

CSC 35

NYASALAND PROTECTORATE



**Annual Report**  
of the  
**Department**  
of  
**Game, Fish and Tsetse Control**  
for the  
**Year ended 31st December**  
**1954**

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# Annual Report of the Department of Game, Fish and Tsetse Control for the Year, 1954

## (a) Staff and General

1. In June of this year Mr. B. L. Mitchell, Tsetse Entomologist, left the Department on transfer to the Game and Tsetse Department, Northern Rhodesia. His services as a general naturalist will be very much missed by the Department, as well as in the specialized field of Tsetse Control. We wish him well in his new appointment.

2. Dr. Steele, who worked for some two and three quarter years as Botanist to the Tsetse Survey, went on leave in May, but returned in late December to occupy a post on the staff of the Department proper. He will take Mr. Mitchell's place as technical officer in charge of Tsetse Control.

3. Mr. Rickman, Tsetse Ranger, returned from leave in June and Mr. Llewellyn, Game Control Officer, was on leave from May to December. Mr. Carey, Game Control Officer, went on leave after handing over to Mr. Llewellyn. Mr. Jackson, Officer in charge of the Fishery Research team at Nkata Bay, went on leave at the beginning of December, Mr. Iles taking over as officer in charge.

4. The staff position as at 31st December is set out in Appendix I.

## (b) Game

### CROP PROTECTION

5. In the year under Report the crop protection teams directly administered by the Game Control Officers continued to give priority to action against heavy game. In general the control of pigs and baboons was left to locally directed netting teams and to the efforts of private individuals, under the encouragement of the bounty system. This last type of effort again showed increase, particularly in the Central Province, where propaganda by the Game Control Officers was doubtless not without its effect. Unfortunately the netting teams produced rather disappointing results on the whole and it appears that these teams cannot be left to local direction as much as was hoped. At the same time, though the number of actual kills was disappointing, some of them did form a useful focal point for private effort.

6. In the Northern Province two armed teams were maintained, one in Karonga and the other in Rumpi District, both being administered by the respective District Commissioners. Both did useful work, though their contributions were probably more valuable in the political than the directly economic sense. A very creditable score was recorded against pig in Karonga District. The inhabitants of Nkata Bay District again did good work against baboon and vermin generally, in response to the bounty system, though the score was a little below that of 1953.

7. In the Central Province a large portion of the two teams was held as a cordon round Kasungu and Kota Kota Game Reserves, particularly during the planting season. They did good, if unspectacular, work in preventing raids from the Reserves by heavy game. In addition there was considerable action against hippopotamus along the Lake-shore, with special reference to Domira Bay and its embryonic rice scheme. In the absence of one of the Game Control Officers on leave, both teams had to be administered by the remaining officer during the second half of the year. There being few urgent calls for work against heavy game at this time, the hunters were largely employed against vermin and made a gradual sweep through a considerable part of Dedza, Kota Kota, Fort Manning and Kasungu Districts. The number of kills was moderate and lacking the possibility of really close direction by a European officer in the field the effort was probably not very lasting in its

effect. Like the Northern Province effort, it probably had considerable value in the political sense.

8. Three netting teams were maintained but produced only moderate results on the average, and the big effort against vermin came from private individuals acting under the bounty system. A total of some 8,600 head were disposed of under this system, more than double that of last year. It is unlikely that even this number begins to overtake natural regeneration, and the effect of the effort is probably not as great in any one place as was the carefully directed shooting of the large armed teams a year or so ago. Nevertheless it may increase to a biologically significant figure under further encouragement, and has the advantage of not involving any overhead costs.

9. In the Southern Province the major action by the armed team was against elephant in the central Shire Valley and on the fringes of the Kirk Range. The wheat crop was successfully defended against elephant and, with respect to the rest of this part of the Province, the herds were kept so continuously on the move that the incidence of damage did not press heavily in any one area. A small cordon was also maintained round the elephant country of the Majete, in defence of the cotton lands of the Mwanza and, later in the year, the team was in action against buffalo in protection of the same area.

10. One netting team was maintained in the Province, in action in Port Herald District, being largely paid for by the Native Administration. It did not receive much practical support and results were very poor. Attempts to start another team in the central Shire Valley were also abandoned because of lack of support from the local populace. The Game Control Officer had some considerable success against baboons by baiting with maize beer, but the method proved of limited seasonal application and although successful within those limits it was never adopted by the villagers. There was no other action against vermin. The armed team is no longer designed to be large enough for really effective action in this field, and the Southern Province Development Committee rejected, some years ago, the idea of any large scale bounty system.

Details of animals shot, staff employed and revenue accruing, are set out in Appendices II and III.

#### CROCODILE HUNTING

11. There was some increase in activity during 1954, four licensees being in action by the end of it. A total of 2,850 reptiles were dealt with of which 943 were trapped by Africans and sold to the licensees. Crocodile skins exported were valued at some £10,000 by the exporters.

#### GAME CONSERVATION

12. During the second half of the year the new Game Ordinance, enacted in 1953, was brought into operation simultaneously with the making of Rules under it. The hunting season was well advanced by the time it came into force and it was considered wisest to devote the remaining portion of the year to publicizing and explaining the new provisions rather than embarking on a general strict enforcement forthwith. The effect of the new regulations will not, therefore, be felt until 1955.

