes* was found in February, 1956. These, in apparent contradiction to experience elsewhere, appeared to be attracted to lights. Opportunity is awaited to test the effect of coloured lighting of the train carriages, since the disinfestation of trains is otherwise a very troublesome process.

102. In Chikwawa District, the origin of trypanosomiasis outbreaks in many areas remains puzzling and no determined effort will be made to study it until the Veterinary scheme for trypanosomiasis control in the area is begun. It is now considered possible that *Glossina brevipalpis* may exist on the lower slopes of the Cholo escarpment, which would explain the outbreaks of disease east of the Shire. This question will be investigated in 1957.

Karonga Reclamation Scheme (*Glossina brevipalpis*)

103. In 1956 the scheme took fresh impetus from the success of the minor clearings made in 1955. Persistence of small numbers of flies, after the main clearing, had been perturbing but the 1955 clearing showed that, by abandoning the policy of clearing the whole area to a general level and concentrating on places where flies are persistently caught, progress can still be made.

104. The Ngerenge sector, where the number of flies is extremely low, shows marked improvement since the 1955 clearings and flies have been almost completely eradicated. At the Wirore Stream, where flies were notoriously persistent ever since the primary clearings, no flies at all have been found since the discovery and clearing of a small clump of *Piliostigma thonningi* trees in August, 1955. The flies which appeared in this sector in 1956 were found at only two points and it is confidently expected that these will be eliminated in 1957.

105. The primary clearance of Yembe South was carried out in 1953, before which time catches of the order of 8–10 flies per patrol were recorded. Flies persisted on an average of 1–2 per patrol until two of the main points of persistence were cleared in 1955. The average was maintained at well below one per patrol throughout 1956. This sector seems also to have benefited from the clearing of the neighbouring Yembe North sector later in 1956.

106. A vigorous campaign of clearance on Yembe North was carried out in August and September by the Tsetse Ranger. By the last two months of the year this had effected a spectacular drop in fly catches of the order of 90 per cent. Thus the area of densest infestation has been reduced to a level at which the attack on persistent fly concentrations can be carried out.

107. The whole of the fly population affecting the cattle on the Lake-shore is now reduced to a low level. It is proposed to continue the attack on the remaining fly there, but not to tackle in the same programme the Mweningorongo sector, which dominates the Songwe Valley. Settlement of the cleared valleys on Yembe North is now being permitted so as to maintain the clearings and to reinforce the isolating effect of the stretch of open hillside separating Yembe North from Mweningorongo.

108. Senior members of the Tanganyika Department of Tsetse Control visited the scheme in October and after a combined tour of affected areas on both sides of the Border a conference was held. A memorandum proposing a joint scheme for complete eradication of the whole *G. brevipalpis* area and elimination of trypanosomiasis was drawn up and is now being considered.

Decontamination Posts

109. Details of the flies caught at decontamination posts are shown in Appendix VII. The work of the posts continued, but the Lirangwe and Masamba posts were closed down later in the year. The Lirangwe post was no longer catching flies and the road into the Sumbu sleeping sickness area, which the Masamba post was intended to cover, was abandoned. The Masamba post had provided valuable information on the seasonal distribution of flies in this area.

110. The number of flies trapped at the Kasupe post began to rise slightly at the end of the year, probably due to traffic from a nearby Forest Reserve being opened for firewood extraction. Increasing traffic is beginning to cause difficulty and a number of motorists, finding the post in action with the doors closed, have mistakenly driven past.

111. The efficiency of the posts in Kota-Kota District was well maintained under the supervision of the local Game Control Officer. Catches at Kota-Kota and Mbobo continued to rise. At Chota they remain small, but the post covers the fringe of the fly area in the south-east and provides a valuable indicator for any advance.

112. The numbers of fly caught at Fort Johnston reached a low level in the first few months of the year, but thereafter began to rise again. Although the total catch is lower than 1955, catches in the last few months of 1956 were higher than the corresponding months of 1955.

(e) Addendum

113. Reference was made in the 1955 Report, paragraph 20, to the Nyala klipspringer. This should have read Nyasa klipspringer (*Oreotragus saltator aceratos*).