13. Nevertheless the putting into force of the Ordinance and the accompanying publicity focussed a certain amount of attention on fundamental provisions such as hunting licences, sanctity of Reserves, etc., which, as mere continuations of old provisions, were suitable for immediate enforcement, and these were rather better observed than previously. The number of Game Licences issued is set out in Appendix IV.

14. The Game Officers, again, paid increasing attention to the conservation side of the picture and during the dry season their main attention was directed to



the Reserves and other sanctuaries. There were a number of prosecutions or poaching but this is certainly a reflection of increasing vigilance rather than increasing poaching.

15. Visits by Game Staff and Honorary Game Wardens to the Reserves and other sanctuaries showed an encouraging position, particularly in respect to Kasungu Reserve and the Nyika and Majete non-shooting areas. Mr. Hayes, visiting the Nyika for three days in October saw a total of 438 head distributed through separate herds, many of which were seen on more than one occasion. Six species were represented. The Director in the course of an overnight visit to Kasungu in November, after early rains had permitted some dispersal of game from the major river line inspected, saw some 60 head including three separate elephant herds. The animals were calm and observed with ease, and all were within half an hour of easy walking from the Reserve camp at the end of the 13 mile access road made last year. The Game Control Officer reports a number of similar experiences. Very good concentrations of game were also round the Majete water holes in October. It is not, of course, pretended that these numbers would be worthy of comment in many African territories but in Nyasaland, where game is generally scarce, wild, and now almost completely nocturnal in its movements, the contrast is refreshing.

16. There are reports of heavy depredations by wild dog on the Nyika and some have been active in the Mwabvi. With regard to the former, depredations may have been heavy but one nevertheless gets an impression of an overall increase in game as far as the Nyasaland section is concerned.

17. A Game Officer's inspection of the Mwabvi, now some two hunting seasons old, showed a fairly representative collection of species and a fair standard of tameness, though the animals appear to withdraw to the south-western corner during most of the daylight hours of the very hot weather and hence are difficult to observe at that time. Rhinoceros are there in what, for Nyasaland, represent reasonable numbers, and elephant visited the area for a part of the year. They have not previously been reported in this Reserve. Unfortunately, presence of Nyala is now open to question, as they have still not been actually seen by a European, though when the area was first visited by Mr. Mitchell in 1950 it was confidently asserted by the local Africans that they were present.

18. The Departmental proposals for the revision of the boundaries of the Kota Kota Reserve were accepted during the year and the Reserve received an extension in the west which adds some 300 sq miles to its area. This is all very poor agricultural land and its inclusion in the Reserve should ease the problem of keeping the larger animals off the rich land on the eastern edge.

### (c) Fishery

#### STATE OF THE FISH STOCKS

19. Analysis of statistics for 1954 suggests the need for caution in the ring net fishery for *Tilapia* in the south-east Arm. The average catch per single haul of net by the older of two non-African firms show a slight but perceptible fall for the second year in succession, while those of the other, having risen greatly in 1953, fell very sharply in 1954 so that the overall picture for this year was of fall. There was a very considerable increase in the number of hauls made but this did not offset the fall in average catch and this year showed a landing of 210,710 dozen *Tilapia* as against 228,120 dozen last year with a markedly smaller effort.

20. The position does not, at present, seem at all serious. In general this fall in average catch per unit effort by the older firm is the result of very poor catches in January. Catches per unit effort for the other months show an increase on the whole, and even the average for the year is still nearly double that of 1948. The very sharp fall in the average catch of the newer firm may well have been caused by less skilful fishing.



21. Nevertheless, the overall picture does suggest that more fish are being taken out of the limited area fished than are being recruited to the stock and that the ring netting firms should make slight reductions in their efforts here if a good level of catches is to be maintained indefinitely. Expansion should take the form of increased use of gill nets against species other than *Tilapia* and of attempts to exploit the more distant parts of the area. The position must be watched carefully in the early months of 1955 and it may prove necessary to extend the close season slightly, at least in respect of the area south of Boadzulu Island. An appreciable reduction in effort during January and February, when it is often so difficult to get fish to market, might well pay a considerable dividend in the long run.

22. The position of the inshore stocks of *Tilapia*, as revealed by statistics of African fishing, does not appear to be decisively different from that in the previous year, there being a drop in average catch at some stations and rise at others. Rises and falls were scattered fairly evenly amongst the stations in and out of the South-east arm. There was an overall drop in observed landings but much of this was due to decreased effort as distinct from decreased average catch, and in general the stock seems fairly static at a fairly low level compared with some ten years ago.

23. A feature of the African fishery during 1954 was the reappearance of immature *Tilapia* in appreciable numbers in the small meshed seine catches. This is viewed with mixed feelings as it is unfortunate that they should be caught but an encouraging sign that they should be available for catching. At all stations except Monkey Bay catches continued to be small in proportion to the *Haplochromid* catches, against which fish these small meshed seines are primarily used.

24. *Haplochromids*, that is the "Utaka" complex, seem to be reasonably abundant and most "utaka" stations showed a considerable rise in catch per single haul. At Malindi the true "Utaka" (*Haplochromis trimaculatus*) which reappeared there last year, continued to yield good catches and the total landings of this species were more than doubled.

25. The stocks of Labeo and Catfish, judging by the statistics of the non-African gill net fishery, continued at a high level and the average catch per single set of net increased by an appreciable amount in spite of considerable increase in the number of sets. Data from the African fishery on the whole support the above impression.

#### THE NON-AFRICAN FISHERIES

26. The two old established licences in the south-east Arm functioned normally during the year, with some improvements in fishing craft. One firm built two large launches on its own premises and the other put into service smaller imported vessels.

27. Both ring net fishing and gill netting efforts were increased by these firms and though the former gave a decreased landing of *Tilapia* the latter more than made up the shortage with other fish. There was thus an overall rise in tonnage landed, from 2,118 short tons in 1953 to 2,147 short tons in 1954.

28. Two other licensees started operations in the south-west Arm, just before the end of the year, but their activities are in too early a stage to be suitable for comment. One is a gill net fishery only.

29. A third firm, first licensed for the central portion of the Lake in 1952, continued some desultory operations into the early months of 1954 but became discouraged by poor results and broke off operations at the end of the '53-'54 season. This is very disappointing, but by no means a final condemnation of the possibility of exploiting central Lake waters. The methods tried were an exact parallel to those used in the comparatively enclosed waters of the south-east Arm, and it is very possible that quite different methods will have to be evolved before this more exposed water can be exploited.

## THE AFRICAN FISHERY

30. The year showed the usual change of emphasis from place to place in conformity with minor variations in fish stocks. The return of *Utaka* to the Malindi area gave rise to a marked increase in use of the small meshed seines and there was a similar rise at the Bar fishing stations. The use of large meshed seines remained fairly stable, while gill nets increased markedly at some stations and decreased at others.

31. Unfortunately, the registration of African nets by Native Authorities is still incomplete and the registration system is not yet of any service for estimating numbers of nets or trends of fishing.

32. During the year the Department ceased to supply imported twine to African fishermen and withdrew in favour of commercial enterprise. The firm which started operations in 1953 has opened a depot in Fort Johnston area and appointed selling agents in many parts of the territory. Representatives of another British twine and net firm visited the territory during the year with a view to increasing sales, and an increasing number of stores begin to hold small stocks of netting and other twine.

33. This change in attitude towards the sale of fishing gear on the part of traders is significant and welcome. It indicates greater interest in serious fishing on the part of the African fishing population, and it is considered that the present trend reflects the success of both the Departmental sales scheme and Departmental propaganda.

34. The more progressive fishermen continued to concentrate on the better quality gear and to reject inferior qualities in spite of their relative cheapness. This is, in part, a result of their own experience but to a greater extent due to the evidence and advice proffered by the Department.

35. The most significant change in the African effort, however, is the beginning of the emergence of truly commercial organizations. More than one of these has failed, due to a combination of insufficient reserve of capital and low prices of fish during the main fishing season, but two enterprises seem to be well established in the south-east Arm.

36. One of these operates three boats and two outboard engines, uses a ring net of the European pattern, and has a regular labour force of some 24 men at competitive wages. The other is a gill net fishery, using nylon nets, and has two commercially built boats, an outboard engine and an 8 cwt. truck for fish distribution. These fisheries, in spite of their fairly impressive capital equipment and scale, still need very careful management and guidance to make them thoroughly sound, and every effort is being made to persuade their owners to keep proper books and catch records.

37. A number of other Africans in the south-east Arm are attempting similar enterprises to the above. A very good effort is being made by a combine of five men at the Chia Lagoon and an effort is about to be made at Nkata Bay.

38. It is thus evident that although the great proportion of the African industry remains largely subsistence and, in a sense, sub-economic, there are signs that progressive Africans are becoming increasingly interested in its real commercial possibilities. It is to be noted that few if any of the businesses mentioned above are owned or run by local fishermen. They are practically all educated men from other areas and other walks of life. It is also worthy of record that the Fisheries Officer has established a close liason with them and they are very appreciative and receptive of his advice and guidance.

## THE FISH TRADE

39. The situation in the trade continues to be very complex. Complaints were rife during the period from January to March that fish dealers, both African

and non-African, could not get rid of their consignment at economic prices, and on the other hand, during the cold weather months, prices on many of the up-country markets were quite unreasonably high.

40. At all times, and at all prices, cured fish seem to "move" very slowly. It appeared from data collected that on the average it took eight days to sell 300 lbs. of dried fish and it was not unusual for a dealer to take a month to sell fish which he had purchased for £20.

41. The studies of the markets suggest that dealers, in the main, continue to demand as high a price as they can eventually get for fish, quite irrespective of the time it takes to sell it. Setting practically no value on their time they make little or no attempt to raise income by increasing turnover and rely entirely on raised prices for increased profits. The result appears to be that though for three months of the year fish is at fairly low price level it is so high for the remainder that the product is out of reach of more than a few Africans. It thus has little chance to reach the status of a common article of diet, and is therefore not bought with great speed even when at a low price.