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

APPENDIX I

Staff as at 31st December, 1956

Director	H. J. H. Borley, M.A.
Fisheries Officer	A. D. Sanson, B.Sc.
Tsetse Botanist	B. Steele, B.Sc., Ph.D.
Fish Ranger (Rivers)	A. V. Gifkins
Fish Ranger	K. T. Howard
Game Control Officers	E. T. Llewellyn
	G. D. Muldoon
	O. J. Carey
Tsetse Ranger	C. H. E. Rickman

Fishery Research Organization
(Nkata Bay Sub-Station)

Scientific Officer	T. D. Iles, B.Sc.

APPENDIX II

CROP PROTECTION SCHEME

Animals Killed and Staff employed 1st January, 1956 to 31st December, 1956

	Totals 1955	*Northern Province*	*Central Province*	*Southern Province*	*Totals* 1956
Average No. of hunters per month	25	4	10	7	21
Average No. of Netters	4	—	4	—	4
Average total men per month	29	4	14	7	25
Animals Killed:					
Elephant	20	—	21	4	25
Hippo	137	1	54	19	74
Buffalo	32	5	—	4	9
Waterbuck	—	1	—	—	1
Eland, roan, kudu	3	—	—	—	—
Other buck	18	—	1	1	2
Baboon	1,666	69	560	334	963
Pig	184	2	7	41	50
Vermin netted	340	No teams	546	No teams	546
Vermin killed for bounty by private effort	8,158	1,657	2,586	—	4,243
		Figures incomplete due to lack of Returns			
Rounds per beast	—	1.5	1.5	1.5	—
Beasts killed per man employed	83	29	108	60	65
		No effort after April			

APPENDIX III

Revenue accruing from Crop Protection Activities

Value of ivory	£79
Value of meat and skin sales	£118

APPENDIX IV

Game Licences issued during 1956

Type	*No. issued*	*Value* £
Residents	2,098	2,098
Protectorate Full	114	570
Visitors Full	15	150
Temporary	38	114
Elephant	5	50
Licences for sale and export of meat	6	25
TOTAL		£3,007

APPENDIX V

NON-AFRICAN FISHERY

Table I. Total Hauls of each type of net per annum. S.E. Arm

Type of Net	1952	1953	1954	1955	1956
Ring Net	3,926	3,755	4,729	4,214	3,728
Gill Net	560	600	814	649	858

Table II. Average Catch per Single Haul of Net

(*Numbers Represent Dozens*)

Firm Type of Net		1952	1953	1954	1955	1956
No. 1 Ring Net S.E.Arm	Tilapia	66	60	52	88	121
	Labeo	0.3	0.7	0.2	0.1	0.1
	Catfish	—	—	—	—	—
No. 2 Ring Net S.E.Arm	Tilapia	42	62	36	48	53
	Labeo	—	0.9	0.2	0.02	0.06
	Catfish	—	—	—	—	0.03
Gill Net S.E. Arm *	Tilapia	2	2	—	0.02	1.5
	Labeo	40	36	52	43.3	30.88
	Catfish	6	6	8	1.4	8.3
Gill Net S.W. Arm *	Tilapia	—	—	—	3.6	9.19
	Labeo	—	—	—	11.6	32.04
	Catfish	—	—	—	17.8	15.91

*Figures corrected to average length of 1,600 yds. set length.

Table III. Total Catches of more important Species

(*Numbers Represent Dozens. Weight estimated as short tons*)

Year *S.E. Arm*	*Tilapia (Adult)*	*Tilapia (Immature)*	*Labeo*	*Catfish*	*Other*	*Wt.*
1952	214,854	—	25,418	4,659	36	1,978
1953	228,820	—	28,818	5,044	5	2,118
1954	210,710	—	41,015	8,071	18	2,147
1955	287,003	—	27,658	3,525	5	2,536
1956	304,660	—	23,094	6,192	—	2,680
S.W. Arm						
1955	1,261	—	2,508	5,612	322	135
1956	2,802	—	9,977	5,367	912	213

Table IV. Landings per Month. (*Short Tons*)

Jan.	*Feb.*	*March*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
303	340	444	373	306	220	98	95	184	157	279	94

Table V. Number of Nets registered by non-African Firms

Type of Net	*Number*	*Average Length*	*Average Depth*	*Fees Paid*
Ring Net	5	400 yds.	120 ft.	£50
Gill Net	13,400 yds.	—	16 ft.	£67