42. It must also be remembered that most populations are conservative in their diet. The landing of really big catches from Lake Nyasa and the provision of even the rather indifferent transport facilities which now exist, are comparatively recent developments. It would be unreasonable to suppose that the comparatively sudden increase in catch and wider distribution must automatically and immediately result in the adoption of fish as a standard article by people, who a few years ago, could seldom get hold of it.

43. The situation does not greatly worry the dealers, who have, in the main, small capital commitments and very small overheads. Nor does it worry the small scale, owner-manned, sub-economic subsistence fisheries, whose activities are not, in the last analysis, designed to yield a real commercial profit. It does, however, make things very difficult for the embryonic commercial African fishermen, who with labour forces to pay, perishable nets to maintain and slender reserves of capital, must have a reasonably quick turnover and a ponderable income within a few weeks.

44. The solution would seem to be some form of bulk buying and retailing organization which could, with its capital reserves, maintain a reasonably steady price to both consumer and producer all the year round, and damp down the considerable fluctuations of supply and price which take place. This would have to be allied with some totally new departure in processing, which would make possible the stock-piling of wet season surpluses against dry season shortages.

45. In the face of difficulties encountered with selling of cured fish the two non-African firms continued to sell their fish uncured whenever at all possible. This is an excellent thing in many ways but tends to lead to temporary overloading of the more accessible Southern Province markets. There is also appreciable wastage when the weather is bad and road transport uncertain. Cured fish were, on several occasions, offered on the open market by non-African firms, at prices much lower than those pertaining amongst African dealers. Sales were, however, impracticably slow.

#### DEVELOPMENTAL WORK

46. The sale of twine to African fishermen was discontinued during the year and the way left clear for private enterprise. Happily, the abandonment of this activity has not led to loss of contact with the progressive fishermen, though they were originally met in consequence of it, and much time and effort were spent in advising and guiding them. The unspectacular nature of this sort of work should not be allowed to obscure its great importance.

47. Boat-building continued under the scheme, financed by the Native Development and Welfare Fund, but was again severely handicapped by shortages of plank timber. Nevertheless, the scheme was kept alive and the demand for boats, though still small, is steadily increasing. It is still not large enough to support a commercial undertaking of any considerable scale but building these small craft should form a profitable field for a one or two-man African enterprise. Unfortunately, endeavours to sponsor such a business have not yet been successful; the small partnership referred to in the 1953 Report having broken up after an encouraging start.

48. An important contribution to fishing operations was made by evolving and arranging for the commercial manufacture of baked clay weights for net footropes, to replace the clumsy lumps of rock usually used by the African fishermen. The smooth clay weights are surprisingly resistant to breakage, should increase efficiency by bringing the footrope closer to the bottom, and considerably reduce tearing of the net.

#### EXPERIMENTAL WORK

49. Test fishing with 1 ins. meshed "utaka" seines and nets of equivalent length but 3 ins. minimum mesh, was carried out.

50. The object was to determine the comparative catch of the two nets and estimate to what extent depression of "utaka" catches resulting from the use of the larger mesh would be off-set by catches of other species.

51. The results showed plainly that the catch of other species with the larger mesh would not nearly compensate for the "utaka" lost, the catch of the small mesh net being three times the weight of the large mesh: secondly, that not more than 10 per cent. of the standard size "utaka" net catch was immature *Tilapia*.

52. It would thus appear that an attempt to protect immature *Tilapia* by insisting on large meshes for the standard size "utaka" net would bring the "utaka" fishery to a stand still and, in view of the importance of this fishery, would be false economy.

53. It was considered, however, that there was no case for permitting the use of very large nets with a mesh likely to catch immature *Tilapia*, since these would do some appreciable damage and were unnecessarily large for the prosecution of the "utaka" fishery. It was therefore decided to insist on a minimum mesh of 4 inches for nets of 250 yards or more. African seine nets in the south-east Arm will thus be brought into line with the non-African nets.

54. Gill net tests were continued with a variety of experimental objects, and the following conclusions reached:—

(1) That hand made nylon nets were superior in life and catching power to the 1953/54 machine made productions, the knots of which slip badly.

(2) That the efficiency of nylon and terylene nets was not markedly different in Lake Nyasa. Comparative length of life of the terylene nets has not yet been determined.

(3) That gill nets made with heavy (252) nylon cord had twice the actual life of nets made with light (126) cord but that the total catch was much less in spite of this fact.

(4) That preserving cotton gill nets with a copper preservative gave them 50 per cent. more life and did not greatly alter catching efficiency.

55. Some experiments were also made with baiting of nets in the attempt to increase efficiency. The method of baiting chosen gave inconclusive results and the experiment will be continued using other methods.

#### FISHERIES RESEARCH ORGANIZATION

56. The Research Organization will produce its own Report in due course so there is no necessity to go into detail here.



57. It suffices to say therefore that the team has pressed forward with the collection of fundamental data on plankton density distribution and constitution; chemical constituents of Lake water; seasonal temperature changes; oxygen content at varying depths, and matters of a similar nature which it is necessary to know before the desired estimate of the basic productivity of the northern waters can be made.

58. Much progress has also been made in sorting out the bionomics of the "Utaka" complex, which must be done before a logical plan for exploitation can be drawn up.

59. Finally, on the directly practical side, the deep water gill netting has been continued and, in the course of tours, carried on for test periods in more distant waters, notably in the vicinity of Likoma Island. Here the catches made gave rise to considerable interest on the part of the local Africans. Unfortunately, owing to delays in receipt of the necessary gear, it has not been possible to make experiments with complete new methods such as mid-water trawls.

60. In the course of the fishing experiments several fish new to science have been found including two new types of catfish. Much interest was also aroused by the discovery of a true eel at Nkata Bay, a single specimen only. This fish had not previously been authoritatively recorded from Lake Nyasa or the Shire River above the Livingstone Falls. Investigations at Fort Johnston brought to light three more eels in the Shire River, just at the turn of the year, but as the local fishermen appear unable to distinguish between it and a totally unrelated but eel-like fish, long known to be present, it is difficult to say how common it really is. To date the indication is that true eels are not unknown but are certainly not common.

61. During the year work of the Fisheries Research organization received an added stimulus from the arrival of the long expected deep water launch "Gigipat". Her equipment includes echo-sounding apparatus, which is proving a most valuable tool for the discovery of hitherto unsuspected banks and shelves in the off-shore water and for revealing the location of fish shoals when there is no visible sign on the surface.

62. "Gigipat's" arrival was not unattended by trouble for it was found, on her arrival at Beira, that a mistake had been made in the measurements made by the ship-building firm in England, who were responsible for renovation and conversion, and she proved larger than information from them had previously indicated. It was hence necessary to cut away a considerable portion of her decking and upper works before she could be carried to Nyasaland by rail. On arrival in Nyasaland the next task was the replacing of the several portions. This was by no means easy but with the willing co-operation of the Nyasaland Railways, the invaluable assistance of the Public Works Department and the skill and determination of Mr. Gilbert, Technical Assistant to the Research Organization, it was eventually achieved.

#### TROUT FISHERY

63. This year the first attempt was made to hatch eggs from local fish at the Nchenachena Hatchery, previous hatchings having been from imported eggs.

64. The operation was hindered by a good deal of ill-fortune. The first mishap was a devastating raid by a family of otters on the hatchery the night before stripping was to begin, when a large number of trout specially selected for breeding was destroyed. This was a very severe setback as it meant the loss of the best fish and also the loss of the early breeders, but a fresh collection for stripping was got together somehow, from the main hatchery stock, wild fish from the Nchenachena stream, etc., and stripping proceeded as planned.

65. In all some 14,400 eggs were stripped and fertilized and hatching and rearing commenced. The next trouble was the rather abnormally high stream temperatures

which then occurred and at times closely approached the lethal point. In the event considerable mortality occurred but in spite of these conditions 4,412 embryos were brought through to the fry stage. Considering the initial setback of the otter attack and the misfortune of temperatures, which had not been experienced during previous years, it is considered that this was a good result.

66. The fry were reared in the hatchery ponds during the remainder of the year and will be distributed during 1955.

67. During 1954 the Northern Rumpi and the Lunyangwa Rivers were opened to fishing for the first time. Few fishermen took advantage but some good fish were killed, the largest on the Northern Rumpi and Lunyangwa being 18 ins. and 16 ins. respectively.

68. Of the other northern streams stocked, the Kaziwiziwi has trout, but they are not yet numerous enough to permit fishing, while the Chelinda Rumpi, stocked at the same rate as the Northern Rumpi initially, only now begins to show a few fish, which do not take a fly readily. This stream carries a lot of silt in the lower levels during the rains, due largely to bad cultivation high up in its valley, and this may well be responsible for the poor results so far shown by it.

69. The full season for trout fishing does not end till 31st March and returns from licensees are not received till after that, so that detailed analysis of fish catches for the year under report cannot be given.

70. Mlunguzi Stream returns for the 1952/53 season have, however, been duly received and it is now possible to say a little about the results of that season.

71. A total of 1,060 fish were caught of which the largest was 17 ins. A total of 294 were returned as under sized. Details of the catch are set forth below in tabular form, with the Trout Warden's estimate of the age of the various groups and the percentage which each age group makes up of the total catch. In this table although the majority of 6 inch fish are taken as one year old a small proportion are estimated as being virtually two years old:—

<i>Length (inches)</i>	<i>No. Caught</i>	<i>Estimated Age in years</i>	<i>Percentage of total catch made up by each age group</i>
3-6	444	1	30.8
7	138	2	58.3
8	167		
9	194	3	7.5
10	52		
11	27	4	2.6
12	22		
13	6	5	.8
14	5		
15	-		
16	1		
17	2		

72. By comparison with results of investigations on Kenya streams with electric fishing apparatus, which is completely non-selective, the percentages of three four and five year old fish look rather low. The scale readings on which the Mlunguzi age estimates were made were, however, unavoidably rather few in number and judging by readings of a larger number of scales, made some years ago, there may be a tendency to underestimate the age. Kenya River Research Station opinion on the previous scale readings was that Mlunguzi fish were growing rather slowly

after the 6 ins. point and it is possible that some of the 9 ins. fish were in fact three years. Clearly more extensive scale readings are needed and during the 1954/55 season arrangements were made to collect these.

73. Meanwhile, so far as can be ascertained in discussion, Mlunguzi fishing during the 1954/55 season has been much as last year, though some fishermen say the new dam has either bred or collected a rather larger number of big fish.