APPENDIX VI

AFRICAN FISHERY

Table I. Total Number of Hauls of main Types of Net observed at Recording Stations

	Large Meshed Seines			*Small Meshed Seines*			*Gill Nets*			*Chilimila or Ring Nets*		
	1954	*1955*	*1956*	*1954*	*1955*	*1956*	*1954*	*1955*	*1956*	*1954*	*1955*	*1956*
Malindi	—	—	—	2,535	1,424	2,782	11	209	238	—	—	—
Mateweri	145	189	58	124	147	323	133	46	28	—	—	—
Shire River	1,733	1,271	912	—	—	—	—	—	—	—	—	—
Mpemba	66	5	55	263	554	220	68	212	2,400	719	703	662
Monkey Bay	64	16	17	87	145	47	14	20	57	—	261	495
Kota Kota	126	148	140	114	8	268	765	483	251	—	—	—
Salima	455	509	587	50	124	21	178	7	100	—	—	—
Domira Bay	173	197	95	95	74	198	1,046	784	147	—	—	—
Chia	923	176	251	14	10	—	94	450	648	147	262	476
Lake Chilwa	—	—	—	—	—	—	8,777	5,570	6,215	—	—	—
Lake Malombe ..	68	383	296	—	—	—	34	16	34	—	—	—

Table II. Average Catch per Single Haul of Net at Recording Station

(Figures Represent Actual Numbers of Fish)

A. Large Meshed Seines

Period and Station		*Tilapia (Adult)*	*Tilapia (Immature)*	*Labeo*	*Catfish*	*Haplochromids*
Mateweri	1953	110.45	—	5.28	0.73	—
	1954	130.61	—	5.59	3.40	—
	1955	91.52	—	3.32	2.24	—
	1956	42.67	—	0.39	0.84	—
Mpemba	1953	40.93	—	3.56	0.37	—
	1954	17.38	—	6.33	2.66	—
	1955	78.20	—	4.20	6.60	—
	1956	12.35	—	2.62	0.60	—
Shire River	1953	27.53	0.25	2.09	0.23	—
	1954	31.30	—	2.91	0.19	—
	1955	25.79	—	1.95	0.23	—
	1956	40.14	—	0.93	0.58	—
Monkey Bay	1953	4.00	—	0.89	0.37	—
	1954	18.37	—	6.73	1.41	—
	1955	58.12	.115	11.00	1.00	—
	1956	22.94	.170	6.29	1.41	10
Kota Kota	1953	64.55	3.50	97.17	16.16	—
	1954	96.04	—	52.61	12.92	—
	1955	30.27	—	75.12	16.82	—
	1956	52.16	—	20.21	10.35	160
Salima	1953	74.30	—	11.98	3.78	—
	1954	44.87	—	1.43	2.71	—
	1955	49.21	—	17.62	6.17	—
	1956	79.30	—	22.78	6.03	—
Domira Bay	1953	127.00	—	20.58	3.32	—
	1954	135.17	15	51.15	9.72	—
	1955	109.71	—	70.94	12.43	—
	1956	167.10	—	49.16	9.06	55
Chia Lagoon	1953	31.10	—	1.56	7.62	—
	1954	27.70	—	1.83	9.02	—
	1955	28.86	—	4.65	5.24	—
	1956	15.61	—	0.50	1.78	—
Mpamba	1953	—	—	—	—	—
	1954	31.11	—	96.2	11.42	—
	1955	31.84	—	76.09	33.76	—
	1956	124.87	—	79.95	18.89	—
Lake Malombe	1953	—	—	—	—	—
	1954	263.03	—	2.29	0.50	—
	1955	245.37	—	2.75	1.03	—
	1956	93.28	—	1.37	0.68	—

Table II—(*Continued*)