74. A further small consignment of trout were successfully carried from the Mlunguzi to Domasi. Those put in during 1952 are still observable and seem to have grown well but there are as yet no signs of young Domasi-bred fish.

#### FISH FARMING

74. The *Tilapia* introduced to the Nchenachena ponds have continued to multiply. Some experiments have been initiated into the effect of various fertilizers on growth but the ponds are too irregular in shape and still not watertight enough to permit of any conclusions concerning effects.

75. The main value of the 1954 activities at Nchenachena has been to build up a very valuable stock of fry. In this connection it is worth reporting that a stock of 161 fish, introduced into the main pond, had, by December, developed into a stock of 1,473 fish of 8 cm and over, plus an estimated 6,000 fish of 7 cm and under which were too small to be actually caught.

76. In addition to the above activities, work started on the construction of more regular-shaped ponds in a neighbouring valley of more favourable terrain, where it should be possible to work in a more carefully organized manner and attempt more controlled production.

77. Fish farming trials are also planned at Makanga Experimental Farm at Chiromo, in collaboration with the Agricultural Department. Unfortunately, it was not possible to make any progress with these as it was not till late in the year that a pond which would hold water was completed.

#### (d) Tsetse Control

78. The report on the Tsetse Survey was duly produced and submitted to Government during the year. It is at present under consideration. The survey covered the Central and Southern Province belts but, apart from Karonga, did not touch the Northern Province. The survey of the remaining Northern Province belts was, however, attacked by Mr. Rickman on his return from leave in June and the greater part of the S. Rukuru Valley, the only known tsetse area apart from Karonga, had been covered by the end of the year. A further inspection will be necessary during the wet season to amplify and confirm the dry season findings.

79. There was little field action in respect of the Karonga Reclamation Scheme. Fly patrols were maintained during the early part of the year and though fly incidence continued low in the clear-felled area it obstinately refused to fall to absolute zero. In discussion with the Tsetse and Trypanosomiasis Committee it was therefore decided to try the effect of insecticides on the neighbouring unfelled area of the belt. This was in the hope of achieving a quick elimination in this area, if only a short-term one, and of settling the question as to whether the flies still being found in the clear-felled areas had been bred there, or were merely migrants from the untouched part of the belt.

80. As it was late in the year before the necessary equipment, insecticide, etc., could be got up to the scene of action it was decided that operations must be held over till the end of the rains.

81. Meanwhile the fly patrols were continued and the clear-felled areas again subjected to as fierce a burn as possible. The data collected by the fly patrols are set forth in Appendix VII. They show plainly that there is a marked difference

between the felled and unfelled areas but that while fly incidence remains low in the former, it has not disappeared entirely.

82. The effect on cattle trypanosomiasis in the area has, nevertheless, been encouraging as cases have dropped from 255 in 1952, when clear-felling started, to 63 in 1954. In the Ngerenge area at the extreme south of the belt only 18 cases were recorded as against 30 in 1953 and 100 in 1952. Kaporo area had six cases in 1954 as against 65 in 1953 and the highest incidence is now in the Songwe area, in the vicinity of the unattacked portion of Yembe Hill.

83. The decontamination sheds on the main traffic routes of the Central and Southern Provinces were maintained as usual. Catches of fly are set out in Appendix VIII.

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

APPENDIX I

Staff as at 31st December, 1954

Director .. .. .	H. J. J. BORLEY, M.A.
Fisheries Officer .. .. .	A. D. SANSON, B.SC.
Tsetse Botanist .. .. .	B. STEELE, B.SC., PH.D.
Game Control Officers .. .. .	E. T. LLEWELLYN
	G. D. MULDOON
	O. J. CAREY
Trout Warden .. .. .	A. V. GIFFKINS
Tsetse Ranger .. .. .	C. H. E. RICKMAN

FISHERY RESEARCH ORGANIZATION

Senior Scientific and Officer in Charge ..	P. B. N. JACKSON, M.SC.
Scientific Officers .. .. .	T. D. ILES, B.SC.
	D. HARDING, B.SC.
	G. FRYER, B.SC.
Technical Assistant .. .. .	M. P. GILBERT



APPENDIX II  
CROP PROTECTION SCHEME

Table of Animals Killed and Staff employed 1st January, 1954, to 31st December, 1954

	Totals 1953	Northern Province	Central Province	Southern Province	Totals
Average No. of armed hunters per month ..	31	5.8	17.0	7.0	30
Average No. of Netters ..	10	—	6.1	3.7	10
Average total men per month	<u>41</u>	<u>5.8</u>	<u>23.1</u>	<u>10.7</u>	<u>40</u>
<b>ANIMALS KILLED:</b>					
Elephant .. ..	63	5	27	78	110
Hippo .. ..	58	7	33	8	48
Buffalo .. ..	19	16	1	14	31
Waterbuck .. ..	1	—	—	—	—
Roan, eland, kudu ..	—	—	4	—	4
Other buck .. ..	62	29	2	—	31
<b>Baboon:</b>					
Shot .. ..	2,871	759	3,236	—	3,995
Netted .. ..	999	—	641	391	1,032
Poisoned .. ..	38	—	—	—	—
	} 3,908				} 5,027
<b>Pig:</b>					
Shot .. ..	175	191	36	—	227
Netted .. ..	—	—	—	3	3
					} 230
Vermin killed for bounty by private effort ..	7,056	1,804	8,609	137	10,550
Carnivora .. ..	40	1	14	11	26
Rounds per beast ..		?	1.7	7	?
Beasts killed per men employed .. ..	107	173	173	47	137

APPENDIX III

Revenue accruing from Crop Protection Activities

Value of ivory .. ..	£1,760
Value of meat sold .. ..	£147

APPENDIX IV

Game Licences issued during 1954

Type	No. Issued	Value
Residents' .. ..	2,234	£2,234
Protectorate .. ..	92	460
Visitors' Full .. ..	—	—
Temporary .. ..	4	12
Elephant .. ..	6	60
		<u>£2,766</u>

APPENDIX V

NON-AFRICAN FISHERY

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

Type of Net	1951	1952	1953	1954
Ring Net .. ..	4,264	3,926	3,755	4,729
Gill Net .. ..	344	560	600	814

Table II. Average Catch per Single Haul of Net

(Numbers Represent Dozens)

Firm Type of Net		1951	1952	1953	1954
No. 1 Ring Net S.E. Arm	Tilapia .. ..	44	66	60	52
	Labeo .. ..	—	0.3	0.7	.2
	Catfish .. ..	—	—	—	—
No. 2 Ring Net S.E. Arm	Tilapia .. ..	26	42	62	36
	Labeo .. ..	—	—	0.9	0.3
	Catfish .. ..	—	—	—	—
Gill Net S.E. Arm	Tilapia .. ..	13	2	2	—
	Labeo .. ..	86	40	36	52
	Catfish .. ..	33	6	6	8

Table III. Total Catches of more Important Species in S.E. Arm

(Numbers Represent Dozens. Weight estimated as Short Tons)

Year	Tilapia (Adult)	Tilapia (Immature)	Labeo	Catfish	Other	Wt.
1951 .. ..	131,247	—	15,557	6,423	848	1,278
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

Table IV. Landings per Month. (Short Tons)

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
100	215	340	248	376	180	131	116	86	112	166	77

Table V.—Number of Nets registered by Non-African Firms

Type of Net	Number	Average Length	Average Depth	Fees paid
Ring Net .. ..	4	400 yds.	120 ft.	£40
Gill Net .. ..	6,200 yds.	—	16 ft.	£50

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	
	1953	1954	1953	1954	1953	1954	1953	1954
Malindi .. ..	—	—	1,617	2,535	36	11	—	—
Matewari .. ..	186	145	13	124	30	133	—	—
Shire River .. ..	1,930	1,733	22	—	—	—	—	—
Mpemba .. ..	64	66	155	263	219	68	694	719
Monkey Bay .. ..	123	64	215	87	37	14	—	—
Kota Kota .. ..	211	126	81	114	2,185	765	—	—
Salima .. ..	585	455	—	50	78	178	—	—
Domira Bay .. ..	169	173	—	95	671	1,046	—	—
Chia .. ..	—	—	—	14	2	94	371	147
Lake Chilwa .. ..	1,110	923	—	—	—	—	—	—
Lake Malombe .. ..	—	—	—	—	5,575	8,777	—	—
	Not observed	68	Not observed	—	Not observed	34	Not observed	—

Table II. Average Catch per Single Haul of Net at Recording Stations  
(Figures Represent Actual Numbers of Fish)

A. Large Meshed Seines.

Period and Station		Tilapia (Adult)	Tilapia (Immature)	Labeo	Catfish	Haplochromids
Mateweri	1952	102.19	—	1.6	1.4	—
	1953	110.45	—	5.28	0.73	—
	1954	130.61	—	5.59	3.4	—
Mpemba	1952	40.93	—	7.9	2.15	—
	1953	17.38	—	3.56	0.37	—
	1954	30.64	—	6.33	2.66	—
Shire River	1952	27.53	.15	2.84	0.45	—
	1953	31.3	.25	2.09	0.23	—
	1954	22.53	—	2.91	0.19	—
Monkey Bay	1952	38	—	13.89	.63	—
	1953	4	—	.89	.37	—
	1954	18.37	.2	6.73	1.14	—
Kota Kota	1952	69.17	—	91.90	9.44	—
	1953	64.55	3.5	97.17	16.16	—
	1954	96.04	—	52.61	12.92	—
Salima	1952	59.58	—	8.07	2.85	—
	1953	74.30	—	11.98	3.78	—
	1954	44.87	—	7.43	2.71	—
Domira Bay	1952	159	55	39.76	3.67	—
	1953	127	—	20.58	3.32	—
	1954	135.17	15.00	51.15	9.72	—
Chia Lagoon	1952	25	—	1.30	8.00	—
	1953	31.1	—	1.56	7.62	—
	1954	27.7	—	1.83	9.02	—
Mpamba	1954	31.11	—	96.2	11.42	—
Lake Malombe	1954	263.03	—	2.29	.5	—