B. Small Meshed Seines

Period and Station		*Tilapia (Adult)*	*Tilapia (Immature)*	*Labeo*	*Catfish*	*Haplochromids*
Malindi	1953	0.46	0.05	0.47	0.53	455
	1954	0.51	10.00	0.61	0.33	645
	1955	0.93	34.50	2.03	0.40	645
	1956	0.34	110.00	1.25	0.29	1,250
Mateweri	1953	1.23	—	—	0.53	905
	1954	0.73	95	0.02	—	655
	1955	2.29	530	0.006	0.01	913
	1956	3.39	210	0.09	0.07	375
Mpemba	1953	0.72	70	0.34	0.09	310
	1954	0.32	175	0.001	0.003	770
	1955	0.24	115	0.009	0.02	1,079
	1956	0.64	70	0.05	1.92	685
Monkey Bay	1953	4.08	20	13.14	1.56	1,345
	1954	42.88	170	43.40	0.34	230
	1955	3.21	95	7.07	1.07	1,290
	1956	10.80	675	63.64	0.96	135
Kota Kota	1953	15.40	90	2.17	4.64	490
	1954	5.43	—	3.20	3.19	990
	1955	8.12	—	13.00	13.75	185
	1956	5.95	135	5.46	1.72	165
Salima	1953	20.40	—	6.92	2.60	535
	1954	26.48	2	13.50	16.96	305
	1955	7.72	—	5.59	6.95	1,410
	1956	46.05	—	1.76	3.67	1,205
Domira Bay	1953	161.26	—	31.73	11.53	25
	1954	80.35	10	16.87	9.65	50
	1955	60.85	—	21.83	9.94	530
	1956	87.39	230	24.68	4.80	465
Chia Lagoon	1954	0.79	—	—	—	1,065
	1955	6.50	—	0.10	—	—
	1956	—	—	—	—	—
Mpamba	1954	—	—	0.41	0.14	—
	1955	—	—	—	—	—
	1956	—	—	—	—	—

Table III. Summary of Catches by all Methods Observed at Recording Stations, 1956

(*Actual Numbers of Fish*)

Station	*Tilapia (Adult)*	*Tilapia (Immature)*	*Labeo*	*Catfish*	*Haplochromids*
Malindi	2,380	29,625	4,534	2,489	2,725,375
Mateweri	5,500	70,650	2,117	1,002	120,700
Shire River	43,490	—	464	1,678	—
Mpemba	13,307	15,250	12,447	11,538	499,050
Monkey Bay	1,154	39,650	3,264	1,003	25,410
Kota Kota	9,476	36,375	27,768	6,632	68,000
Salima	76,496	—	13,220	6,273	64,375
Domira Bay	22,382	29,100	11,694	2,073	97,350
Chia Lagoon	33,905	—	4,969	1,981	—
Lake Chilwa	15,304	—	—	1,747	—
Mpamba	9,249	—	6,032	1,510	—
Lake Malombe	28,023	—	408	1,050	—

APPENDIX VII

Summary of Traffic and Flies Caught at Decontamination Posts, 1956

Post	*Position*	*Number Motor Vehicles*	*Flies Caught*	*Number Cycles*	*Flies Caught*	*Number Pedestrians*	*Flies Caught*	*Total Flies*
Kota Kota	Outskirts Kota Kota township (N)	2,607	49	11,445	52	37,600	4	105
Chota	Outskirts Kota Kota township (S)	—	—	14,542	—	59,727	5	5
Mbobo	Approach to C.P. Highlands Kota-Kota–Lilongwe Rd.	1,191	126	1,987	66	3,153	11	203
Fort Johnston	Outskirts Ft. Johnston township East of Ferry crossing	2,717	96	121,867	640	156,772	849	1,589
Kasupe	Approach to Zomba Highlands Liwonde–Zomba Rd.	8,923	14	10,987	41	8,857	8	63
Lirangwe†	Approach to Shire Highlands From Shire Valley Matope Rd.	5,672	0	6,897	2	8,538	0	2
Masamba*	Approach to Chikwawa from Sumbu area	91	7	6,128	54	13,798	1	62

† Closed temporarily from September, 1956.
* Closed temporarily from December, 1956.

Long Term Records from De-Flying Posts

Station	*Total Flies* 1953	1954	1955	1956
Kota Kota	34	16	28	105
Chota	16	12	7	5
Mbobo	45	24	50	203
Fort Johnston	11,750	9,591	2,652	1,589
Kasupe	88	96	46	63
Lirangwe	32	11	0	2
Masamba	—	—	47	62