B. Small Meshed Seines.

Period and Station		Tilapia (Adult)	Tilapia (Immature)	Labeo	Catfish	Haplochromids
Malindi	1952	0.3	—	0.44	0.17	570
	1953	0.46	.05	0.47	0.53	455
	1954	0.51	10	0.61	0.33	645
Mateweri	1952	1.6	460	0.3	0.3	1,250
	1953	1.23	—	—	0.53	905
	1954	0.73	95	0.02	—	655
Mpemba	1952	0.40	10	0.03	0.1	220
	1953	0.72	70	0.34	0.09	310
	1954	0.32	175	.001	.003	770
Monkey Bay	1952	23.74	30	7.17	1.56	840
	1953	4.08	20	13.14	1.56	1,345
	1954	42.88	170	43.4	.34	230
Kota Kota	1952	40.0	—	4.73	4.36	—
	1953	15.4	90	2.17	4.64	490
	1954	5.43	—	3.2	3.19	990
Salima	1952	23.28	—	4.73	2.67	80
	1953	20.64	—	6.92	2.60	535
	1954	26.48	2	13.5	16.96	305
Domira Bay	1952	6.50	—	1.50	2.50	—
	1953	161.26	—	31.73	11.53	25
	1954	80.35	10	16.87	9.65	50
Chia Lagoon	1954	0.79	—	—	—	1,065
Mpamba	1954	—	—	.41	.14	—

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

(Actual Numbers of Fish)

Station	<i>Tilapia</i> (Adult)	<i>Tilapia</i> (Immature)	<i>Labeo</i>	Catfish	<i>Haplo-</i> <i>chromids</i>
Malindi .. ..	1,239 ..	2,730 ..	1,643 ..	920 ..	1,544,250
Matewari .. ..	25,277 ..	13,225 ..	4,413 ..	967 ..	91,750
Shire River .. ..	42,901 ..	— ..	5,054 ..	1,027 ..	—
Mpemba .. ..	2,436 ..	46,350 ..	1,634 ..	807 ..	751,550
Monkey Bay .. ..	5,849 ..	13,945 ..	4,128 ..	492 ..	20,750
Kota Kota .. ..	7,598 ..	— ..	32,158 ..	3,241 ..	63,875
Salima .. ..	28,592 ..	100 ..	8,551 ..	3,454 ..	14,750
Domira Bay .. ..	31,875 ..	3,600 ..	27,080 ..	4,051 ..	17,750
Chia Lagoon .. ..	34,140 ..	— ..	3,316 ..	12,553 ..	58,850
Lake Chilwa .. ..	50,042 ..	— ..	11 ..	4,201 ..	—
Mpamba .. ..	2,121 ..	— ..	6,693 ..	1,894 ..	—
Lake Malombe .. ..	18,216 ..	— ..	266 ..	55 ..	—

APPENDIX VII

Karonga Reclamation Scheme, 1954

Position with regard to gully vegetation.	Month	Average No. of flies per patrol in various sections			
		Ngerenge section	Katumbi section	Yembe S. section	Yembe N. section
<b>NGERENGE SECTION</b>					
Gullies clear felled in 1952-53 .. ..	Jan.	0.4	2.7	1.3	10
Burnt in October 1953 and 1954 .. ..	Feb.	0.24	3.8	2.1	11.5
No other action 1954 .. ..	March	0.4	2.0	1.6	11.5
<b>KATUMBI SECTION</b>					
Lower canopy only cleared in gullies in 1951 and 1952 .. ..	April	0.06	2.4	1.7	9.5
.. ..	May	0.07	3.4	1.1	8.65
No action since .. ..	June	0.2	3.4	1.1	10.2
<b>YEMBE S. SECTION</b>					
Clear felled in 1952-53 .. ..	July	0.12	2.7	1.6	10.0
Burnt October 1953 and 1954 .. ..	Aug.	0.08	3.2	1.4	12.0
No other action 1954 .. ..	Sept.	0.05	2.7	0.8	8.5
<b>YEMBE N. SECTION</b>					
Lower canopy only cleared in gullies in 1951 .. ..	Oct.	0.05	4.2	0.55	9.15
.. ..	Nov.	0.03	1.8	0.38	8.18
No action since .. ..	Dec.	0.02	1.98	0.88	7.68



APPENDIX VIII  
Summary of Traffic and Flies Caught at Decontamination Posts, 1954

Post	Position	Number Motor Vehicles	Flies Caught	Number Cycles	Flies Caught	Number Pedestrians	Flies Caught	Total Flies
Kota Kota	.. Outskirts Kota Kota township (N)	1,762	5	11,209	7	22,612	4	16
Chota ..	.. Outskirts Kota Kota township (S)	—	—	9,159	5	51,738	7	12
Mbobo	.. Approach to C.P. Highlands Kota Kota—Lilongwe Rd.	890	7	6,758	13	14,707	4	24
Mvera	.. Approach to C.P. Highlands Salima—Lilongwe Rd.	6,556	—	4,242	1	6,002	—	1
Fort Johnston	.. Outskirts Ft. Johnston township East of Ferry crossing	1,806	258	90,242	3,387	201,964	2,944	9,591
Kasupe	.. Approach to Zomba Highlands Liwonde—Zomba Rd.	5,357	35	12,486	58	11,434	3	96
Lirangwe	.. Approach to Shire Highlands From Shire Valley Matope Rd.	5,511	3	10,693	8	11,366	—	11

